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Contents

Foreword

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

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

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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

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need not indicates permission not to do something

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can indicates that something is possible

cannot indicates that something is impossible

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

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

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

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

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

In addition:

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

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

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

1   Scope

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

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

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

2   References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1]   3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

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

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

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

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

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

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

[8]   IETF RFC 9113: "HTTP/2".

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

[25]   void

[26]   3GPP TS 38.305: "NG Radio Access Network (NG-RAN); Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN"

3   Definitions of terms, symbols and abbreviations

3.1   Terms

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

3.2   Symbols

Void

3.3   Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

5GC	5G Core Network
AMF	Access and Mobility Management Function
GAD	Geographical Area Description
GMLC	Gateway Mobile Location Centre
GPSI	Generic Public Subscription Identifier
LCS	Location Services
LDR	Location Deferred Request
LPHAP	Low Power and High Accuracy Positioning
MBSR	Mobile Base Station Relay
MO-LR	Mobile Originated Location Request
MT-LR	Mobile Terminated Location Request
NEF	Network Exposure Function
NI-LR	Network Induced Location Request
NRF	Network Repository Function
SUPI	Subscription Permanent Identifier

4   Overview

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

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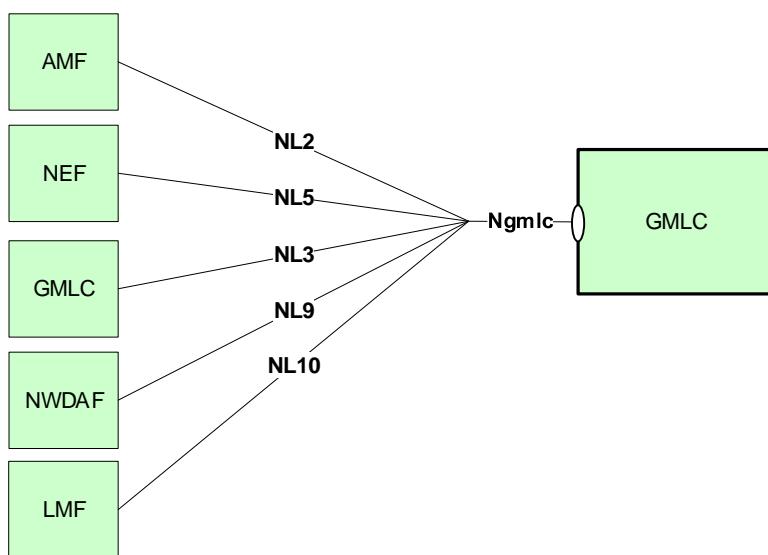
Figure 4-1: Reference model – GMLC

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

5 Services offered by the GMLC

5.1 Introduction

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

Table 5.1-1: List of GMLC Services

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

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

Table 5.1-2: API Descriptions

Service Name	Clause	Description	OpenAPI Specification File	apiName	Annex
Ngmlc_Location	6.1	Ngmlc Location Service	TS29515_Ngmlc_Location.yaml	ngmlc-loc	A.2

5.2 Ngmlc_Location Service

5.2.1 Service Description

The Ngmlc_Location service enables an NF to request location determination (current geodetic and optionally local and/or civic location) for a target UE or to request relative locations, distance, or direction between UEs. The following are the key functionalities of this NF service.

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

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

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

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

- Allow the consumer NF to perform privacy check and ID mapping of a UE for Ranging SL Positioning service.

- Allow the consumer NF to request the relative locations, distance, or direction between UEs.

5.2.2 Service Operations

5.2.2.1 Introduction

The service operations defined for the Ngmlc_Location services are as follows:

- ProvideLocation

- LocationUpdate

- CancelLocation

- EventNotify

- LocationUpdateNotify

- LocationUpdateSubscribe

- PrivacyCheckIdMapping

5.2.2.2 ProvideLocation

5.2.2.2.1 General

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

- Provide location of a single UE

- Provide locations of a group of UEs

- Provide locations of a single UE relative to one or more related UEs

5.2.2.2.2 Provide Location of a single UE

The service operation is used during the procedures:

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

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

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

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

- Procedures of SL-MT-LR involving LMF (see 3GPP TS 23.273 [4], clause 6.20.3)

- Procedures of SL-MT-LR for periodic, triggered Location Events (see 3GPP TS 23.273 [4], clause 6.20.4)

- 5GC-MT-LR Procedure using SL positioning (see 3GPP TS 23.273 [4], clause 6.20.5)

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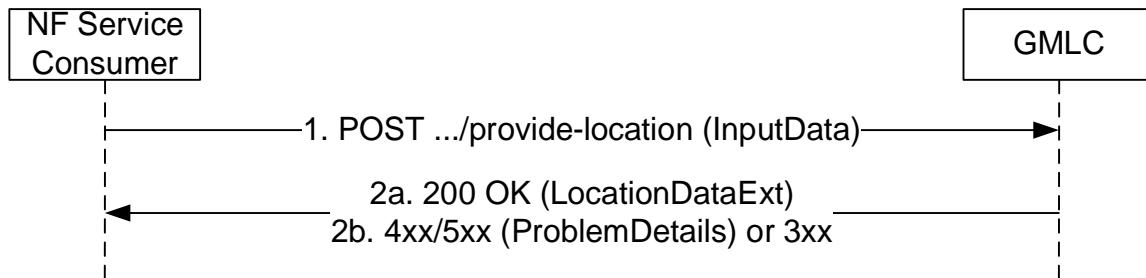
Figure 5.2.2.2.2-1: ProvideLocation Request/Response for a target UE

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

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

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

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

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

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

5.2.2.2.3 Provide Locations of a group of UEs

The service operation is used during the procedures:

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

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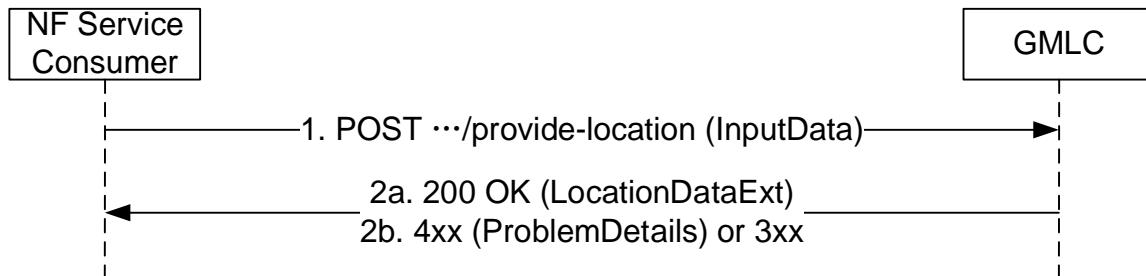

Figure 5.2.2.2.3-1: ProvideLocation Request/Response for a target group

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

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

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

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

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

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

5.2.2.3 LocationUpdate

5.2.2.3.1 General

The service operation is used during the procedure:

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

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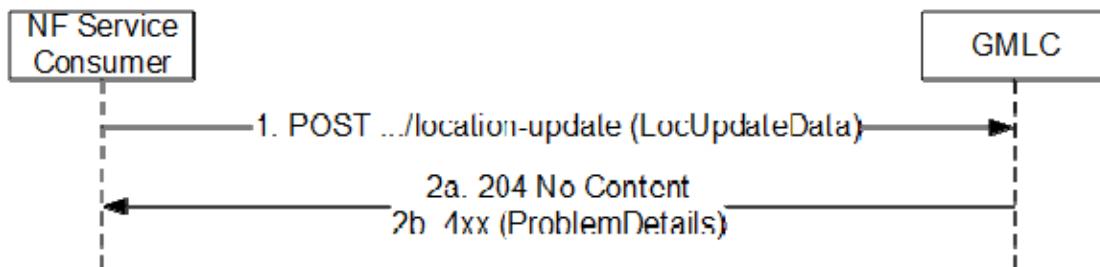
Figure 5.2.2.3.1-1: LocationUpdate Request/Response

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

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

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

5.2.2.4　　CancelLocation

5.2.2.4.1　　General

The service operation is used during the procedure:

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

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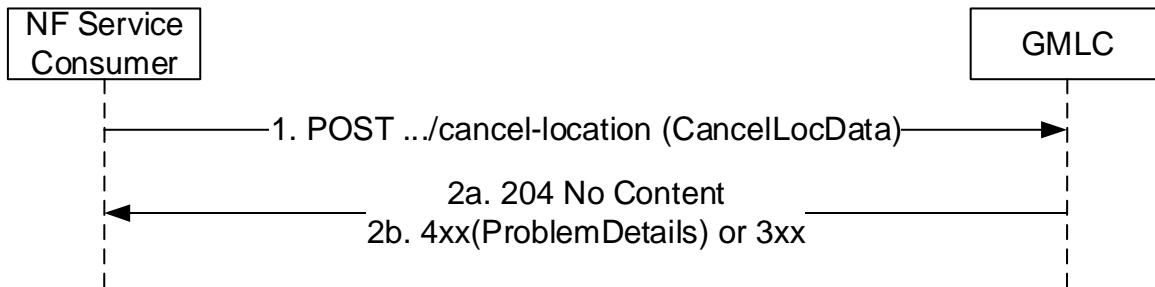
Figure 5.2.2.4.1-1: CancelLocation Request/Response

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

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

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

5.2.2.5 EventNotify

5.2.2.5.1 General

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

- EventNotify for a single UE

- EventNotify for the UEs in a target group

- EventNotify for a single UE relative to one or more related UEs

5.2.2.5.2 EventNotify for a single UE

The service operation is used during the procedure:

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

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

- Procedures of SL-MT-LR for periodic, triggered Location Events (see 3GPP TS 23.273 [4], clause 6.20.4)

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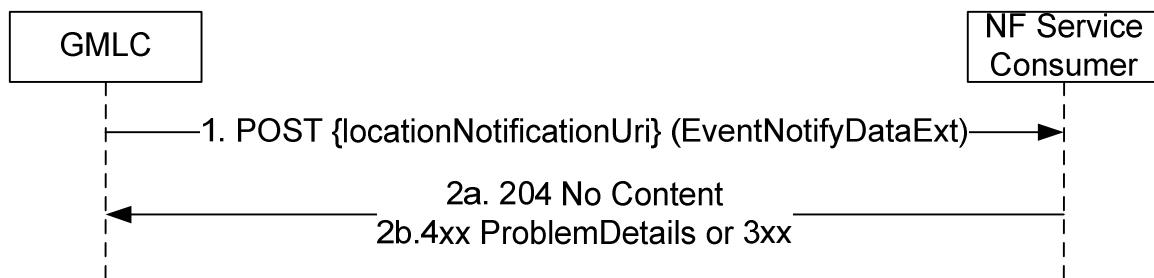
Figure 5.2.2.5.2-1: EventNotify Notification for a single UE

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

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

   The locationNotificationUri shall be set to:

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

   - the hgmlcCallBackURI received from the AMF/LMF;

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

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

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

If there are more than one related UEs, EventNotifyData for each related UE is included.

