

# ETSI TS 129 172 V14.3.0 (2020-01)



**Digital cellular telecommunications system (Phase 2+) (GSM);  
Universal Mobile Telecommunications System (UMTS);  
LTE;  
Location Services (LCS);  
Evolved Packet Core (EPC) LCS Protocol (ELP)  
between the Gateway Mobile Location Centre (GMLC)  
and the Mobile Management Entity (MME);  
SLg interface  
(3GPP TS 29.172 version 14.3.0 Release 14)**



---

**Reference**RTS/TSGC-0429172ve30

---

**Keywords**GSM,LTE,UMTS

---

**ETSI**

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

---

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° 7803/88

---

**Important notice**

---

The present document can be downloaded from:  
<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at [www.etsi.org/deliver](http://www.etsi.org/deliver).

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at <https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:  
<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

---

**Copyright Notification**

---

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2020.

All rights reserved.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

**oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners.

**GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

---

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

## Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

---

# Legal Notice

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

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

---

# Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

# Contents

Intellectual Property Rights .....	2
Legal Notice .....	2
Modal verbs terminology.....	2
Foreword.....	6
1 Scope .....	7
2 References .....	7
3 Definitions, symbols and abbreviations .....	8
3.1 Definitions .....	8
3.2 Symbols.....	8
3.3 Abbreviations .....	8
4 Functional Overview .....	9
4.1 General .....	9
5 ELP Message Transport .....	10
5.1 General .....	10
5.2 Use of Diameter base protocol .....	10
5.3 Securing Diameter Messages .....	10
5.4 Accounting functionality .....	10
5.5 Use of sessions .....	10
5.6 Transport protocol.....	11
5.7 Routing considerations.....	11
5.8 Advertising Application Support.....	11
6 ELP Procedures .....	11
6.1 General .....	11
6.2 Provide Subscriber Location .....	12
6.2.1 General.....	12
6.2.2 Successful Operation .....	12
6.2.3 Unsuccessful Operation .....	19
6.3 Subscriber Location Report.....	19
6.3.1 General.....	19
6.3.2 Successful Operation .....	19
6.3.3 Unsuccessful Operation .....	23
7 ELP Messages and Message Formats .....	23
7.1 General .....	23
7.2 Message Formats.....	24
7.3 ELP Messages .....	24
7.3.1 Provide-Location-Request (PLR) Command.....	24
7.3.2 Provide-Location-Answer (PLA) Command .....	25
7.3.3 Location-Report-Request (LRR) Command.....	25
7.3.4 Location-Report-Answer (LRA) Command .....	26
7.4 Information Elements .....	27
7.4.1 General.....	27
7.4.2 SLg-Location-Type.....	30
7.4.3 LCS-EPS-Client-Name .....	30
7.4.4 LCS-Requestor-Name.....	31
7.4.5 LCS-Priority .....	31
7.4.6 LCS-QoS .....	31
7.4.7 Horizontal-Accuracy.....	31
7.4.8 Vertical-Accuracy.....	31
7.4.9 Vertical-Requested.....	31
7.4.10 Velocity-Requested.....	32
7.4.11 Response-Time .....	32
7.4.12 Supported-GAD-Shapes .....	32

