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# Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

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

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

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 Ngmc.

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 3.0.0 Specification", <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md>.

[8] IETF RFC 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".

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

[10] IETF RFC 7807: "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".

# 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

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 and NEF via the Ngmlc service based interface (see 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3]).

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 |
|  | LocationUpdate | Request/Response | AMF, V-GMLC |
|  | LocationUpdateNotify | Notify | NEF |
|  | CancelLocation | Request/Response | H-GMLC, NEF |
|  | EventNotify | Notify | H-GMLC, NEF |

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 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 civic location of a target UE.

- Allow the consumer NF to subscribe/unsubscribe the geodetic and optionally 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 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

- LocationUpdateSubscribe- LocationUpdateNotify

- CancelLocation

- EventNotify

#### 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 Locaitons 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)

- Deferred 5GC-MT-LR Procedure for Periodic, Triggered and UE Available Location Events (see 3GPP TS 23.273 [4], clause 6.3.1)

The ProvideLocation service operation is invoked by a NF Service Consumer, e.g. a NEF or GMLC, towards the GMLC to request to provide the location information (geodetic location and, optionally, 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) should 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 subscrpiton of EventNotify provided by AMF, and NEF Callback URI may be included in the HTTP POST request body to GMLC/H-GMLC for implicit subscrpiton of EventNotify provided by GMLC/H-GMLC.

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, 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 error 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, towards the GMLC (e.g. (H)GMLC when roaming) to request to provide the location informations (geodetic location and, optionally, 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 indentification (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.

GMLC shall translate the target group indentification 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 error 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:

- Deferred 5GC-MT-LR Procedure for Periodic, Triggered and UE Available Location Events (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 6.3.1 or clause 6.3.2)

The EventNotify for a single UE enables the consumer NF (e.g. (H)GMLC, NEF) to get notified about the geodetic and optionally 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 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, Civic Location, Position Methods Used, serving LMF identification etc.) should be included in the HTTP POST request body. 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,

- the callback URI of NEF provided by NEF 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) to get notified about the geodetic and optionally 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 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 callback URI of the NF consumer (e.g. NEF). The response body shall contain a LocUpdateNotification object.

The callback URI (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 5.2.2.6A.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 6.1.3.4.2-2 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 7540 [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/2, as defined in IETF RFC 7540 [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 7807 [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 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 UE to update UE location information towards the consumer NF |
| {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 |
| LocationData | 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  - Civic Location  - Age of Location  - Accuracy of Location  - Positioning methods |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection. The response shall include a Location header field containing a different URI, or the same URI if a request is redirected to the same target resource via a different SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. The response shall include a Location header field containing a different URI, or the same URI if a request is redirected to the same target resource via a different SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set. |
| 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.  Or the same URI, if a request is redirected to the same target resource via a different SCP. |
| 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.  Or the same URI, if a request is redirected to the same target resource via a different SCP. |
| 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. The response shall include a Location header field containing a different URI, or the same URI if a request is redirected to the same target resource via a different SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. The response shall include a Location header field containing a different URI, or the same URI if a request is redirected to the same target resource via a different SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set. |
| 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.  Or the same URI, if a request is redirected to the same target resource via a different SCP. |
| 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.  Or the same URI, if a request is redirected to the same target resource via a different SCP. |
| 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. The response shall include a Location header field containing a different URI, or the same URI if a request is redirected to the same target resource via a different SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. The response shall include a Location header field containing a different URI, or the same URI if a request is redirected to the same target resource via a different SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set. |
| 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.  Or the same URI, if a request is redirected to the same target resource via a different SCP. |
| 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.  Or the same URI, if a request is redirected to the same target resource via a different SCP. |
| 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. The response shall include a Location header field containing a different URI, or the same URI if a request is redirected to the same target resource via a different SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. The response shall include a Location header field containing a different URI, or the same URI if a request is redirected to the same target resource via a different SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same GMLC or GMLC (service) set. |
| 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.  Or the same URI, if a request is redirected to the same target resource via a different SCP. |
| 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.  Or the same URI, if a request is redirected to the same target resource via a different SCP. |
| 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

#### 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) 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).

##### 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. The NF service consumer shall generate a Location header field containing a URI pointing to the endpoint of another NF service consumer to which the notification should be sent.  If an SCP redirects the message to another SCP then the location header field shall contain the same URI or a different URI pointing to the endpoint of the NF service consumer to which the notification should be sent. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. The NF service consumer shall generate a Location header field containing a URI pointing to the endpoint of another NF service consumer to which the notification should be sent.  If an SCP redirects the message to another SCP then the location header field shall contain the same URI or a different URI pointing to the endpoint of the NF service consumer to which the notification should be sent. |
| 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 |
| 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 |
| 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: {locationUpdateCallbackUri}

##### 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. The NF service consumer shall generate a Location header field containing a URI pointing to the endpoint of another NF service consumer to which the notification should be sent.  If an SCP redirects the message to another SCP then the location header field shall contain the same URI or a different URI pointing to the endpoint of the NF service consumer to which the notification should be sent. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection. The NF service consumer shall generate a Location header field containing a URI pointing to the endpoint of another NF service consumer to which the notification should be sent.  If an SCP redirects the message to another SCP then the location header field shall contain the same URI or a different URI pointing to the endpoint of the NF service consumer to which the notification should be sent. |
| 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 1: 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 |
| 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 |
| 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 | the response parameters in ProvideLocation service operation |  |
| 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 |  |
| 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 |  |
| 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 |  |

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 |  |
| 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 |  |
| RedirectResponse | 3GPP TS 29.571 [11] |  |  |

