|  |  |
| --- | --- |
| 3GPP TS 29.515 V18.4.0 (2023-12) | |
| Technical Specification | |
| 3rd Generation Partnership Project;  Technical Specification Group Core Network and Terminals;  5G System;  Gateway Mobile Location Services;  Stage 3  (Release 18) | |
|  | |
|  |  |
|  | |
| The present document has been developed within the 3rd Generation Partnership Project (3GPP TM) and may be further elaborated for the purposes of 3GPP. The present document has not been subject to any approval process by the 3GPPOrganizational Partners and shall not be implemented. This Specification is provided for future development work within 3GPPonly. The Organizational Partners accept no liability for any use of this Specification. Specifications and Reports for implementation of the 3GPP TM system should be obtained via the 3GPP Organizational Partners' Publications Offices. | |

|  |  |
| --- | --- |
|  | |
| ***3GPP***  Postal address  3GPP support office address  650 Route des Lucioles - Sophia Antipolis  Valbonne - FRANCE  Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16  Internet  http://www.3gpp.org | |
| ***Copyright Notification***  No part may be reproduced except as authorized by written permission. The copyright and the foregoing restriction extend to reproduction in all media.  © 2023, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).  All rights reserved.  UMTS™ is a Trade Mark of ETSI registered for the benefit of its members  3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners LTE™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners  GSM® and the GSM logo are registered and owned by the GSM Association | |

Contents

Foreword 5

1 Scope 6

2 References 6

3 Definitions of terms, symbols and abbreviations 7

3.1 Terms 7

3.2 Symbols 7

3.3 Abbreviations 7

4 Overview 7

5 Services offered by the GMLC 8

5.1 Introduction 8

5.2 Ngmlc\_Location Service 9

5.2.1 Service Description 9

5.2.2 Service Operations 9

5.2.2.1 Introduction 9

5.2.2.2 ProvideLocation 9

5.2.2.2.1 General 9

5.2.2.2.2 Provide Location of a single UE 9

5.2.2.2.3 Provide Locations of a group of UEs 10

5.2.2.3 LocationUpdate 11

5.2.2.3.1 General 11

5.2.2.4 CancelLocation 12

5.2.2.4.1 General 12

5.2.2.5 EventNotify 12

5.2.2.5.1 General 12

5.2.2.5.2 EventNotify for a single UE 13

5.2.2.5.3 EventNotify for the UEs in a target group 14

5.2.2.6 LocationUpdateNotify 14

5.2.2.6.1 General 14

5.2.2.7 LocationUpdateSubscribe 15

5.2.2.7.1 General 15

6 API Definitions 16

6.1 Ngmlc\_Location Service API 16

6.1.1 Introduction 16

6.1.2 Usage of HTTP 16

6.1.2.1 General 16

6.1.2.2 HTTP standard headers 16

6.1.2.2.1 General 16

6.1.2.2.2 Content type 16

6.1.2.3 HTTP custom headers 16

6.1.2.3.1 General 16

6.1.3 Custom Operations without associated resources 17

6.1.3.1 Overview 17

6.1.3.2 Operation: provide-location 17

6.1.3.2.1 Description 17

6.1.3.2.2 Operation Definition 18

6.1.3.3 Operation: cancel-location 19

6.1.3.3.1 Description 19

6.1.3.3.2 Operation Definition 19

6.1.3.4 Operation: location-update 20

6.1.3.4.1 Description 20

6.1.3.4.2 Operation Definition 20

6.1.3.5 Operation: loc-update-subs 21

6.1.3.5.1 Description 21

6.1.3.5.2 Operation Definition 21

6.1.4 Notifications 22

6.1.4.1 General 22

6.1.4.2 Eventnotify 22

6.1.4.2.1 Description 22

6.1.4.2.2 Notification Definition 22

6.1.4.2.3 Notification Standard Methods 22

6.1.4.2.3.1 POST 22

6.1.4.3 LocationUpdateNotify 23

6.1.4.3.1 Description 23

6.1.4.3.2 Notification Definition 23

6.1.4.3.3 Notification Standard Methods 24

6.1.4.3.3.1 POST 24

6.1.5 Data Model 24

6.1.5.1 General 24

6.1.5.2 Structured data types 27

6.1.5.2.1 Introduction 27

6.1.5.2.2 Type: InputData 28

6.1.5.2.3 Type: LocationData 32

6.1.5.2.4 Type: CancelLocData 35

6.1.5.2.5 Type: LocUpdateData 36

6.1.5.2.6 Type: EventNotifyData 37

6.1.5.2.7 Type: UePrivacyRequirements 39

6.1.5.2.8 Void 40

6.1.5.2.9 Type: LocUpdateNotification 40

6.1.5.2.10 Type: LocUpdateSubs 40

6.1.5.2.11 Type: EventNotifyDataAdditionalInfo 41

6.1.5.2.12 Type: EventNotifyDataExt 41

6.1.5.2.13 Type: AreaEventInfoAddition 41

6.1.5.2.14 Type: AreaEventInfoExt 41

6.1.5.2.15 Type: IntegrityRequirements 42

6.1.5.2.16 Type: AlertLimit 42

6.1.5.2.17 Type: UpLocRepInfoAf 42

6.1.5.2.18 Type: UpCumEvtRptCriteria 42

6.1.5.2.19 Type: AddLocationDatas 43

6.1.5.2.20 Type: LocationDataExt 43

6.1.5.3 Simple data types and enumerations 43

6.1.5.3.1 Introduction 43

6.1.5.3.2 Simple data types 43

6.1.5.3.3 Enumeration: PseudonymIndicator 43

6.1.5.3.4 Enumeration: LocationRequestType 44

6.1.5.3.5 Enumeration: LocationTypeRequested 44

6.1.5.3.6 Enumeration: EventNotifyDataType 44

6.1.5.3.7 Enumeration: FailureCause 45

6.1.5.3.8 Enumeration: SuccessType 45

6.1.5.3.9 Enumeration: ReportingInd 45

6.1.6 Error Handling 45

6.1.6.1 General 45

6.1.6.2 Protocol Errors 45

6.1.6.3 Application Errors 45

6.1.7 Feature negotiation 46

6.1.8 Security 46

6.1.9 HTTP redirection 47

Annex A (normative): OpenAPI specification 48

A.1 General 48

A.2 Ngmlc\_Location API 48

Annex B (informative): Change history 61

# 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.

In the present document, modal verbs have the following meanings:

**shall** indicates a mandatory requirement to do something

**shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

**should** indicates a recommendation to do something

**should not** indicates a recommendation not to do something

**may** indicates permission to do something

**need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

**can** indicates that something is possible

**cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

**will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

# 1 Scope

The present document specifies the stage 3 protocol and data model for the Ngmlc Service Based Interface. It provides stage 3 protocol definitions and message flows, and specifies the API for each service offered by the GMLCc.

The 5G System stage 2 architecture and procedures are specified in 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3].

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [5] and 3GPP TS 29.501 [6].

# 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 23.501: "System Architecture for the 5G System; Stage 2".

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

[4] 3GPP TS 23.273: "5G System Location Services (LCS)".

[5] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[6] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[7] OpenAPI Initiative, "OpenAPI Specification Version 3.0.0", <https://spec.openapis.org/oas/v3.0.0>.

[8] IETF RFC 9113: "HTTP/2".

[9] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".

[10] IETF RFC 9457: "Problem Details for HTTP APIs".

[11] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

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

[13] ITU Recommendation E.164: "The international public telecommunication numbering plan".

[14] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[15] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[16] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".

[17] 3GPP TS 29.510: "Network Function Repository Services; Stage 3".

[18] 3GPP TS 22.071: "Location Services (LCS); Service description; Stage 1".

[19] 3GPP TR 21.900: "Technical Specification Group working methods".

[20] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[21] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[22] 3GPP TS 33.256: "Security aspects of Uncrewed Aerial Systems (UAS)".

[23] 3GPP TS 37.355: "Technical Specification Group Radio Access Network; LTE Positioning Protocol (LPP)".

[24] 3GPP TS 29.122: "T8 reference point for Northbound APIs".

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms and definitions given in 3GPP 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 3GPP TR 21.905 [1].

## 3.2 Symbols

Void

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP 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 3GPP TR 21.905 [1].

5GC 5G Core Network

AMF Access and Mobility Management Function

GAD Geographical Area Description

GMLC Gateway Mobile Location Centre

GPSI Generic Public Subscription Identifier

LCS Location Services

LDR Location Deferred Request

LPHAP Low Power and High Accuracy Positioning

MO-LR Mobile Originated Location Request

MT-LR Mobile Terminated Location Request

NEF Network Exposure Function

NI-LR Network Induced Location Request

NRF Network Repository Function

SUPI Subscription Permanent Identifier

# 4 Overview

The Gateway Mobile Location Centre (GMLC) is the network entity in the 5G Core Network (5GC) supporting Location Services (LCS). Within the 5GC, the GMLC offers services to the AMF, GMLC, NEF, NWDAF and LMF via the Ngmlc service based interface (see 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.273 [4]).

Figure 4-1 provides the reference model (in service based interface representation and in reference point representation), with focus on the GMLC:



Figure 4-1: Reference model – GMLC

The functionalities supported by the GMLC are listed in clause 4.3.3 of 3GPP TS 23.273 [4].

# 5 Services offered by the GMLC

## 5.1 Introduction

The table 5.1-1 shows the GMLC Services and GMLC Service Operations:

Table 5.1-1: List of GMLC Services

|  |  |  |  |
| --- | --- | --- | --- |
| Service Name | Service Operations | Operation  Semantics | Example Consumer(s) |
| Ngmlc\_Location | ProvideLocation | Request/Response | H-GMLC, NEF, NWDAF, LMF, AMF |
|  | LocationUpdate | Request/Response | AMF, V-GMLC |
|  | LocationUpdateNotify | Notify | NEF |
|  | CancelLocation | Request/Response | H-GMLC, NEF, NWDAF |
|  | EventNotify | Notify | H-GMLC, NEF, NWDAF |

Table 5.1-2 summarizes the corresponding APIs defined for this specification.

Table 5.1-2: API Descriptions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Service Name | Clause | Description | OpenAPI Specification File | apiName | **Annex** |
| Ngmlc\_Location | 6.1 | Ngmlc Location Service | TS29515\_Ngmlc\_Location.yaml | ngmlc-loc | A.2 |

## 5.2 Ngmlc\_Location Service

### 5.2.1 Service Description

The Ngmlc\_Location service enables an NF to request location determination (current geodetic and optionally local and/or civic location) for a target UE. The following are the key functionalities of this NF service.

- Allow the consumer NF to request the current geodetic and optionally local and/or civic location of a target UE.

- Allow the consumer NF to subscribe/unsubscribe the geodetic and optionally local and/or civic location of a target UE for some certain events.

- Allow the consumer NF to cancel an on-going periodic or triggered location request of a target UE.

- Allow the consumer NF to get notified about the geodetic and optionally local and/or civic location of a target UE when some certain events are detected.

### 5.2.2 Service Operations

#### 5.2.2.1 Introduction

The service operations defined for the Ngmlc\_Location services are as follows:

- ProvideLocation

- LocationUpdate

- CancelLocation

- EventNotify

- LocationUpdateNotify

- LocationUpdateSubscribe

#### 5.2.2.2 ProvideLocation

##### 5.2.2.2.1 General

The following procedures are supported using the "ProvideLocation" service operation:

- Provide location of a single UE

- Provide locations of a group of UEs

##### 5.2.2.2.2 Provide Location of a single UE

The service operation is used during the procedures:

- 5GC-MT-LR Procedure for the commercial location service (see 3GPP TS 23.273 [4], clause 6.1.2 and 6.1.4)

- Initiation and Reporting of Location Events (see 3GPP TS 23.273 [4], clause 6.3.1, clause 6.16.1)

- Unified Location Service Exposure Procedure without routing by a UDM (see 3GPP TS 23.273 [4], clause 6.5.1)

- Procedures with interaction between 5GC and EPC (see 3GPP TS 23.273 [4], clause 6.13)

The ProvideLocation service operation is invoked by a NF Service Consumer, e.g. a NEF, GMLC NWDAF or LMF, towards the GMLC to request to provide the location information (geodetic location and, optionally local and/or civic location) for a target UE or to subscribe to periodic or triggered deferred location for a target UE. See Figure 5.2.2.2.2-1.



Figure 5.2.2.2.2-1: ProvideLocation Request/Response for a target UE

1. The NF Service Consumer shall send an HTTP POST request to the URI associated with the "provide-location" custom operation. The input parameters for the request (the target UE identification (SUPI or GPSI), required QoS, supported GAD shapes, LCS client type, external Service Identity, Codeword, service coverage, LDR type, serving AMF address, LDR reference, scheduled location time, LMF ID, LpHapType, Event Report Expected Area, reporting indication, integrity requirements, LOS/NLOS measurement indication, …) may be included in the HTTP POST request body, H-GMLC Callback URI may be included in the HTTP POST request body to V-GMLC (eventually to AMF) for implicit subscripiton of EventNotify provided by GMLC, and NEF or NWDAF Callback URI may be included in the HTTP POST request body to GMLC/H-GMLC for implicit subscripiton of EventNotify provided by GMLC/H-GMLC.

If the request is to use a location reporting via user plane, an indication of the request of location reporting via user plane shall be included in the HTTP POST contents. If the indication of the request of location reporting via user plane is included in the HTTP POST contents, the endpoint address of the user plane for location reporting may be included in the HTTP POST contents. The criteria for sending cumulative event reports over control plane may be included in the contents when the request is sent from H-GMLC to V-GMLC.

Editor's Note: [CR0116, 5G\_eLCS\_Ph3] Whether the security related materials can be included in the contents is FFS.

If Multiple Location QoS was requested, the H-GMLC as NF service consumer may perform the Location QoS mapping to obtain the location QoS that can be applicable to EPS based on the original multiple QoS (see clause 6.19 of 3GPP TS 23.273 [4]) and may include the mapped Location QoS applicable to EPS in the request to the V-GMLC as NF service producer.

2a. On success, "200 OK" shall be returned. The response body shall contain the parameters related to the determined position of the UE if any (geodetic position, local position, civic location, positioning methods…).

If geographic area(s) are received in the request for area event, the GMLC (or V-GMLC when roaming) shall convert the received geographic area(s) into a corresponding list of cell and/or tracking area identities when invoking AMF location services.

2b On failure or redirection, one of the HTTP status code listed in Table 6.1.3.2.2-2 may be returned. For a 4xx/5xx response, the message body may contain a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.1.3.2.2-2.

