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Technical Specification

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LTE;
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Evolved Packet Core (EPC) LCS Protocol (ELP)
between the Gateway Mobile Location Centre (GMLC
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Foreword

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

1 Scope

The present document specifies the procedures and information coding for the EPC LCS Protocol (ELP) that is needed to support the location services in E-UTRAN. The ELP message set is applicable to the SLg interface between the MME and the GMLC. ELP 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".

[2] 3GPP TS 23.271: "Functional stage 2 description of Location Services (LCS)".

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

[4] IETF RFC 3588: "Diameter Base Protocol".

[5] IETF RFC 2234: "Augmented BNF for syntax specifications".

[6] 3GPP TS 23.003: "Numbering, addressing and identification".

[7] 3GPP TS 29.171: "LCS Application Protocol (LCS-AP) between the MME and E-SMLC".

[8] 3GPP TS 29.274: "Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C)".

[90] IETF Draft draft-ietf-dime-rfc3588bis-18: "Diameter Base Protocol", work in progress.

[10] 3GPP TS 32.299: "Charging management; Diameter charging applications".

[11] 3GPP TS 29.272: "Evolved Packet System; MME and SGSN Related Interfaces Based on Diameter Protocol".

[12] 3GPP TS 29.329: "Sh Interface based on the Diameter protocol".

[13] 3GPP TS 33.210: "3G Security; Network Domain Security; IP Network Layer Security".

[14] IETF RFC 4960: "Stream Control Transmission Protocol".

[15] 3GPP TS 22.071: "Location Services (LCS); Service description".

[16] IETF RFC 5778: "Diameter Mobile IPv6: Support for Home Agent to Diameter Server Interaction".

[17] 3GPP TS 29.229: "Cx and Dx Interfaces based on the Diameter protocol; protocol details".

[18] 3GPP TS 29.173: "Location Services; Diameter-based SLh interface for Control Plane LCS".

[19] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

3 Definitions, symbols 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].

EPC-MO-LR: EPC Mobile Originating Location Request

EPC-MT-LR: EPC Mobile Terminating Location Request

EPC-NI-LR: EPC Network Induced Location Request

LCS: LoCation Services

LCS Client: software and/or hardware entity that interacts with a LCS Server (in this case, the GMLC) for the purpose of obtaining location information for one or more Mobile Stations. LCS Clients subscribe to LCS in order to obtain location information. LCS Clients may or may not interact with human users. The LCS Client is responsible for formatting and presenting data and managing the user interface (dialogue). The LCS Client may reside in the Mobile Station (UE).

LCS QoS: The QoS class determines the degree of adherence to the quality of service information as required by the source of a location request.

Target: UE being positioned

3.2 Symbols

For the purposes of the present document, the following symbols apply:

SLg Interface between GMLC and MME

3.3 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].

GMLC	Gateway Mobile Location Centre
EPC	Enhanced Packet Core
IMEI	International Mobile Equipment Identity
IMS	IP Multimedia Subsystem
IMSI	International Mobile Subscriber Identity
MME	Mobility Management Entity
UE	User Equipment, as defined in 3GPP TS 23.032 [3]

4 Functional Overview

4.1 General

This document defines the EPC LCS Protocol (ELP) used on the SLg interface between the GMLC and the MME in the Evolved Packet Core (EPC).

The location of the SLg interface within the LCS logical architecture is shown in Figure 4.1-1.

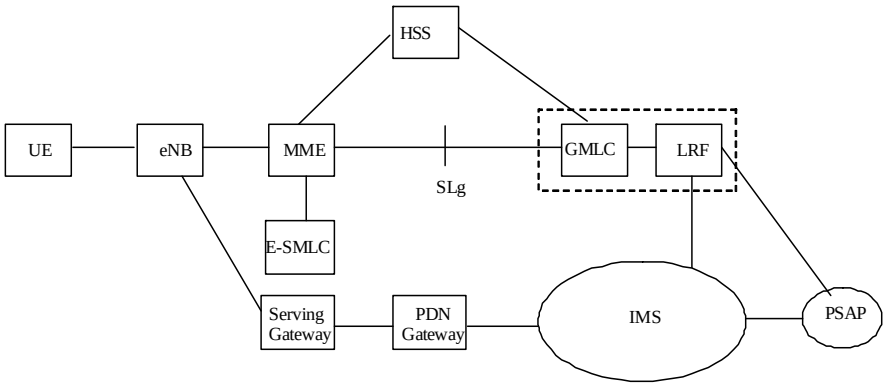

Figure 4.1-1 SLg interface in the LCS Architecture

The high level functions of the ELP protocol are described in 3GPP TS 23.271 [2].

The main functions of the protocol are:

- To allow the GMLC to request position estimates for a particular target UE from the MME in order to support the EPC-MT-LR positioning procedures. This is achieved using the Provide Subscriber Location message;
- To allow the MME to return a position estimate or an error report to the GMLC in response to a Provide Subscriber Location request as part of an EPC-MT-LR positioning procedure;
- To allow the MME to forward an unsolicited position estimate to the GMLC as part of the EPC-MO-LR or EPC-NI-LR procedures;
- To allow the GMLC to acknowledge receipt of an unsolicited position estimate as part of the EPC-MO-LR or EPC-NI-LR procedures;
- To support the procedures for handover of an IMS emergency call with EPS/GPRS access.