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

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

5.2.2.5.3 EventNotify for the UEs in a target group

The service operation is used during the procedure:

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

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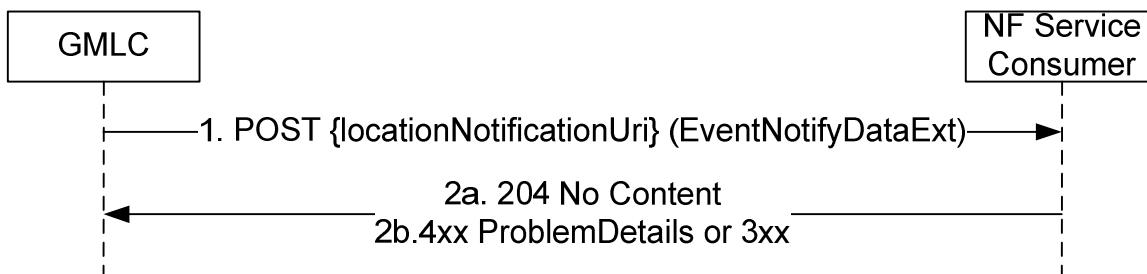
Figure 5.2.2.5.3-1: EventNotify Notification for the UEs in a target group

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

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

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

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

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

5.2.2.6 LocationUpdateNotify

5.2.2.6.1 General

The service operation is used during the procedure:

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

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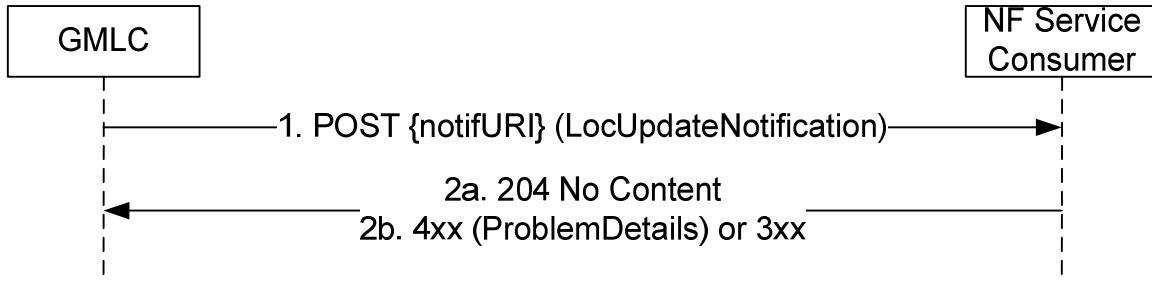
Figure 5.2.2.6.1-1: LocationUpdateNotify Notification

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

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

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

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

5.2.2.7 LocationUpdateSubscribe

5.2.2.7.1 General

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

NOTE: This service operation is not used by the current stage 2 specifications in 3GPP TS 23.273 [4], i.e. the subscription to notifications on UE location information update is implicit.
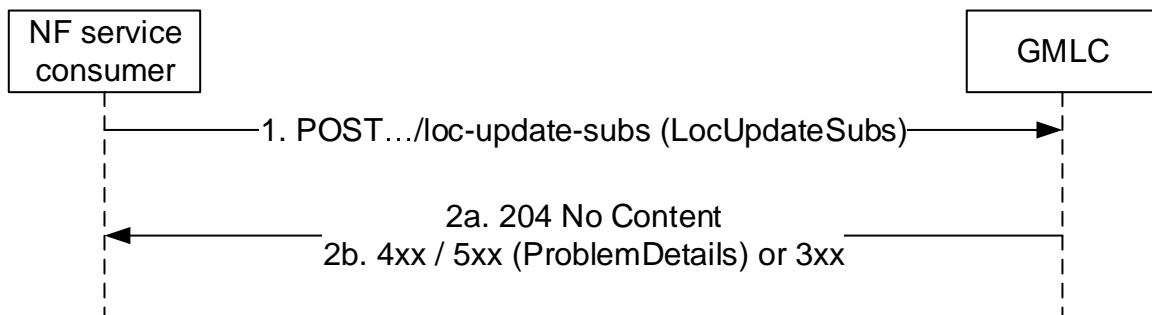
Figure 5.2.2.7.1-1: Subscription to UE location information update

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

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

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

5.2.2.8   PrivacyCheckIdMapping

5.2.2.8.1   General

The service operation is used during the procedure:

- SL-MT-LR Procedure (see 3GPP TS 23.273 [4], clause 6.20)

The PrivacyCheckIdMapping enables the NF consumer (e.g. H-GMLC) to perform the privacy check and ID mapping of a UE for Ranging SL service. See Figure 5.2.2.8.1-1.
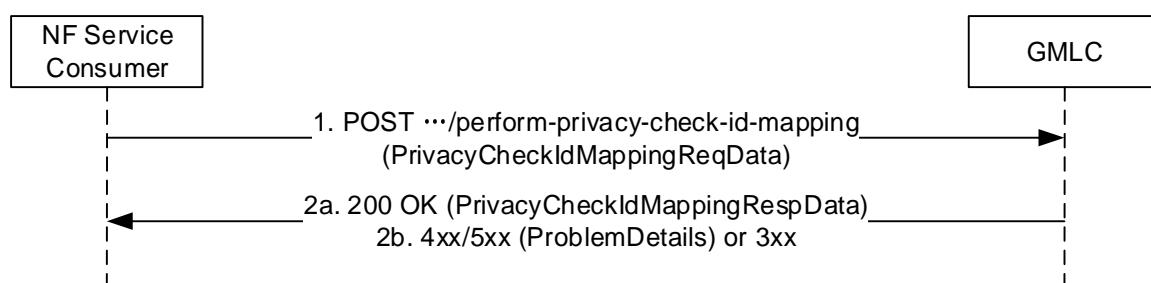
Figure 5.2.2.8.1-1: PrivacyCheckIdMapping Request/Response

1. The NF Service Consumer shall send an HTTP POST request to the URI associated with the "perform-privacy-check-id-mapping" custom operation. The request body shall contain a PrivacyCheckIdMappingReqData object.

2a. On success, i.e. the privacy check and ID mapping are successful, "200 OK" shall be returned by the GMLC. The response body shall include a PrivacyCheckIdMappingRespData object containing the information of ID mapping.

2b. On failure or redirection, one of the HTTP status codes listed in Table 6.1.3.6.2-2 may be returned. For 4xx/5xx status codes, the message body may contain a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.1.3.6.2-2.

5.2.2.9   Void

6   API Definitions

6.1   Ngmlc_Location Service API

6.1.1   Introduction

The Ngmlc_Location service shall use the Ngmlc_Location API.

The API URI of the Ngmlc_Location API shall be:

{apiRoot}/<apiName>/<apiVersion>

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

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

with the following components:

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

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

- The <apiVersion> shall be "v1".

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

6.1.2 Usage of HTTP

6.1.2.1 General

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

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

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

6.1.2.2 HTTP standard headers

6.1.2.2.1 General

6.1.2.2.2 Content type

The following content types shall be supported:

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

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

6.1.2.3 HTTP custom headers

6.1.2.3.1 General

The following HTTP custom headers shall be supported:

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

This API does not define any new HTTP custom headers.

6.1.3 Custom Operations without associated resources

6.1.3.1 Overview

The structure of the custom operation URIs of the Ngmlc_Location service is shown in Figure 6.1.3.1-1.
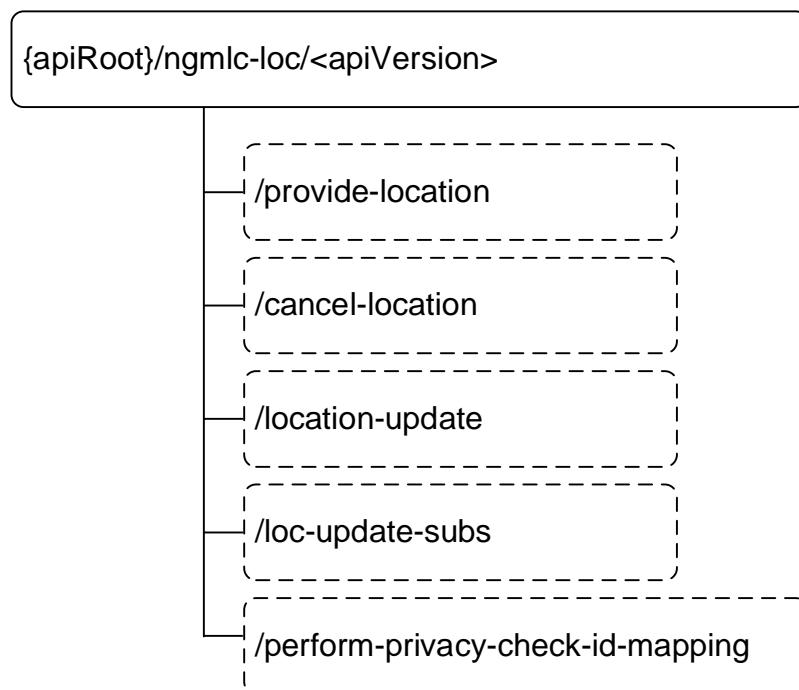
Figure 6.1.3.1-1: Custom operation URI structure of the Ngmlc_Location API

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

Table 6.1.3.1-1: Custom operations

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

NOTE: The Custom operation URI above are deviating from the URI Path Segment Naming Conventions defined in clause 5.1.3.2 of 3GPP TS 29.501 [5], but they are not changed to maintain backwards compatibility.

6.1.3.2 Operation: provide-location

6.1.3.2.1 Description

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

6.1.3.2.2 Operation Definition

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

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

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

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

Data type	P	Cardinality	Response codes	Description

LocationDataExt	M	1	200 OK	This case represents the successful retrieval of the location of the UE or successful subscription of periodic or triggered location of the UE, or represents completely or partially accept of the requesting locations for a target group.
				
				Upon success, a response body is returned containing the different parameters of the location data if obtained, such as:
				  - Geographic Area
				  - Local Location
				  - Civic Location
				  - Age of Location
				  - Accuracy of Location
				  - Positioning methods

RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.

ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors:
				  - POSITIONING_DENIED
				  - UNSPECIFIED
				  - UNSUPPORTED_BY_UE
				  - DETACHED_USER
				  -- MAX_TARGET_UE_NUM_EXCEED
				
				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	501 Not Implemented	The "cause" attribute may be used to indicate one of the following application errors: - UNSUPPORTED_EVENT_TYPE
ProblemDetails	O	0..1	504 Gateway Timeout	The "cause" attribute may be used to indicate the following application error: - UNREACHABLE_USER - PEER_NOT_RESPONDING See table 6.1.6.3-1 for the description of this error.
NOTE:	The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] other than those specified in the table above also apply, with a ProblemDetails data type when needed (see clause 5.2.7 of 3GPP TS 29.500 [5]).			

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

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

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

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

6.1.3.3 Operation: cancel-location

6.1.3.3.1 Description

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

6.1.3.3.2 Operation Definition

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

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

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

ETSI

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

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	This case represents successful cancellation of location.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.

ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors:
				    - UNSPECIFIED
				    - LOCATION_SESSION_UNKNOWN
				
				See table 6.1.6.3-1 for the description of this error.

NOTE:				The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] other than those specified in the table above also apply, with a ProblemDetails data type when needed (see clause 5.2.7 of 3GPP TS 29.500 [5]).

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

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

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

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

6.1.3.4   Operation: location-update

6.1.3.4.1   Description

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

6.1.3.4.2   Operation Definition

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

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

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

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

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	This case represents successful update of location.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.

ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors:
				   - UNSPECIFIED
				   - UNREQUESTED_BY_UE
				   - UNKOWN_EXTERNAL_CLIENT_OR_AF
				   - UNREACHABLE_EXTERNAL_CLIENT_OR_AF
				
				See table 6.1.6.3-1 for the description of this error.

NOTE:			The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] other than those specified in the table above also apply, with a ProblemDetails data type when needed (see clause 5.2.7 of 3GPP TS 29.500 [5]).	

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

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

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

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

6.1.3.5   Operation: loc-update-subs

6.1.3.5.1   Description

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

6.1.3.5.2 Operation Definition

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

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

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

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

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	This case represents the successful UE location information subscription creation.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.

ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors:
				    - UNSPECIFIED
				    - UNREQUESTED_BY_UE
				
				See table 6.1.6.3-1 for the description of these errors.

NOTE: The mandatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply.				

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

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

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

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

6.1.3.6 Operation: perform-privacy-check-id-mapping

6.1.3.6.1 Description

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

6.1.3.6.2 Operation Definition

This operation shall support the request and response data structures and response codes specified in table 6.1.3.6.2-1 and table 6.1.3.6.2-2.