##### 5.2.2.2.3 Provide Locations of a group of UEs

The service operation is used during the procedures:

- Bulk Operation of LCS Service Request Targeting to Multiple UEs (see 3GPP TS 23.273 [4], clause 6.8)

The ProvideLocation service operation is invoked by a NF Service Consumer, e.g. a NEF or NWDAF, towards the GMLC (e.g. (H)GMLC when roaming) to request to provide the location information (geodetic location and, optionally local and/or civic location) for a target group of UEs or to subscribe to periodic or triggered deferred location for a target group of UEs. See Figure 5.2.2.2.3-1.



Figure 5.2.2.2.3-1: ProvideLocation Request/Response for a target group

1. The NF Service Consumer shall send an HTTP POST request to the URI associated with the "provide-location" custom operation. The input parameters the target group identification (the External Group ID or the Internal Group ID), LCS client type, eventNotificationUri shall be included in the HTTP POST request body, LDR type, LDR reference shall be also included in the request if requesting the deferred LCS service, the required QoS, supported GAD shapes, external Service Identity, service coverage should be included in the request. If the request is related to location determination at the scheduled time, the scheduled location time shall be included in the HTTP POST request body.

If the request is to use a location reporting via user plane, an indication of the request of location reporting via user plane shall be included in the HTTP POST contents. If the indication of the request of location reporting via user plane is included in the HTTP POST contents, the endpoint address of the user plane for location reporting may be included in the HTTP POST contents. The criteria for sending cumulative event reports over control plane may be included in the contents when the request is sent from H-GMLC to V-GMLC.

Editor's Note: [CR0116, 5G\_eLCS\_Ph3] Whether the security related materials can be included in the contents is FFS.

GMLC shall translate the target group identification into the list of the UE identifications which belong to the target group by invoking the related service provided by UDM, then for each UE in the list, GMLC initiates following steps of procedures of the 5GC-MT-LR or Deferred 5GC-MT-LR as defined in 3GPP TS 23.273 [4] clause 6.8.

If geographic area(s) are received in the request for area event, the GMLC (or V-GMLC when roaming) shall convert the received geographic area(s) into a corresponding list of cell and/or tracking area identities when invoking AMF location services.

2a. On success, "200 OK" shall be returned. The response body shall contain the success type.

2b On failure or redirection, one of the HTTP status code listed in Table 6.1.3.2.2-2 may be returned. For a 4xx/5xx response, the message body may contain a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.1.3.2.2-2.

#### 5.2.2.3 LocationUpdate

##### 5.2.2.3.1 General

The service operation is used during the procedure:

- 5GC-MO-LR Procedure (see 3GPP TS 23.273 [4], clause 6.2)

The LocationUpdate enables the NF consumer (e.g. AMF) to update UE location information towards the GMLC. See Figure 5.2.2.3.1-1.



Figure 5.2.2.3.1-1: LocationUpdate Request/Response

1. The NF Service Consumer shall send an HTTP POST request to the URI associated with the "location-update" custom operation. The request body shall contain a LocUpdateData object..

2a. On success, "204 No content" shall be returned by the GMLC.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.4.2-2 may be returned. For a 4xx response, the message body may contain a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.1.3.4.2-2.

#### 5.2.2.4 CancelLocation

##### 5.2.2.4.1 General

The service operation is used during the procedure:

- Cancellation of Reporting of Location Events by an AF, an NF or External LCS Client or GMLC (see 3GPP TS 23.273 [4], clause 6.3.3)

The CancelLocation enables the consumer NF to use the service operation to cancel a deferred 5GC-MT-LR procedure for periodic or triggered location for a single UE or for a group. See Figure 5.2.2.4.1-1.



Figure 5.2.2.4.1-1: CancelLocation Request/Response

1. The NF Service Consumer shall send an HTTP POST request to the URI associated with the "cancel-location" custom operation. The input parameters for the request ((H-)GMLC contact address, LDR reference number, LMF identification, serving AMF address) should be included in the HTTP POST request body.

2a. On success, "204 No Content" shall be returned.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.3.2-2 may be returned. For a 4xx response, the message body may contain a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.1.3.3.2-2.

#### 5.2.2.5 EventNotify

##### 5.2.2.5.1 General

The following procedures are supported using the "EventNotify" service operation:

- EventNotify for a single UE

- EventNotify for the UEs in a target group

##### 5.2.2.5.2 EventNotify for a single UE

The service operation is used during the procedure:

- Deferred 5GC-MT-LR Procedure for Periodic, Triggered and UE Available Location Events (see 3GPP TS 23.273 [4], clause 6.3)

- Unified Location Service Exposure Procedure without routing by a UDM (see 3GPP TS 23.273 [4], clause 6.5.1)

The EventNotify for a single UE enables the consumer NF (e.g. (H)GMLC, NEF, NWDAF) to get notified about the geodetic and optionally local and/or civic location, the completion or activation of deferred location, mobility to a different AMF/MME of a UE with deferred location for a target UE, the active state of the location reporting over user plane, or the statistics on the location reporting over user plane, when some certain events are detected. See Figure 5.2.2.5.2-1.



Figure 5.2.2.5.2-1: EventNotify Notification for a single UE

1. The GMLC shall send an HTTP POST to the locationNotificationUri to send a notification. The input parameters for the notification (Notification Correlation ID, UE (SUPI and if available GPSI), Type of location related event (e.g. deferred location for the UE available event, activation of location for periodic or triggered location, mobility of a target UE to a new AMF or MME for a deferred location, Geodetic Location, Local Location, Civic Location, Position Methods Used, serving LMF identification etc.) should be included in the HTTP POST request body.

If the GMLC receives the statistics on the location reporting over user plane (e.g., the number of location reports over user plane) from the AMF, the statistics on the location reporting over user plane shall be included in the HTTP POST contents.

The locationNotificationUri shall be set to:

If the notification is sent from (V)GMLC to (H)GMLC when roaming with (V)GMLC used,

- the hgmlcCallBackURI received from the AMF/LMF;

If the notification is sent from (H)GMLC to NEF, or other NF (e.g. NWDAF),

- the callback URI (i.e., eventNotificationUri) of NEF or other NF (e.g. NWDAF) provided by NEF or other NF (e.g. NWDAF) during requesting the ProvideLocation service operation for the periodic or triggered deferred location for a target UE or ;

- the callback URI of NEF locally provisioned in the (H)GMLC.

2a. If the notification is received, the NF Service Consumer shall reply with the status code 204 indicating the notification is received, in the response message.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.4.2.3.1-2 may be returned. For a 4xx response, the message body may contain a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.1.4.2.3.1-2.

##### 5.2.2.5.3 EventNotify for the UEs in a target group

The service operation is used during the procedure:

- Bulk Operation of LCS Service Request Targeting to Multiple UEs (see 3GPP TS 23.273 [4], clause 6.8)

The EventNotify for the UEs in a target group enables the consumer NF (e.g. NEF, NWDAF) to get notified about the geodetic and optionally local and/or civic locations (immediate locations or deferred locations) for the UEs in target group, the failures of requesting location for the UEs in the target group, completion or activation of deferred location for the UEs in the target group. See Figure 5.2.2.5.3-1.



Figure 5.2.2.5.3-1: EventNotify Notification for the UEs in a target group

1. The GMLC/(H)GMLC shall send an HTTP POST to the locationNotificationUri to send a notification. The Request body shall contain event report(s) for one or more UEs in the group. The event report for each UE shall include the LDR Reference, UE identifier (SUPI or GPSI), location data (location data for immediate location service request or location data for deferred location service request) or failure cause of positioning. The locationNotificationUri shall be set to:

- the callback URI of NEF, or other NF (e.g. NWDAF) provided by NEF during requesting the ProvideLocation service operation for a target group of UEs or;

- the callback URI of NEF locally provisioned in the GMLC/(H)GMLC.

2a. If the notification is received, the NF Service Consumer shall reply with the status code 204 indicating the notification is received, in the response message.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.4.2.3.1-2 may be returned. For a 4xx response, the message body may contain a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.1.4.2.3.1-2.

#### 5.2.2.6 LocationUpdateNotify

##### 5.2.2.6.1 General

The service operation is used during the procedure:

- 5GC-MO-LR Procedure (see 3GPP TS 23.273 [4], clause 6.2)

The LocationUpdateNotify enables the NF consumer (e.g. NEF) to get notified about the UE location information update. See Figure 5.2.2.6.1-1.



Figure 5.2.2.6.1-1: LocationUpdateNotify Notification

1. The GMLC shall send an HTTP POST request to the notifURI of the NF consumer (e.g. NEF). The response body shall contain a LocUpdateNotification object.

The notifURI (e.g. NEF address for callback) is locally configured on GMLC or discovered via NRF.

2a. On success, "204 No content" shall be returned by the NF consumer.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.4.3.3.1-2 may be returned. For a 4xx response, the message body may contain a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.1.4.3.3.1-2.

#### 5.2.2.7 LocationUpdateSubscribe

##### 5.2.2.7.1 General

This service operation is used by a NF Service Consumer (e.g. NEF) to trigger a subscription to notifications on UE location information update for the 5GC-MO-LR Procedure (see 3GPP TS 23.273 [4], clause 6.2). See Figure 5.2.2.7.1-1.

NOTE: This service operation is not used by the current stage 2 specifications in 3GPP TS 23.273 [4], i.e. the subscription to notifications on UE location information update is implicit.



Figure 5.2.2.7.1-1: Subscription to UE location information update

1. The NF service consumer (e.g. NEF) sends a POST request to the parent resource, i.e. collection of subscriptions (.../loc-update-subs), to create a subscription to UE location information update for the 5GC-MO-LR Procedure, as provided in LocUpdateSubs information conveyed in the message body.

2a. On success, "204 No content" shall be returned by the GMLC.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.5.2-2 may be returned. For a 4xx/5xx response, the message body may contain a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.1.3.4.2-2.

# 6 API Definitions

## 6.1 Ngmlc\_Location Service API

### 6.1.1 Introduction

The Ngmlc\_Location service shall use the Ngmlc\_Location API.

The API URI of the Ngmlc\_Location API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URIs used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [6], i.e.:

**{apiRoot}/<apiName>/<apiVersion>/<apiSpecificResourceUriPart>**

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [6].

- The <apiName>shall be "ngmlc-loc".

- The <apiVersion> shall be "v1".

- The <apiSpecificResourceUriPart> shall be set as described in clause 6.1.3.

### 6.1.2 Usage of HTTP

#### 6.1.2.1 General

HTTP/2, as defined in IETF RFC 9113 [8], shall be used as specified in clause 5 of 3GPP TS 29.500 [5].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [5].

HTTP messages and bodies for the Ngmlc\_Location service shall comply with the OpenAPI [7] specification contained in Annex A.

#### 6.1.2.2 HTTP standard headers

##### 6.1.2.2.1 General

##### 6.1.2.2.2 Content type

The following content types shall be supported:

- JSON, as defined in IETF RFC 8259 [9], shall be used as content type of the HTTP bodies specified in the present specification as indicated in clause 5.4 of 3GPP TS 29.500 [5].

- The Problem Details JSON Object (IETF RFC 9457 [10]). The use of the Problem Details JSON object in a HTTP response body shall be signalled by the content type "application/problem+json".

#### 6.1.2.3 HTTP custom headers

##### 6.1.2.3.1 General

The following HTTP custom headers shall be supported:

- 3gpp-Sbi-Message-Priority: See 3GPP TS 29.500 [5], clause 5.2.3.2.2.

This API does not define any new HTTP custom headers.

### 6.1.3 Custom Operations without associated resources

#### 6.1.3.1 Overview

The structure of the custom operation URIs of the Ngmlc\_Location service is shown in Figure 6.1.3.1-1.



Figure 6.1.3.1-1: Custom operation URI structure of the Ngmlc\_Location API

Table 6.1.3.1-1 provides an overview of the custom operations and applicable HTTP methods.

Table 6.1.3.1-1: Custom operations

|  |  |  |
| --- | --- | --- |
| Custom operation URI | Mapped HTTP method | Description |
| {apiRoot}/ngmlc-loc/<apiVersion>/provide-location | POST | Request or Subscribe the geodetic and optionally local and/or civic location of a target UE or a target group of UEs |
| {apiRoot}/ngmlc-loc/<apiVersion>/cancel-location | POST | Cancel an on-going periodic or triggered location request of a target UE or a target group of UEs |
| {apiRoot}/ngmlc-loc/<apiVersion>/location-update | POST | Enable the NF consumer to update UE location information towards the GMLC |
| {apiRoot}/ngmlc-loc/<apiVersion>/loc-update-subs | POST | Enable a NF service consumer (e.g. NEF) to subscribe to UE location information |

#### 6.1.3.2 Operation: provide-location

##### 6.1.3.2.1 Description

This clause will describe the custom operation and what it is used for, and the custom operations URI.

##### 6.1.3.2.2 Operation Definition

The operation shall support the response data structures and response codes specified in tables 6.1.3.2.2-1 and 6.1.3.2.2-2.

Table 6.1.3.2.2-1: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| InputData | M | 1 | Input parameters to the "Provide-Location" operation |

Table 6.1.3.2.2-2: Data structures supported by the POST Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| LocationDataExt | M | 1 | 200 OK | This case represents the successful retrieval of the location of the UE or successful subscription of periodic or triggered location of the UE, or represents completely or partially accept of the requesting locations for a target group.  Upon success, a response body is returned containing the different parameters of the location data if obtained, such as:  - Geographic Area  - Local Location  - Civic Location  - Age of Location  - Accuracy of Location  - Positioning methods |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. |
| ProblemDetails | O | 0..1 | 403 Forbidden | The "cause" attribute may be used to indicate one of the following application errors:  - POSITIONING\_DENIED  - UNSPECIFIED  - UNSUPPORTED\_BY\_UE  - DETACHED\_USER  See table 6.1.6.3-1 for the description of these errors. |
| ProblemDetails | O | 0..1 | 500 Internal Server Error | The "cause" attribute may be used to indicate the following application error:  - POSITIONING\_FAILED  See table 6.1.6.3-1 for the description of these errors. |
| ProblemDetails | O | 0..1 | 504 Gateway Timeout | The "cause" attribute may be used to indicate the following application error:  - UNREACHABLE\_USER  - PEER\_NOT\_RESPONDING  See table 6.1.6.3-1 for the description of this error. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] other than those specified in the table above also apply, with a ProblemDetails data type when needed (see clause 5.2.7 of 3GPP TS 29.500 [5]). | | | | |

Table 6.1.3.2.2-3: Headers supported by the 307 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set.  For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

Table 6.1.3.2.2-4: Headers supported by the 308 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set.  For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

#### 6.1.3.3 Operation: cancel-location

##### 6.1.3.3.1 Description

This clause will describe the custom operation and what it is used for, and the custom operation's URI.