5 ELP Message Transport

5.1 General

The ELP protocol is defined as a Vendor Specific diameter application (SLg application). It reuses the basic mechanisms defined by the diameter base protocol, and it defines a number of additional commands and AVPs to implement the SLg specific procedures.

5.2 Use of Diameter base protocol

The Diameter Base Protocol as specified in IETF RFC 3588 [4] shall apply except as modified by the defined support of the methods and the defined support of the commands and AVPs, result and error codes as described in this specification. Unless otherwise specified, the procedures (including error handling and unrecognised information handling) shall be used unmodified.

5.3 Securing Diameter Messages

For secure transport of Diameter messages, see 3GPP TS 33.210 [13].

5.4 Accounting functionality

Accounting functionality (Accounting Session State Machine, related command codes and AVPs) shall not be used on the SLg interface.

5.5 Use of sessions

Between the MME and the GMLC, Diameter sessions shall be implicitly terminated. An implicitly terminated session is one for which the server does not maintain state information. The client shall not send any re-authorization or session termination requests to the server.

The Diameter base protocol includes the Auth-Session-State AVP as the mechanism for the implementation of implicitly terminated sessions.

The client (server) shall include in its requests (responses) the Auth-Session-State AVP set to the value NO_STATE_MAINTAINED (1), as described in IETF RFC 3588 [4]. As a consequence, the server shall not maintain any state information about this session and the client shall not send any session termination request. Neither the Authorization-Lifetime AVP nor the Session-Timeout AVP shall be present in requests or responses.

5.6 Transport protocol

Diameter messages over the SLg interface shall make use of SCTP (see IETF RFC 4960 [14]).

5.7 Routing considerations

This clause specifies the use of the Diameter routing AVPs Destination-Realm and Destination-Host.

Destination-Realm AVP shall always be included in all diameter requests, and therefore is declared as mandatory in the ABNF for all commands.

When a request is initiated by the GMLC, the name of the MME shall be determined by querying the HSS over the SLh interface, and retrieve the specific MME that is currently serving the UE. Therefore, Destination-Host AVP shall always be included in the commands originated at the GMLC, and is declared as mandatory in the ABNF.

When a request is initiated by the MME, the name of the GMLC may be either locally configured in the MME (e.g., in the intra-domain scenario, when the GMLC belongs to the same PLMN as the MME), or it is known from a previously received location procedure initiated at the GMLC. Therefore, the Destination-Host AVP is declared as mandatory in the ABNF of the commands originated at the MME.

5.8 Advertising Application Support

The MME and GMLC shall advertise support of the Diameter SLg Application by including the value of the application identifier in the Auth-Application-Id AVP within the Vendor-Specific-Application-Id grouped AVP of the Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands.

The vendor identifier value of 3GPP (10415) shall be included in the Supported-Vendor-Id AVP of the Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands, and in the Vendor-Id AVP within the Vendor-Specific-Application-Id grouped AVP of the Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands.

The Vendor-Id AVP included in Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands that is not included in the Vendor-Specific-Application-Id AVPs as described above shall indicate the manufacturer of the Diameter node as per RFC 3588 [4].

6 ELP Procedures

6.1 General

The ELP procedures, between the GMLC and the MME, are used to exchange messages related to location services over the SLg interface. The ELP can be divided into the following sub-procedures.

- Provide Subscriber Location
- Subscriber Location Report

6.2 Provide Subscriber Location

6.2.1 General

The Provide Subscriber Location operation is used by a GMLC to request the location of a target UE from the MME at any time. The response contains a location estimate of the target UE and other additional information.

6.2.2 Successful Operation

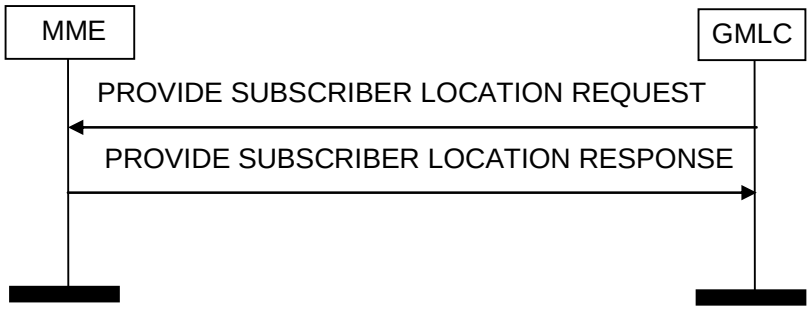

Figure 6.2.2-1: Provide Subscriber Location procedure. Successful operation.

The GMLC initiates the procedure by sending a PROVIDE SUBSCRIBER LOCATION REQUEST message to the MME. This message carries the type of location information requested (e.g. current location and optionally, velocity), the UE subscriber's IMSI, LCS QoS information (e.g. accuracy, response time) and an indication of whether the LCS client has the override capability.

Upon reception of PROVIDE SUBSCRIBER LOCATION REQUEST message, the MME shall perform authentication privacy verification on the location request. After that, the MME shall retrieve the location information of the target UE from E-UTRAN according to the procedures described in 3GPP TS 23.271 [2].