Table 6.1.3.6.2-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
PrivacyCheckIdMappingReqData	M	1	Input parameters to the "privacy-check-id-mapping" service operation

Table 6.1.3.6.2-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
PrivacyCheckIdMappingRespData	M	1	200 OK	This case represents the successful result of the "privacy-check-id-mapping" service operation
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors: - ID_MAPPING_NOT_AVAILABLE - RANGING_SL_POS_NOT_ALLOWED - UNKNOWN_UE_IDENTIFIER - UNSPECIFIED 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 6.1.3.6.2-3: Headers supported by the 307 Response Code on this resource

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

Table 6.1.3.6.2-4: Headers supported by the 308 Response Code on this resource

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

6.1.3.7 Void

6.1.4 Notifications

6.1.4.1 General

This clause specifies the notifications provided by the Ngmlc_Location service.

Table 6.1.4.1-1: Notifications overview

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

6.1.4.2 Eventnotify

6.1.4.2.1 Description

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

6.1.4.2.2 Notification Definition

Call-back URI: {locationNotificationUri}

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

6.1.4.2.3 Notification Standard Methods

6.1.4.2.3.1 POST

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

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

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

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

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

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	This case represents successful notification of the event.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.

ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors:
				    - UNSPECIFIED
				    - LOCATION_SESSION_UNKNOWN
				
				See table 6.1.6.3-1 for the description of this error.

NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] other than those specified in the table above also apply, with a ProblemDetails data type when needed (see clause 5.2.7 of 3GPP TS 29.500 [5]).				

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

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

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

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

6.1.4.3   LocationUpdateNotify

6.1.4.3.1   Description

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

6.1.4.3.2   Notification Definition

Call-back URI: {notifURI}

6.1.4.3.3   Notification Standard Methods

6.1.4.3.3.1 POST

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

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

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

Data type	P	Cardinality	Description
LocUpdateNotific ation	M	1	Input parameters to the "LocationUpdateNotification" operation

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

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

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

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

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

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

6.1.5 Data Model

6.1.5.1 General

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

Table 6.1.5.1-1 specifies the data types defined for the Ngmlc_Location service based interface protocol.

Table 6.1.5.1-1: Ngmlc_Location specific Data Types

Data type	Clause defined	Description	Applicability
InputData	6.1.5.2.2	the input parameters in ProvideLocation service operation	
LocationData	6.1.5.2.3	Location data	
CancelLocData	6.1.5.2.4	the input parameters in CancelLocation service operation	
LocUpdateData	6.1.5.2.5	the input parameters in LocationUpdate service operation	
EventNotifyData	6.1.5.2.6	the input parameters for the target UE in EventNotify Notification service operation	
UePrivacyRequirements	6.1.5.2.7	UE privacy requirements from (H)GMLC to the serving AMF or VGMLC(in the roaming case) for the target UE	
LocUpdateNotification	6.1.5.2.9	Location Update Notification	
LocUpdateSubs	6.1.5.2.10	UE location information subscription	
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	
AreaEventInfoAddition	6.1.5.2.13	Additional information for Extended Area event information	
AreaEventInfoExt	6.1.5.2.14	Extended Area Event Information	
IntegrityRequirements	6.1.5.2.15	Integrity requirements	
AlertLimit	6.1.5.2.16	Alert Limit	
UpLocRepInfoAf	6.1.5.2.17	Information for the location reporting over user plane	
UpCumEvtRptCriteria	6.1.5.2.18	Criteria for sending cumulative events reports over control plane	
AddLocationDatas	6.1.5.2.19	Additional location data	
LocationDataExt	6.1.5.2.20	the response parameters in ProvideLocation service operation including one or more LocationData	
RelatedUe	6.1.5.2.21	Indicates information for related UE for ranging and sidelink positioning	
PrivacyCheckIdMappingReqData	6.1.5.2.22	Privacy Check ID Mapping Request Data	
PrivacyCheckIdMappingRespData	6.1.5.2.23	Privacy Check ID Mapping Response Data	
IntegrityProtectionLevel	6.1.5.2.27	Integrity Protection Level	
IntegrityResult	6.1.5.2.28	Integrity Result	
ServiceIdentity	6.1.5.3.2	service identity	
CodeWord	6.1.5.3.2	codeword	
ExternalClientIdentification	6.1.5.3.2	external client identification	
E164CountryCodeOfGeographicArea	6.1.5.3.2	E.164 country codes for geographic areas	
LcsServiceTypeId	6.1.5.3.2	LCS Service Type Id	
TimeToAlert	6.1.5.3.2	Time-to-Alert	
TargetIntegrityRisk	6.1.5.3.2	Target Integrity Risk	
HorizontalProtectionLevel	6.1.5.3.2	Horizontal Protection Level	
VerticalProtectionLevel	6.1.5.3.2	Vertical Protection Level	
PseudonymIndicator	6.1.5.3.3	It defines if a pseudonym is requested	
LocationRequestType	6.1.5.3.4	NI-LR, MT-LR or MO-LR	
LocationTypeRequested	6.1.5.3.5	the location type requested by the LCS client	
EventNotifyDataType	6.1.5.3.6	the type of event that triggers event notification	
FailureCause	6.1.5.3.7	Positioning failure cause	
SuccessType	6.1.5.3.8	Success Type to indicate full or partial success	
ReportingInd	6.1.5.3.9	Reporting indication on how a target UE sends event reports when the UE is outside the event report allowed area	
IntegrityComputingEntity	6.1.5.3.10	Integrity Computing Entity	

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

Table 6.1.5.1-2: Ngmlc_Location re-used Data Types

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

3DRelativeLocation	3GPP TS 29.572 [12]	Represents 3D local co-ordinates with origin corresponding to another known point.	
MappedLocationQoSEps	3GPP TS 29.572 [12]	Mapped Location QoS for EPS	
ApplicationlayerId	3GPP TS 29.571 [11]	Application Layer ID	

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).	
appLayerId	ApplicationlayerId	O	0..1	Application Layer ID (NOTE 3).	Ranging_SL
extGroupId	ExternalGroupId	O	0..1	This IE may be present when requesting LCS service for a group of target UEs, if present this IE shall contain the External Group ID (NOTE 3).	
intGroupId	GroupId	O	0..1	This IE may be present when requesting LCS service for a group of target UEs, if present this IE shall contain the Internal Group ID (NOTE 3).	
externalClientType	ExternalClientType	M	1	This IE shall contain LCS client type	
locationQoS	LocationQoS	O	0..1	Requested location QoS Multiple QoS Class (lcsQosClass sets to "MULTIPLE_QOS") shall only be used when GMLC support MUTIQOS feature.	
supportedGADShapes	array(SupportedGADShapes)	O	1..N	Supported Geographical Area Description shapes	
serviceIdentity	ServiceIdentity	O	0..1	Service identity	
serviceCoverage	array(E164CountryCodeOfGeographicArea)	O	1..N	A list of E.164 country codes for geographic areas (see ITU Recommendation E.164 [13]) where the LCS client is permitted to request and receive UE location information.	
ldrType	LdrType	C	0..1	Location deferred request event type. This IE shall be present when request deferred 5GC MT LCS service.	
periodicEventInfo	PeriodicEventInfo	C	0..1	Periodic event information of the location request for a target UE. This IE shall be present when ldrType is set to "PERIODIC".	
areaEventInfo	AreaEventInfoExt	C	0..1	Area event information of the location request for a target UE. This IE shall be present when ldrType is set to "ENTERING_INTO_AREA", "LEAVING_FROM_AREA" or "BEING_INSIDE_AREA".	
motionEventInfo	MotionEventInfo	C	0..1	Motion event information of the location request for a target UE. This IE shall be present when ldrType is set to "MOTION".	

ldrReference	LdrReference	C	0..1	Notification correlation ID It shall be present in the request from NEF if it is allocated by NEF for the Deferred 5GC-MT-LR procedure. It shall be present in the request from NEF for requesting location service for a group of UEs. It shall be present in the request to VGMLC for the Deferred 5GC-MT-LR procedure. This IE shall be present for location service in PNI-NPN with signalling optimisation, as specified in 3GPP TS 23.273 [4] clause 6.1.2.	
hgmlcCallBackUri	Uri	O	0..1	Notification target address for HGMLC This IE shall also be present for location service in PNI-NPN with signalling optimisation, as specified in 3GPP TS 23.273 [4] clause 6.1.2	
eventNotificationUri	Uri	O	0..1	The call-back Uri of NF service consumer (i.e. NEF, NWDAF) for implicit subscription to notification of Eventnotify. This IE should be included and is used to receive the location information for UEs in the group when requesting LCS service for a group of target UEs or requesting deferred 5GC MT LCS service for a single UE.	
externalClientIdentification	ExternalClientIdentification	O	0..1	External LCS client identification	
afId	string	O	0..1	The identification of AF that initiated location request	
uePrivacyRequirements	UePrivacyRequirements	O	0..1	UE privacy requirement	
lcsServiceType	LcsServiceType	O	0..1	LCS service type This IE may be present when being sent from HGMLC to VGMLC. When present, it shall contain the LCS service type, which is mapped from attribute serviceIdentity of the LCS Request by the HGMLC.	
velocityRequested	VelocityRequested	O	0..1	Velocity of the target UE is requested	
priority	LcsPriority	O	0..1	Priority of the location request	
locationTypeRequested	LocationTypeRequested	O	0..1	Requested type of location, applicable to location immediate request (NOTE 2)	
maximumAgeOfLocationEstimate	AgeOfLocationEstimate	O	0..1	Requested maximum age of the location estimate	
amfId	AmfId	O	0..1	The identification of serving AMF	
codeWord	CodeWord	O	0..1	Code word (NOTE 1)	
scheduledLocTime	DateTime	O	0..1	The scheduled time (in UTC) for location determination	

reliableLocReq	boolean	C	0..1	This IE shall be included with the value "true" to indicate that reliable UE location information is required, as specified in 3GPP TS 33.256 [22] clause 5.3.2. When present, this IE shall be set as following: - true: the reliable UE location information is required - false (default): the reliable UE location information is not required	
servingLmfId	LMFIdentification	O	0..1	If present, this IE contains the identification of a serving LMF selected by the GMLC.	
lpHapType	LpHapType	C	0..1	This IE shall be included and set to "LOW_POW_HIGH_ACCU_POS" to request low power and high accuracy positioning, as specified in clause 6.1.2 of 3GPP TS 23.273 [4].	
evtRptExpectedArea	GeographicArea	O	0..1	This IE shall be present in the request from H-GMLC to V-GMLC if the event report expected area was retrieved from UDM. When present, this IE shall indicate the event report expected area.	

reportingInd	ReportingInd	C	0..1	This IE shall be present in the request from H-GMLC to V-GMLC if the area usage indication is provided by UDM and event report expected area is present.
				
				When present, this IE shall indicate whether the UE is allowed to generate and send the reports inside or outside the event report expected area:
				  - Inside reporting (default)
				  - Outside reporting
				(see 3GPP TS 23.273 [4] clause 5.14 and 6.3.1)	

integrityRequirements	IntegrityRequirements	O	0..1	When present, this IE shall indicate the integrity requirements.	
upLocRepStatAf	integer	O	0..1	When present, this IE contains the number of event reports have transferred over user plane. If the culumative event report has been sent previously, this IE contains the number of event reports have transferred over user plane since the last cumulative event report was sent	
requestedRangingSlResult	array(RangingSlResult)	O	1..N	When present, this IE shall contain the type of result requested for ranging and sidelink positioning, such as absolute locations, relative locations or distances and directions related to the UEs, etc.	Ranging_SL

relatedUes	array(RelatedUe)	O	1..N	When present, this IE contains a list of the information for the related UEs for the ranging and sidelink positioning.	Ranging_SL
mappedQoSEps	MappedLocationQoSEps	C	0..1	This IE may only be present in the service request from H-GMLC to V-GMLC, if the Multiple QoS Class is indicated in the locationQoS IE. When present, this IE shall indicate the mapped Location QoS applicable to EPS ("BEST_EFFORT" or "ASSURED") based on the Multiple Location QoS (see clause 6.19 of 3GPP TS 23.273 [4]).	MUTIQOS
coordinateID	integer	O	0..1	This IE may be present when requestedRangingSlResult indicates "ABSOLUTE_LOCATION". When present, this IE represents a local coordinate (see clause 6.20.3 of 3GPP TS 23.273 [4]).	Ranging_SL
mbsrPosInd	boolean	C	0..1	This attribute shall be present and set to true when the GMLC is requested to derive the location of the MBSR for the purpose of determining the location of a target UE served by the MBSR. Otherwise, this attribute shall be absent.	MBSR
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 or appLayerId) shall be included, if retrieving the UE locations for a target group, the group identification (attributes extGroupId and/or intGroupId), UE identification and group identification shall be included exclusively.					