##### 6.1.3.3.2 Operation Definition

This operation shall support the request and response data structures and response codes specified in table 6.1.3.3.2-1 and table 6.1.3.3.2-2.

Table 6.1.3.3.2-1: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| CancelLocData | M | 1 | The information is used to cancel deferred 5GC-MT-LR for a single UE or for a group of UE. |

Table 6.1.3.3.2-2: Data structures supported by the POST Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 No Content | This case represents successful cancellation of location. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. |
| ProblemDetails | O | 0..1 | 403 Forbidden | The "cause" attribute may be used to indicate one of the following application errors:  - UNSPECIFIED  - LOCATION\_SESSION\_UNKNOWN  See table 6.1.6.3-1 for the description of this error. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] other than those specified in the table above also apply, with a ProblemDetails data type when needed (see clause 5.2.7 of 3GPP TS 29.500 [5]). | | | | |

Table 6.1.3.3.2-3: Headers supported by the 307 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set.  For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

Table 6.1.3.3.2-4: Headers supported by the 308 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set.  For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

#### 6.1.3.4 Operation: location-update

##### 6.1.3.4.1 Description

This clause will describe the custom operation and what it is used for, and the custom operation's URI.

##### 6.1.3.4.2 Operation Definition

This operation shall support the request and response data structures and response codes specified in table 6.1.3.4.2-1 and table 6.1.3.4.2-2.

Table 6.1.3.4.2-1: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| LocUpdateData | M | 1 | Input parameters to the "location-update" operation |

Table 6.1.3.4.2-2: Data structures supported by the POST Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 No Content | This case represents successful update of location. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. |
| ProblemDetails | O | 0..1 | 403 Forbidden | The "cause" attribute may be used to indicate one of the following application errors:  - UNSPECIFIED  - UNREQUESTED\_BY\_UE  - UNKOWN\_EXTERNAL\_CLIENT\_OR\_AF  - UNREACHABLE\_EXTERNAL\_CLIENT\_OR\_AF  See table 6.1.6.3-1 for the description of this error. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] other than those specified in the table above also apply, with a ProblemDetails data type when needed (see clause 5.2.7 of 3GPP TS 29.500 [5]). | | | | |

Table 6.1.3.4.2-3: Headers supported by the 307 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set.  For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

Table 6.1.3.4.2-4: Headers supported by the 308 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set.  For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

#### 6.1.3.5 Operation: loc-update-subs

##### 6.1.3.5.1 Description

This clause will describe the custom operation and what it is used for, and the custom operations URI.

##### 6.1.3.5.2 Operation Definition

The operation shall support the request and response data structures and response codes specified in tables 6.1.3.5.2-1 and 6.1.3.5.2-2.

Table 6.1.3.5.2-1: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | **Description** |
| LocUpdateSubs | M | 1 | Contains the subscription to UE location update information that is to be created. |

Table 6.1.3.5.2-2: Data structures supported by the POST Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | **Description** |
| n/a |  |  | 204 No Content | This case represents the successful UE location information subscription creation. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. |
| ProblemDetails | O | 0..1 | 403 Forbidden | The "cause" attribute may be used to indicate one of the following application errors:  - UNSPECIFIED  - UNREQUESTED\_BY\_UE  See table 6.1.6.3-1 for the description of these errors. |
| NOTE: The mandatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply. | | | | |

Table 6.1.3.5.2-3: Headers supported by the 307 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set.  For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

Table 6.1.3.5.2-4: Headers supported by the 308 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set.  For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

### 6.1.4 Notifications

#### 6.1.4.1 General

This clause specifies the notifications provided by the Ngmlc\_Location service.

Table 6.1.4.1-1: Notifications overview

|  |  |  |  |
| --- | --- | --- | --- |
| Notification | Callback URI | HTTP method or custom operation | Description  (service operation) |
| EventNotify | {locationNotificationUri} | POST |  |
| LocationUpdateNotify | {notifURI} | POST |  |

#### 6.1.4.2 Eventnotify

##### 6.1.4.2.1 Description

The EventNotify operation is used to the occurrence of periodic or triggered location event for a target UE to a consumer NF (e.g. (H)GMLC, NEF, NWDAF) or used to report the locations (e.g. the immediate locations or deferred locations) for the UEs in a target group to a consumer NF (e.g. NEF, NWDAF).

##### 6.1.4.2.2 Notification Definition

Call-back URI: {locationNotificationUri}

See clause 5.2.2.5 for the description of how the GMLC obtains the Call-back URI of the NF Service Consumer.

##### 6.1.4.2.3 Notification Standard Methods

###### 6.1.4.2.3.1 POST

This method sends a Location event notify to the NF Service Consumer.

This method shall support the request and response data structures and response codes specified in table 6.1.4.2.3.1-1 and table 6.1.4.2.3.1-2.

Table 6.1.4.2.3.1-1: Data structures supported by the POST Request Body

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| EventNotifyDataExt | M | 1 | Input parameters to the "Event Notify" operation |

Table 6.1.4.2.3.1-2: Data structures supported by the POST Response Body

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 No Content | This case represents successful notification of the event. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. |
| ProblemDetails | O | 0..1 | 403 Forbidden | The "cause" attribute may be used to indicate one of the following application errors:  - UNSPECIFIED  - LOCATION\_SESSION\_UNKNOWN  See table 6.1.6.3-1 for the description of this error. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] other than those specified in the table above also apply, with a ProblemDetails data type when needed (see clause 5.2.7 of 3GPP TS 29.500 [5]). | | | | |

Table 6.1.4.2.3.1-3: Headers supported by the 307 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | A URI pointing to the endpoint of NF service consumer to which the notification should be sent. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the notification is redirected |

Table 6.1.4.2.3.1-4: Headers supported by the 308 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | A URI pointing to the endpoint of NF service consumer to which the notification should be sent. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the notification is redirected |

#### 6.1.4.3 LocationUpdateNotify

##### 6.1.4.3.1 Description

The LocationUpdateNotify operation is used to deliver the location update for a UE to a consumer NF (e.g. NEF).

##### 6.1.4.3.2 Notification Definition

Call-back URI: {notifURI}

##### 6.1.4.3.3 Notification Standard Methods

###### 6.1.4.3.3.1 POST

This method sends a Location update notification to the NF Service Consumer.

This method shall support the request and response data structures and response codes specified in table 6.1.4.3.3.1-1 and table 6.1.4.3.3.1-2.

Table 6.1.4.3.3.1-1: Data structures supported by the POST Request Body

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| LocUpdateNotification | M | 1 | Input parameters to the "LocationUpdateNotification" operation |

Table 6.1.4.3.3.1-2: Data structures supported by the POST Response Body

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 No Content | This case represents successful notification of the event. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. |
| ProblemDetails | O | 0..1 | 403 Forbidden | The "cause" attribute may be used to indicate one of the following application errors:  - UNSPECIFIED  - UNKOWN\_EXTERNAL\_CLIENT\_OR\_AF  - UNREACHABLE\_EXTERNAL\_CLIENT\_OR\_AF  See table 6.1.6.3-1 for the description of this error. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] other than those specified in the table above also apply, with a ProblemDetails data type when needed (see clause 5.2.7 of 3GPP TS 29.500 [5]). | | | | |

Table 6.1.4.3.3.1-3: Headers supported by the 307 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | A URI pointing to the endpoint of NF service consumer to which the notification should be sent. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the notification is redirected |

Table 6.1.4.3.3.1-4: Headers supported by the 308 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | A URI pointing to the endpoint of NF service consumer to which the notification should be sent. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the notification is redirected |

### 6.1.5 Data Model

#### 6.1.5.1 General

This clause specifies the application data model supported by the API.

Table 6.1.5.1-1 specifies the data types defined for the Ngmlc\_Location service based interface protocol.

Table 6.1.5.1-1: Ngmlc\_Location specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Clause defined | Description | Applicability |
| InputData | 6.1.5.2.2 | the input parameters in ProvideLocation service operation |  |
| LocationData | 6.1.5.2.3 | Location data |  |
| CancelLocData | 6.1.5.2.4 | the input parameters in CancelLocation service operation |  |
| LocUpdateData | 6.1.5.2.5 | the input parameters in LocationUpdate service operation |  |
| EventNotifyData | 6.1.5.2.6 | the input parameters for the target UE in EventNotify Notification service operation |  |
| UePrivacyRequirements | 6.1.5.2.7 | UE privacy requirements from (H)GMLC to the serving AMF or VGMLC(in the roaming case) for the target UE |  |
| LocUpdateNotification | 6.1.5.2.9 | Location Update Notification |  |
| LocUpdateSubs | 6.1.5.2.10 | UE location information subscription |  |
| AreaEventInfoAddition | 6.1.5.2.13 | Additional information for Extended Area event information |  |
| AreaEventInfoExt | 6.1.5.2.14 | Extended Area Event Information |  |
| IntegrityRequirements | 6.1.5.2.15 | GNSS integrity requirements |  |
| AlertLimit | 6.1.5.2.16 | Alert Limit |  |
| UpLocRepInfoAf | 6.1.5.2.17 | Information for the location reporting over user plane |  |
| UpCumEvtRptCriteria | 6.1.5.2.18 | Criteria for sending cumulative events reports over control plane |  |
| AddLocationDatas | 6.1.5.2.19 | Additional location data |  |
| LocationDataExt | 6.1.5.2.20 | the response parameters in ProvideLocation service operation including one or more LocationData |  |
| ServiceIdentity | 6.1.5.3.2 | service identity |  |
| CodeWord | 6.1.5.3.2 | codeword |  |
| ExternalClientIdentification | 6.1.5.3.2 | external client identification |  |
| E164CountryCodeOfGeographicArea | 6.1.5.3.2 | E.164 country codes for geographic areas |  |
| LcsServiceTypeId | 6.1.5.3.2 | LCS Service Type Id |  |
| TimeToAlert | 6.1.5.3.2 | Time-to-Alert |  |
| TargetIntegrityRisk | 6.1.5.3.2 | Target Integrity Risk |  |
| HorizontalProtectionLevel | 6.1.5.3.2 | Horizontal Protection Level |  |
| VerticalProtectionLevel | 6.1.5.3.2 | Vertical Protection Level |  |
| PseudonymIndicator | 6.1.5.3.3 | It defines if a pseudonym is requested |  |
| LocationRequestType | 6.1.5.3.4 | NI-LR, MT-LR or MO-LR |  |
| LocationTypeRequested | 6.1.5.3.5 | the location type requested by the LCS client |  |
| EventNotifyDataType | 6.1.5.3.6 | the type of event that triggers event notification |  |
| EventNotifyDataAdditionalInfo | 6.1.5.2.11 | Additional information to Event Notify Data |  |
| EventNotifyDataExt | 6.1.5.2.12 | Extended Event Notify Data for UEs of a target group |  |
| FailureCause | 6.1.5.3.7 | Positioning failure cause |  |
| SuccessType | 6.1.5.3.8 | Success Type to indicate full or partial success |  |
| ReportingInd | 6.1.5.3.9 | Reporting indication on how a target UE sends event reports when the UE is outside the event report allowed area |  |

Table 6.1.5.1-2 specifies data types re-used by the Ngmlc\_Location service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Ngmlc\_Location service based interface.

Table 6.1.5.1-2: Ngmlc\_Location re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| Gpsi | 3GPP TS 29.571 [11] |  |  |
| Supi | 3GPP TS 29.571 [11] |  |  |
| Uri | 3GPP TS 29.571 [11] |  |  |
| AmfId | 3GPP TS 29.571 [11] |  |  |
| NfInstanceId | 3GPP TS 29.571 [11] |  |  |
| ExternalClientType | 3GPP TS 29.572 [12] |  |  |
| LocationQoS | 3GPP TS 29.572 [12] |  |  |
| LcsQosClass | 3GPP TS 29.572 [12] |  |  |
| SupportedGADShapes | 3GPP TS 29.572 [12] |  |  |
| PeriodicEventInfo | 3GPP TS 29.572 [12] |  |  |
| AreaEventInfo | 3GPP TS 29.572 [12] |  |  |
| MotionEventInfo | 3GPP TS 29.572 [12] |  |  |
| LdrType | 3GPP TS 29.572 [12] |  |  |
| LdrReference | 3GPP TS 29.572 [12] |  |  |
| AgeOfLocationEstimate | 3GPP TS 29.572 [12] |  |  |
| PositioningMethod | 3GPP TS 29.572 [12] |  |  |
| AccuracyFulfilmentIndicator | 3GPP TS 29.572 [12] |  |  |
| LmfIdentification | 3GPP TS 29.572 [12] |  |  |
| LcsServiceType | 3GPP TS 29.572 [12] |  |  |
| VelocityRequested | 3GPP TS 29.572 [12] |  |  |
| LcsPriority | 3GPP TS 29.572 [12] |  |  |
| VelocityEstimate | 3GPP TS 29.572 [12] |  |  |
| TerminationCause | 3GPP TS 29.572 [12] |  |  |
| PositioningMethodAndUsage | 3GPP TS 29.572 [12] |  |  |
| GnssPositioningMethodAndUsage | 3GPP TS 29.572 [12] |  |  |
| LcsServiceAuth | 3GPP TS 29.571 [11] |  |  |
| Ecgi | 3GPP TS 29.571 [11] |  |  |
| Ncgi | 3GPP TS 29.571 [11] |  |  |
| Altitude | 3GPP TS 29.572 [12] | Altitude |  |
| BarometricPressure | 3GPP TS 29.572 [12] | Barometric pressure |  |
| MinorLocationQoS | 3GPP TS 29.572 [12] | Minor Location QoS | MUTIQOS |
| LocationPrivacyVerResult | 3GPP TS 29.518 [20] |  |  |
| ExternalGroupId | 3GPP TS 29.571 [11] | External Group Identifier |  |
| GroupId | 3GPP TS 29.571 [11] | Group Identifier |  |
| CivicAddress | 3GPP TS 29.572 [12] | Civic Address |  |
| GeographicArea | 3GPP TS 29.572 [12] | Geographic Area |  |
| LocalArea | 3GPP TS 29.572 [12] | Local area specified by different shape |  |
| RedirectResponse | 3GPP TS 29.571 [11] |  |  |
| DateTime | 3GPP TS 29.571 [11] | Date and Time |  |
| LpHapType | 3GPP TS 29.518 [20] | Type of Low Power and/or High Accuracy Positioning |  |
| HighAccuracyGnssMetrics | 3GPP TS 29.572 [12] | High Accuracy GNSS Metrics |  |
| LosNlosMeasureInd | 3GPP TS 29.572 [12] | LOS/NLOS measurement indication |  |
| UpLocRepAddrAfRm | 3GPP TS 29.122 [24] | User plane addressing information |  |
| IndoorOutdoorInd | 3GPP TS 29.572 [25] | Indicates an area for event reporting |  |
| RangingSlResult | 3GPP TS 29.572 [12] | Indicates result type for ranging and sidelink positioning |  |
| RelatedUE | 3GPP TS 29.572 [12] | Indicates information for related UE for ranging and sidelink positioning |  |
| RangeDirection | 3GPP TS 29.572 [12] | Represents the range and direction between two points. |  |
| 2DRelativeLocation | 3GPP TS 29.572 [12] | Represents 2D local co-ordinates with origin corresponding to another known point. |  |
| 3DRelativeLocation | 3GPP TS 29.572 [12] | Represents 3D local co-ordinates with origin corresponding to another known point. |  |
| MappedLocationQoSEps | 3GPP TS 29.572 [12] | Mapped Location QoS for EPS |  |

#### 6.1.5.2 Structured data types

##### 6.1.5.2.1 Introduction

This clause defines the structures to be used in resource representations.