7.4.13	LCS-Codeword .....	32
7.4.14	LCS-Privacy-Check .....	32
7.4.15	Accuracy-Fulfilment-Indicator .....	33
7.4.16	Age-Of-Location-Estimate .....	33
7.4.17	Velocity-Estimate .....	33
7.4.18	EUTRAN-Positioning-Data .....	33
7.4.19	ECGI .....	33
7.4.20	Location-Event .....	33
7.4.21	Pseudonym-Indicator .....	33
7.4.22	LCS-Service-Type-ID .....	34
7.4.23	LCS-Privacy-Check-Non-Session .....	34
7.4.24	LCS-Privacy-Check-Session .....	34
7.4.25	Feature-List-ID .....	34
7.4.26	Feature-List .....	34
7.4.27	LCS-QoS-Class .....	34
7.4.28	Serving-Node .....	34
7.4.29	GERAN-Positioning-Info .....	34
7.4.30	GERAN-Positioning-Data .....	35
7.4.31	GERAN-GANSS-Positioning-Data .....	35
7.4.32	UTRAN-Positioning-Info .....	35
7.4.33	UTRAN-Positioning-Data .....	35
7.4.34	UTRAN-GANSS-Positioning-Data .....	35
7.4.35	LRR-Flags .....	35
7.4.37	LCS-Reference-Number .....	36
7.4.38	Area-Event-Info .....	36
7.4.39	Area-Definition .....	37
7.4.40	Area .....	37
7.4.41	Area-Type .....	37
7.4.42	Area-Identification .....	38
7.4.43	Occurrence-Info .....	38
7.4.44	Interval-Time .....	38
7.4.45	Periodic-LDR-Info .....	38
7.4.46	Reporting-Amount .....	38
7.4.47	Reporting-Interval .....	38
7.4.48	Reporting-PLMN-List .....	38
7.4.49	PLMN-ID-List .....	39
7.4.54	Deferred-MT-LR-Data .....	40
7.4.55	Termination-Cause .....	41
7.4.57	ESMLC-Cell-Info .....	41
7.4.58	Cell-Portion-ID .....	42
7.4.59	1xRTT-RCID .....	42
7.4.60	Delayed-Location-Reporting-Data .....	42
7.4.61	Civic-Address .....	42
7.4.62	Barometric-Pressure .....	42
7.4.63	UTRAN-Additional-Positioning-Data .....	42
7.4.65	Linear-Distance .....	43
7.4.66	Maximum-Interval .....	43
7.4.67	Sampling-Interval .....	43
7.4.68	Reporting-Duration .....	43
7.4.69	Reporting-Location-Requirements .....	43
7.4.70	Additional-Area .....	43
7.5	Result-Code AVP and Experimental-Result AVP Values .....	44
7.5.1	General .....	44
7.5.2	Success .....	44
7.5.3	Permanent Failures .....	44
7.5.3.1	DIAMETER_ERROR_USER_UNKNOWN (5001) .....	44
7.5.3.2	DIAMETER_ERROR_UNAUTHORIZED_REQUESTING_NETWORK (5490) .....	44
7.5.4	Transient Failures .....	44
7.5.4.1	DIAMETER_ERROR_UNREACHABLE_USER (4221) .....	44
7.5.4.2	DIAMETER_ERROR_SUSPENDED_USER (4222) .....	44
7.5.4.3	DIAMETER_ERROR_DETACHED_USER (4223) .....	44
7.5.4.4	DIAMETER_ERROR_POSITIONING_DENIED (4224) .....	45

7.5.4.5 DIAMETER\_ERROR\_POSITIONING\_FAILED (4225).....45  
7.5.4.6 DIAMETER\_ERROR\_UNKNOWN\_UNREACHABLE LCS\_CLIENT (4226) .....45  
**Annex A (informative): Change history .....46**  
History .....47

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/c1d50e70-ecbb-48d3-b4b8-7589ea0f5868/etsi-ts-129-172-v14.3.0-2020-01>

---

# Foreword

This Technical Specification has been produced by the 3<sup>rd</sup> 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.

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/c1d50e70-ecbb-48d3-b4b8-7589ea0f5868/etsi-ts-129-172-v14.3.0-2020-01>

---

# 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, UTRAN and GERAN. The ELP message set is applicable to the SLg interface between the MME and the GMLC and the Lgd interface between the SGSN and the GMLC. ELP is developed in accordance to the general principles stated in 3GPP TS 23.271 [2].

---

# 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] Void.
- [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)".
- [9] Void
- [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".
- [20] 3GPP TS 49.031: "Location Services (LCS) – Base Station System Application Part LCS Extension – (BSSAP-LE)".



- [21] 3GPP TS 25.413: "UTRAN Iu Interface RANAP signalling".
- [22] 3GPP2 A.S0014-D v5.0: "Interoperability Specification (IOS) for cdma2000 Access Network Interfaces – Part 4 (A1, A1p, A2, and A5 Interfaces) UTRAN Iu Interface RANAP signalling".
- [23] IETF RFC 6733: "Diameter Base Protocol".
- [24] 3GPP TS 24.080: "Mobile radio interface layer 3 Supplementary services specification; Formats and coding".

## 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

**PS-MO-LR:** Packet Switched Mobile Originating Location Request

**PS-MT-LR:** Packet Switched Mobile Terminating Location Request

**PS-NI-LR:** Packet Switched 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
Lgd	Interface between GMLC and SGSN

### 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

TTPP            Transfer To Third Party  
 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 and on the Lgd interface between the GMLC and the SGSN in the Evolved Packet Core (EPC).