#### 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 |  |
| 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. |  |
| hgmlcCallBackUri | Uri | O | 0..1 | Notification target address for HGMLC |  |
| eventNotificationUri | Uri | O | 0..1 | The call-back Uri of NF service consumer (i.e. NEF) 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) |  |
| 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 |  |
| ageOfLocationEstimate | AgeOfLocationEstimate | O | 0..1 | Age of location estimate |  |
| 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. |  |

##### 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). |  |
|  |  | 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 |  |
| 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 |  |
| ageOfLocationEstimate | AgeOfLocationEstimate | O | 0..1 | Age of location estimate |  |
| 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. |  |

##### 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 |  |
| 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. |

##### 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 |  |

#### 6.1.5.3 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 [xx].  Minimum = 0. Maximum = 127 |  |

##### 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. |  |

##### 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. |  |

### 6.1.6 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 |
|  |  |  |

### 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 scopes for OAuth2 authorization as specified in 3GPP TS 33.501 [15]; it defines a single scope consisting on the name of the service (i.e., "ngmlc-loc"), and it does not define any additional scopes at resource or operation level.

### 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 [4]).

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 [4].

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 [4].

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: '1.0.6'

title: Ngmlc\_Location

description: |

Ngmlc\_Location Service.

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externalDocs:

description: 3GPP TS 29.515 V16.7.0; 5G System; Gateway Mobile Location Services; Stage 3

url: 'http://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

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/LocationData'

'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'

'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'

'503':

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

'504':

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

default:

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

EventNotifyNef:

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

post:

requestBody:

description: UE Event Notification

content:

application/json:

schema:

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

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'

'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

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'

'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

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'

'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

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'

'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'

'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

schemas:

#

# COMPLEX TYPES

#

InputData:

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'

LocationData:

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'

ageOfLocationEstimate:

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

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'

CancelLocData:

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:

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'

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:

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'

ageOfLocationEstimate:

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

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'

UePrivacyRequirements:

type: object

properties:

lcsServiceAuthInfo:

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

codeWordCheck:

type: boolean

LocUpdateNotification:

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'

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:

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:

allOf:

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

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

EventNotifyDataAdditionalInfo:

type: object

properties:

addEventDataList:

type: array

items:

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

minItems: 1

AreaEventInfoAddition:

type: object

properties:

geoAreaList:

type: array

items:

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

minItems: 1

ignoreAreaDefInd:

type: boolean

default: false

AreaEventInfoExt:

allOf:

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

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

#

# SIMPLE TYPES

#

ServiceIdentity:

type: string

ExternalClientIdentification:

type: string

CodeWord:

type: string

E164CountryCodeOfGeographicArea:

type: string

LcsServiceTypeId:

description: LCS Service Type Id.

type: integer

minimum: 0

maximum: 127

#

# ENUMS

#

PseudonymIndicator:

anyOf:

- type: string

enum:

- PSEUDONYM\_REQUESTED

- PSEUDONYM\_NOT\_REQUESTED

- type: string

LocationRequestType:

anyOf:

- type: string

enum:

- NI\_LR

- MT\_LR

- MO\_LR

- type: string

LocationTypeRequested:

anyOf:

- type: string

enum:

- CURRENT\_LOCATION

- CURRENT\_OR\_LAST\_KNOWN\_LOCATION

- INITIAL\_LOCATION

- NOTIFICATION\_VERIFICATION\_ONLY

- type: string

EventNotifyDataType:

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

- type: string

FailureCause:

anyOf:

- type: string

enum:

- POSITIONING\_DENIED

- UNSUPPORTED\_BY\_UE

- NOT\_REGISTED\_UE

- UNSPECIFIED

- type: string

SuccessType:

anyOf:

- type: string

enum:

- SUCCESS\_COMPLETELY

- SUCCESS\_PARTIALLY

- type: string

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 |
| 2021-06 | CT#92e | [CP-211059](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211059) | 0039 | 1 | F | 3xx description correction for SCP | 16.5.0 |
| 2021-06 | CT#92e | [CP-211059](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211059) | 0045 | 1 | F | Redirect Responses | 16.5.0 |
| 2021-06 | CT#92e | [CP-211063](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211063) | 0037 | 1 | F | LCS Service Type and External Client Type | 16.5.0 |
| 2021-06 | CT#92e | [CP-211063](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211063) | 0043 | - | F | Remove LcsServiceType | 16.5.0 |
| 2021-06 | CT#92e | [CP-211063](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211063) | 0049 | - | F | Wrong data type name | 16.5.0 |
| 2021-06 | CT#92e | [CP-211073](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211073) | 0051 | - | F | 29.515 Rel-16 API version and External doc update | 16.5.0 |
| 2021-09 | CT#93e | [C4-214711](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211073) | 0055 | 1 | F | LCS Service Type | 16.6.0 |
| 2021-09 | CT#93e | [C4-214788](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211073) | 0058 | - | F | 29.515 Rel-16 API version and External doc update | 16.6.0 |
| 2021-12 | CT#94e | [C4-216163](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211073) | 0062 | - | F | Correct the table name of SuccessType | 16.7.0 |
| 2021-12 | CT#94e | [C4-216519](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211073) | 0064 | 1 | F | Add the missing pseudonymIndicator IE in OpenAPI | 16.7.0 |
| 2021-12 | CT#94e | [C4-216533](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211073) | 0066 | 1 | F | Information for HGMLC Discovery | 16.7.0 |
| 2021-12 | CT#94e | CP-213173 | 0068 | 2 | F | LCS Service Type in MO-LR | 16.7.0 |
| 2021-12 | CT#94e | [C4-216498](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-211073) | 0071 | - | F | 29.515 Rel-16 API version and External doc update | 16.7.0 |