**3GPP TSG-CT WG3 Meeting #108eC3-201259**

**E-Meeting, 19th – 28th February 2020**

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| --- |
| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **29.522** | **CR** | **0139** | **rev** | **1** | **Current version:** | **16.2.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

|  |
| --- |
|  |
| ***Title:***  | Supporting the Location services in NEF |
|  |  |
| ***Source to WG:*** | CATT |
| ***Source to TSG:*** | CT3 |
|  |  |
| ***Work item code:*** | 5G\_eLCS |  | ***Date:*** | 2019-12-25 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | As indicated in subclause 6.5, TS 23.273 v16.2.0, a consumer NF (e.g. AF) in the HPLMN for a target UE may invokes an Nnef\_ProvideLocation Request service operation towards an NEF in the HPLMN to request location information of the target UE.Moreover, a UE may initiate MO-LR to notify the UE’s location information. After receiving the Location Notification message from H-GMLC, the NEF transfers the location information to the targeted AF by invoking the Nnef\_LocationUpdateNotify service operation.Lastly, Location reporting by EventExposure service should apply to NEF as well. |
|  |  |
| ***Summary of change:*** | Include the Location services in NEF:1. Add the Nnef\_Location Service in the NF Services provided by NEF;
2. Add the Nnef\_ProvideLocation service operation in the Nef\_Location Service provided by NEF;
3. Add the Nnef\_Location\_LocationUpdateNotify service operation to support the notification of MO-LR location information,
4. Add the EventExposure service to support Location Reporting defined in TS 29.122.
 |
|  |  |
| ***Consequences if not approved:*** | The function of Location Services provided by NEF is missing in stage3. |
|  |  |
| ***Clauses affected:*** | 2, 4.1, 4.4.z(new), 5.3, 5.x(new), A.y(new) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** | This CR includes a backwards compatible feature to the OpenAPI file |
|  |  |
| ***This CR's revision history:*** |  |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*The start of changes\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# 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 23.502: "Procedures for the 5G system".

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

[4] 3GPP TS 29.122: "T8 reference point for northbound Application Programming Interfaces (APIs)".

[5] Open API Initiative, "OpenAPI 3.0.0 Specification", <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md>.

[6] 3GPP TS 33.501: "Security architecture and procedures for 5G System".

[7] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

[8] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[9] 3GPP TS 29.521: "5G System; Binding Support Management Service; Stage 3".

[10] Void.

[11] 3GPP TS 23.222: "Common API Framework for 3GPP Northbound APIs; Stage 2".

[12] 3GPP TS 29.222: "Common API Framework for 3GPP Northbound APIs; Stage 3".

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

[14] 3GPP TS 33.122: "Security Aspects of Common API Framework for 3GPP Northbound APIs".

[15] Void.

[16] IETF RFC 5246: "The Transport Layer Security (TLS) Protocol Version 1.2".

[17] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[18] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[19] 3GPP TS 29.554: "5G System; Background Data Transfer Policy Control Service; Stage 3".

[20] 3GPP TS 29.504: "5G System; Unified Data Repository Services; Stage 3".

[21] 3GPP TR 21.900: "Technical Specification Group working methods".

[22] 3GPP TS 29.523: "5G System; Policy Control Event Exposure Service; Stage 3".

[23] 3GPP TS 29.519: "5G System; Usage of the Unified Data Repository service for Policy Control Data, Application Data and Structured Data for Exposure; Stage 3".

[24] 3GPP TS 29.541: "5G System; Session Management Services for Non-IP Data Delivery (NIDD); Stage 3".

[25] 3GPP TS 29.502: "5G System, Session Management Services; Stage 3".

[26] 3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".

[27] 3GPP TS 29.520: "5G System; Network Data Analytics Services; Stage 3".

[28] 3GPP TS 23.316: "Wireless and wireline convergence access support for the 5G system (5GS)".

[29] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

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

[yy] 3GPP TS 29.515: "5G System; Gateway Mobile Location Services; Stage 3".

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

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Next change\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

## 4.1 Overview

The NEF Northbound interface is between the NEF and the AF. It specifies RESTful APIs that allow the AF to access the services and capabilities provided by 3GPP network entities and securely exposed by the NEF.

This document also specifies the procedures triggered at the NEF by API requests from the AF and by event notifications received from 3GPP network entities.

The stage 2 level requirements and signalling flows for the NEF Northbound interface are defined in 3GPP TS 23.502 [2].

The NEF Northbound interface supports the following procedures:

1) Procedures for Monitoring

2) Procedures for Device Triggering

3) Procedures for resource management of Background Data Transfer

4) Procedures for CP Parameters, Network Configuration Parameters Provisioning and 5G LAN Parameters Provisioning

5) Procedures for PFD Management

6) Procedures for Traffic Influence

7) Procedures for changing the chargeable party at session set up or during the session

8) Procedures for setting up an AF session with required QoS

9) Procedures for MSISDN-less Mobile Originated SMS

10) Procedures for non-IP data delivery

11) Procedures for analytics information exposure

12) Procedure for applying BDT policy

13) Procedures for Enhanced Coverage Restriction Control

14) Procedures for IPTV Configuration

15) Procedures for Location Services

Which correspond to the following services respectively, supported by the NEF as defined in 3GPP TS 23.502 [2]:

1) Nnef\_EventExposure service and Nnef\_APISupportCapability service

2) Nnef\_Trigger service

3) Nnef\_BDTPNegotiation service

4) Nnef\_ParameterProvision service

5) Nnef\_PFDManagement service

6) Nnef\_TrafficInfluence service

7) Nnef\_ChargeableParty service

8) Nnef\_AFsessionWithQoS service

9) Nnef\_MSISDN-less\_MO\_SMS service

10) Nnef\_NIDDConfiguration and Nnef\_NIDD services

11) Nnef\_AnalyticsExposure service

12) Nnef\_ApplyPolicy service

13) Nnef\_ECRestriction service

14) Nnef\_IPTVConfiguration service

15) Nef\_Location service

NOTE 1: For Nnef\_PFDManagement service, only the Nnef\_PFDManagement\_Create/Update/Delete service operations are applicable for the NEF Northbound interface.