##### 6.1.5.2.2 Type: InputData

Table 6.1.5.2.2-1: Definition of type InputData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| gpsi | Gpsi | O | 0..1 | Generic Public Subscription Identifier  (NOTE 3). |  |
| supi | Supi | O | 0..1 | Subscription Permanent Identifier  (NOTE 3). |  |
| extGroupId | ExternalGroupId | O | 0..1 | This IE may be present when requesting LCS service for a group of target UEs, if present this IE shall contain the External Group ID  (NOTE 3). |  |
| intGroupId | GroupId | O | 0..1 | This IE may be present when requesting LCS service for a group of target UEs, if present this IE shall contain the Internal Group ID  (NOTE 3). |  |
| externalClientType | ExternalClientType | M | 1 | This IE shall contain LCS client type |  |
| locationQoS | LocationQoS | O | 0..1 | Requested location QoS  Multiple QoS Class (lcsQosClass sets to "MULTIPLE\_QOS") shall only be used when GMLC support MUTIQOS feature. |  |
| supportedGADShapes | array(SupportedGADShapes) | O | 1..N | Supported Geographical Area Description shapes |  |
| serviceIdentity | ServiceIdentity | O | 0..1 | Service identity |  |
| serviceCoverage | array(E164CountryCodeOfGeographicArea) | O | 1..N | A list of E.164 country codes for geographic areas (see ITU Recommendation E.164 [13]) where the LCS client is permitted to request and receive UE location information. |  |
| ldrType | LdrType | C | 0..1 | Location deferred request event type |  |
| periodicEventInfo | PeriodicEventInfo | C | 0..1 | Periodic event information of the location request for a target UE |  |
| areaEventInfo | AreaEventInfoExt | C | 0..1 | Area event information of the location request for a target UE |  |
| motionEventInfo | MotionEventInfo | C | 0..1 | Motion event information of the location request for a target UE |  |
| ldrReference | LdrReference | C | 0..1 | Notification correlation  ID  It shall be present in the request from NEF if it is allocated by NEF for the Deferred 5GC-MT-LR procedure.  It shall be present in the request from NEF for requesting location service for a group of UEs.  It shall be present in the request to VGMLC for the Deferred 5GC-MT-LR procedure.  This IE shall be present for location service in PNI-NPN with signalling optimisation, as specified in 3GPP TS 23.273 [4] clause 6.1.2. |  |
| hgmlcCallBackUri | Uri | O | 0..1 | Notification target address for HGMLC  This IE shall also be present for location service in PNI-NPN with signalling optimisation, as specified in 3GPP TS 23.273 [4] clause 6.1.2 |  |
| eventNotificationUri | Uri | O | 0..1 | The call-back Uri of NF service consumer (i.e. NEF, NWDAF) for implicit subscription to notification of Eventnotify.  This IE should be included and is used to receive the location information for UEs in the group when requesting LCS service for a group of target UEs or requesting deferred 5GC MT LCS service for a single UE. |  |
| externalClientIdentification | ExternalClientIdentification | O | 0..1 | External LCS client identification |  |
| afId | string | O | 0..1 | The identification of AF that initiated location request |  |
| uePrivacyRequirements | UePrivacyRequirements | O | 0..1 | UE privacy requirement |  |
| lcsServiceType | LcsServiceType | O | 0..1 | LCS service type  This IE may be present when being sent from HGMLC to VGMLC.  When present, it shall contain the LCS service type, which is mapped from attribute serviceIdentity of the LCS Request by the HGMLC. |  |
| velocityRequested | VelocityRequested | O | 0..1 | Velocity of the target UE is requested |  |
| priority | LcsPriority | O | 0..1 | Priority of the location request |  |
| locationTypeRequested | LocationTypeRequested | O | 0..1 | Requested type of location, applicable to location immediate request (NOTE 2) |  |
| maximumAgeOfLocationEstimate | AgeOfLocationEstimate | O | 0..1 | Requested maximum age of the location estimate |  |
| amfId | AmfId | O | 0..1 | The identification of serving AMF |  |
| codeWord | CodeWord | O | 0..1 | Code word (NOTE 1) |  |
| scheduledLocTime | DateTime | O | 0..1 | The scheduled time (in UTC) for location determination |  |
| reliableLocReq | boolean | C | 0..1 | This IE shall be included with the value "true" to indicate that reliable UE location information is required, as specified in 3GPP TS 33.256 [22] clause 5.3.2.  When present, this IE shall be set as following:  - true: the reliable UE location information is required  - false (default): the reliable UE location information is not required |  |
| servingLmfId | LMFIdentification | O | 0..1 | If present, this IE contains the identification of a serving LMF selected by the GMLC. |  |
| lpHapType | LpHapType | C | 0..1 | This IE shall be included and set to "LOW\_POW\_HIGH\_ACCU\_POS" to request low power and high accuracy positioning, as specified in clause 6.1.2 of 3GPP TS 23.273 [4]. |  |
| evtRptExpectedArea | GeographicArea | O | 0..1 | This IE shall be present in the request from H-GMLC to V-GMLC if the event report expected area was retrieved from UDM.  When present, this IE shall indicate the event report expected area. |  |
| reportingInd | ReportingInd | C | 0..1 | This IE shall be present in the request from H-GMLC to V-GMLC if the area usage indication is provided by UDM and event report expected area is present.  When present, this IE shall indicate whether the UE is allowed to generate and send the reports inside or outside the event report expected area:  - Inside reporting (default)  - Outside reporting  (see 3GPP TS 23.273 [4] clause 5.14 and 6.3.1) |  |
| integrityRequirements | IntegrityRequirements | O | 0..1 | When present, this IE shall indicate the integrity requirements. |  |
| upLocRepStatAf | integer | O | 0..1 | When present, this IE contains the number of event reports have transferred over user plane. If the culumative event report has been sent previously, this IE contains the number of event reports have transferred over user plane since the last cumulative event report was sent |  |
| requestedRangingSlResult | array(RangingSlResult) | O | 1..N | When present, this IE shall contain the type of result requested for ranging and sidelink positioning, such as absolute locations, relative locations or ranges and directions related to the UEs, etc. | Ranging\_SL |
| relatedUEs | array(RelatedUE) | O | 1..N | When present, this IE contains a list of the information for the related UEs for the ranging and sidelink positioning. | Ranging\_SL |
| mappedQoSEps | MappedLocationQoSEps | C | 0..1 | This IE may only be present in the service request from H-GMLC to V-GMLC, if the Multiple QoS Class is indicated in the locationQoS IE.  When present, this IE shall indicate the mapped Location QoS applicable to EPS ("BEST\_EFFORT" or "ASSURED") based on the Multiple Location QoS (see clause 6.19 of 3GPP TS 23.273 [4]). | MUTIQOS |
| NOTE 1: Checking of the Codeword in UE applies only when the Codeword parameter is present and when the codeWordCheck parameter (specified in clause 6.1.5.2.7) is present and set to TRUE.  NOTE 2: If the LocationTypeRequested parameter is set to value "NOTIFICATION\_VERIFICATION\_ONLY", then the lcsServiceAuthInfo attribute in the uePrivacyRequirements IE, if present, shall be set to either "NOTIFICATION\_ONLY" or "NOTIFICATION\_AND\_VERIFICATION\_ONLY".  NOTE 3: If retrieving the location for a target UE, the UE identification (attributes gpsi and/or supi) shall be included, if retrieving the UE locations for a target group, the group identification (attributes extGroupId and/or intGroupId), UE identification and group identification shall be included exclusively. | | | | | |

##### 6.1.5.2.3 Type: LocationData

Table 6.1.5.2.3-1: Definition of type LocationData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| gpsi | Gpsi | O | 0..1 | Generic Public Subscription Identitfier |  |
| supi | Supi | O | 0..1 | Subscription Permanent Identifier |  |
| locationEstimate | GeographicArea | O | 0..1 | Geographic area of the target UE |  |
| civicAddress | CivicAddress | O | 0..1 | Civic address of the target UE |  |
| localLocationEstimate | LocalArea | O | 0..1 | When present, this IE shall indicate a local area in renference system. |  |
| ageOfLocationEstimate | AgeOfLocationEstimate | O | 0..1 | Age of location estimate |  |
| timestampOfLocationEstimate | DateTime | O | 0..1 | When present, this IE shall indicate the estimated UTC time when the location estimate corresponded to the UE location (i.e. when the location estimate and the actual UE location was the same). |  |
| positioningDataList | array(PositioningMethodAndUsage) | O | 1..N | If present, this IE shall indicate the usage of each non-GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully. |  |
| gnssPositioningDataList | array(GnssPositioningMethodAndUsage) | O | 1..N | If present, this IE shall indicate the usage of each GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully. |  |
| accuracyFulfilmentIndicator | AccuracyFulfilmentIndicator | O | 0..1 | The indication whether the obtained location estimate satisfies the requested accuracy or not |  |
| ueVelocity | VelocityEstimate | O | 0..1 | Responded UE velocity, if requested and available |  |
| ldrReference | LdrReference | C | 0..1 | Notification correlation ID  It shall be present in the response to NEF if it is allocated by HGMLC for the the Deferred 5GC-MT-LR procedure. |  |
| altitude | Altitude | C | 0..1 | If present, this IE indicates the altitude of the positioning estimate.  This IE shall be sent from (V)GMLC to (H)GMLC if received by VGMLC from AMF when roaming. |  |
| servingLMFIdentification | LMFIdentification | C | 0..1 | If present, this IE contains the identification of a serving LMF for periodic or triggered location.  This IE shall be sent from (V)GMLC to (H)GMLC if received by VGMLC from AMF when roaming. |  |
| locationPrivacyVerResult | LocationPrivacyVerResult | C | 0..1 | If present, this IE contains the result of location privacy verification by UE.  The IE shall be included from (V)GMLC to (H)GMLC if received from the serving AMF by (V)GMLC when roaming and a location request with notification and privacy verification only indication is sent to the serving AMF via (V)GMLC by (H)GMLC during location request procedure.. |  |
| successType | SuccessType | C | 0..1 | This IE is only used for requesting LCS service for a group, and shall be present to indicate one of the following value.  - SUCCESS\_COMPLETELY  - SUCCESS\_PARTIALLY  The value "SUCCESS\_COMPLETELY" indicates that requesting/subscribing to LCS service is successful for all the UE(s) within the group identified by the external/internal group ID.  The value "SUCCESS\_PARTIALLY" indicates that requesting/subscribing to LCS service is only successful for a part of the UE(s) within the group identified by the external/internal group ID.  The default value of this attribute is "SUCCESS\_COMPLETELY" if this IE is not present. |  |
| achievedQos | MinorLocationQoS | O | 0..1 | When present, this IE shall contain the achieved Location QoS Accuracy of the estimated location.  This IE shall be present if received. | MUTIQOS |
| directReportInd | boolean | C | 0..1 | When present, this IE shall be set for the following value:  - true: location determination will be sent by LMF to GMLC directly  - false (default): location determination will not be sent by LMF to GMLC directly  This IE shall be present if received from LMF. |  |
| acceptedPeriodicEventInfo | PeriodicEventInfo | C | 0..1 | This IE shall be present if received from AMF/LMF.  When present, this IE shall provide the accepted periodic event reporting information. |  |
| haGnssMetrics | HighAccuracyGnssMetrics | C | 0..1 | This IE should be included when received from LMF/AMF.  When present, this IE shall indicate the high accuracy GNSS metrics for the location estimate. |  |
| losNlosMeasureInd | LosNlosMeasureInd | O | 0..1 | When present, this IE shall indicate whether LOS measurement or NLOS measurement is used. |  |
| indoorOutdoorInd | IndoorOutdoorInd | O | 0..1 | When present, this IE shall indicate whether the UE is indoor or outdoor. |  |
| relatedApplicationlayerId | ApplicationlayerId | O | 0..1 | Identifies the application layer ID of the related UE for ranging and sidelink positioning, such as located UE, reference UE, etc. | Ranging\_SL |
| rangeDirection | RangeDirection | O | 0..1 | When present, this IE identifies a range and direction from a point  A to a point B, comprising a range from point A to point B, an azimuth direction from point A to point B and an elevation direction from point A to point B. | Ranging\_SL |
| 2dRelativeLocation | 2DRelativeLocation | O | 0..1 | When present, this IE identifies a relative 2D location with uncertainty ellipse, characterised by a point described in 2D local co-ordinates with origin corresponding to another known point, distances r1 and r2 and an angle of orientation A. | Ranging\_SL |
| 3dRelativeLocation | 3DRelativeLocation | O | 0..1 | When present, this IE identifies a relative 3D location with uncertainty ellipsoid, characterised by a point described in 3D local co-ordinates with origin corresponding to another known point, distances r1 (the "semi-major uncertainty"), r2 (the "semi-minor uncertainty") and r3 (the "vertical uncertainty") and an angle of orientation A (the "angle of the major axis"). | Ranging\_SL |
| relativeVelocity | VelocityEstimate | O | 0..1 | When present, this IE identifies UE velocity relative to the UE identified with relatedApplicationlayerId. | Ranging\_SL |