6.1.5.2.3   Type: LocationData

Table 6.1.5.2.3-1: Definition of type LocationData

Attribute name	Data type	P	Cardinality	Description	Applicability
gpsi	Gpsi	O	0..1	Generic Public Subscription Identitfier	
supi	Supi	O	0..1	Subscription Permanent Identifier	
locationEstimate	GeographicArea	O	0..1	Geographic area of the target UE	
civicAddress	CivicAddress	O	0..1	Civic address of the target UE	
localLocationEstimate	LocalArea	O	0..1	When present, this IE shall indicate a local area in renference system.	
ageOfLocationEstimate	AgeOfLocationEstimate	O	0..1	Age of location estimate	
timestampOfLocationEstimate	DateTime	O	0..1	When present, this IE shall indicate the estimated UTC time when the location estimate corresponded to the UE location (i.e. when the location estimate and the actual UE location was the same).	
positioningDataList	array(PositioningMethodAndUsage)	O	1..N	If present, this IE shall indicate the usage of each non-GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully.	
gnssPositioningDataList	array(GnssPositioningMethodAndUsage)	O	1..N	If present, this IE shall indicate the usage of each GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully.	
accuracyFulfilmentIndicator	AccuracyFulfilmentIndicator	O	0..1	The indication whether the obtained location estimate satisfies the requested accuracy or not	
ueVelocity	VelocityEstimate	O	0..1	Responded UE velocity, if requested and available	
ldrReference	LdrReference	C	0..1	Notification correlation ID It shall be present in the response to NEF if it is allocated by HGMLC for the the Deferred 5GC-MT-LR procedure.	
altitude	Altitude	C	0..1	If present, this IE indicates the altitude of the positioning estimate. This IE shall be sent from (V)GMLC to (H)GMLC if received by VGMLC from AMF when roaming.	
servingLMFIdentification	LMFIdentification	C	0..1	If present, this IE contains the identification of a serving LMF for periodic or triggered location. This IE shall be sent from (V)GMLC to (H)GMLC if received by VGMLC from AMF when roaming.	

locationPrivacyVer Result	LocationPrivacy VerResult	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_COMPLETE LY - SUCCESS_PARTIALLY The value "SUCCESS_COMPLETELY " indicates that requesting/subscribing to LCS service is successful for all the UE(s) within the group identified by the external/internal group ID. The value "SUCCESS_PARTIALLY" indicates that requesting/subscribing to LCS service is only successful for a part of the UE(s) within the group identified by the external/internal group ID. The default value of this attribute is "SUCCESS_COMPLETELY " if this IE is not present.	
achievedQos	MinorLocationQ oS	O	0..1	When present, this IE shall contain the achieved Location QoS Accuracy of the estimated location. This IE shall be present if received.	MUTIQOS
directReportInd	boolean	C	0..1	When present, this IE shall be set for the following value: - true: location determination will be sent by LMF to GMLC directly - false (default): location determination will not be sent by LMF to GMLC directly This IE shall be present if received from LMF.	

acceptedPeriodicEventInfo	PeriodicEventInfo	C	0..1	This IE shall be present if received from AMF/LMF. When present, this IE shall provide the accepted periodic event reporting information.	
haGnssMetrics	HighAccuracyGnssMetrics	C	0..1	This IE should be included when received from LMF/AMF. When present, this IE shall indicate the high accuracy GNSS metrics for the location estimate.	
losNlosMeasureInd	LosNlosMeasureInd	O	0..1	When present, this IE shall indicate whether LOS measurement or NLOS measurement is used.	
indoorOutdoorInd	IndoorOutdoorInd	O	0..1	When present, this IE shall indicate whether the UE is indoor or outdoor.	
relatedApplicationlayerId	ApplicationlayerId	O	0..1	Identifies the application layer ID of the related UE for ranging and sidelink positioning, such as located UE, reference UE, etc.	Ranging_SL
distanceDirection	RangeDirection	O	0..1	When present, this IE identifies a distance and direction from a point A to a point B, comprising a distance from point A to point B, an azimuth direction from point A to point B and an elevation direction from point A to point B.	Ranging_SL
2dRelativeLocation	2DRelativeLocation	O	0..1	When present, this IE identifies a relative 2D location with uncertainty ellipse, characterised by a point described in 2D local co-ordinates with origin corresponding to another known point, distances r1 and r2 and an angle of orientation A.	Ranging_SL
3dRelativeLocation	3DRelativeLocation	O	0..1	When present, this IE identifies a relative 3D location with uncertainty ellipsoid, characterised by a point described in 3D local co-ordinates with origin corresponding to another known point, distances r1 (the "semi-major uncertainty"), r2 (the "semi-minor uncertainty") and r3 (the "vertical uncertainty") and an angle of orientation A (the "angle of the major axis").	Ranging_SL
relativeVelocity	VelocityEstimate	O	0..1	When present, this IE identifies UE velocity relative to the UE identified with relatedApplicationlayerId.	Ranging_SL

| integrityResult | IntegrityResult | C | 0..1 | This IE should be present when the integrity requirements are present in the request.

When present, this IE shall indicate the integrity result. | |

6.1.5.2.4   Type: CancelLocData

Table 6.1.5.2.4-1: Definition of type CancelLocData

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

6.1.5.2.5 Type: LocUpdateData

Table 6.1.5.2.5-1: Definition of type LocUpdateData

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

6.1.5.2.6 Type: EventNotifyData

Table 6.1.5.2.6-1: Definition of type EventNotifyData

Attribute name	Data type	P	Cardinality	Description	Applicability
supi	Supi	O	0..1	Subscription Permanent Identifier	
gpsi	Gpsi	O	0..1	Generic Public Subscription Identifier	
ldrReference	LdrReference	M	1	LDR Reference	
eventNotifyDataType	EventNotifyDataType	M	1	The type of event that triggers event notification	
locationEstimate	GeographicArea	O	0..1	Geographic area of the target UE	
civicAddress	CivicAddress	O	0..1	Civic address of the target UE	
localLocationEstimate	LocalArea	O	0..1	When present, this IE shall indicate a local area in renference system.	
ageOfLocationEstimate	AgeOfLocationEstimate	O	0..1	Age of location estimate	
timestampOfLocationEstimate	DateTime	O	0..1	When present, this IE shall indicate the estimated UTC time when the location estimate corresponded to the UE location (i.e. when the location estimate and the actual UE location was the same).	
positioningDataList	array(PositioningMethodAndUsage)	O	1..N	If present, this IE shall indicate the usage of each non-GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully.	
gnssPositioningDataList	array(GnssPositioningMethodAndUsage)	O	1..N	If present, this IE shall indicate the usage of each GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully.	
lmfIdentification	LmfIdentification	O	0..1	LMF identification that stores the location context of the target UE	
amfId	AmfId	O	0..1	The identification of AMF that is serving the target UE	
terminationCause	TerminationCause	C	0..1	The IE shall be included if event reporting has been terminated	
velocityEstimate	VelocityEstimate	C	0..1	If present, this IE contain an estimate of the velocity of the target UE, composed by horizontal speed, vertical speed, and their respective uncertainty. This IE shall be sent from (V)GMLC to (H)GMLC if received by VGMLC from AMF when roaming.	
altitude	Altitude	C	0..1	If present, this IE indicates the altitude of the positioning estimate. This IE shall be sent from (V)GMLC to (H)GMLC if received by VGMLC from AMF when roaming.	

targetNode	NfInstanceId	C	0..1	For mobility of a UE with periodic or triggered location, this IE contains the address of the new serving node and shall be sent from (V)GMLC to (H)GMLC if received by VGMLC from AMF when roaming.	
accuracyFulfilmentIndicator	AccuracyFulfilmentIndicator	O	0..1	The indication whether the obtained location estimate satisfies the requested accuracy or not	
failureCause	FailureCause	C	0..1	This IE shall contain the failure cause for the UE if present. The IE shall be included if positioning has failed for the target UE in the target group.	
achievedQos	MinorLocationQoS	O	0..1	When present, this IE shall contain the achieved Location QoS Accuracy of the estimated location. This IE shall be present if received.	MUTIQOS
haGnssMetrics	HighAccuracyGnssMetrics	C	0..1	This IE should be included when received from LMF/AMF. When present, this IE shall indicate the high accuracy GNSS metrics for the location estimate.	
losNlosMeasureInd	LosNlosMeasureInd	O	0..1	When present, this IE shall indicate whether LOS measurement or NLOS measurement is used.	
indoorOutdoorInd	IndoorOutdoorInd	O	0..1	When present, this IE shall indicate whether the UE is indoor or outdoor.	
relatedApplicationlayerId	ApplicationlayerId	O	0..1	Identifies the application layer ID of the related UE for ranging and sidelink positioning, such as located UE, reference UE, etc.	Ranging_SL
distanceDirection	RangeDirection	O	0..1	When present, this IE identifies a distance and direction from a point A to a point B, comprising a distance from point A to point B, an azimuth direction from point A to point B and an elevation direction from point A to point B.	Ranging_SL
2dRelativeLocation	2DRelativeLocation	O	0..1	When present, this IE identifies a relative 2D location with uncertainty ellipse, characterised by a point described in 2D local co-ordinates with origin corresponding to another known point, distances r1 and r2 and an angle of orientation A.	Ranging_SL

3dRelativeLocation	3DRelativeLocation	O	0..1	When present, this IE identifies a relative 3D location with uncertainty ellipsoid, characterised by a point described in 3D local co-ordinates with origin corresponding to another known point, distances r1 (the "semi-major uncertainty"), r2 (the "semi-minor uncertainty") and r3 (the "vertical uncertainty") and an angle of orientation A (the "angle of the major axis").	Ranging_SL
relativeVelocity	VelocityEstimate	O	0..1	When present, this IE identifies UE velocity relative to the UE identified with relatedApplicationlayerId.	Ranging_SL
integrityResult	IntegrityResult	C	0..1	This IE should be present when the integrity requirements are present in the request. When present, this IE shall indicate the integrity result.	

6.1.5.2.7   Type: UePrivacyRequirements

Table 6.1.5.2.7-1: Definition of type UePrivacyRequirements

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

6.1.5.2.8   Void

6.1.5.2.9   Type: LocUpdateNotification

Table 6.1.5.2.9-1: Definition of type LocUpdateNotification

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

6.1.5.2.10   Type: LocUpdateSubs

Table 6.1.5.2.10-1: Definition of type LocUpdateSubs

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

6.1.5.2.11 Type: EventNotifyDataAdditionalInfo

Table 6.1.5.2.11-1: Definition of type EventNotifyDataAdditionalInfo

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

6.1.5.2.12 Type: EventNotifyDataExt

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

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

6.1.5.2.13 Type: AreaEventInfoAddition

Table 6.1.5.2.13-1: Definition of type AreaEventInfoAddition

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

6.1.5.2.14 Type: AreaEventInfoExt

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

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

6.1.5.2.15 Type: IntegrityRequirements

Table 6.1.5.2.15-1: Definition of type IntegrityRequirements

Attribute name	Data type	P	Cardinality	Description
targetIntegrityRisk	TargetIntegrityRisk	O	0..1	This IE shall indicate Target Integrity Risk (TIR), as specified in 3GPP TS 37.355 [23] and 3GPP TS 38.305 [26].
timeToAlert	TimeToAlert	O	0..1	This IE shall indicate the Time-to-Alert (TTA) as specified in 3GPP TS 38.305 [26].
alertLimit	AlertLimit	O	0..1	This IE shall indicate Alert Limit (AL), as specified in 3GPP TS 37.355 [23] and 3GPP TS 38.305 [26].