The MME returns a PROVIDE SUBSCRIBER LOCATION RESPONSE to the GMLC. The message shall contain the location estimate, its age and obtained accuracy. If the MME failed to get the current location and the LCS client is requesting the current or last known location, the MME may return the last known location of the target UE if this is known.

This procedure is mapped to the commands Provide-Location-Request/Answer in the Diameter application specified in sections 7.3.1 and 7.3.2.

Table 6.2.2-1: Provide Subscriber Location Request

Information element name	Mapping to Diameter AVP	Cat.	Description
Location Type	Location-Type	M	This Information Element shall contain the type of location measurement requested, such as current location, initial location, last known location, etc. (see 3GPP TS 22.071 [15]).
IMSI	User-Name	C	If present, this Information Element shall contain the IMSI of the user whose UE is to be positioned (see Note 1).
MSISDN	MSISDN	C	If present, this Information Element shall contain the MSISDN of the user whose UE is to be positioned (see Note 1).
IMEI	IMEI	C	If present, this Information Element shall contain the IMEI of the UE to be positioned (see Note 1).
Client Name	LCS-EPS-Client-Name	M	This Information Element shall contain the name of the LCS client issuing the positioning request.
Client Type	LCS-Client-Type	M	This Information Element shall contain the type of LCS client (Emergency, Lawful Interception …) issuing the positioning request (see 3GPP TS 23.271 [2] and 3GPP TS 32.299 [10]).
Requestor Name	LCS-Requestor-Name	O	If present, this Information Element contains the identity of the originating entity which has requested the location of the target UE from the LCS Client.
Priority	LCS-Priority	O	If present, this Information Element shall contain the priority of the LCS client issuing the positioning request.
QoS	LCS-QoS	O	If present, this Information Element shall contain the quality of service requested, such as the accuracy of the positioning measurement and the response time of the positioning operation.
Velocity Requested	Velocity-Requested	O	If present, this information element shall contain an indication of whether or not the Velocity of the target UE is requested.
Supported GAD Shapes	LCS-Supported-GAD-Shapes	O	If present, this Information Element shall contain the list of supported GAD shapes by the LCS client.
Service Type ID	LCS-Service-Type-ID	O	If present, this Information Element shall contain the service type associated for the particular positioning request (the meaning of the different service types is defined in 3GPP TS 22.071 [15]).
Codeword	LCS-Codeword	O	If present, this Information Element shall contain the Codeword to be used between an LCS client and a target UE in order to check and accept or reject the positioning request.
APN	Service-Selection	C	If present, this Information Element shall contain the Access Point Name (APN) Network Identifier of the LCS client, as used by the target UE. It shall only be included in session-related location requests.
Session-Related Privacy Check	LCS-Privacy-Check-Session	O	If present, this Information Element shall contain an indication of how the positioning operation should proceed in the relation to the checking of the session-related privacy settings of the user.
Non-Session-Related Privacy Check	LCS-Privacy-Check-Non-Session	O	If present, this Information Element shall contain an indication of how the positioning operation should proceed in the relation to the checking of the non-session-related privacy settings of the user.
Supported Features (See 3GPP TS 29.229 [17])	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.
NOTE 1: At least one of these IEs shall be present in the message.			

Table 6.2.2-2: Provide Subscriber Location Answer

Information element name	Mapping to Diameter AVP	Cat.	Description
Result	Result-Code / Experimental-Result	M	This Information Element shall contain the result of the operation. The Result-Code AVP shall be used to indicate success / errors as defined in the Diameter Base Protocol. The Experimental-Result AVP shall be used for ELP errors. This is a grouped AVP which shall contain the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP.
Location Estimate	Location-Estimate	O	If present, this Information Element shall contain an estimate of the location of the UE in universal coordinates and the accuracy of the estimate.
Accuracy Fulfilment Indicator	Accuracy-Fulfilment-Indicator	O	If present, this Information Element shall contain an indication of whether the requested accuracy (as indicated in the LCS-QoS IE in the request message) was fulfilled or not.
Age of Location Estimate	Age-of-Location-Estimate	O	If present, this Information Element shall contain an indication of how long ago the location estimate was obtained.
Velocity Estimate	Velocity-Estimate	O	If present, this Information Element shall contain an estimate of the velocity of the target UE, composed by horizontal speed, vertical speed, and their respective uncertainty (see 3GPP TS 23.032 [3]).
EUTRAN Positioning Data	EUTRAN-Positioning-Data	O	If present, this Information Element shall indicate the usage of each positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully. The internal structure and encoding is defined in 3GPP TS 29.171 [7].
ECGI	ECGI	O	If present, this Information Element shall contain the current cell location of the target UE. The E-UTRAN Cell Global Identifier (ECGI) is used to globally identify a cell.
Target Serving Node Identity	Serving-Node	O	If present, this information element shall contain the address of the target side serving node for handover of an IMS Emergency Call.
Supported Features (See 3GPP TS 29.229 [17])	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.

6.2.3 Unsuccessful Operation

On receipt of a PROVIDE SUBSCRIBER LOCATION RESPONSE with a Result-Code or Experimental-Result AVP indicating failure the GMLC considers the positioning request as failed.