##### 6.1.5.2.4 Type: CancelLocData

Table 6.1.5.2.4-1: Definition of type CancelLocData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| supi | Supi | O | 0..1 | This IE may be present when requesting cancellation of LCS service for a single UE.  When present, this IE shall contain the Subscription Permanent Identifier of the target UE.  (NOTE). |  |
| gpsi | Gpsi | O | 0..1 | This IE may be present when requesting cancellation of LCS service for a single UE.  When present, this IE shall contain the Generic Public Subscription identifier of the target UE.  (NOTE). |  |
| extGroupId | ExternalGroupId | O | 0..1 | This IE may be present when requesting cancellation of LCS service for a group of target UEs.  When present this IE shall contain the External Group ID  (NOTE). |  |
| intGroupId | GroupId | O | 0..1 | This IE may be present when requesting cancellation of LCS service for a group of target UEs.  When present this IE shall contain the Internal Group ID  (NOTE). |  |
| hgmlcCallBackUri | Uri | M | 1 | Notification target address |  |
| ldrReference | LdrReference | M | 1 | LDR Reference |  |
| lmfIdentification | LmfIdentification | O | 0..1 | The latest LMF identification received |  |
| amfId | AmfId | O | 0..1 | The identification of the serving AMF |  |
| NOTE: If cancelling the location for a target UE, the UE identification (attributes gpsi and/or supi) shall be included, if cancelling the UE locations for a target group, the group identification (attributes extGroupId and/or intGroupId), UE identification and group identification shall be included exclusively. | | | | | |

##### 6.1.5.2.5 Type: LocUpdateData

Table 6.1.5.2.5-1: Definition of type LocUpdateData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| supi | Supi | O | 0..1 | Subscription Permanent Identifier |  |
| gpsi | Gpsi | O | 0..1 | Generic Public Subscription identitfier |  |
| pseudonymIndicator | PseudonymIndicator | O | 0..1 | Pseudonym indicator |  |
| locationRequestType | LocationRequestType | M | 1 | Event causing the location estimate (5GC-MO-LR) |  |
| locationEstimate | GeographicArea | M | 1 | Geographic area of the target UE |  |
| ageOfLocationEstimate | AgeOfLocationEstimate | M | 1 | Age of location estimate |  |
| timestampOfLocationEstimate | DateTime | O | 0..1 | When present, this IE shall indicate the estimated UTC time when the location estimate corresponded to the UE location (i.e. when the location estimate and the actual UE location was the same). |  |
| accuracyFulfilmentIndicator | AccuracyFulfilmentIndicator | M | 1 | The indication whether the obtained location estimate satisfies the requested accuracy or not |  |
| civicAddress | CivicAddress | O | 0..1 | Civic address of the target UE |  |
| lcsQosClass | LcsQosClass | M | 1 | The LCS QoS Class requested by the target UE |  |
| externalClientIdentification | ExternalClientIdentification | O | 0..1 | Identity of the LCS client |  |
| afId | string | O | 0..1 | Identity of the AF |  |
| gmlcNumber | string | C | 0..1 | This IE shall be included by the AMF in the request to V-GMLC, if the "mlc-number" IE is received in MO request from the UE.  When present, this IE shall contain the GMLC Number (in E.164 international number format) indicated in the "mlc-number" IE of the MO request from the UE. The V-GMLC may query NRF to obtain the H-GMLC using the GMLC Number.  Pattern: "^[0-9]{5,15}$" |  |
| lcsServiceType | LcsServiceTypeId | O | 0..1 | When present, this IE shall contain the LCS Service Type received from the UE, as specified in clause 6.2 of 3GPP TS 23.273 [4].  When received, the H-GMLC shall map the received LCS Service Type to the Service Identity in Location Update Notification. |  |

##### 6.1.5.2.6 Type: EventNotifyData

Table 6.1.5.2.6-1: Definition of type EventNotifyData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| supi | Supi | O | 0..1 | Subscription Permanent Identifier |  |
| gpsi | Gpsi | O | 0..1 | Generic Public Subscription Identifier |  |
| ldrReference | LdrReference | M | 1 | LDR Reference |  |
| eventNotifyDataType | EventNotifyDataType | M | 1 | The type of event that triggers event notification |  |
| locationEstimate | GeographicArea | O | 0..1 | Geographic area of the target UE |  |
| civicAddress | CivicAddress | O | 0..1 | Civic address of the target UE |  |
| localLocationEstimate | LocalArea | O | 0..1 | When present, this IE shall indicate a local area in renference system. |  |
| ageOfLocationEstimate | AgeOfLocationEstimate | O | 0..1 | Age of location estimate |  |
| timestampOfLocationEstimate | DateTime | O | 0..1 | When present, this IE shall indicate the estimated UTC time when the location estimate corresponded to the UE location (i.e. when the location estimate and the actual UE location was the same). |  |
| positioningDataList | array(PositioningMethodAndUsage) | O | 1..N | If present, this IE shall indicate the usage of each non-GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully. |  |
| gnssPositioningDataList | array(GnssPositioningMethodAndUsage) | O | 1..N | If present, this IE shall indicate the usage of each GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully. |  |
| lmfIdentification | LmfIdentification | O | 0..1 | LMF identification that stores the location context of the target UE |  |
| amfId | AmfId | O | 0..1 | The identification of AMF that is serving the target UE |  |
| terminationCause | TerminationCause | C | 0..1 | The IE shall be included if event reporting has been terminated |  |
| velocityEstimate | VelocityEstimate | C | 0..1 | If present, this IE contain an estimate of the velocity of the target UE, composed by horizontal speed, vertical speed, and their respective uncertainty.  This IE shall be sent from (V)GMLC to (H)GMLC if received by VGMLC from AMF when roaming. |  |
| altitude | Altitude | C | 0..1 | If present, this IE indicates the altitude of the positioning estimate.  This IE shall be sent from (V)GMLC to (H)GMLC if received by VGMLC from AMF when roaming. |  |
| targetNode | NfInstanceId | C | 0..1 | For mobility of a UE with periodic or triggered location, this IE contains the address of the new serving node and shall be sent from (V)GMLC to (H)GMLC if received by VGMLC from AMF when roaming. |  |
| accuracyFulfilmentIndicator | AccuracyFulfilmentIndicator | O | 0..1 | The indication whether the obtained location estimate satisfies the requested accuracy or not |  |
| failureCause | FailureCause | C | 0..1 | This IE shall contain the failure cause for the UE if present.  The IE shall be included if positioning has failed for the target UE in the target group. |  |
| achievedQos | MinorLocationQoS | O | 0..1 | When present, this IE shall contain the achieved Location QoS Accuracy of the estimated location.  This IE shall be present if received. | MUTIQOS |
| haGnssMetrics | HighAccuracyGnssMetrics | C | 0..1 | This IE should be included when received from LMF/AMF.  When present, this IE shall indicate the high accuracy GNSS metrics for the location estimate. |  |
| losNlosMeasureInd | LosNlosMeasureInd | O | 0..1 | When present, this IE shall indicate whether LOS measurement or NLOS measurement is used. |  |
| indoorOutdoorInd | IndoorOutdoorInd | O | 0..1 | When present, this IE shall indicate whether the UE is indoor or outdoor. |  |
| relatedApplicationlayerId | ApplicationlayerId | O | 0..1 | Identifies the application layer ID of the related UE for ranging and sidelink positioning, such as located UE, reference UE, etc. | Ranging\_SL |
| rangeDirection | RangeDirection | O | 0..1 | When present, this IE identifies a range and direction from a point A to a point B, comprising a range from point A to point B, an azimuth direction from point A to point B and an elevation direction from point A to point B. | Ranging\_SL |
| 2dRelativeLocation | 2DRelativeLocation | O | 0..1 | When present, this IE identifies a relative 2D location with uncertainty ellipse, characterised by a point described in 2D local co-ordinates with origin corresponding to another known point, distances r1 and r2 and an angle of orientation A. | Ranging\_SL |
| 3dRelativeLocation | 3DRelativeLocation | O | 0..1 | When present, this IE identifies a relative 3D location with uncertainty ellipsoid, characterised by a point described in 3D local co-ordinates with origin corresponding to another known point, distances r1 (the "semi-major uncertainty"), r2 (the "semi-minor uncertainty") and r3 (the "vertical uncertainty") and an angle of orientation A (the "angle of the major axis"). | Ranging\_SL |
| relativeVelocity | VelocityEstimate | O | 0..1 | When present, this IE identifies UE velocity relative to the UE identified with relatedApplicationlayerId. | Ranging\_SL |

##### 6.1.5.2.7 Type: UePrivacyRequirements

Table 6.1.5.2.7-1: Definition of type UePrivacyRequirements

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| lcsServiceAuthInfo | LcsServiceAuth | O | 0..1 | When present, this IE shall contain an indication of privacy related notification or verification for the target UE.  The default value of this parameter if not presents is "LOCATION\_ALLOWED\_WITHOUT\_NOTIFICATION". |  |
| codeWordCheck | boolean | O | 0..1 | When present, it shall indicate whether the Codeword parameter shall be checked in UE. (NOTE) |  |
| NOTE: Checking of the Codeword in UE applies only when the Codeword parameter (specified in clause 6.1.5.2.2) is present and when the codeWordCheck parameter is present and set to TRUE. | | | | | |

##### 6.1.5.2.8 Void

##### 6.1.5.2.9 Type: LocUpdateNotification

Table 6.1.5.2.9-1: Definition of type LocUpdateNotification

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| supi | Supi | O | 0..1 | Subscription Permanent Identifier |  |
| gpsi | Gpsi | O | 0..1 | Generic Public Subscription identitfier |  |
| locationRequestType | LocationRequestType | M | 1 | Event causing the location estimate (5GC-MO-LR) |  |
| locationEstimate | GeographicArea | M | 1 | geographic area of the target UE |  |
| ageOfLocationEstimate | AgeOfLocationEstimate | M | 1 | Age of location estimate |  |
| timestampOfLocationEstimate | DateTime | O | 0..1 | When present, this IE shall indicate the estimated UTC time when the location estimate corresponded to the UE location (i.e. when the location estimate and the actual UE location was the same). |  |
| accuracyFulfilmentIndicator | AccuracyFulfilmentIndicator | M | 1 | The indication whether the obtained location estimate satisfies the requested accuracy or not |  |
| civicAddress | CivicAddress | O | 0..1 | Civic address of the target UE |  |
| lcsQosClass | LcsQosClass | M | 1 | The LCS QoS Class requested by the target UE |  |
| afId | string | O | 0..1 | Identity of the AF |  |
| serviceIdentity | ServiceIdentity | O | 0..1 | When present, this IE shall contain Service Identity mapped from the LCS Service Type specified by the UE, as specified in clause 6.2 of 3GPP TS 23.273 [4]. |  |

##### 6.1.5.2.10 Type: LocUpdateSubs

Table 6.1.5.2.10-1: Definition of type LocUpdateSubs

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| nfInstanceId | NfInstanceId | M | 1 | Identity of the NF Instance creating the subscription. |  |
| notifUri | Uri | M | 1 | The URI via which the NF service consumer wants to receive notifications related to this subscription. |  |
| supi | Supi | C | 0..1 | SUPI of the UE concerned by the subscription.  This attribute shall be present if the gpsi attribute is not present. |  |
| gpsi | Gpsi | C | 0..1 | GPSI of the UE concerned by the subscription.  This attribute shall be present if the supi attribute is not present. |  |

##### 6.1.5.2.11 Type: EventNotifyDataAdditionalInfo

Table 6.1.5.2.11-1: Definition of type EventNotifyDataAdditionalInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| addEventDataList | array(EventNotifyData) | O | 1..N | When present, this IE shall include a list of event reports of the additional UE(s) which belong to the target group. |  |

##### 6.1.5.2.12 Type: EventNotifyDataExt

Table 6.1.5.2.12-1: Definition of type EventNotifyDataExt as a list of to be combined data

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Cardinality | Description | Applicability |
| EventNotifyData | 1 | Event Notification Data |  |
| EventNotifyDataAdditionalInfo | 1 | Additional information of the Event Notification Data |  |

##### 6.1.5.2.13 Type: AreaEventInfoAddition

Table 6.1.5.2.13-1: Definition of type AreaEventInfoAddition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| geoAreaList | array(GeographicArea) | O | 1..N | One or more geographic areas for location reporting event |
| ignoreAreaDefInd | boolean | O | 0..1 | Indicating whether the "areaDefinition" IE in AreaEventInfoExt combined data type shall be ignored or not:  - true: the "areaDefinition" IE shall be ignored.  - false (default)" the "areaDefinition" IE shall not be ignored. |
| additionalCheckInd | boolean | O | 0..1 | This IE shall be included with the value "true" to indicate that additional check whether UE is located within the requested target area is required, as specified in 3GPP TS 23.273 [4] clause 6.3.1.  When present, this IE shall be set as following:  - true: the additional check whether UE is located within the requested target area is required  - false (default): the additional check whether UE is located within the requested target area is not required |

##### 6.1.5.2.14 Type: AreaEventInfoExt

Table 6.1.5.2.14-1: Definition of type AreaEventInfoExt as a list of to be combined data

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Cardinality | Description | Applicability |
| AreaEventInfo | 1 | Area Event Information |  |
| AreaEventInfoAddition | 1 | Addition information for Extended Area Event Information |  |

##### 6.1.5.2.15 Type: IntegrityRequirements

Table 6.1.5.2.15-1: Definition of type IntegrityRequirements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| targetIntegrityRisk | TargetIntegrityRisk | O | 0..1 | This IE shall indicate Target Integrity Risk (TIR), as specified in 3GPP TR 37.355 [23]. |
| timeToAlert | TimeToAlert | O | 0..1 | This IE shall indicate the Time-to-Alert (TTA). |
| alertLimit | AlertLimit | O | 0..1 | This IE shall indicate Alert Limit (AL), as specified in 3GPP TS 37.355 [23]. |

##### 6.1.5.2.16 Type: AlertLimit

Table 6.1.5.2.16-1: Definition of type AlertLimit

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| horizontalProtectionLevel | HorizontalProtectionLevel | M | 1 | This IE shall indicate the Horizontal Protection Level, as specified in 3GPP TS 37.355 [23]. |
| verticalProtectionLevel | VerticalProtectionLevel | O | 0..1 | This IE shall indicate the Vertical Protection Level, as specified in 3GPP TS 37.355 [23]. |

##### 6.1.5.2.17 Type: UpLocRepInfoAf

Table 6.1.5.2.17-1: Definition of type UpLocRepInfoAf

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| upLocRepAfInd | boolean | C | 0..1 | This IE shall be included to indicate that the location reporting over user plane is required.  When present, this IE shall be set as following:  - true: the location reporting over user plane is required.  Presence of this IE with false value is prohibited |  |
| upLocRepAddrAf | UpLocRepAddrAfRm | O | 0..1 | Notification target (LCS client or AF) endpoint address for location reporting over user plane. |  |
| upCumEvtRptCriteria | UpCumEvtRptCriteria | O | 0..1 | Criteria for sending cumulative event reports over control plane |  |

##### 6.1.5.2.18 Type: UpCumEvtRptCriteria

Table 6.1.5.2.18-1: Definition of type UpCumEvtRptCriteria

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| evtRptTimeCriteria | integer | O | 0..1 | This IE shall contain a timer in seconds to trigger cumulative event report over control plane when location reporting over user plane is ongoing |  |
| evtRptCountCriteria | integer | O | 0..1 | This IE shall contain a number to trigger cumulative event report over control plane when location reporting over user plane is ongoing |  |

##### 6.1.5.2.19 Type: AddLocationDatas

Table 6.1.5.2.19-1: Definition of type AddLocationDatas

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| addLocationDatas | array(LocationData) | O | 1..N | Contains one or more LocationData. |  |

##### 6.1.5.2.20 Type: LocationDataExt

Table 6.1.5.2.20-1: Definition of type LocationDataExt as a list of data types to be combined

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Cardinality | Description | Applicability |
| LocationData | 1 | Location Data |  |
| AddLocationDatas | 1 | Additional Location Data |  |

#### 6.1.5.3 Simple data types and enumerations

##### 6.1.5.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses.

##### 6.1.5.3.2 Simple data types

The simple data types defined in table 6.1.5.3.2-1 shall be supported.