6.1.5.2.16 Type: AlertLimit

Table 6.1.5.2.16-1: Definition of type AlertLimit

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

6.1.5.2.17 Type: UpLocRepInfoAf

Table 6.1.5.2.17-1: Definition of type UpLocRepInfoAf

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

6.1.5.2.18   Type: UpCumEvtRptCriteria

Table 6.1.5.2.18-1: Definition of type UpCumEvtRptCriteria

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

6.1.5.2.19   Type: AddLocationDatas

Table 6.1.5.2.19-1: Definition of type AddLocationDatas

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

6.1.5.2.20   Type: LocationDataExt

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

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

6.1.6.2.21   Type: RelatedUe

Table 6.1.6.2.21-1: Definition of type RelatedUe

Attribute name	Data type	P	Cardinality	Description
appLayerId	ApplicationlayerId	C	0..1	The Application Layer ID of the UE. (NOTE)
gpsi	Gpsi	C	0..1	The GPSI of the UE. (NOTE)
supi	Supi	C	0..1	The SUPI of the UE. (NOTE)
relatedUeType	RelatedUeType	M	1	The type of the related UE for ranging and sidelink positioning, such as located UE, reference UE, etc.
NOTE: At least one of the appLayerId IE, the gpsi IE and the supi IE shall be present.				

6.1.5.2.22   Type: PrivacyCheckIdMappingReqData

Table 6.1.5.2.22-1: Definition of type PrivacyCheckIdMappingReqData

Attribute name	Data type	P	Cardinality	Description
gpsiList	array(Gpsi)	C	1..N	The list of GPSI of the UE(s) . (NOTE)
appLayerIds	array(ApplicationlayerId)	C	1..N	The list of Application Layer Id of the UE(s) . (NOTE)
externalClientId	ExternalClientIdentification	O	0..1	When present, this IE indicates the identity of the LCS client
afId	string	O	0..1	When present, this IE indicates the identity of the AF
NOTE: Either the gpsiList IE or the appLayerIds IE shall be present.				

6.1.5.2.23   Type: PrivacyCheckIdMappingRespData

Table 6.1.5.2.23-1: Definition of type PrivacyCheckIdMappingRespData

Attribute name	Data type	P	Cardinality	Description
appLayerIds	array(ApplicationlayerId)	C	1..N	This IE shall be present if the privacy check is successful for at least one of the UEs and the GPSI of the list of UE(s) is included in the request. When present, this IE shall indicate the list of Application Layer Id of the UE(s) with successful privacy check.
gpsiList	array(Gpsi)	C	1..N	This IE shall be present if the privacy check is successful for at least one of the UEs and the list of Application Layer Id of the UE(s) is included in the request. When present, this IE shall indicate the list of GPSI of the UE(s) with successful privacy check.

6.1.5.2.24   Void

6.1.5.2.25   Void

6.1.5.2.26   Void

6.1.5.2.27   Type: IntegrityProtectionLevel

Table 6.1.5.2.27-1: Definition of type IntegrityProtectionLevel

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

6.1.5.2.28 Type: IntegrityResult

Table 6.1.5.2.28-1: Definition of type IntegrityResult

Attribute name	Data type	P	Cardinality	Description
computingEntity	IntegrityComputingEntity	O	0..1	When present, this IE shall indicate the entity(ies) who calculated (and determined) the integrity result.
portectionLevel	IntegrityProtectionLevel	C	0..1	When present, this IE shall indicate the calculated PL, based on the measurement, assistance information and TIR. (NOTE)
integrityReqMetInd	boolean	C	0..1	When present, this IE shall indicate whether the integrity requirements in the request are met or not: - true: the integrity requirements were met. - false: the integrity requiremesnt were not met. (NOTE)
achievedTir	TargetIntegrityRisk	O	0..1	The IE may be present when the integrityReqMetInd IE is present with the value false. When present, this IE shall indicate the achieved Target Integrity Risk (TIR).
NOTE: Either the "protectionLevel" IE or the "integrityReqMetInd" IE shall be present.				

6.1.5.3 Simple data types and enumerations

6.1.5.3.1 Introduction

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

6.1.5.3.2 Simple data types

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

Table 6.1.5.3.2-1: Simple data types

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

6.1.5.3.3 Enumeration: PseudonymIndicator

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

Table 6.1.5.3.3-1: Enumeration PseudonymIndicator

Enumeration value	Description	Applicability
"PSEUDONYM_REQUESTED"	A pseudonym is requested	
"PSEUDONYM_NOT_REQUESTED"	A pseudonym is not requested	

6.1.5.3.4 Enumeration: LocationRequestType

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

Table 6.1.5.3.4-1: Enumeration LocationRequestType

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

NOTE: Some of the values in the enumeration deviate from the naming conventions indicated in clause 5.1.4 of 3GPP TS 29.501 [6] (i.e. to use UPPER_WITH_UNDERSCORE); however, it is kept as currently defined in this specification to maintain backwards compatibility

6.1.5.3.5 Enumeration: LocationTypeRequested

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

Table 6.1.5.3.5-1: Enumeration LocationTypeRequested

Enumeration value	Description	Applicability
"CURRENT_LOCATION"	Requesting the current location of the target UE	
"CURRENT_OR_LAST_KNOWN_LOCATION"	Requesting the current or last known location of the target UE	
"INITIAL_LOCATION"	Requesting the initial location of the target UE	
"NOTIFICATION_VERIFICATION_ONLY"	Requesting notification verification only	

6.1.5.3.6 Enumeration: EventNotifyDataType

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

Table 6.1.5.3.6-1: Enumeration EventNotifyDataType

Enumeration value	Description	Applicability
"UE_AVAILABLE"	UE available event	
"PERIODIC"	Periodic event	
"ENTERING_INTO_AREA"	Entering area event	
"LEAVING_FROM_AREA"	Leaving area event	
"BEING_INSIDE_AREA"	Being inside area event	
"MOTION"	Motion event	
"MAXIMUM_INTERVAL_EXPIRATION_EVENT"	Expiration of maximum reporting interval event	
"LOCATION_CANCELLATION_EVENT"	Cancellation of location reporting event	
"ACTIVATION_OF_DEFERRED_LOCATION"	A confirmation that periodic or triggered location was successfully activated in the target UE	
"UE_MOBILITY_FOR_DEFERRED_LOCATION"	Mobility of the target UE to a different NF	
"5GC_MT_LR"	Report of immediate 5GC mobile terminated location. It is used for 5GC_MT_LR request targeting to a group of UE procedure.	
"DIRECT_REPORT_EVENT"	Direct location reporting event	
"CUMULATIVE_EVENT_REPORT"	Cumulative event report for events reported	

6.1.5.3.7 Enumeration: FailureCause

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

Table 6.1.5.3.7-1: Enumeration FailureCause

Enumeration value	Description	Applicability
"POSITIONING_DENIED"	Positioning is denied	
"UNSUPPORTED_BY_UE"	Positioning is not supported by UE	
"NOT_REGISTED_UE"	UE doesn't register	
"UNSPECIFIED"	Unspecified	

6.1.5.3.8 Enumeration: SuccessType

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

Table 6.1.5.3.8-1: Enumeration SuccessType

Enumeration value	Description	Applicability
"SUCCESS_COMPLETELY"	It is completely successful.	
"SUCCESS_PARTIALLY"	It is partially successful.	

6.1.5.3.9   Enumeration: ReportingInd

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

Table 6.1.5.3.9-1: Enumeration ReportingInd

Enumeration value	Description	Applicability
"INSIDE_REPORTING"	The UE is allowed to generate and send the event report when the UE is inside the event report allowed/expected area.	
"OUTSIDE_REPORTING"	The UE is allowed to generate and send the event report when the UE is outside the event report allowed/expected area	

6.1.5.3.10   Enumeration: IntegrityComputingEntity

The enumeration IntegrityComputingEntity represents the entity who calculated (and determined) the integrity result. It shall comply with the provisions defined in table 6.1.5.3.10-1.

Table 6.1.5.3.10-1: Enumeration IntegrityComputingEntity

Enumeration value	Description
"UE"	Indicates that the Integrity result was calculated (and determined) by the UE.
"LMF"	Indicates that the Integrity result was calculated (and determined) by the LMF.
"BOTH"	Indicates that the Integrity result was calculated (and determined) by both the UE and the LMF.

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
ID_MAPPING_NOT_AVAILABLE	403 Forbidden	The ID Mapping information is not available for the UE identifier.
RANGING_SL_POS_NOT_ALLOWED	403 Forbidden	Ranging SL Positioning Service not allowed by the UE or the Ranging SL Positioning Service for the UE to not allowed to be exposed to the SL Positioning Client UE
UNKNOWN_UE_IDENTIFIER	403 Forbidden	The UE Identifier is unknown
MAX_TARGET_UE_NUM_EXCEED	403 Forbidden	the request is rejected because the maximum allowed number of targeting UEs by the LCS client is exceeded.
POSITIONING_FAILED	500 Internal Server Error	the positioning procedure failed
UNSUPPORTED_EVENT_TYPE	501 Not Implemented	The request for creation of a subscription is rejected because none of the events is supported by the GMLC.
UNREACHABLE_USER	504 Gateway Timeout	the user could not be reached in order to perform positioning procedure
PEER_NOT_RESPONDING	504 Gateway Timeout	No response is received from a remote peer, i.e., 1) The response from the serving AMF wasn't received by (V)GMLC, or; 2) (V)GMLC received HTTP status code 504 with PEER_NOT_RESPONDING from AMF.

6.1.7   Feature negotiation

The optional features in table 6.1.7-1 are defined for the Ngmlc_Location API.

Table 6.1.7-1: Supported Features

Feature number	Feature Name	Description
1	MUTIQOS	Support of Multiple Location QoSes. This feature bit indicates the support of more than one Location QoSes during consuming location service.
2	Ranging_SL	Support of Ranging and Sidelink Positioning This feature indicates the support of Ranging and Sidelink Positioning.
3	MBSR	Support of Mobile Base Station Relay. This feature indicates the support of location service capability for MBSR.

