ETSI TS 123 273 V16.4.0 (2020-07)

5G;
5G System (5GS) Location Services (LCS);
Stage 2
(3GPP TS 23.273 version 16.4.0 Release 16)

Reference

RTS/TSGS-0223273vg40

Keywords

5G

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.

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

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

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 stage 2 of the service-based architecture used for location services in the 5G system, and corresponding Network Functions (NFs), NF services and procedures, to meet the service requirements defined in TS 22.261 [3] and TS 22.071 [2].

Location Services specified in the present document include regulatory location services and commercial location services. The architecture and signalling procedures in NG-RAN are defined in TS 38.305 [9].

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 22.071: "Technical Specification Group Systems Aspects; Location Services (LCS)".

[3] 3GPP TS 22.261: "Service requirements for next generation new services and markets; Stage 1".

[4] 3GPP TS 23.271: "Functional stage 2 description of Location Services (LCS)".

[5] 3GPP TS 43.059: "Functional Stage 2 description of Location Services in GERAN".

[6] Void.

[7] 3GPP TS 36.305: "Stage 2 functional specification of User Equipment (UE) positioning in E-UTRAN".

[8] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

[9] 3GPP TS 38.305: "Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN".

[10] 3GPP TS 23.167: "IP Multimedia Subsystem (IMS) emergency sessions".

[11] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[12] 3GPP TS 29.572: "5G System; Location Management Services; Stage 3".

[13] OMA MLP TS: "Mobile Location Protocol", [http://www.openmobilealliance.org].

[14] OMA RLP TS: "Roaming Location Protocol", [http://www.openmobilealliance.org].

[15] 3GPP TS 38.455: "NG-RAN; NR Positioning Protocol A (NRPPa)".

[16] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[17] 3GPP TS 25.305: "Stage 2 functional specification of User Equipment (UE) positioning in UTRAN".

[18] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[19] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[20] 3GPP TS 36.355: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)".

[21] 3GPP TS 23.316: "Wireless and wireline convergence access support for the 5G System (5GS)".

[22] ETSI ES 282 004: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture; Network Attachment Sub-System (NASS)".

[23] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

[24] 3GPP TS 23.222: "Common Application Programming Interface (API) framework for 3GPP northbound APIs".

[25] RFC 2396: "Uniform Resource Identifiers".

[26] RFC 3261: "SIP: Session Initiation Protocol".

[27] 3GPP TS 23.228: "IP multimedia subsystem (IMS)".

[28] 3GPP TS 23.003: "Numbering, addressing and identification".

[29] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[30] 3GPP TS 32.271: "Telecommunication management; Charging management; Location Services (LCS) charging".

[31] 3GPP TS 32.298: "Telecommunication management; Charging management; Charging Data Record (CDR) parameter description".

[32] Void.

[33] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[34] 3GPP TS 29.171: "Location Services (LCS); LCS Application Protocol (LCS-AP) between the Mobile Management Entity (MME) and Evolved Serving Mobile Location Centre (E-SMLC); SLs interface".

[35] 3GPP TS 29.122: "T8 reference point for Northbound APIs".

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].

LCS Client: entity that interacts with GMLC for the purpose of obtaining location information for one or more UEs. The LCS Client may reside in the UE.

For the purposes of the present document, the following terms and definitions given in TS 23.271 [4] apply:

Call Related: see TS 23.271 [4].

Codeword: see TS 23.271 [4].

Current Location: see TS 23.271 [4].

Deferred location request: see TS 23.271 [4].

Immediate location request: see TS 23.271 [4].

Last Known Location: see TS 23.271 [4].

LCS (LoCation Services): see TS 23.271 [4].

Location Estimate: see TS 23.271 [4].

Pseudonym: see TS 23.271 [4].

Pseudonym mediation device: Functionality that verifies pseudonyms to verinyms.

Requestor: see TS 23.271 [4].

Requestor Identity: see TS 23.271 [4].

Response Method: for LCS Client using the OMA MLP protocol. Detail see TS 23.271 [4].

Target UE: see TS 23.271 [4].

Velocity: see TS 23.271 [4].

Verinym: see TS 23.271 [4].

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].

APN	Access Point Name
APN-NI	APN Network Identifier
EDT	Early Data Transmission
E-SMLC	Evolved Serving Mobile Location Centre
GMLC	Gateway Mobile Location Centre
HGMLC	Home GMLC
LCS	LoCation Services
LDR	Location Deferred Request
LMF	Location Management Function
LPI	LCS Privacy Indicator
LRF	Location Retrieval Function
MO-LR	Mobile Originated Location Request
MT-LR	Mobile Terminated Location Request
NI-LR	Network Induced Location Request
PMD	Pseudonym mediation device functionality
POI	Privacy Override Indicator
TNAN	Trusted Non-3GPP Access Network
UNAN	Untrusted Non-3GPP Access Network
VGMLC	Visited GMLC

4 Architecture Model and Concepts

4.1 General Concepts

A general description of location services and service requirements are given in the specification TS 22.071 [2]. Support of location services for GERAN, UTRAN and E-UTRAN access networks is described in TS 23.271 [4], TS 43.059 [5], TS 25.305 [17] and TS 36.305 [7].