6.3 Subscriber Location Report

6.3.1 General

The Subscriber Location Report operation is used by an MME to provide the location of a target UE to a GMLC when a request for location has been implicitly issued.

6.3.2 Successful Operation

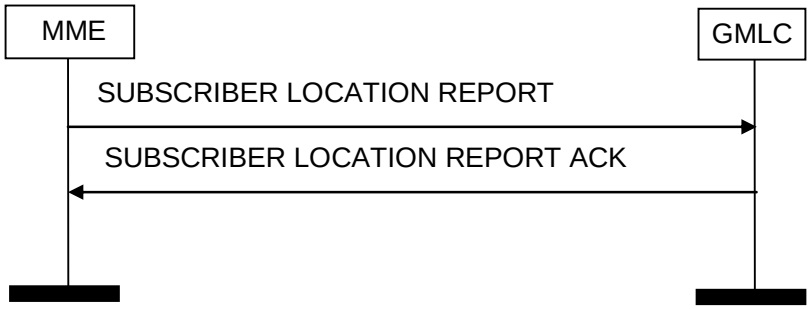

Figure 6.3.2-1: Subscriber Location Report procedure. Successful operation.

The MME initiates the procedure by sending a SUBSCRIBER LOCATION REPORT message to the GMLC. The message may carry the identity of the UE, the location estimate and its age, and the event causing the location report.

Upon reception of SUBSCRIBER LOCATION REPORT message, the GMLC shall return a SUBSCRIBER LOCATION REPORT ACK to the MME and process the location report accordingly, e.g. transfer of the location estimate to an external LCS Client according to procedure described in 3GPP TS 23.271 [2].

This procedure is mapped to the commands Location-Report-Request/Answer in the Diameter application specified in sections 7.3.3 and 7.3.4.

Table 6.3.2-1: Subscriber Location Report

Information element name	Mapping to Diameter AVP	Cat.	Description
Location Event	Location-Event	M	This Information Element shall contain the type of event that caused the location procedure to be initiated.
IMSI	User-Name	C	If present, this Information Element shall contain the IMSI of the user whose UE is to be positioned (see Note 1).
MSISDN	MSISDN	C	If present, this Information Element shall contain the MSISDN of the user whose UE is to be positioned (see Note 1).
IMEI	IMEI	C	If present, this Information Element shall contain the IMEI of the UE to be positioned (see Note 1).
Client Name	LCS-EPS-Client-Name	O	If present, this Information Element shall contain the name of the LCS client where the result of the positioning operation should be sent.
Location Estimate	Location-Estimate	O	If present, this Information Element shall contain an estimate of the location of the UE in universal coordinates and the accuracy of the estimate.
Accuracy Fulfilment Indicator	Accuracy-Fulfilment-Indicator	O	If present, this Information Element shall contain an indication of whether the requested accuracy was fulfilled or not.
Age of Location Estimate	Age-of-Location-Estimate	O	If present, this Information Element shall contain an indication of how long ago the location estimate was obtained.
Velocity Estimate	Velocity-Estimate	O	If present, this Information Element shall contain an estimate of the velocity of the UE, composed by horizontal speed, vertical speed, and their respective uncertainty (see 3GPP TS 23.032 [3]).
EUTRAN Positioning Data	EUTRAN-Positioning-Data	O	If present, this Information Element shall indicate the usage of each positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully. The internal structure and encoding is defined in 3GPP TS 29.171 [7].
ECGI	ECGI	O	If present, this Information Element shall contain the current cell location of the target UE. The E-UTRAN Cell Global Identifier (ECGI) is used to globally identify a cell..
Service Type ID	LCS-Service-Type-ID	O	If present, this Information Element shall contain the service type associated for the particular positioning report identifying the service at the receiving LCS Client (the meaning of the different service types is defined in 3GPP TS 22.071 [15]).
Pseudonym Indicator	Pseudonym-Indicator	O	If present, this Information Element shall contain an indication of whether or not a pseudonym must be allocated by the network and transferred to the LCS client as the identity of the UE.
Supported Features (See 3GPP TS 29.229 [17])	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.
LCS QoS Class	LCS-QoS-Class	O	If present, this Information Element shall contain the LCS-QoS-Class requested by the target UE.
Target Serving Node Identity	Serving-Node	O	If present, this information element shall contain the address of the target side serving node for handover of an IMS Emergency Call.
NOTE 1: At least one of these IEs shall be present in the message.			

Table 6.3.2-2: Subscriber Location Report Ack

Information element name	Mapping to Diameter AVP	Cat.	Description
Result	Result-Code / Experimental-Result	M	This Information Element shall contain the result of the operation. The Result-Code AVP shall be used to indicate success / errors as defined in the Diameter Base Protocol. The Experimental-Result AVP shall be used for ELP errors. This is a grouped AVP which shall contain the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP.
Supported Features (See 3GPP TS 29.229 [17])	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.

6.3.3 Unsuccessful Operation

If for some reason the GMLC does not accept the SUBSCRIBER LOCATION REPORT APDU, the GMLC shall send a SUBSCRIBER LOCATION REPORT ACK message with a Result-Code or Experimental-Result AVP indicating failure.