6.1.8   Security

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

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

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

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

Table 6.1.8-1: OAuth2 scopes defined in Ngmlc_Location API

Scope	Description
"ngmlc-loc"	Access to the Ngmlc_Location API.
"ngmlc-loc:provide-location:invoke"	Access to invoke Provide Location
"ngmlc-loc:cancel-location:invoke"	Access to invoke Cancel Location
"ngmlc-loc:location-update:invoke"	Access to invoke Location update
"ngmlc-loc:loc-update-subs:invoke"	Access to invoke Location update subscribe
"ngmlc-loc:perform-privacy-check-id-mapping:invoke"	Access to invoke Privacy Check Id Mapping

6.1.9 HTTP redirection

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

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

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

Annex A (normative): OpenAPI specification

A.1 General

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

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

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

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

A.2 Ngmlc_Location API

```
openapi: 3.0.0
info:
  version: '1.2.0'
  title: 'Ngmlc_Location'
  description: |
    GMLC Location Service.
    © 2024, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.515 V18.6.0; 5G System; Gateway Mobile Location Services; Stage 3
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.515/'

servers:
  - url: '{apiRoot}/ngmlc-loc/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

security:
  - {}
  - oAuth2ClientCredentials:
      - ngmlc-loc

paths:
  /provide-location:
    post:
      summary: Request Location of an UE
      operationId: RequestLocation
      tags:
        - Request Location
      security:
        - {}
        - oAuth2ClientCredentials:
          - ngmlc-loc
        - oAuth2ClientCredentials:
          - ngmlc-loc
          - ngmlc-loc:provide-location:invoke
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/InputData'
        required: true
      responses:
```

```
          '200':
            description: Expected response to a valid request
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/LocationDataExt'
          '307':
            $ref: 'TS29571_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29571_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29571_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29571_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29571_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29571_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29571_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29571_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29571_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29571_CommonData.yaml#/components/responses/429'
          '501':
            $ref: 'TS29571_CommonData.yaml#/components/responses/501'
          '500':
            $ref: 'TS29571_CommonData.yaml#/components/responses/500'
          '502':
            $ref: 'TS29571_CommonData.yaml#/components/responses/502'
          '503':
            $ref: 'TS29571_CommonData.yaml#/components/responses/503'
          '504':
            $ref: 'TS29571_CommonData.yaml#/components/responses/504'
          default:
            $ref: 'TS29571_CommonData.yaml#/components/responses/default'
      callbacks:
        EventNotify:
          '{$request.body#/hgmlcCallBackUri}':
            post:
              requestBody:
                description: UE Event Notification
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/EventNotifyDataExt'
              responses:
                '204':
                  description: Expected response to a valid notification
                '307':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/307'
                '308':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/308'
                '400':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/404'
                '411':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
                '502':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/502'
                '503':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
                '504':
```

```
                  $ref: 'TS29571_CommonData.yaml#/components/responses/504'
                default:
                  $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    EventNotifyNf:
      '{$request.body#/eventNotificationUri}':
        post:
          requestBody:
            description: UE Event Notification
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/EventNotifyDataExt'
          responses:
            '204':
              description: Expected response to a valid notification
            '307':
              $ref: 'TS29571_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29571_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29571_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29571_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29571_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29571_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29571_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29571_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29571_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29571_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29571_CommonData.yaml#/components/responses/500'
            '502':
              $ref: 'TS29571_CommonData.yaml#/components/responses/502'
            '503':
              $ref: 'TS29571_CommonData.yaml#/components/responses/503'
            '504':
              $ref: 'TS29571_CommonData.yaml#/components/responses/504'
            default:
              $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  /cancel-location:
    post:
      summary: request cancellation of periodic or triggered location
      operationId: CancelLocation
      tags:
        - Cancel Location
      security:
        - {}
        - oAuth2ClientCredentials:
          - ngmlc-loc
        - oAuth2ClientCredentials:
          - ngmlc-loc
          - ngmlc-loc:cancel-location:invoke
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/CancelLocData'
        required: true
      responses:
        '204':
          description: Expected response to a successful cancellation
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
```

```
              $ref: 'TS29571_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29571_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29571_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29571_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29571_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29571_CommonData.yaml#/components/responses/500'
            '502':
              $ref: 'TS29571_CommonData.yaml#/components/responses/502'
            '503':
              $ref: 'TS29571_CommonData.yaml#/components/responses/503'
            '504':
              $ref: 'TS29571_CommonData.yaml#/components/responses/504'
            default:
              $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  /location-update:
    post:
      summary: update UE location information
      operationId: UpdateLocation
      tags:
        - Update Location
      security:
        - {}
        - oAuth2ClientCredentials:
          - ngmlc-loc
        - oAuth2ClientCredentials:
          - ngmlc-loc
          - ngmlc-loc:location-update:invoke
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/LocUpdateData'
        required: true
      responses:
        '204':
          description: Expected response to successful location context transfer
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        '504':
          $ref: 'TS29571_CommonData.yaml#/components/responses/504'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  /loc-update-subs:
    post:
      summary: subscribe to notifications of UE location information
      operationId: LocationUpdateSubcribe
      tags:
        - UE location information Subscription creation
      security:
```

```
            - {}
          - oAuth2ClientCredentials:
            - ngmlc-loc
          - oAuth2ClientCredentials:
            - ngmlc-loc
            - ngmlc-loc:loc-update-subs:invoke
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/LocUpdateSubs'
        required: true
      responses:
        '204':
          description: Expected response to successful UE location information subscription
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        '504':
          $ref: 'TS29571_CommonData.yaml#/components/responses/504'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
      callbacks:
        LocationUpdateNotify:
          '{$request.body#/notifUri}':
            post:
              requestBody:
                description: Location Update Notification
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/LocUpdateNotification'
              responses:
                '204':
                  description: Expected response to a valid notification
                '307':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/307'
                '308':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/308'
                '400':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/404'
                '411':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
```

```yaml
                '500':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
                '502':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/502'
                '503':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
                '504':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/504'
                default:
                  $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  /perform-privacy-check-id-mapping:
    post:
      summary: Privacy Check Id Mapping for Ranging SL Positioing Service
      operationId: PrivacyCheckIdMapping
      tags:
        - Privacy Check Id Mapping
      security:
        - {}
        - oAuth2ClientCredentials:
          - ngmlc-loc
        - oAuth2ClientCredentials:
          - ngmlc-loc
          - ngmlc-loc:perform-privacy-check-id-mapping:invoke
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/PrivacyCheckIdMappingReqData'
        required: true
      responses:
        '200':
          description: Successful result for Privacy Check Id Mapping
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PrivacyCheckIdMappingRespData'
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        '504':
          $ref: 'TS29571_CommonData.yaml#/components/responses/504'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            ngmlc-loc: Access to the Ngmlc_Location API
            ngmlc-loc:provide-location:invoke: Access to invoke Provide Location
            ngmlc-loc:cancel-location:invoke: Access to invoke Cancel Location
```

```
                    ngmlc-loc:location-update:invoke: Access to invoke Location update
                    ngmlc-loc:loc-update-subs:invoke: Access to invoke Location update subscribe
                    ngmlc-loc:perform-privacy-check-id-mapping:invoke: Access to invoke Privacy Check Id
Mapping


  schemas:
#
# COMPLEX TYPES
#
    InputData:
      description: Contains the input parameters in ProvideLocation service operation
      type: object
      required:
        - externalClientType
      properties:
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        appLayerId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationlayerId'
        extGroupId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ExternalGroupId'
        intGroupId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
        externalClientType:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/ExternalClientType'
        locationQoS:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LocationQoS'
        supportedGADShapes:
          type: array
          items:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/SupportedGADShapes'
          minItems: 1
        serviceIdentity:
          $ref: '#/components/schemas/ServiceIdentity'
        serviceCoverage:
          type: array
          items:
            $ref: '#/components/schemas/E164CountryCodeOfGeographicArea'
          minItems: 1
        ldrType:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LdrType'
        periodicEventInfo:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/PeriodicEventInfo'
        areaEventInfo:
          $ref: '#/components/schemas/AreaEventInfoExt'
        motionEventInfo:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/MotionEventInfo'
        ldrReference:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LdrReference'
        hgmlcCallBackUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        eventNotificationUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        externalClientIdentification:
          $ref: '#/components/schemas/ExternalClientIdentification'
        afId:
          type: string
        uePrivacyRequirements:
          $ref: '#/components/schemas/UePrivacyRequirements'
        lcsServiceType:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LcsServiceType'
        velocityRequested:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/VelocityRequested'
        priority:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LcsPriority'
        locationTypeRequested:
          $ref: '#/components/schemas/LocationTypeRequested'
        maximumAgeOfLocationEstimate:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AgeOfLocationEstimate'
        amfId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AmfId'
        codeWord:
          $ref: '#/components/schemas/CodeWord'
        scheduledLocTime:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
```

```
        reliableLocReq:
          type: boolean
          default: false
        servingLmfId:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LMFIdentification'
        lpHapType:
          $ref: 'TS29518_Namf_Location.yaml#/components/schemas/LpHapType'
        evtRptExpectedArea:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
        reportingInd:
          allOf:
            - $ref: '#/components/schemas/ReportingInd'
          default: INSIDE_REPORTING
        integrityRequirements:
          $ref: '#/components/schemas/IntegrityRequirements'
        upLocRepInfoAf:
          $ref: '#/components/schemas/UpLocRepInfoAf'
        requestedRangingSlResult:
          type: array
          items:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/RangingSlResult'
          minItems: 1
        relatedUes:
          type: array
          items:
            $ref: '#/components/schemas/RelatedUe'
          minItems: 1
        mappedQoSEps:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/MappedLocationQoSEps'
        coordinateID:
          type: integer
        mbsrPosInd:
          type: boolean
          enum:
            - true

    LocationDataExt:
      description: Extended Location Data for UEs
      allOf:
        - $ref: '#/components/schemas/LocationData'
        - $ref: '#/components/schemas/AddLocationDatas'


    LocationData:
      description: Contains the response parameters in ProvideLocation service operation
      type: object
      properties:
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        locationEstimate:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
        civicAddress:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CivicAddress'
        localLocationEstimate:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LocalArea'
        ageOfLocationEstimate:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AgeOfLocationEstimate'
        timestampOfLocationEstimate:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        positioningDataList:
          type: array
          items:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/PositioningMethodAndUsage'
          minItems: 1
        gnssPositioningDataList:
          type: array
          items:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GnssPositioningMethodAndUsage'
          minItems: 1
        accuracyFulfilmentIndicator:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AccuracyFulfilmentIndicator'
        ueVelocity:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/VelocityEstimate'
        ldrReference:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LdrReference'
```

```
          altitude:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/Altitude'
          servingLMFIdentification:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LMFIdentification'
          locationPrivacyVerResult:
            $ref: 'TS29518_Namf_Location.yaml#/components/schemas/LocationPrivacyVerResult'
          successType:
            $ref: '#/components/schemas/SuccessType'
          achievedQos:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/MinorLocationQoS'
          directReportInd:
            type: boolean
            default: false
          acceptedPeriodicEventInfo:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/PeriodicEventInfo'
          haGnssMetrics:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/HighAccuracyGnssMetrics'
          losNlosMeasureInd:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LosNlosMeasureInd'
          indoorOutdoorInd:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/IndoorOutdoorInd'
          relatedApplicationlayerId:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationlayerId'
          distanceDirection:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/RangeDirection'
          2dRelativeLocation:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/2DRelativeLocation'
          3dRelativeLocation:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/3DRelativeLocation'
          relativeVelocity:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/VelocityEstimate'
          integrityResult:
            $ref: '#/components/schemas/IntegrityResult'

    CancelLocData:
      description: Contains the input parameters in CancelLocation service operation
      type: object
      required:
        - hgmlcCallBackUri
        - ldrReference
      properties:
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        extGroupId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ExternalGroupId'
        intGroupId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
        hgmlcCallBackUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        ldrReference:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LdrReference'
        lmfIdentification:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LMFIdentification'
        amfId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AmfId'

    LocUpdateData:
      description: Contains the input parameters in LocationUpdate service operation
      type: object
      required:
        - locationRequestType
        - locationEstimate
        - ageOfLocationEstimate
        - accuracyFulfilmentIndicator
        - lcsQosClass
      properties:
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        pseudonymIndicator:
          $ref: '#/components/schemas/PseudonymIndicator'
        locationRequestType:
          $ref: '#/components/schemas/LocationRequestType'
        locationEstimate:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
```

```
      ageOfLocationEstimate:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AgeOfLocationEstimate'
      timestampOfLocationEstimate:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      accuracyFulfilmentIndicator:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AccuracyFulfilmentIndicator'
      civicAddress:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CivicAddress'
      lcsQosClass:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LcsQosClass'
      externalClientIdentification:
        $ref: '#/components/schemas/ExternalClientIdentification'
      afId:
        type: string
      gmlcNumber:
        type: string
        pattern: '^[0-9]{5,15}$'
      lcsServiceType:
        $ref: '#/components/schemas/LcsServiceTypeId'

  EventNotifyData:
    description: >
      Contains the input parameters for the target UE in EventNotify Notification
      service operation
    type: object
    required:
      - eventNotifyDataType
      - ldrReference
    properties:
      gpsi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
      supi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      ldrReference:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LdrReference'
      eventNotifyDataType:
        $ref: '#/components/schemas/EventNotifyDataType'
      locationEstimate:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
      civicAddress:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CivicAddress'
      localLocationEstimate:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LocalArea'
      ageOfLocationEstimate:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AgeOfLocationEstimate'
      timestampOfLocationEstimate:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      positioningDataList:
        type: array
        items:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/PositioningMethodAndUsage'
        minItems: 1
      gnssPositioningDataList:
        type: array
        items:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GnssPositioningMethodAndUsage'
        minItems: 1
      lmfIdentification:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LMFIdentification'
      amfId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/AmfId'
      terminationCause:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/TerminationCause'
      velocityEstimate:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/VelocityEstimate'
      altitude:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/Altitude'
      targetNode:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
      accuracyFulfilmentIndicator:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AccuracyFulfilmentIndicator'
      failureCause:
        $ref: '#/components/schemas/FailureCause'
      achievedQos:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/MinorLocationQoS'
      haGnssMetrics:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/HighAccuracyGnssMetrics'
      losNlosMeasureInd:
```

```
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LosNlosMeasureInd'
          upLocRepStatAf:
            type: integer
          indoorOutdoorInd:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/IndoorOutdoorInd'
          relatedApplicationlayerId:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationlayerId'
          distanceDirection:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/RangeDirection'
          2dRelativeLocation:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/2DRelativeLocation'
          3dRelativeLocation:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/3DRelativeLocation'
          relativeVelocity:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/VelocityEstimate'
          integrityResult:
            $ref: '#/components/schemas/IntegrityResult'

    UePrivacyRequirements:
      description: >
        UE privacy requirements from (H)GMLC to the serving AMF or VGMLC(in the roaming case)
        for the target UE
      type: object
      properties:
        lcsServiceAuthInfo:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/LcsServiceAuth'
        codeWordCheck:
          type: boolean

    LocUpdateNotification:
      description: Location Update Notification
      type: object
      required:
        - locationRequestType
        - locationEstimate
        - ageOfLocationEstimate
        - accuracyFulfilmentIndicator
        - lcsQosClass
      properties:
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        locationRequestType:
          $ref: '#/components/schemas/LocationRequestType'
        locationEstimate:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
        ageOfLocationEstimate:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AgeOfLocationEstimate'
        timestampOfLocationEstimate:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        accuracyFulfilmentIndicator:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AccuracyFulfilmentIndicator'
        civicAddress:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CivicAddress'
        lcsQosClass:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LcsQosClass'
        afId:
          type: string
        serviceIdentity:
          $ref: '#/components/schemas/ServiceIdentity'

    LocUpdateSubs:
      description: UE location information subscription
      type: object
      required:
        - nfInstanceId
        - notifURI
      properties:
        nfInstanceId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
        notifURI:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
```

```
  EventNotifyDataExt:
    description: Extended Event Notify Data for UEs of a target group
    allOf:
      - $ref: '#/components/schemas/EventNotifyData'
      - $ref: '#/components/schemas/EventNotifyDataAdditionalInfo'

  EventNotifyDataAdditionalInfo:
    description: Additional information to Event Notify Data
    type: object
    properties:
      addEventDataList:
        type: array
        items:
          $ref: '#/components/schemas/EventNotifyData'
        minItems: 1

  AreaEventInfoAddition:
    description: Additional information for Extended Area event information
    type: object
    properties:
      geoAreaList:
        type: array
        items:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
        minItems: 1
      ignoreAreaDefInd:
        type: boolean
        default: false
      additionalCheckInd:
        type: boolean
        default: false

  AreaEventInfoExt:
    description: Extended Area Event Information
    allOf:
      - $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AreaEventInfo'
      - $ref: '#/components/schemas/AreaEventInfoAddition'
  IntegrityRequirements:
    description: integrity requirements.
    type: object
    properties:
      timeToAlert:
        $ref: '#/components/schemas/TimeToAlert'
      targetIntegrityRisk:
        $ref: '#/components/schemas/TargetIntegrityRisk'
      alertLimit:
        $ref: '#/components/schemas/AlertLimit'

  AlertLimit:
    description: Alert Limit.
    type: object
    required:
      - horizontalProtectionLevel
    properties:
      horizontalProtectionLevel:
        $ref: '#/components/schemas/HorizontalProtectionLevel'
      verticalProtectionLevel:
        $ref: '#/components/schemas/VerticalProtectionLevel'

  UpLocRepInfoAf:
    description: Information for the location reporting over user plane
    type: object
    properties:
      upLocRepAfInd:
        type: boolean
        enum:
          - true
      upLocRepAddrAf:
        $ref: 'TS29122_MonitoringEvent.yaml#/components/schemas/UpLocRepAddrAfRm'
      upCumEvtRptCriteria:
        $ref: '#/components/schemas/UpCumEvtRptCriteria'

  UpCumEvtRptCriteria:
    description: Criteria for sending cumulative events reports over control plane
    type: object
    properties:
      evtRptTimeCriteria:
        type: integer
```