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

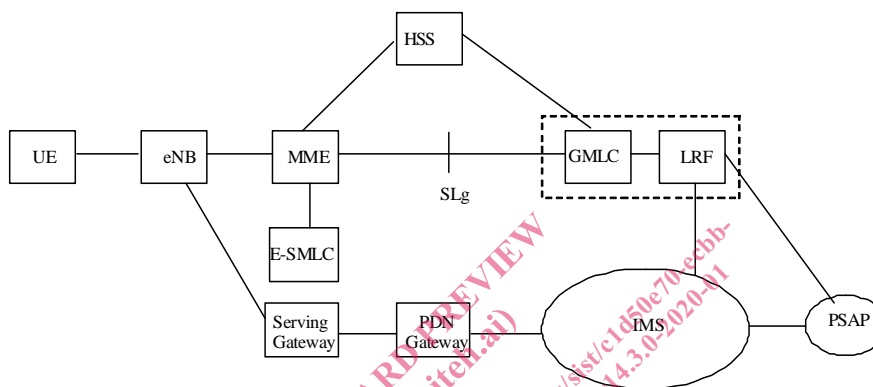


Figure 4.1-1 SLg interface in the LCS Architecture

The location of the Lgd interface within the LCS logical architecture is shown in Figure 4.1-2.

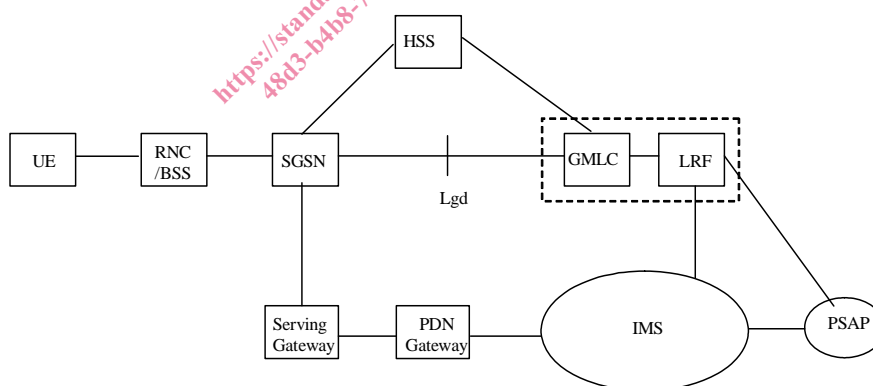


Figure 4.1-2 Lgd interface in the LCS Architecture

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 or SGSN in order to support the EPC-MT-LR or PS-MT-LR positioning procedures. This is achieved using the Provide Subscriber Location message;

- To allow the MME or SGSN 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 or PS-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. This is achieved using the Subscriber Location Report message;
- To allow the SGSN to forward an unsolicited position estimate to the GMLC as part of the PS-MO-LR, PS-NI-LR or periodic MO-LR TTP procedures. This is achieved using the Subscriber Location Report message;
- To allow the GMLC to acknowledge receipt of an unsolicited position estimate as part of the EPC-MO-LR, EPC-NI-LR, PS-MO-LR, PS-NI-LR or periodic MO-LR TTP procedures;
- To allow the GMLC to request position estimates for a particular target UE from the SGSN or MME as part of the deferred MT-LR procedure. This is achieved using the Provide Subscriber Location message;
- To allow the SGSN or MME to acknowledge receipt of position estimate request to the GMLC as part of a deferred MT-LR procedure;
- 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 as specified in IETF RFC 6733 [23], and it defines a number of additional commands and AVPs to implement the SLg, Lgd specific procedures.

### 5.2 Use of Diameter base protocol

The Diameter base protocol as specified in IETF RFC 6733 [23] 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, Lgd interfaces.

### 5.5 Use of sessions

Between the MME and the GMLC and between the SGSN 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 as specified in IETF RFC 6733 [23] 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 6733 [23]. 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 and Lgd interfaces 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 or SGSN shall be determined by querying the HSS over the SLh interface, and retrieve the specific MME or SGSN 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 or SGSN, the name of the GMLC may be either locally configured in the MME/SGSN (e.g., in the intra-domain scenario, when the GMLC belongs to the same PLMN as the MME/SGSN), 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 or SGSN.

If the Vendor-Specific-Application-ID AVP is received in any of the commands defined in this specification, it shall be ignored by the receiving node, and it shall not be used for routing purposes.

## 5.8 Advertising Application Support

The MME, SGSN 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 IETF RFC 6733 [23].

---

# 6 ELP Procedures

## 6.1 General

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

- Provide Subscriber Location
- Subscriber Location Report