Table 6.1.5.3.2-1: Simple data types

|  |  |  |  |
| --- | --- | --- | --- |
| Type Name | Type Definition | Description | Applicability |
| ServiceIdentity | string | Service identity |  |
| ExternalClientIdentification | string | External LCS client identification |  |
| CodeWord | string | codeword |  |
| E164CountryCodeOfGeographicArea | string | The combination of one, two or three digits identifying a specific country, countries in an integrated numbering plan, or a specific geographic area |  |
| LcsServiceTypeId | integer | LCS Service Type Id, as specified clause 7.6.11.15 of 3GPP TS 29.002 [21].  Minimum = 0. Maximum = 127 |  |
| TimeToAlert | integer | Time-to-Alert  Minimum = 1. Maximum = 300 |  |
| TargetIntegrityRisk | integer | Target Integrity Risk  Minimum = 10. Maximum = 90 |  |
| HorizontalProtectionLevel | integer | Horizontal Protection Level  Minimum = 0. Maximum = 50000 |  |
| VerticalProtectionLevel | integer | Vertical Protection Level  Minimum = 0. Maximum = 50000 |  |

##### 6.1.5.3.3 Enumeration: PseudonymIndicator

The enumeration PseudonymIndicator represents whether pseudonym should be used as the identity of the target UE. It shall comply with the provisions defined in table 6.1.5.3.3-1.

Table 6.1.5.3.3-1: Enumeration PseudonymIndicator

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "PSEUDONYM\_REQUESTED" | A pseudonym is requested |  |
| "PSEUDONYM\_NOT\_REQUESTED" | A pseudonym is not requested |  |

##### 6.1.5.3.4 Enumeration: LocationRequestType

The enumeration LocationRequestType represents how the location request is triggered. It shall comply with the provisions defined in table 6.1.5.3.4-1.

Table 6.1.5.3.4-1: Enumeration LocationRequestType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "NI-LR" | Network induced location request |  |
| "MT-LR" | Mobile terminated location request |  |
| "MO-LR" | Mobile originated location request |  |

##### 6.1.5.3.5 Enumeration: LocationTypeRequested

The enumeration LocationTypeRequested represents the requested type of location which is only applicable to location immediate request. It shall comply with the provisions defined in table 6.1.5.3.5-1.

Table 6.1.5.3.5-1: Enumeration LocationTypeRequested

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "CURRENT\_LOCATION" | Requesting the current location of the target UE |  |
| "CURRENT\_OR\_LAST\_KNOWN\_LOCATION" | Requesting the current or last known location of the target UE |  |
| "INITIAL\_LOCATION" | Requesting the initial location of the target UE |  |
| "NOTIFICATION\_VERIFICATION\_ONLY" | Requesting notification verification only |  |

##### 6.1.5.3.6 Enumeration: EventNotifyDataType

The enumeration EventNotifyDataType represents the type of event notification. It shall comply with the provisions defined in table 6.1.5.3.6-1.

Table 6.1.5.3.6-1: Enumeration EventNotifyDataType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "UE\_AVAILABLE" | UE available event |  |
| "PERIODIC" | Periodic event |  |
| "ENTERING\_INTO\_AREA" | Entering area event |  |
| "LEAVING\_FROM\_AREA" | Leaving area event |  |
| "BEING\_INSIDE\_AREA" | Being inside area event |  |
| "MOTION" | Motion event |  |
| "MAXIMUM\_INTERVAL\_EXPIRATION\_EVENT" | Expiration of maximum reporting interval event |  |
| "LOCATION\_CANCELLATION\_EVENT" | Cancellation of location reporting event |  |
| "ACTIVATION\_OF\_DEFERRED\_LOCATION" | A confirmation that periodic or triggered location was successfully activated in the target UE |  |
| "UE\_MOBILITY\_FOR\_DEFERRED\_LOCATION" | Mobility of the target UE to a different NF |  |
| "5GC\_MT\_LR" | Report of immediate 5GC mobile terminated location.  It is used for 5GC\_MT\_LR request targeting to a group of UE procedure. |  |
| "DIRECT\_REPORT\_EVENT" | Direct location reporting event |  |
| "CUMULATIVE\_EVENT\_REPORT" | Cumulative event report for events reported |  |

##### 6.1.5.3.7 Enumeration: FailureCause

The enumeration FailureCause represents the cause of positioning failure. It shall comply with the provisions defined in table 6.1.5.3.7-1.

Table 6.1.5.3.7-1: Enumeration FailureCause

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "POSITIONING\_DENIED" | Positioning is denied |  |
| "UNSUPPORTED\_BY\_UE" | Positioning is not supported by UE |  |
| "NOT\_REGISTED\_UE" | UE doesn't register |  |
| "UNSPECIFIED" | Unspecified |  |

##### 6.1.5.3.8 Enumeration: SuccessType

The enumeration SuccessType represents the type of success. It shall comply with the provisions defined in table 6.1.5.3.8-1.

Table 6.1.5.3.8-1: Enumeration SuccessType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "SUCCESS\_COMPLETELY" | It is completely successful. |  |
| "SUCCESS\_PARTIALLY" | It is partially successful. |  |

##### 6.1.5.3.9 Enumeration: ReportingInd

The enumeration ReportingInd represents whether the UE is allowed to generate and send the event report when the UE detects the triggered or periodic event happens, if it is inside or outside the event report allowed/expected area. It shall comply with the provisions defined in table 6.1.5.3.9-1.

Table 6.1.5.3.x-1: Enumeration ReportingInd

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "INSIDE\_REPORTING" | The UE is allowed to generate and send the event report when the UE is inside the event report allowed/expected area. |  |
| "OUTSIDE\_REPORTING" | The UE is allowed to generate and send the event report when the UE is outside the event report allowed/expected area |  |

### 6.1.6 Error Handling

#### 6.1.6.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [5].

#### 6.1.6.2 Protocol Errors

Protocol errors handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [5].

#### 6.1.6.3 Application Errors

The application errors defined for the Ngmlc\_Location service are listed in Table 6.1.6.3-1.

Table 6.1.6.3-1: Application errors

|  |  |  |
| --- | --- | --- |
| Application Error | HTTP status code | Description |
| POSITIONING\_DENIED | 403 Forbidden | the positioning procedure was denied. |
| UNSPECIFIED | 403 Forbidden | the request is rejected due to unspecified reasons. |
| UNSUPPORTED\_BY\_UE | 403 Forbidden | the position request for periodic or triggered location is not supported by the target UE |
| LOCATION\_SESSION\_UNKNOWN | 403 Forbidden | the location context was not found |
| UNREQUESTED\_BY\_UE | 403 Forbidden | the UE did not request transfer of its location to an LCS Client or AF |
| UNKOWN\_EXTERNAL\_CLIENT\_OR\_AF | 403 Forbidden | the external LCS client or AF is unknown |
| UNREACHABLE\_EXTERNAL\_CLIENT\_OR\_AF | 403 Forbidden | the external LCS client or AF is unreachable |
| DETACHED\_USER | 403 Forbidden | the user is deregistered in the AMF |
| POSITIONING\_FAILED | 500 Internal Server Error | the positioning procedure failed |
| UNREACHABLE\_USER | 504 Gateway Timeout | the user could not be reached in order to perform positioning procedure |
| PEER\_NOT\_RESPONDING | 504 Gateway Timeout | No response is received from a remote peer, i.e.,  1) The response from the serving AMF wasn't received by (V)GMLC, or;  2) (V)GMLC received HTTP status code 504 with PEER\_NOT\_RESPONDING from AMF. |

### 6.1.7 Feature negotiation

The optional features in table 6.1.7-1 are defined for the Ngmlc\_Location API.

Table 6.1.7-1: Supported Features

|  |  |  |
| --- | --- | --- |
| Feature number | Feature Name | Description |
| 1 | MUTIQOS | Support of Multiple Location QoSes.  This feature bit indicates whether the GMLC support that more than one Location QoSes during consuming location service are required. |
| 2 | Ranging\_SL | This feature supports the enhanced location exposure service (e.g. location information for ranging and sidelink positioning), and requires the support of eLCS feature.  The feature is not applicable to pre-5G (e.g. 4G). |

### 6.1.8 Security

As indicated in 3GPP TS 33.501 [15], the access to the Ngmlc\_Location API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [16]), using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [17]) plays the role of the authorization server.

If Oauth2 authorization is used, an NF Service Consumer, prior to consuming services offered by the Ngmlc\_Location API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [17], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Ngmlc\_Location service.

The Ngmlc\_Location API defines the following scopes for OAuth2 authorization as specified in 3GPP TS 33.501 [15]:

Table 6.1.8-1: OAuth2 scopes defined in Ngmlc\_Location API

|  |  |
| --- | --- |
| Scope | Description |
| "ngmlc\_loc" | Access to the Ngmlc\_Location API. |
| "ngmlc\_loc:provide-location:invoke" | Access to invoke Provide Location |
| "ngmlc\_loc:cancel-location:invoke" | Access to invoke Cancel Location |
| "ngmlc\_loc:location-update:invoke" | Access to invoke Location update |
| "ngmlc\_loc:loc-update-subs:invoke" | Access to invoke Location update subscribe |

### 6.1.9 HTTP redirection

An HTTP request may be redirected to a different GMLC service instance, within the same GMLC or a different GMLC of an GMLC set, e.g. when an GMLC service instance is part of an GMLC (service) set or when using indirect communications (see 3GPP TS 29.500 [5]).

An SCP that reselects a different GMLC producer instance will return the NF Instance ID of the new GMLC producer instance in the 3gpp-Sbi-Producer-Id header, as specified in clause 6.10.3.4 of 3GPP TS 29.500 [5].

If an GMLC within an GMLC set redirects a service request to a different GMLC of the set using an 307 Temporary Redirect or 308 Permanent Redirect status code, the identity of the new GMLC towards which the service request is redirected shall be indicated in the 3gpp-Sbi-Target-Nf-Id header of the 307 Temporary Redirect or 308 Permanent Redirect response as specified in clause 6.10.9.1 of 3GPP TS 29.500 [5].

Annex A (normative):  
OpenAPI specification

# A.1 General

This Annex specifies the formal definition of the Ngmlc\_Location service. It consists of OpenAPI 3.0.0 specifications, in YAML format.

This Annex takes precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API(s).

NOTE: The semantics and procedures, as well as conditions, e.g. for the applicability and allowed combinations of attributes or values, not expressed in the OpenAPI definitions but defined in other parts of the specification also apply.

Informative copies of the OpenAPI specification files contained in this 3GPP Technical Specification are available on a Git-based repository, that uses the GitLab software version control system (see 3GPP TS 29.501 [6] clause 5.3.1 and 3GPP TR 21.900 [19] clause 5B).

# A.2 Ngmlc\_Location API

openapi: 3.0.0

info:

version: '1.2.0-alpha.5'

title: 'Ngmlc\_Location'

description: |

GMLC Location Service.