The positioning of a UE can be supported by RAT dependent position methods, which rely on for example 3GPP RAT measurements obtained by a target UE and/or on measurements obtained by an Access Network of 3GPP RAT signals transmitted by a target UE. Positioning of a UE can also be supported by RAT independent position methods which may rely on non-RAT measurements obtained by a UE and/or on other information.

The positioning of a UE can be performed by either 3GPP access network or non-3GPP access network. A proper access type shall be determined to assure that the positioning result can fulfil the requested QoS and operator policy.

Location information for one or multiple target UEs may be requested by and reported to an LCS client or an AF within or external to a PLMN, or a control plane NF within a PLMN. Location information contained in the location request and location information contained in the location response are defined in clause 5.5.

For location request from LCS client (neither in the UE nor in the NG-RAN) or AF external to a PLMN, privacy verification of the target UE shall be enabled to check whether it is allowed to acquire the UE location information based on UE LCS privacy profile and whether the LCS client or the AF is authorised to use the location service as defined in clause 5.4. Additionally, UEs may optionally support privacy notification and verification on behalf of a user. Privacy override is also supported for regulatory LCS services according to local regulation.

The capabilities of a target UE to support LCS may be signalled by the UE to a serving PLMN at the AS, NAS and application (positioning protocol) levels to enable use of position methods supported by the UE.

To provide Location Service in the EPC interworking scenario, an EPC and 5GC common interface shall be used for the location request from LCS client or AF.

4.1a Types of Location Request

4.1a.1 Network Induced Location Request (NI-LR)

With a Network Induced Location Request (NI-LR), a serving AMF for a UE initiates location of the UE for some regulatory service (e.g. an emergency call from the UE).

4.1a.2 Mobile Terminated Location Request (MT-LR)

With a Mobile Terminated Location Request (MT-LR), an LCS client or AF external to or internal to a serving PLMN sends a location request to the PLMN (which may be the HPLMN or VPLMN) for the location of a target UE.

4.1a.3 Mobile Originated Location Request (MO-LR)

With a Mobile Originated Location Request (MO-LR), a UE sends a request to a serving PLMN for location related information for the UE.

4.1a.4 Immediate Location Request

With an immediate location request, an LCS client or AF sends or instigates a location request for a target UE (or group of target UEs) and expects to receive a response containing location information for the target UE (or group of target UEs) within a short time period which may be specified using QoS. An immediate location request may be used for an NI-LR. MT-LR or MO-LR.

4.1a.5 Deferred Location Request

With a deferred location request, an LCS client or AF sends a location request to a PLMN for a target UE (or group of target UEs) and expects to receive a response containing the indication of event occurrence and location information if requested for the target UE (or group of target UEs) at some future time (or times), which may be associated with specific events associated with the target UE (or group of target UEs). In this version of the specification, only deferred location requests for an MT-LR are supported.

4.1a.5.1 Types of event

The following types of event are defined for a deferred location request.

a) UE availability: Any event in which the 5GCN has established a contact with the UE. This event is considered to be applicable when the UE is temporarily unavailable due to inaction by the user, or for temporarily loss of radio connectivity or IMSI detach and so on. The UE Available event only requires one response to an LCS client/AF and after this response, the UE Available event is concluded.

b) Area: An event where the UE enters, leaves or remains within a pre-defined geographical area. At least one type of area event can be defined (i.e. entering, leaving or remaining within the area). The LCS client or AF may define the target area as a geographical area or as a geopolitical name of an area. The PLMN may translate and define the target area as the identities of one or more radio cells or tracking areas. The area event may be reported one time only, or multiple times. The area event report shall contain an indication of the event occurrence. The location estimate may be included in the report. If an area event is detected by the UE but an event report cannot be sent (e.g. because the UE cannot access the network or due to a minimum reporting interval), a report shall be sent later when possible irrespective of whether the area event still applies for the current UE location. Area event reporting is controlled by a minimum and a maximum reporting time. The minimum reporting time defines the minimum allowed time between successive area events. The maximum reporting time defines the maximum time between successive reports. When a UE sends a report due to expiration of the maximum reporting time, the UE indicates expiration of the maximum reporting time as the trigger event. The maximum reporting time enables the AF, LCS client and HGMLC to remain aware of continuing support by the UE for the area event (e.g. to detect if area event reporting may have been aborted due to UE power off).

c) Periodic Location: An event where a defined periodic timer expires in the UE and activates a location report. If a periodic event is detected by the UE but an event report cannot be sent (e.g. because the UE cannot access the network temporarily), a report shall be sent later when possible and the periodic timer for the next event shall then be started. The reporting duration for periodic location shall equal the requested number of reports multiplied by the periodic interval even when reports are delayed.

d) Motion: An event where the UE moves by more than some predefined straight line distance from a previous location. The motion event may be reported one time only, or multiple times. The motion event report shall contain an indication of the event occurrence. A location estimate may be included in the report if requested by the LCS client or AF. For successive motion event reports, motion is determined relative to the UE location corresponding to the immediately preceding event report (including an event report triggered by expiration of the maximum reporting time). If a motion event is detected by the UE but an event report is deferred (e.g. because the UE cannot access the network temporarily), a report shall be sent later when possible irrespective of whether the motion event still applies to the current UE location. Motion reporting is controlled by a minimum and a maximum reporting time. The minimum reporting time defines the minimum allowed time between successive event reports. The maximum reporting time defines the maximum time between successive reports. When a UE sends a report due to expiration of the maximum reporting time, the UE indicates expiration of the maximum reporting time as the trigger event. The maximum reporting time enables the AF, LCS client and HGMLC to remain aware of continuing support by the UE for the motion event (e.g. to detect if motion event reporting may have been aborted due to UE power off).