7 ELP Messages and Message Formats

7.1 General

The Diameter Base Protocol as specified in IETF RFC 3588 [4] shall apply except as modified by the defined support of the methods and the defined support of the commands and AVPs, result and error codes as specified in this specification. Unless otherwise specified, the procedures (including error handling and unrecognised information handling) shall be used unmodified.

This clause specifies a Diameter application that allows a Diameter server and a Diameter client:

- to retrieve the location information of a target UE
- to report the location information of a target UE

The SLg interface protocol is defined as an IETF vendor specific Diameter application, where the vendor is 3GPP. The vendor identifier assigned by IANA to 3GPP (http://www.iana.org/assignments/enterprise-numbers) is 10415.

The Diameter application identifier assigned to the SLg interface application is 16777255 (allocated by IANA).

7.2 Message Formats

This section defines Command-Code values for the SLg interface application.

Every command is defined by means of the ABNF syntax IETF RFC 2234 [5], according to the rules in IETF RFC 3588 [4]. If the definition and use of an AVP is not specified in this document, the guidelines in IETF RFC 3588 [4] shall apply.

For these commands, the Application-ID field shall be set to16777255 (application identifier of the SLg interface application).

The following Command Codes are defined in this specification:

Table 7.2-1: Command-Code values

Command-Name	Abbreviation	Code	Section
Provide-Location-Request	PLR	8388620	7.3.1
Provide-Location -Answer	PLA	8388620	7.3.2
Location-Report-Request	LRR	8388621	7.3.3
Location-Report-Answer	LRA	8388621	7.3.4

7.3 ELP Messages

7.3.1 Provide-Location-Request (PLR) Command

The Provide-Location-Request (PLR) command, indicated by the Command-Code field set to 8388620 and the "R" bit set in the Command Flags field, is sent by the GMLC in order to request subscriber location to the MME.

Message Format

< Provide-Location-Request> ::= < Diameter Header: 8388620, REQ, PXY, 16777255 >

< Session-Id >
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
{Destination-Host }
{ Destination-Realm }
{ Location-Type }
[User-Name]
[MSISDN]
[IMEI]
{ LCS-EPS-Client-Name }
{ LCS-Client-Type }
[LCS-Requestor-Name]
[LCS-Priority]
[LCS-QoS]
[Velocity-Requested]
[Supported-GAD-Shapes]
[LCS-Service-Type-ID]
[LCS-Codeword]
[LCS-Privacy-Check-Non-Session]
[LCS-Privacy-Check-Session]
[Service-Selection]
*[Supported-Features]
*[AVP]
*[Proxy-Info]
*[Route-Record]

7.3.2 Provide-Location-Answer (PLA) Command

The Provide-Location-Answer (PLA) command, indicated by the Command-Code field set to 8388620 and the "R" bit cleared in the Command Flags field, is sent by the MME to the GMLC in response to the Provide-Location-Request command.

Message Format

< Provide-Location-Answer > ::= < Diameter Header: 8388620, PXY, 16777255 >
< Session-Id >
[Result-Code]
[Experimental-Result]
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
[Location-Estimate]
[Accuracy-Fulfilment-Indicator]
[Age-Of-Location-Estimate]
[Velocity-Estimate]
[EUTRAN-Positioning-Data]
[ECGI]
[Serving-Node]
*[Supported-Features]
*[AVP]
*[Failed-AVP]
*[Proxy-Info]
*[Route-Record]

7.3.3 Location-Report-Request (LRR) Command

The Location-Report-Request (LRR) command, indicated by the Command-Code field set to 8388621 and the "R" bit set in the Command Flags field, is sent by the MME in order to provide subscriber location data to the GMLC.

Message Format

```
< Location-Report-Request> ::=  < Diameter Header: 8388621, REQ, PXY, 16777255 >
                                < Session-Id >
                                { Auth-Session-State }
                                { Origin-Host }
                                { Origin-Realm }
                                { Destination-Host }
                                { Destination-Realm }
                                { Location-Event }
                                [ LCS-EPS-Client-Name ]
                                [ User-Name ]
                                [ MSISDN]
                                [ IMEI ]
                                [ Location-Estimate ]
                                [ Accuracy-Fulfilment-Indicator ]
                                [ Age-Of-Location-Estimate ]
                                [ Velocity-Estimate ]
                                [ EUTRAN-Positioning-Data ]
                                [ ECGI]
                                [ LCS-Service-Type-ID ]
                                [ Pseudonym-Indicator ]
                                [ LCS-QoS-Class ]
                                [ Serving-Node ]
                                *[ Supported-Features ]
                                *[ AVP ]
                                *[ Proxy-Info ]
                                *[ Route-Record ]
```

7.3.4 Location-Report-Answer (LRA) Command

The Location-Report-Answer (LRA) command, indicated by the Command-Code field set to8388621 and the "R" bit cleared in the Command Flags field, is sent by the GMLC to the MME in response to the Location-Report-Request command.