ETSI

```
            evtRptCountCriteria:
              type: integer

    RelatedUe:
      description: Related UE Information
      type: object
      required:
        - relatedUeType
      properties:
        appLayerId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationlayerId'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        relatedUeType:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/RelatedUeType'

    PrivacyCheckIdMappingReqData:
      description: Privacy Check Id Mapping Request Data
      type: object
      properties:
        gpsiList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
          minItems: 1
        appLayerIds:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationlayerId'
          minItems: 1
        externalClientId:
          $ref: '#/components/schemas/ExternalClientIdentification'
        afId:
          type: string

    PrivacyCheckIdMappingRespData:
      description: Privacy Check Id Mapping Response Data
      type: object
      properties:
        appLayerIds:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationlayerId'
          minItems: 1
        gpsiList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
          minItems: 1

    IntegrityProtectionLevel:
      description: Integrity Protection Level.
      type: object
      required:
        - horizontalProtectionLevel
      properties:
        horizontalProtectionLevel:
          $ref: '#/components/schemas/HorizontalProtectionLevel'
        verticalProtectionLevel:
          $ref: '#/components/schemas/VerticalProtectionLevel'

    IntegrityResult:
      description: Integrity Result.
      type: object
      properties:
        computingEntity:
          $ref: '#/components/schemas/IntegrityComputingEntity'
        protectionLevel:
          $ref: '#/components/schemas/IntegrityProtectionLevel'
        integrityReqMetInd:
          type: boolean
        achievedTir:
          $ref: '#/components/schemas/TargetIntegrityRisk'

#
# SIMPLE TYPES
```

```
#
    ServiceIdentity:
      description: Contains the service identity
      type: string
    ExternalClientIdentification:
      description: Contains the external client identification
      type: string
    CodeWord:
      description: Contains the codeword
      type: string
    E164CountryCodeOfGeographicArea:
      description: Contains the E.164 country codes for geographic areas
      type: string
    LcsServiceTypeId:
      description: LCS Service Type Id.
      type: integer
      minimum: 0
      maximum: 127
    TimeToAlert:
      description: Contains the time-to-alert
      type: integer
      minimum: 1
      maximum: 300
    TargetIntegrityRisk:
      description: Contains the target integrity risk
      type: integer
      minimum: 10
      maximum: 90
    HorizontalProtectionLevel:
      description: Contains the Horizontal Protection Level
      type: integer
      minimum: 0
      maximum: 50000
    VerticalProtectionLevel:
      description: Contains the Vertical Protection Level
      type: integer
      minimum: 0
      maximum: 50000
#
# ENUMS
#
    PseudonymIndicator:
      description: It defines if a pseudonym is requested
      anyOf:
        - type: string
          enum:
            - PSEUDONYM_REQUESTED
            - PSEUDONYM_NOT_REQUESTED
        - type: string
    LocationRequestType:
      description: NI-LR, MT-LR or MO-LR
      anyOf:
        - type: string
          enum:
            - NI_LR
            - MT_LR
            - MO_LR
        - type: string
    LocationTypeRequested:
      description: Contains the location type requested by the LCS client
      anyOf:
        - type: string
          enum:
            - CURRENT_LOCATION
            - CURRENT_OR_LAST_KNOWN_LOCATION
            - INITIAL_LOCATION
            - NOTIFICATION_VERIFICATION_ONLY
        - type: string
    EventNotifyDataType:
      description: Contains the type of event that triggers event notification
      anyOf:
        - type: string
          enum:
            - UE_AVAILABLE
            - PERIODIC
            - ENTERING_INTO_AREA
            - LEAVING_FROM_AREA
            - BEING_INSIDE_AREA
```

```
                - MOTION
                - MAXIMUM_INTERVAL_EXPIRATION_EVENT
                - LOCATION_CANCELLATION_EVENT
                - ACTIVATION_OF_DEFERRED_LOCATION
                - UE_MOBILITY_FOR_DEFERRED_LOCATION
                - 5GC_MT_LR
                - DIRECT_REPORT_EVENT
                - CUMULATIVE_EVENT_REPORT
        - type: string
    FailureCause:
      description: Positioning failure cause
      anyOf:
        - type: string
          enum:
            - POSITIONING_DENIED
            - UNSUPPORTED_BY_UE
            - NOT_REGISTED_UE
            - UNSPECIFIED
        - type: string


    SuccessType:
      description: Success Type to indicate full or partial success
      anyOf:
        - type: string
          enum:
            - SUCCESS_COMPLETELY
            - SUCCESS_PARTIALLY
        - type: string



    ReportingInd:
      description: >
        Indicates whether the UE is allowed to generate and send the event report inside or outside
        the event report allowed(expected) area
      anyOf:
        - type: string
          enum:
            - INSIDE_REPORTING
            - OUTSIDE_REPORTING
        - type: string

    IntegrityComputingEntity:
      description: Integrity Computing Entity
      anyOf:
        - type: string
          enum:
            - UE
            - LMF
            - BOTH
        - type: string

    AddLocationDatas:
      description: Contains one or more LocationData
      type: array
      items:
        $ref: '#/components/schemas/LocationData'
      minItems: 1
```