4.1b LCS Quality of Service

LCS Quality of Service is used to characterise the location request. It can either be determined by the operator or determined based on the negotiation with the LCS client or the AF. It is optional for LCS client or the AF to provide the LCS Quality of Service in the location request.

LCS Quality of Service information is characterised by 3 key attributes:

- LCS QoS Class as defined below.
- Accuracy: i.e. Horizontal Accuracy (see clause 4.3.1 of TS 22.071 [2]) and Vertical Accuracy (see clause 4.3.2 of TS 22.071 [2].
- Response Time (e.g. no delay, low delay or delay tolerant as described in clause 4.3.3 of TS 22.071 [2]).

The LCS QoS Class defines the degree of adherence by the Location Service to another quality of service parameter (Accuracy), if requested. The 5G system shall attempt to satisfy the other quality of service parameter regardless of the use of QoS Class. There are 2 LCS QoS Classes:

- Best Effort Class: This class defines the least stringent requirement on the QoS achieved for a location request. If a location estimate obtained does not fulfil the other QoS requirements, it should still be returned but with an appropriate indication that the requested QoS was not met. If no location estimate is obtained, an appropriate error cause is sent.

- Assured Class: This class defines the most stringent requirement on the accuracy achieved for a location request. If a location estimate obtained does not fulfil the other QoS requirements, then it shall be discarded, and an appropriate error cause shall be sent.

For LCS client, it may indicate accuracy defined in TS 29.572 [12], tables 6.1.6.3.2-1 and 6.1.6.3.5-1. For AF, it may either indicate the accuracy defined in TS 29.572 [12], table 6.1.6.3.2-1, or indicate a particular value e.g. PLMN ID defined in TS 29.122 [35], table 5.3.2.4.7-1.

4.2 Architectural Reference Model

4.2.1 Non-roaming reference architecture

Figure 4.2.1-1 shows an architectural reference model for 5GS LCS for a non-roaming UE in reference point representation.

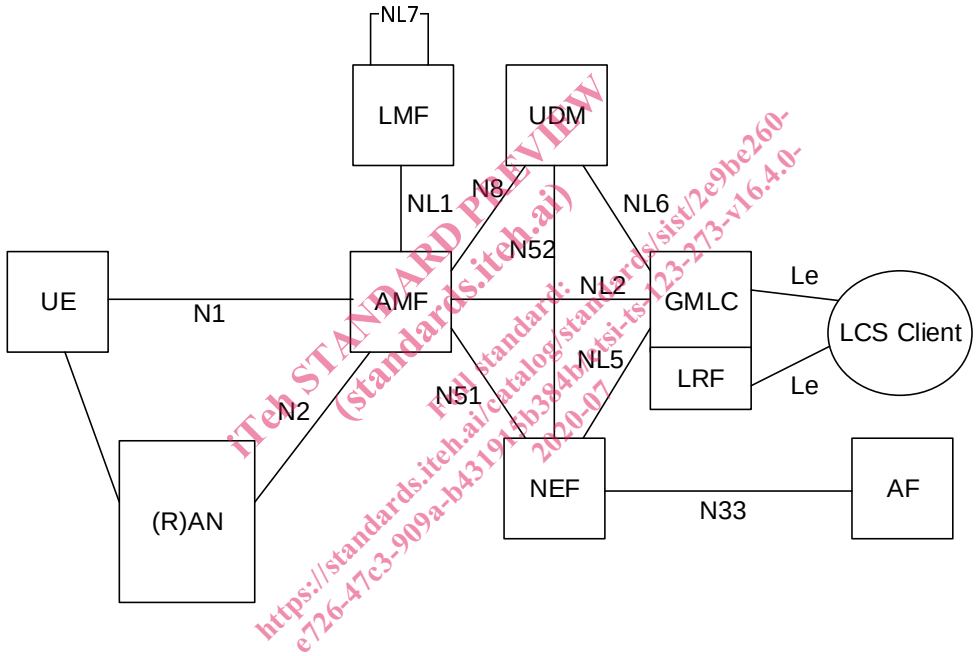

Figure 4.2.1-1: Non-roaming reference architecture for Location Services in reference point representation

NOTE 1: (R)AN represents NG-RAN, trusted non-3GPP access or untrusted non-3GPP access.

NOTE 2: Reference point interface related to charging functionality is not shown in this specification.

Figure 4.2.1-2 shows an architectural reference model for 5GS LCS for a non-roaming UE in SBI representation.