Message Format

```
< Location-Report-Answer > ::=  < Diameter Header: 8388621, PXY, 16777255>
                                < Session-Id >
                                [ Result-Code ]
                                [ Experimental-Result ]
                                { Auth-Session-State }
                                { Origin-Host }
                                { Origin-Realm }
                                *[ Supported-Features ]
                                *[ AVP ]
                                *[ Failed-AVP ]
                                *[ Proxy-Info ]
                                *[ Route-Record ]
```

7.4 Information Elements

7.4.1 General

The following table describes the Diameter AVPs defined for the SLg interface protocol, their AVP Code values, types, possible flag values and whether the AVP may or not be encrypted.

Table 7.4.1-1: Diameter ELP Application AVPs

Attribute Name	AVP Code	Section defined	Value Type	AVP Flag rules				
				Must	May	Should not	Must not	May Encrypt
Location-Type	2500	7.4.2	Enumerated	M, V				No
LCS-EPS-Client-Name	2501	7.4.3	Grouped	M, V				No
LCS-Requestor-Name	2502	7.4.4	Grouped	M, V				No
LCS-Priority	2503	7.4.5	Unsigned32	M, V				No
LCS-QoS	2504	7.4.6	Grouped	M, V				No
LCS-QoS-Class	2523	7.4.27	Enumerated	M, V				No
Horizontal-Accuracy	2505	7.4.7	Unsigned32	M, V				No
Vertical-Accuracy	2506	7.4.8	Unsigned32	M, V				No
Vertical-Requested	2507	7.4.9	Enumerated	M, V				No
Velocity-Requested	2508	7.4.10	Enumerated	M, V				No
Response-Time	2509	7.4.11	Enumerated	M, V				No
Supported-GAD-Shapes	2510	7.4.12	Unsigned32	M, V				No
LCS-Codeword	2511	7.4.13	UTF8String	M, V				No
LCS-Privacy-Check	2512	7.4.14	Enumerated	M, V				No
Accuracy-Fulfilment-Indicator	2513	7.4.15	Enumerated	M, V				No
Age-Of-Location-Estimate	2514	7.4.16	Unsigned32	M, V				No
Velocity-Estimate	2515	7.4.17	OctetString	M, V				No
EUTRAN-Positioning-Data	2516	7.4.18	OctetString	M, V				No
ECGI	2517	7.4.19	OctetString	M, V				No
Location-Event	2518	7.4.20	Enumerated	M, V				No
Pseudonym-Indicator	2519	7.4.21	Enumerated	M, V				No
LCS-Service-Type-ID	2520	7.4.22	Unsigned32	M, V				No
LCS-Privacy-Check-Non-Session	2521	7.4.23	Grouped	M, V				No
LCS-Privacy-Check-Session	2522	7.4.24	Grouped	M, V				No
Note: The AVP header bit denoted as "M", indicates whether support of the AVP is required. The AVP header bit denoted as "V", indicates whether the optional Vendor-ID field is present in the AVP header. For further details, see IETF RFC 3588 [4].								

Table 7.4.1-2: Diameter ELP Application reused AVPs

Attribute Name	AVP Code	Reference	Value Type	Comment
LCS-Format-Indicator	1237	3GPP TS 32.299 [10]	UTF8String	
LCS-Name-String	1238	3GPP TS 32.299 [10]	UTF8String	
LCS-Client-Type	1241	3GPP TS 32.299 [10]	Enumerated	
LCS-Requestor-Id-String	1240	3GPP TS 32.299 [10]	UTF8String	
Location-Estimate	1242	3GPP TS 32.299 [10]	UTF8String	
IMEI	1402	3GPP TS 29.272 [11]	UTF8String	
MSISDN	701	3GPP TS 29.329 [12]	OctetString	
Service-Selection	493	3GPP TS 29.272 [11], IETF RFC 5778 [16]	UTF8String	It is used to define the APN
User-Name	1	IETF RFC 3588 [4]	UTF8String	It is used to include the user's IMSI
Supported-Features	628	3GPP TS 29.229 [17]	Grouped	
Feature-List-ID	629	3GPP TS 29.229 [17]	Unsigned32	See clause 7.4.25
Feature-List	630	3GPP TS 29.229 [17]	Unsigned32	See clause 7.4.26
Serving-Node	2401	3GPP TS 29.173 [18]	Grouped	See clause 7.4.28

7.4.2 Location-Type

The Location-Type AVP is of type Enumerated. The following values are defined:

CURRENT_LOCATION (0)

CURRENT_OR_LAST_KNOWN_LOCATION (1)

INITIAL_LOCATION (2)

RESERVED (3)

RESERVED (4)

NOTIFICATION_VERIFICATION_ONLY (5)

NOTE: Values (3) and (4) are reserved for future use. The other values are homogeneous with those defined for the equivalent information element in MAP.

7.4.3 LCS-EPS-Client-Name

The LCS-EPS-Client-Name AVP is of type Grouped.

AVP format:

LCS-EPS-Client-Name ::= <AVP header: 2501 10415>

[LCS-Name-String]
[LCS-Format-Indicator]

The details of the LCS-Name-String AVP and the LCS-Format-Indicator AVP are described in 3GPP TS 32.299 [10].

7.4.4 LCS-Requestor-Name

The LCS-Requestor-Name AVP is of type Grouped.

AVP format:

LCS-Requestor-Name ::= <AVP header: 2502 10415>

[LCS-Requestor-Id-String]
[LCS-Format-Indicator]

The details of the LCS-Requestor-Id-String AVP and the LCS-Format-Indicator AVP are described in 3GPP TS 32.299 [10].