Annex B (informative):
Change history

						Change history	
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2019-04	CT4#90	C4-191340				Initial Draft of Gateway Mobile Location Services	0.1.0
2019-05	CT4#91	C4-192485				V0.2.0	0.2.0
2019-09	CT4#93	C4-193845				Implementation of pCRs agreed at CT4#93	0.3.0
2019-10	CT4#94	C4-194555				Implementation of pCRs agreed at CT4#94	0.4.0
2019-11	CT4#95	C4-195413, C4-195409, C4-195296				Implementation of pCRs agreed at CT4#95	0.5.0
2019-12	CT#86	CP-193065				TS presented for information	1.0.0
2020-03	CT4#96e	C4-200725, C4-200727, C4-200943, C4-200993, C4-200995, C4-201286				Implementation of pCRs agreed at CT4#96e	1.1.0
2020-03	CT#87e	CP-200060				TS presented for approval	2.0.0
2020-03	CT#87e					Approved at CT87e	16.0.0
2020-04	CT#87e	C4-202409	0001	1	F	Correct the errors	16.1.0
2020-04	CT#87e	C4-202325	0003	-	F	Miscellaneous corrections on TS 29.515	16.1.0
2020-04	CT#87e	C4-202326	0004	-	F	Removing pseudonym of UE	16.1.0
2020-04	CT#87e	C4-202532	0005	1	F	UE Privacy Requirements Corrections	16.1.0
2020-06	CT#88e	C4-203181	0006	-	F	Error corrections	16.1.0
2020-06	CT#88e	C4-203540	0007	1	F	Storage of YAML files in ETSI Forge	16.1.0
2020-06	CT#88e	C4-203524	0008	1	F	Correct the Example Consumer(s) in Table 5.1-1	16.1.0
2020-06	CT#88e	C4-203269	0010	-	F	LDRreference	16.1.0
2020-06	CT#88e	C4-203360	0003	1	F	Miscellaneous corrections on TS 29.515	16.1.0
2020-06	CT#88e	C4-203645	0011	-	F	3GPP TS 29.515 API Version Update	16.1.0
2020-09	CT#89e	CP-202112	0012	1	F	API name correction	16.2.0
2020-09	CT#89e	CP-202112	0014	1	F	Correction of CodeWord Checking for UE Notification and Verification	16.2.0
2020-09	CT#89e	CP-202112	0015	1	F	Correction of Notification or Verification only for UE Positioning	16.2.0
2020-09	CT#89e	CP-202112	0016	1	F	Corrections on EventNotify service operation	16.2.0
2020-09	CT#89e	CP-202112	0017	1	F	Corrections on Application Errors in provide-location response	16.2.0
2020-09	CT#89e	CP-202112	0018	1	F	Corrections on LocationData	16.2.0
2020-09	CT#89e	CP-202139	0020	2	F	Essential correction to OpenAPI specification for LocationUpdateNotify service operation	16.2.0
2020-09	CT#89e	CP-202096	0021	-	F	API version and External doc update	16.2.0
2020-11	CT#90e	CP-203050	0022	1	F	CancelLocation for a group of UEs	16.3.0
2020-11	CT#90e	CP-203050	0023	2	F	EventNotify for UEs in a group	16.3.0
2020-11	CT#90e	CP-203050	0024	1	F	Provide Locations of a group of UEs	16.3.0
2020-11	CT#90e	CP-203050	0028	-	F	Essential corrections	16.3.0
2020-11	CT#90e	CP-203050	0029	-	F	Storage of YAML files in 3GPP Forge	16.3.0
2020-11	CT#90e	CP-203050	0030	-	F	API version and External doc update	16.3.0
2021-03	CT#91e	CP-210037	0033	1	F	HTTP 3xx redirection	16.4.0
2021-03	CT#91e	CP-210041	0032	1	F	Geographic Area	16.4.0
2021-03	CT#91e	CP-210054	0035	-	F	29.515 Rel-16 API version and External doc update	16.4.0
2021-03	CT#91e	CP-210034	0034	1	F	OpenAPI Reference	17.0.0
2021-06	CT#92e	CP-211026	0036	2	B	Add Local Address	17.1.0
2021-06	CT#92e	CP-211028	0047	-	F	Data Types Descriptions	17.1.0
2021-06	CT#92e	CP-211050	0050	-	F	29.515 Rel-17 API version and External doc update	17.1.0
2021-06	CT#92e	CP-211059	0040	1	A	3xx description correction for SCP	17.1.0
2021-06	CT#92e	CP-211059	0046	1	A	Redirect Responses	17.1.0
2021-06	CT#92e	CP-211063	0038	1	A	LCS Service Type and External Client Type	17.1.0
2021-06	CT#92e	CP-211063	0044	-	A	Remove LcsServiceType	17.1.0
2021-06	CT#92e	CP-211063	0048	-	A	Wrong data type name	17.1.0
2021-09	CT#93e	C4-214712	0056	1	A	LCS Service Type	17.2.0
2021-09	CT#93e	C4-214826	0054	1	B	Multiple QoS Class	17.2.0
2021-09	CT#93e	C4-214766	0057	-	F	29.515 Rel-17 API version and External doc update	17.2.0
2021-12	CT#94e	C4-215455	0059	-	B	Higher Resolution Timestamp for Location Estimates	17.3.0
2021-12	CT#94e	C4-216164	0063	-	A	Correct the table name of SuccessType	17.3.0
2021-12	CT#94e	C4-216520	0065	1	A	Add the missing pseudonymIndicator IE in OpenAPI	17.3.0
2021-12	CT#94e	C4-216534	0067	1	A	Information for HGMLC Discovery	17.3.0
2021-12	CT#94e	CP-213174	0069	2	A	LCS Service Type in MO-LR	17.3.0
2021-12	CT#94e	C4-216481	0070	-	F	29.515 Rel-17 API version and External doc update	17.3.0
2022-03	CT#95e	C4-220339	0074	1	F	Editorial corrections	17.4.0
2022-03	CT#95e	C4-220368	0072	1	B	Schedule location time for GMLC	17.4.0
2022-03	CT#95e	C4-221352	0076	-	F	Editorial corrections	17.4.0
2022-03	CT#95e	C4-221603	0077	-	F	29.515 Rel-17 API version and External doc update	17.4.0
2022-06	CT#96	CP-221022	0079	-	B	Scheduled location time for bulk operation	17.5.0
2022-06	CT#96	CP-221051	0081	-	F	29.515 Rel-17 API version and External doc update	17.5.0

2022-09	CT#97e	CP-222036	0082	1	F	Indication of Network Assisted Positioning method	17.6.0
2022-09	CT#97e	CP-222058	0083	-	F	29.515 Rel-17 API version and External doc update	17.6.0
2022-12	CT#98e	CP-223028	0084	1	F	Missing mandatory status codes in OpenAPI	18.0.0
2022-12	CT#98e	CP-223033	0085	-	F	29.515 Rel-18 API version and External doc update	18.0.0
2023-03	CT#99	CP-230065	0090	-	F	Correction on the figure of EventNotify	18.1.0
2023-03	CT#99	CP-230032	0093	2	B	Location service in PNI-NPN with signalling optimisation	18.1.0
2023-03	CT#99	CP-230032	0094	1	B	Support of LMF selection	18.1.0
2023-03	CT#99	CP-230032	0095	1	B	Support of location comparision task	18.1.0
2023-03	CT#99	CP-230032	0096	2	B	Support of low power and high accuracy positioning	18.1.0
2023-03	CT#99	CP-230071	0098	-	F	29.515 Rel-18 API version and External doc update	18.1.0
2023-06	CT#100	CP-231026	0097	3	F	Location header description	18.2.0
2023-06	CT#100	CP-231031	0100	1	B	Add NWDAF as GMLC service consumer	18.2.0
2023-06	CT#100	CP-231025	0101	-	F	Miscellaneous corrections	18.2.0
2023-06	CT#100	CP-231075	0103	1	A	Missing finer periodicities than 1s and an infinite reporting amount	18.2.0
2023-06	CT#100	CP-231031	0105	2	B	Support of event report allowed area	18.2.0
2023-06	CT#100	CP-231031	0109	1	F	Update the incorrect reference	18.2.0
2023-06	CT#100	CP-231026	0110	-	B	OAuth2 scopes in the Ngmlc_Location API	18.2.0
2023-06	CT#100	CP-231031	0112	2	B	Add reporting indication	18.2.0
2023-06	CT#100	CP-231028	0113	-	F	Wrong reference number	18.2.0
2023-06	CT#100	CP-231070	0114	-	F	29.515 Rel-18 API version and External doc update	18.2.0
2023-09	CT#101	CP-232035	0117	1	F	Correction on Reporting Indication	18.3.0
2023-09	CT#101	CP-232063	0119	-	A	Missed HA GNSS Metrics Support over SBI	18.3.0
2023-09	CT#101	CP-232053	0120	-	B	Support of 5GC-MT-LR procedure involving Mobile Base Station Relay	18.3.0
2023-09	CT#101	CP-232035	0121	1	B	Support on NLOS/LOS measurement indication	18.3.0
2023-09	CT#101	CP-232062	0124	1	A	Add GNSS integrity requirement	18.3.0
2023-09	CT#101	CP-232060	0125	-	F	29.515 Rel-18 API version and External doc update	18.3.0
2023-12	CT#102	CP-233037	0116	5	B	Periodic or triggered location events via user plane to an LCS Client or AF	18.4.0
2023-12	CT#102	CP-233037	0127	1	B	Addition of missing interface between LMF and GMLC	18.4.0
2023-12	CT#102	CP-233037	0128	-	F	Correction on the description of scheduledLocTime	18.4.0
2023-12	CT#102	CP-233037	0129	-	B	Resolve Editor's note	18.4.0
2023-12	CT#102	CP-233037	0130	-	B	Support on Indoor/Ourdoor indication	18.4.0
2023-12	CT#102	CP-233028	0131	1	F	HTTP RFCs obsoleted by IETF RFC 9113	18.4.0
2023-12	CT#102	CP-233072	0136	-	A	Incomplete CR implementation	18.4.0
2023-12	CT#102	CP-233295	0137	4	B	Update on Ngmlc_Location_ProvideLocation service for ranging_SL	18.4.0
2023-12	CT#102	CP-233037	0138	2	F	Reporting Indication Definition Alignment to Stage 2	18.4.0
2023-12	CT#102	CP-233037	0139	1	B	Multiple QoS for Deferred Location Service Continuation from 5GS to EPS	18.4.0
2023-12	CT#102	CP-233030	0140	-	F	ProblemDetails RFC 7807 obsoleted by 9457	18.4.0
2023-12	CT#102	CP-233060	0144	-	F	29.515 Rel-18 API version and External doc update	18.4.0
2024-03	CT#103	CP-240045	0151	-	B	coordinate id in case of absolute locations	18.5.0
2024-03	CT#103	CP-240045	0145	1	F	GPSI and SUPI Support for Related UEs in GMLC API	18.5.0
2024-03	CT#103	CP-240045	0146	1	B	Ngmlc Location Privacy Check and ID Mapping Service Operation	18.5.0
2024-03	CT#103	CP-240045	0147	1	B	Application Layer Id Support for 5G-MT-LR	18.5.0
2024-03	CT#103	CP-240045	0150	1	B	update on Ngmlc_Location service for alignment and UEs belonging to different PLMN(s)	18.5.0
2024-03	CT#103	CP-240045	0154	1	F	Aligning distance and location termilogy with stage 2	18.5.0
2024-03	CT#103	CP-240045	0155	1	F	Corrections on Application Layer ID	18.5.0
2024-03	CT#103	CP-240045	0152	3	B	Ngmlc_Location_ProvideRanging	18.5.0
2024-03	CT#103	CP-240053	0149	-	F	Oauth2 Scope Correction in Table	18.5.0
2024-03	CT#103	CP-240053	0148	1	F	Application Error for Maximum Number of UE Exceeded	18.5.0
2024-03	CT#103	CP-240053	0158	2	F	Clarification on URI Path Segment Naming Conventions for Custom operations	18.5.0
2024-03	CT#103	CP-240056	0162	-	F	29.515 Rel-18 API version and External doc update	18.5.0
2024-06	CT#104	CP-241056	0166	-	A	Integrity Result	18.6.0
2024-06	CT#104	CP-241030	0167	1	F	Remove the ENs for security parameters in the UPP	18.6.0
2024-06	CT#104	CP-241030	0171	1	F	Updates on integrity requirement	18.6.0
2024-06	CT#104	CP-241045	0172	1	F	Updates on feature description	18.6.0
2024-06	CT#104	CP-241045	0175	1	F	Remove Ngmlc_Location_ProvideRanging	18.6.0
2024-06	CT#104	CP-241050	0173	1	D	Editorial corrections	18.6.0
2024-06	CT#104	CP-241050	0174	1	F	Style Corrections of Nlmf_Location API	18.6.0
2024-06	CT#104	CP-241045	0176	2	F	Privacy notification and verification for UEs belonging to different PLMN(s)	18.6.0
2024-06	CT#104	CP-241028	0177	-	B	Returning UNSUPPORTED_EVENT_TYPE	18.6.0
2024-06	CT#104	CP-241048	0182	-	B	Add MBSR positioning indication	18.6.0
2024-06	CT#104	CP-241045	0181	1	F	Alignment with naming conventions.	18.6.0

2024-06	CT#104	CP-241045	0183	1	F	Update privacy check for UEs belonging to different PLMN(s)	18.6.0
2024-06	CT#104	CP-241050	0178	1	F	Add missing condition for conditional parameters	18.6.0
2024-06	CT#104	CP-241050	0179	1	F	Add missing description in the API	18.6.0
2024-06	CT#104	CP-241050	0180	1	F	Updates on naming convention for enumeration	18.6.0
2024-06	CT#104	CP-241052	0184	-	F	29.515 Rel-18 API version and External doc update	18.6.0

History

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