© 2023, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

All rights reserved.

externalDocs:

description: 3GPP TS 29.515 V18.4.0; 5G System; Gateway Mobile Location Services; Stage 3

url: 'https://www.3gpp.org/ftp/Specs/archive/29\_series/29.515/'

servers:

- url: '{apiRoot}/ngmlc-loc/v1'

variables:

apiRoot:

default: https://example.com

description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

security:

- {}

- oAuth2ClientCredentials:

- ngmlc-loc

paths:

/provide-location:

post:

summary: Request Location of an UE

operationId: RequestLocation

tags:

- Request Location

security:

- {}

- oAuth2ClientCredentials:

- ngmlc-loc

- oAuth2ClientCredentials:

- ngmlc-loc

- ngmlc-loc:provide-location:invoke

requestBody:

content:

application/json:

schema:

$ref: '#/components/schemas/InputData'

required: true

responses:

'200':

description: Expected response to a valid request

content:

application/json:

schema:

$ref: '#/components/schemas/LocationDataExt'

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

'504':

$ref: 'TS29571\_CommonData.yaml#/components/responses/504'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

callbacks:

EventNotify:

'{$request.body#/hgmlcCallBackUri}':

post:

requestBody:

description: UE Event Notification

content:

application/json:

schema:

$ref: '#/components/schemas/EventNotifyDataExt'

responses:

'204':

description: Expected response to a valid notification

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

'504':

$ref: 'TS29571\_CommonData.yaml#/components/responses/504'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

EventNotifyNf:

'{$request.body#/eventNotificationUri}':

post:

requestBody:

description: UE Event Notification

content:

application/json:

schema:

$ref: '#/components/schemas/EventNotifyDataExt'

responses:

'204':

description: Expected response to a valid notification

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

'504':

$ref: 'TS29571\_CommonData.yaml#/components/responses/504'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

/cancel-location:

post:

summary: request cancellation of periodic or triggered location

operationId: CancelLocation

tags:

- Cancel Location

security:

- {}

- oAuth2ClientCredentials:

- ngmlc-loc

- oAuth2ClientCredentials:

- ngmlc-loc

- ngmlc-loc:cancel-location:invoke

requestBody:

content:

application/json:

schema:

$ref: '#/components/schemas/CancelLocData'

required: true

responses:

'204':

description: Expected response to a successful cancellation

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

'504':

$ref: 'TS29571\_CommonData.yaml#/components/responses/504'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

/location-update:

post:

summary: update UE location information

operationId: UpdateLocation

tags:

- Update Location

security:

- {}

- oAuth2ClientCredentials:

- ngmlc-loc

- oAuth2ClientCredentials:

- ngmlc-loc

- ngmlc-loc:location-update:invoke

requestBody:

content:

application/json:

schema:

$ref: '#/components/schemas/LocUpdateData'

required: true

responses:

'204':

description: Expected response to successful location context transfer

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

'504':

$ref: 'TS29571\_CommonData.yaml#/components/responses/504'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

/loc-update-subs:

post:

summary: subscribe to notifications of UE location information

operationId: LocationUpdateSubcribe

tags:

- UE location information Subscription creation

security:

- {}

- oAuth2ClientCredentials:

- ngmlc-loc

- oAuth2ClientCredentials:

- ngmlc-loc

- ngmlc-loc:loc-update-subs:invoke

requestBody:

content:

application/json:

schema:

$ref: '#/components/schemas/LocUpdateSubs'

required: true

responses:

'204':

description: Expected response to successful UE location information subscription

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

'504':

$ref: 'TS29571\_CommonData.yaml#/components/responses/504'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

callbacks:

LocationUpdateNotify:

'{$request.body#/notifUri}':

post:

requestBody:

description: Location Update Notification

content:

application/json:

schema:

$ref: '#/components/schemas/LocUpdateNotification'

responses:

'204':

description: Expected response to a valid notification

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

'504':

$ref: 'TS29571\_CommonData.yaml#/components/responses/504'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{nrfApiRoot}/oauth2/token'

scopes:

ngmlc-loc: Access to the Ngmlc\_Location API

ngmlc-loc:provide-location:invoke: Access to invoke Provide Location

ngmlc-loc:cancel-location:invoke: Access to invoke Cancel Location

ngmlc-loc:location-update:invoke: Access to invoke Location update

ngmlc-loc:loc-update-subs:invoke: Access to invoke Location update subscribe

schemas:

#

# COMPLEX TYPES

#

InputData:

description: Contains the input parameters in ProvideLocation service operation

type: object

required:

- externalClientType

properties:

gpsi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

supi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

extGroupId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/ExternalGroupId'

intGroupId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/GroupId'

externalClientType:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/ExternalClientType'

locationQoS:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LocationQoS'

supportedGADShapes:

type: array

items:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/SupportedGADShapes'

minItems: 1

serviceIdentity:

$ref: '#/components/schemas/ServiceIdentity'

serviceCoverage:

type: array

items:

$ref: '#/components/schemas/E164CountryCodeOfGeographicArea'

minItems: 1

ldrType:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LdrType'

periodicEventInfo:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/PeriodicEventInfo'

areaEventInfo:

$ref: '#/components/schemas/AreaEventInfoExt'

motionEventInfo:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/MotionEventInfo'

ldrReference:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LdrReference'

hgmlcCallBackUri:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uri'

eventNotificationUri:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uri'

externalClientIdentification:

$ref: '#/components/schemas/ExternalClientIdentification'

afId:

type: string

uePrivacyRequirements:

$ref: '#/components/schemas/UePrivacyRequirements'

lcsServiceType:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LcsServiceType'

velocityRequested:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/VelocityRequested'

priority:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LcsPriority'

locationTypeRequested:

$ref: '#/components/schemas/LocationTypeRequested'

maximumAgeOfLocationEstimate:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/AgeOfLocationEstimate'

amfId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/AmfId'

codeWord:

$ref: '#/components/schemas/CodeWord'

scheduledLocTime:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

reliableLocReq:

type: boolean

default: false

servingLmfId:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LMFIdentification'

lpHapType:

$ref: 'TS29518\_Namf\_Location.yaml#/components/schemas/LpHapType'

evtRptExpectedArea:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/GeographicArea'

reportingInd:

allOf:

- $ref: '#/components/schemas/ReportingInd'

default: INSIDE\_REPORTING

integrityRequirements:

$ref: '#/components/schemas/IntegrityRequirements'

upLocRepInfoAf:

$ref: '#/components/schemas/UpLocRepInfoAf'

requestedRangingSlResult:

type: array

items:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/RangingSlResult'

minItems: 1

relatedUEs:

type: array

items:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/RelatedUE'

minItems: 1

mappedQoSEps:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/MappedLocationQoSEps'

LocationDataExt:

description: Extended Location Data for UEs

allOf:

- $ref: '#/components/schemas/LocationData'

- $ref: '#/components/schemas/AddLocationDatas'

LocationData:

description: Contains the response parameters in ProvideLocation service operation

type: object

properties:

gpsi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

supi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

locationEstimate:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/GeographicArea'

civicAddress:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/CivicAddress'

localLocationEstimate:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LocalArea'

ageOfLocationEstimate:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/AgeOfLocationEstimate'

timestampOfLocationEstimate:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

positioningDataList:

type: array

items:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/PositioningMethodAndUsage'

minItems: 1

gnssPositioningDataList:

type: array

items:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/GnssPositioningMethodAndUsage'

minItems: 1

accuracyFulfilmentIndicator:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/AccuracyFulfilmentIndicator'

ueVelocity:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/VelocityEstimate'

ldrReference:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LdrReference'

altitude:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/Altitude'

servingLMFIdentification:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LMFIdentification'

locationPrivacyVerResult:

$ref: 'TS29518\_Namf\_Location.yaml#/components/schemas/LocationPrivacyVerResult'

successType:

$ref: '#/components/schemas/SuccessType'

achievedQos:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/MinorLocationQoS'

directReportInd:

type: boolean

default: false

acceptedPeriodicEventInfo:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/PeriodicEventInfo'

haGnssMetrics:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/HighAccuracyGnssMetrics'

losNlosMeasureInd:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LosNlosMeasureInd'

indoorOutdoorInd:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/IndoorOutdoorInd'

relatedApplicationlayerId:

type: string

rangeDirection:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/RangeDirection'

2dRelativeLocation:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/2DRelativeLocation'

3dRelativeLocation:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/3DRelativeLocation'

relativeVelocity:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/VelocityEstimate'

CancelLocData:

description: Contains the input parameters in CancelLocation service operation

type: object

required:

- hgmlcCallBackUri

- ldrReference

properties:

gpsi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

supi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

extGroupId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/ExternalGroupId'

intGroupId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/GroupId'

hgmlcCallBackUri:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uri'

ldrReference:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LdrReference'

lmfIdentification:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LMFIdentification'

amfId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/AmfId'

LocUpdateData:

description: Contains the input parameters in LocationUpdate service operation

type: object

required:

- locationRequestType

- locationEstimate

- ageOfLocationEstimate

- accuracyFulfilmentIndicator

- lcsQosClass

properties:

gpsi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

supi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

pseudonymIndicator:

$ref: '#/components/schemas/PseudonymIndicator'

locationRequestType:

$ref: '#/components/schemas/LocationRequestType'

locationEstimate:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/GeographicArea'

ageOfLocationEstimate:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/AgeOfLocationEstimate'

timestampOfLocationEstimate:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

accuracyFulfilmentIndicator:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/AccuracyFulfilmentIndicator'

civicAddress:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/CivicAddress'

lcsQosClass:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LcsQosClass'

externalClientIdentification:

$ref: '#/components/schemas/ExternalClientIdentification'

afId:

type: string

gmlcNumber:

type: string

pattern: '^[0-9]{5,15}$'

lcsServiceType:

$ref: '#/components/schemas/LcsServiceTypeId'

EventNotifyData:

description: Contains the input parameters for the target UE in EventNotify Notification service operation

type: object

required:

- eventNotifyDataType

- ldrReference

properties:

gpsi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

supi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

ldrReference:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LdrReference'

eventNotifyDataType:

$ref: '#/components/schemas/EventNotifyDataType'

locationEstimate:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/GeographicArea'

civicAddress:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/CivicAddress'

localLocationEstimate:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LocalArea'

ageOfLocationEstimate:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/AgeOfLocationEstimate'

timestampOfLocationEstimate:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

positioningDataList:

type: array

items:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/PositioningMethodAndUsage'

minItems: 1

gnssPositioningDataList:

type: array

items:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/GnssPositioningMethodAndUsage'

minItems: 1

lmfIdentification:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LMFIdentification'

amfId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/AmfId'

terminationCause:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/TerminationCause'

velocityEstimate:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/VelocityEstimate'

altitude:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/Altitude'

targetNode:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/NfInstanceId'

accuracyFulfilmentIndicator:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/AccuracyFulfilmentIndicator'

failureCause:

$ref: '#/components/schemas/FailureCause'

achievedQos:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/MinorLocationQoS'

haGnssMetrics:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/HighAccuracyGnssMetrics'

losNlosMeasureInd:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LosNlosMeasureInd'

upLocRepStatAf:

type: integer

indoorOutdoorInd:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/IndoorOutdoorInd'

relatedApplicationlayerId:

type: string

rangeDirection:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/RangeDirection'

2dRelativeLocation:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/2DRelativeLocation'

3dRelativeLocation:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/3DRelativeLocation'

relativeVelocity:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/VelocityEstimate'

UePrivacyRequirements:

description: UE privacy requirements from (H)GMLC to the serving AMF or VGMLC(in the roaming case) for the target UE

type: object

properties:

lcsServiceAuthInfo:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/LcsServiceAuth'

codeWordCheck:

type: boolean

LocUpdateNotification:

description: Location Update Notification

type: object

required:

- locationRequestType

- locationEstimate

- ageOfLocationEstimate

- accuracyFulfilmentIndicator

- lcsQosClass

properties:

gpsi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

supi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

locationRequestType:

$ref: '#/components/schemas/LocationRequestType'

locationEstimate:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/GeographicArea'

ageOfLocationEstimate:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/AgeOfLocationEstimate'

timestampOfLocationEstimate:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

accuracyFulfilmentIndicator:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/AccuracyFulfilmentIndicator'

civicAddress:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/CivicAddress'

lcsQosClass:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/LcsQosClass'

afId:

type: string

serviceIdentity:

$ref: '#/components/schemas/ServiceIdentity'

LocUpdateSubs:

description: UE location information subscription

type: object

required:

- nfInstanceId

- notifURI

properties:

nfInstanceId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/NfInstanceId'

notifURI:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uri'

gpsi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

supi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

EventNotifyDataExt:

description: Extended Event Notify Data for UEs of a target group

allOf:

- $ref: '#/components/schemas/EventNotifyData'

- $ref: '#/components/schemas/EventNotifyDataAdditionalInfo'

EventNotifyDataAdditionalInfo:

description: Additional information to Event Notify Data

type: object

properties:

addEventDataList:

type: array

items:

$ref: '#/components/schemas/EventNotifyData'

minItems: 1

AreaEventInfoAddition:

description: Additional information for Extended Area event information

type: object

properties:

geoAreaList:

type: array

items:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/GeographicArea'

minItems: 1

ignoreAreaDefInd:

type: boolean

default: false

additionalCheckInd:

type: boolean

default: false

AreaEventInfoExt:

description: Extended Area Event Information

allOf:

- $ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/AreaEventInfo'

- $ref: '#/components/schemas/AreaEventInfoAddition'

IntegrityRequirements:

description: integrity requirements.

type: object

properties:

timeToAlert:

$ref: '#/components/schemas/TimeToAlert'

targetIntegrityRisk:

$ref: '#/components/schemas/TargetIntegrityRisk'

alertLimit:

$ref: '#/components/schemas/AlertLimit'

AlertLimit:

description: Alert Limit.

type: object

required:

- horizontalProtectionLevel

properties:

horizontalProtectionLevel:

$ref: '#/components/schemas/HorizontalProtectionLevel'

verticalProtectionLevel:

$ref: '#/components/schemas/VerticalProtectionLevel'

UpLocRepInfoAf:

description: Information for the location reporting over user plane

type: object

properties:

upLocRepAfInd:

type: boolean

enum:

- true

upLocRepAddrAf:

$ref: 'TS29122\_MonitoringEvent.yaml#/components/schemas/UpLocRepAddrAfRm'

upCumEvtRptCriteria:

$ref: '#/components/schemas/UpCumEvtRptCriteria'

UpCumEvtRptCriteria:

description: Criteria for sending cumulative events reports over control plane

type: object

properties:

evtRptTimeCriteria:

type: integer

evtRptCountCriteria:

type: integer

#

# SIMPLE TYPES

#

ServiceIdentity:

description: Contains the service identity

type: string

ExternalClientIdentification:

description: Contains the external client identification

type: string

CodeWord:

description: Contains the codeword

type: string

E164CountryCodeOfGeographicArea:

description: Contains the E.164 country codes for geographic areas

type: string

LcsServiceTypeId:

description: LCS Service Type Id.

type: integer

minimum: 0

maximum: 127

TimeToAlert:

description: Contains the time-to-alert

type: integer

minimum: 1

maximum: 300

TargetIntegrityRisk:

description: Contains the target integrity risk

type: integer

minimum: 10

maximum: 90

HorizontalProtectionLevel:

description: Contains the Horizontal Protection Level

type: integer

minimum: 0

maximum: 50000

VerticalProtectionLevel:

description: Contains the Vertical Protection Level

type: integer

minimum: 0

maximum: 50000

#

# ENUMS

#

PseudonymIndicator:

description: It defines if a pseudonym is requested

anyOf:

- type: string

enum:

- PSEUDONYM\_REQUESTED

- PSEUDONYM\_NOT\_REQUESTED

- type: string

LocationRequestType:

description: NI-LR, MT-LR or MO-LR

anyOf:

- type: string

enum:

- NI\_LR

- MT\_LR

- MO\_LR

- type: string

LocationTypeRequested:

description: Contains the location type requested by the LCS client

anyOf:

- type: string

enum:

- CURRENT\_LOCATION

- CURRENT\_OR\_LAST\_KNOWN\_LOCATION

- INITIAL\_LOCATION

- NOTIFICATION\_VERIFICATION\_ONLY

- type: string

EventNotifyDataType:

description: Contains the type of event that triggers event notification

anyOf:

- type: string

enum:

- UE\_AVAILABLE

- PERIODIC

- ENTERING\_INTO\_AREA

- LEAVING\_FROM\_AREA

- BEING\_INSIDE\_AREA

- MOTION

- MAXIMUM\_INTERVAL\_EXPIRATION\_EVENT

- LOCATION\_CANCELLATION\_EVENT

- ACTIVATION\_OF\_DEFERRED\_LOCATION

- UE\_MOBILITY\_FOR\_DEFERRED\_LOCATION

- 5GC\_MT\_LR

- DIRECT\_REPORT\_EVENT

- CUMULATIVE\_EVENT\_REPORT

- type: string

FailureCause:

description: Positioning failure cause

anyOf:

- type: string

enum:

- POSITIONING\_DENIED

- UNSUPPORTED\_BY\_UE

- NOT\_REGISTED\_UE

- UNSPECIFIED

- type: string

SuccessType:

description: Success Type to indicate full or partial success

anyOf:

- type: string

enum:

- SUCCESS\_COMPLETELY

- SUCCESS\_PARTIALLY

- type: string

ReportingInd:

description: >

Indicates whether the UE is allowed to generate and send the event report inside or outside

the event report allowed(expected) area

anyOf:

- type: string

enum:

- INSIDE\_REPORTING

- OUTSIDE\_REPORTING

- type: string

AddLocationDatas:

type: array

items:

$ref: '#/components/schemas/LocationData'

minItems: 1

Annex B (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2019-04 | CT4#90 | C4-191340 |  |  |  | Initial Draft of Gateway Mobile Location Services | 0.1.0 |
| 2019-05 | CT4#91 | C4-192485 |  |  |  | V0.2.0 | 0.2.0 |
| 2019-09 | CT4#93 | C4-193845 |  |  |  | Implementation of pCRs agreed at CT4#93 | 0.3.0 |
| 2019-10 | CT4#94 | C4-194555 |  |  |  | Implementation of pCRs agreed at CT4#94 | 0.4.0 |
| 2019-11 | CT4#95 | C4-195413, C4-195409, C4-195296 |  |  |  | Implementation of pCRs agreed at CT4#95 | 0.5.0 |
| 2019-12 | CT#86 | CP-193065 |  |  |  | TS presented for information | 1.0.0 |
| 2020-03 | CT4#96e | C4-200725, C4-200727, C4-200943, C4-200993, C4-200995, C4-201286 |  |  |  | Implementation of pCRs agreed at CT4#96e | 1.1.0 |
| 2020-03 | CT#87e | CP-200060 |  |  |  | TS presented for approval | 2.0.0 |
| 2020-03 | CT#87e |  |  |  |  | Approved at CT87e | 16.0.0 |
| 2020-04 | CT#87e | C4-202409 | 0001 | 1 | F | Correct the errors | 16.1.0 |
| 2020-04 | CT#87e | C4-202325 | 0003 | - | F | Miscellaneous corrections on TS 29.515 | 16.1.0 |
| 2020-04 | CT#87e | C4-202326 | 0004 | - | F | Removing pseudonym of UE | 16.1.0 |
| 2020-04 | CT#87e | C4-202532 | 0005 | 1 | F | UE Privacy Requirements Corrections | 16.1.0 |
| 2020-06 | CT#88e | C4-203181 | 0006 | - | F | Error corrections | 16.1.0 |
| 2020-06 | CT#88e | C4-203540 | 0007 | 1 | F | Storage of YAML files in ETSI Forge | 16.1.0 |
| 2020-06 | CT#88e | C4-203524 | 0008 | 1 | F | Correct the Example Consumer(s) in Table 5.1-1 | 16.1.0 |
| 2020-06 | CT#88e | C4-203269 | 0010 | - | F | LDRreference | 16.1.0 |
| 2020-06 | CT#88e | C4-203360 | 0003 | 1 | F | Miscellaneous corrections on TS 29.515 | 16.1.0 |
| 2020-06 | CT#88e | C4-203645 | 0011 | - | F | 3GPP TS 29.515 API Version Update | 16.1.0 |
| 2020-09 | CT#89e | CP-202112 | 0012 | 1 | F | API name correction | 16.2.0 |
| 2020-09 | CT#89e | CP-202112 | 0014 | 1 | F | Correction of CodeWord Checking for UE Notification and Verification | 16.2.0 |
| 2020-09 | CT#89e | CP-202112 | 0015 | 1 | F | Correction of Notification or Verification only for UE Positioning | 16.2.0 |
| 2020-09 | CT#89e | CP-202112 | 0016 | 1 | F | Corrections on EventNotify service operation | 16.2.0 |
| 2020-09 | CT#89e | CP-202112 | 0017 | 1 | F | Corrections on Application Errors in provide-location response | 16.2.0 |
| 2020-09 | CT#89e | CP-202112 | 0018 | 1 | F | Corrections on LocationData | 16.2.0 |
| 2020-09 | CT#89e | CP-202139 | 0020 | 2 | F | Essential correction to OpenAPI specification for LocationUpdateNotify service operation | 16.2.0 |
| 2020-09 | CT#89e | CP-202096 | 0021 | - | F | API version and External doc update | 16.2.0 |
| 2020-11 | CT#90e | CP-203050 | 0022 | 1 | F | CancelLocation for a group of UEs | 16.3.0 |
| 2020-11 | CT#90e | CP-203050 | 0023 | 2 | F | EventNotify for UEs in a group | 16.3.0 |
| 2020-11 | CT#90e | CP-203050 | 0024 | 1 | F | Provide Locations of a group of UEs | 16.3.0 |
| 2020-11 | CT#90e | CP-203050 | 0028 | - | F | Essential corrections | 16.3.0 |
| 2020-11 | CT#90e | CP-203050 | 0029 | - | F | Storage of YAML files in 3GPP Forge | 16.3.0 |
| 2020-11 | CT#90e | CP-203050 | 0030 | - | F | API version and External doc update | 16.3.0 |
| 2021-03 | CT#91e | CP-210037 | 0033 | 1 | F | HTTP 3xx redirection | 16.4.0 |
| 2021-03 | CT#91e | CP-210041 | 0032 | 1 | F | Geographic Area | 16.4.0 |
| 2021-03 | CT#91e | CP-210054 | 0035 | - | F | 29.515 Rel-16 API version and External doc update | 16.4.0 |
| 2021-03 | CT#91e | CP-210034 | 0034 | 1 | F | OpenAPI Reference | 17.0.0 |
| 2021-06 | CT#92e | [CP-211026](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211026) | 0036 | 2 | B | Add Local Address | 17.1.0 |
| 2021-06 | CT#92e | [CP-211028](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211028) | 0047 | - | F | Data Types Descriptions | 17.1.0 |
| 2021-06 | CT#92e | [CP-211050](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211050) | 0050 | - | F | 29.515 Rel-17 API version and External doc update | 17.1.0 |
| 2021-06 | CT#92e | [CP-211059](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211059) | 0040 | 1 | A | 3xx description correction for SCP | 17.1.0 |
| 2021-06 | CT#92e | [CP-211059](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211059) | 0046 | 1 | A | Redirect Responses | 17.1.0 |
| 2021-06 | CT#92e | [CP-211063](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211063) | 0038 | 1 | A | LCS Service Type and External Client Type | 17.1.0 |
| 2021-06 | CT#92e | [CP-211063](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211063) | 0044 | - | A | Remove LcsServiceType | 17.1.0 |
| 2021-06 | CT#92e | [CP-211063](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211063) | 0048 | - | A | Wrong data type name | 17.1.0 |
| 2021-09 | CT#93e | C4-214712 | 0056 | 1 | A | LCS Service Type | 17.2.0 |
| 2021-09 | CT#93e | C4-214826 | 0054 | 1 | B | Multiple QoS Class | 17.2.0 |
| 2021-09 | CT#93e | C4-214766 | 0057 | - | F | 29.515 Rel-17 API version and External doc update | 17.2.0 |
| 2021-12 | CT#94e | C4-215455 | 0059 | - | B | Higher Resolution Timestamp for Location Estimates | 17.3.0 |
| 2021-12 | CT#94e | C4-216164 | 0063 | - | A | Correct the table name of SuccessType | 17.3.0 |
| 2021-12 | CT#94e | C4-216520 | 0065 | 1 | A | Add the missing pseudonymIndicator IE in OpenAPI | 17.3.0 |
| 2021-12 | CT#94e | C4-216534 | 0067 | 1 | A | Information for HGMLC Discovery | 17.3.0 |
| 2021-12 | CT#94e | CP-213174 | 0069 | 2 | A | LCS Service Type in MO-LR | 17.3.0 |
| 2021-12 | CT#94e | C4-216481 | 0070 | - | F | 29.515 Rel-17 API version and External doc update | 17.3.0 |
| 2022-03 | CT#95e | C4-220339 | 0074 | 1 | F | Editorial corrections | 17.4.0 |
| 2022-03 | CT#95e | C4-220368 | 0072 | 1 | B | Schedule location time for GMLC | 17.4.0 |
| 2022-03 | CT#95e | C4-221352 | 0076 | - | F | Editorial corrections | 17.4.0 |
| 2022-03 | CT#95e | C4-221603 | 0077 | - | F | 29.515 Rel-17 API version and External doc update | 17.4.0 |
| 2022-06 | CT#96 | CP-221022 | 0079 | - | B | Scheduled location time for bulk operation | 17.5.0 |
| 2022-06 | CT#96 | CP-221051 | 0081 | - | F | 29.515 Rel-17 API version and External doc update | 17.5.0 |
| 2022-09 | CT#97e | CP-222036 | 0082 | 1 | F | Indication of Network Assisted Positioning method | 17.6.0 |
| 2022-09 | CT#97e | CP-222058 | 0083 | - | F | 29.515 Rel-17 API version and External doc update | 17.6.0 |
| 2022-12 | CT#98e | CP-223028 | 0084 | 1 | F | Missing mandatory status codes in OpenAPI | 18.0.0 |
| 2022-12 | CT#98e | CP-223033 | 0085 | - | F | 29.515 Rel-18 API version and External doc update | 18.0.0 |
| 2023-03 | CT#99 | CP-230065 | 0090 | - | F | Correction on the figure of EventNotify | 18.1.0 |
| 2023-03 | CT#99 | CP-230032 | 0093 | 2 | B | Location service in PNI-NPN with signalling optimisation | 18.1.0 |
| 2023-03 | CT#99 | CP-230032 | 0094 | 1 | B | Support of LMF selection | 18.1.0 |
| 2023-03 | CT#99 | CP-230032 | 0095 | 1 | B | Support of location comparision task | 18.1.0 |
| 2023-03 | CT#99 | CP-230032 | 0096 | 2 | B | Support of low power and high accuracy positioning | 18.1.0 |
| 2023-03 | CT#99 | CP-230071 | 0098 | - | F | 29.515 Rel-18 API version and External doc update | 18.1.0 |
| 2023-06 | CT#100 | CP-231026 | 0097 | 3 | F | Location header description | 18.2.0 |
| 2023-06 | CT#100 | CP-231031 | 0100 | 1 | B | Add NWDAF as GMLC service consumer | 18.2.0 |
| 2023-06 | CT#100 | CP-231025 | 0101 | - | F | Miscellaneous corrections | 18.2.0 |
| 2023-06 | CT#100 | CP-231075 | 0103 | 1 | A | Missing finer periodicities than 1s and an infinite reporting amount | 18.2.0 |
| 2023-06 | CT#100 | CP-231031 | 0105 | 2 | B | Support of event report allowed area | 18.2.0 |
| 2023-06 | CT#100 | CP-231031 | 0109 | 1 | F | Update the incorrect reference | 18.2.0 |
| 2023-06 | CT#100 | CP-231026 | 0110 | - | B | OAuth2 scopes in the Ngmlc\_Location API | 18.2.0 |
| 2023-06 | CT#100 | CP-231031 | 0112 | 2 | B | Add reporting indication | 18.2.0 |
| 2023-06 | CT#100 | CP-231028 | 0113 | - | F | Wrong reference number | 18.2.0 |
| 2023-06 | CT#100 | CP-231070 | 0114 | - | F | 29.515 Rel-18 API version and External doc update | 18.2.0 |
| 2023-09 | CT#101 | CP-232035 | 0117 | 1 | F | Correction on Reporting Indication | 18.3.0 |
| 2023-09 | CT#101 | CP-232063 | 0119 | - | A | Missed HA GNSS Metrics Support over SBI | 18.3.0 |
| 2023-09 | CT#101 | CP-232053 | 0120 | - | B | Support of 5GC-MT-LR procedure involving Mobile Base Station Relay | 18.3.0 |
| 2023-09 | CT#101 | CP-232035 | 0121 | 1 | B | Support on NLOS/LOS measurement indication | 18.3.0 |
| 2023-09 | CT#101 | CP-232062 | 0124 | 1 | A | Add GNSS integrity requirement | 18.3.0 |
| 2023-09 | CT#101 | CP-232060 | 0125 | - | F | 29.515 Rel-18 API version and External doc update | 18.3.0 |
| 2023-12 | CT#102 | CP-233037 | 0116 | 5 | B | Periodic or triggered location events via user plane to an LCS Client or AF | 18.4.0 |
| 2023-12 | CT#102 | CP-233037 | 0127 | 1 | B | Addition of missing interface between LMF and GMLC | 18.4.0 |
| 2023-12 | CT#102 | CP-233037 | 0128 | - | F | Correction on the description of scheduledLocTime | 18.4.0 |
| 2023-12 | CT#102 | CP-233037 | 0129 | - | B | Resolve Editor's note | 18.4.0 |
| 2023-12 | CT#102 | CP-233037 | 0130 | - | B | Support on Indoor/Ourdoor indication | 18.4.0 |
| 2023-12 | CT#102 | CP-233028 | 0131 | 1 | F | HTTP RFCs obsoleted by IETF RFC 9113 | 18.4.0 |
| 2023-12 | CT#102 | CP-233072 | 0136 | - | A | Incomplete CR implementation | 18.4.0 |
| 2023-12 | CT#102 | CP-233295 | 0137 | 4 | B | Update on Ngmlc\_Location\_ProvideLocation service for ranging\_SL | 18.4.0 |
| 2023-12 | CT#102 | CP-233037 | 0138 | 2 | F | Reporting Indication Definition Alignment to Stage 2 | 18.4.0 |
| 2023-12 | CT#102 | CP-233037 | 0139 | 1 | B | Multiple QoS for Deferred Location Service Continuation from 5GS to EPS | 18.4.0 |
| 2023-12 | CT#102 | CP-233030 | 0140 | - | F | ProblemDetails RFC 7807 obsoleted by 9457 | 18.4.0 |
| 2023-12 | CT#102 | CP-233060 | 0144 | - | F | 29.515 Rel-18 API version and External doc update | 18.4.0 |