7.4.5 LCS-Priority

The LCS-Priority AVP is of type Unsigned32. It indicates the priority of the location request. The value 0 shall indicate the highest priority, and the value 1 shall indicate normal priority. All other values shall be treated as 1 (normal priority). For details, refer to 3GPP TS 22.071 [15].

7.4.6 LCS-QoS

The LCS-QoS AVP is of type Grouped.

AVP format:

LCS-QoS ::= <AVP header: 2504 10415>

[LCS-QoS-Class]
[Horizontal-Accuracy]
[Vertical-Accuracy]
[Vertical-Requested]
[Response-Time]

7.4.7 Horizontal-Accuracy

The Horizontal-Accuracy AVP is of type Unsigned32. Bits 6-0 corresponds to Uncertainty Code defined in 3GPP TS 23.032 [3]. The horizontal location error should be less than the error indicated by the uncertainty code with 67% confidence. Bits 7 to 31 shall be ignored.

7.4.8 Vertical-Accuracy

The Vertical-Accuracy AVP is of type Unsigned32. Bits 6-0 corresponds to Uncertainty Code defined in 3GPP TS 23.032 [3]. The vertical location error should be less than the error indicated by the uncertainty code with 67% confidence. Bits 7 to 31 shall be ignored.

7.4.9 Vertical-Requested

The Vertical-Requested AVP is of type Enumerated. The following values are defined:

VERTICAL_COORDINATE_IS_NOT REQUESTED (0)

VERTICAL_COORDINATE_IS_REQUESTED (1)

Default value if AVP is not present is: VERTICAL_COORDINATE_IS_NOT_REQUESTED (0).

7.4.10 Velocity-Requested

The Velocity-Requested AVP is of type Enumerated. The following values are defined:

VELOCITY_IS_NOT_REQUESTED (0)

VELOCITY_IS_REQUESTED (1)

Default value if AVP is not present is: VELOCITY_IS_NOT_REQUESTED (0).

7.4.11 Response-Time

The Response-Time AVP is of type Enumerated. The following values are defined:

LOW_DELAY (0)

DELAY_TOLERANT (1)

7.4.12 Supported-GAD-Shapes

The Supported-GAD-Shapes AVP is of type Unsigned32 and it shall contain a bitmask.

A node shall mark in the BIT STRING all Shapes defined in 3GPP TS 23.032 [3] it supports.

Bits 6-0 in shall indicate the supported Shapes defined in 3GPP TS 23.032 [3]. Bits 7 to 31 shall be ignored.

ellipsoidPoint (0)

ellipsoidPointWithUncertaintyCircle (1)

ellipsoidPointWithUncertaintyEllipse (2)

polygon (3)

ellipsoidPointWithAltitude (4)

ellipsoidPointWithAltitudeAndUncertaintyElipsoid (5)

ellipsoidArc (6)

7.4.13 LCS-Codeword

The LCS-Codeword AVP is of type UTF8String. It indicates the potential codeword string to send in a notification message to the UE.

7.4.14 LCS-Privacy-Check

The LCS-Privacy-Check AVP is of type Enumerated. The following values are defined:

ALLOWED_WITHOUT_NOTIFICATION (0)

ALLOWED_WITH_NOTIFICATION (1)

ALLOWED_IF_NO_RESPONSE (2)

RESTRICTED_IF_NO_RESPONSE (3)

NOT_ALLOWED (4)

Default value if AVP is not present is: ALLOWED_WITHOUT_NOTIFICATION (0).

7.4.15 Accuracy-Fulfilment-Indicator

The Accuracy-Fulfilment-Indicator AVP is of type Enumerated. The following values are defined:

REQUESTED_ACCURACY_FULFILLED (0)

REQUESTED_ACCURACY_NOT_FULFILLED (1)

7.4.16 Age-Of-Location-Estimate

The Age-Of-Location-Estimate AVP is of type Unsigned32. It indicates how long ago the location estimate was obtained in minutes, as indicated in 3GPP TS 29.002 [19].

7.4.17 Velocity-Estimate

The Velocity-Estimate AVP is of type OctetString. It is composed of 4 or more octets with an internal structure according to 3GPP TS 23.032 [3].

7.4.18 EUTRAN-Positioning-Data

The EUTRAN-Positioning-Data AVP is of type OctetString. It shall contain the encoded content of the "Positioning-Data" Information Element as defined in 3GPP TS 29.171 [7].

7.4.19 ECGI

The ECGI AVP is of type OctetString. It indicates the E-UTRAN Cell Global Identifier. It is coded according to clause 8.21.5, in 3GPP TS 29.274 [8].

7.4.20 Location-Event

The Location-Event AVP is of type Enumerated. The following values are defined:

EMERGENCY_CALL_ORIGINATION (0)

EMERGENCY_CALL_RELEASE (1)

MO_LR (2)

EMERGENCY_CALL_HANDOVER (3)

7.4.21 Pseudonym-Indicator

The Pseudonym-Indicator AVP is of type Enumerated. It defines if a pseudonym is requested. The following values are defined:

PSEUDONYM_NOT_REQUESTED (0)

PSEUDONYM_REQUESTED (1)

Default value if AVP is not present is: PSEUDONYM_NOT_REQUESTED (0).

7.4.22 LCS-Service-Type-ID

The LCS-Service-Type-ID is of type Unsigned32. It defines the identifier associated to one of the Service Types for which the LCS client is allowed to locate the particular UE.

7.4.23 LCS-Privacy-Check-Non-Session

The LCS-Privacy-Check-Non-Session AVP is of type Grouped.

AVP format:

LCS-Privacy-Check-Non-Session ::= <AVP header: 2521 10415>

{ LCS-Privacy-Check }

Default value if AVP is not present is that AVP LCS-Privacy-Check take value: ALLOWED_WITHOUT_NOTIFICATION (0).

7.4.24 LCS-Privacy-Check-Session

The LCS-Privacy-Check-Session AVP is of type Grouped.

AVP format:

LCS-Privacy-Check-Session ::= <AVP header: 2522 10415>

{ LCS-Privacy-Check }

Default value if AVP is not present is that AVP LCS-Privacy-Check take value: NOT_ALLOWED (4).

7.4.25 Feature-List-ID

The syntax of this AVP is defined in 3GPP TS 29.229 [17]. For this release, the Feature-List-ID AVP value shall be set to 1.

7.4.26 Feature-List

The syntax of this AVP is defined in 3GPP TS 29.229 [17]. A null value indicates that there is no feature used by the application.

NOTE: There are no features defined for this release.

7.4.27 LCS-QoS-Class

The LCS-QoS-Class AVP is of the type Enumerated. The following values are defined.

ASSURED (0)

BEST EFFORT (1)

7.4.28 Serving-Node

The Serving-Node AVP is of type Grouped. This AVP shall contain the information about the network node serving the targeted user.

7.5 Result-Code AVP and Experimental-Result AVP Values

7.5.1 General

This section defines result code values that shall be supported by all Diameter implementations that conform to this specification.

7.5.2 Success

Result codes that fall within the Success category shall be used to inform a peer that a request has been successfully completed. The Result-Code AVP values defined in Diameter Base Protocol RFC 3588 [4] shall be applied.

7.5.3 Permanent Failures

Errors that fall within the Permanent Failures category shall be used to inform the peer that the request has failed, and should not be attempted again. The Result-Code AVP values defined in Diameter Base Protocol RFC 3588 [5] shall be applied. When one of the result codes defined here is included in a response, it shall be inside an Experimental-Result AVP and the Result-Code AVP shall be absent.

7.5.3.1 DIAMETER_ERROR_USER_UNKNOWN (5001)

This result code shall be sent by the MME to indicate that the user is unknown. This error code is defined in 3GPP TS 29.229 [17]

7.5.3.2 DIAMETER_ERROR_UNAUTHORIZED_REQUESTING_NETWORK (5490)

This result code shall be sent by the MME to indicate that the requesting GMLC's network is not authorized to request UE location information. This error code is defined in 3GPP TS 29.173 [18]

7.5.4 Transient Failures

Errors that fall within the transient failures category are those used to inform a peer that the request could not be satisfied at the time that it was received. The request may be able to be satisfied in the future.

7.5.4.1 DIAMETER_ERROR_UNREACHABLE_USER (4221)

This result code shall be sent by the MME to indicate that the user could not be reached in order to perform positioning procedure.

7.5.4.2 DIAMETER_ERROR_SUSPENDED_USER (4222)

This result code shall be sent by the MME to indicate that the user is suspended in the MME.

7.5.4.3 DIAMETER_ERROR_DETACHED_USER (4223)

This result code shall be sent by the MME to indicate that the user is detached in the MME.

7.5.4.4 DIAMETER_ERROR_POSITIONING_DENIED (4224)

This result code shall be sent by the MME to indicate that the positioning procedure was denied.

7.5.4.5 DIAMETER_ERROR_POSITIONING_FAILED (4225)

This result code shall be sent by the MME to indicate that the positioning procedure failed.

7.5.4.6 DIAMETER_ERROR_UNKNOWN_UNREACHABLE LCS_CLIENT (4226)

This result code shall be sent by the GMLC to indicate that the LCS Client was not known or could not be reached.

Annex A (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2010-03	CT-47	CP-100055			3GPP TS presented for approval in CT#47	2.0.0	9.0.0
2010-06	CT-48	CP-100286	0001		Velocity-Requested IE	9.0.0	9.1.0
2010-09	CT-49	CP-100463	0002	1	Addition of Command Codes	9.1.0	9.2.0
			0003	1	Notification Verification Only in Location Type		
			0004	1	SLg for Inter Domain Scenarios		
			0005		Editorial Updates		
			0007		Definition of EUTRAN-Positioning-Data		
2010-12	CT-50	CP-100681	0009		Clarification of LCS-priority AVP	9.2.0	9.3.0
			0010		Correction of error code assignment		
			0011		Correction of bit numbering in Horizontal and Vertical Accuracy IEs in SLg		
			0012		Units of Age of Location Estimate IE in SLg		

History

Document history		
V9.0.0	April 2010	Publication
V9.1.0	June 2010	Publication
V9.2.0	October 2010	Publication
V9.3.0	January 2011	Publication