NOTE 2: For Nnef\_NIDD service, NF consumer other than the AF does not use the NEF Northbound interface.

NOTE 3: For Nnef\_NIDDConfiguration service, the Nnef\_NIDDConfiguration\_Trigger service operation is only applicable for the NEF Northbound interface.

NOTE 4: The Nnef\_APISupportCapability service is only applicable in the MonitoringEvent API when the monitoring type sets to "API\_SUPPORT\_CAPABILITY".

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Next change\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### 4.4.z Procedures for Location Services

#### 4.4.z.1 Location Reporting by Event Exposure Service

The procedures for Monitoring of location reporting as described in subclause 4.4.2 of 3GPP TS 29.122 [4] shall be applicable in 5G with the following differences:

- description of the SCS/AS applies to the AF;

- description of the SCEF applies to the NEF.

#### 4.4.z.2 Location Provisioning by Location Service

##### 4.4.z.2.1 General

The procedure is used by NEF to transfer the UE location information to AF. The following procedure support:

- Notify the AF of the UE’s location information;

- Request or subscribe the geodetic and optionally civic location of a target UE.

##### 4.4.z.2.2 MO Location Update Notification triggered by UE

In order to notify the AF of the UE MO location information received from GMLC, the NEF shall initiate an HTTP POST request to the AF. The body of the HTTP POST message shall include the location information related to UE MO-LR.

Upon receipt of the corresponding HTTP POST message, if the AF cannot handle the location estimate of the UE, e.g. the UE does not register to the AF, the AF shall respond to the NEF with an error code. Otherwise, the AF shall handle the location estimate according to the Service Identity, and send a HTTP response including "204 No Content" status code.

##### 4.4.z.2.3 Immediate or Deferred Location Request triggered by AF

In order to request or subscribe a geodetic and optionally civic location of a target UE, the AF shall initiate an HTTP POST request to the NEF. The body of the HTTP POST message shall include the location request related parameters in LocRequestData data structure.

Upon receipt of the corresponding HTTP POST message, if the AF is authorized by the NEF to use location service, the NEF shall determine whether location request can be mapped to an (H)GMLC based location service or to an AMF based location event exposure service. The NEF interacts with the (H)GMLC to request an immediate or deferred location towards (H)GMLC by using Ngmlc\_Location service as defined in 3GPP TS 29.515 [yy] or towards UDM by using Nudm\_SDM and Nudm\_UECM services as defined in 3GPP TS 29.503 [17]. If the request is accepted by the UDM or (H)GMLC and the UDM or (H)GMLC informs the NEF with a successful response, the NEF shall send a HTTP "200 OK" response with LocResponseData data structure as response body. For immediate location request, the LocResponseData should include the target UE’s location information.

For the deferred location request, when the NEF receiveds an event notification as defined in subclause 5.2.2.5 of 3GPP TS 29.515 [yy], the NEF shall send an HTTP POST message to the AF with EventNotifyData data structure as the reporting of periodic or triggered UE Location Events.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Next change\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

## 5.3 Reused APIs

This subclause describes the northbound APIs which are applicable for both EPS and 5GS.

Table 5.3-1: Reused APIs applicable for both EPS and 5GS

|  |  |
| --- | --- |
| API Name | Differences |
| ResourceManagementOfBdt | - The "LocBdt\_5G" feature as described in subclause 5.4.4 of 3GPP TS 29.122 [4] may only be supported in 5G.- The "Group\_Id" feature as described in subclause 5.4.4 of 3GPP TS 29.122 [4] may be supported in 5G.- The "BdtNotification\_5G" feature as described in subclause 5.4.4 of 3GPP TS 29.122 [4] may only be supported in 5G. |
| PfdManagement | The "FailureLocation\_5G" feature as described in subclause 5.11.4 of 3GPP TS 29.122 [4] may only be supported in 5G. |
| MonitoringEvent | - The "Number\_of\_UEs\_in\_an\_area\_notification\_5G" feature as described in subclause 5.3.4 of 3GPP TS 29.122 [4] may only be supported in 5G.- The "Downlink\_data\_delivery\_status\_5G" feature as described in subclause 5.3.4 of 3GPP TS 29.122 [4] may only be supported in 5G.- The "Availability\_after\_DDN\_failure\_notification\_enhancement" feature as described in subclause 5.3.4 of 3GPP TS 29.122 [4] may only be supported in 5G.- The "Location\_notification\_5G" feature as described in subclause 5.3.4 of 3GPP TS 29.122 [4] may only be supported in 5G. |
| DeviceTriggering |  |
| CpProvisioning | - The "ExpectedUMT\_5G" and "ExpectedUmtTime\_5G" features as described in subclause 5.10.4 of 3GPP TS 29.122 [4] may only be supported in 5G.- The "ScheduledCommType\_5G" feature as described in subclause 5.10.4 of 3GPP TS 29.122 [4] may only be supported in 5G. |
| ChargeableParty | - The "EthChgParty\_5G" and "MacAddressRange\_5G" features as described in subclause 5.5.4 of 3GPP TS 29.122 [4] may only be supported in 5G.- The events (i.e. LOSS\_OF\_BEARER, RECOVERY\_OF\_BEARER and RELEASE\_OF\_BEARER) do not apply for 5G. |
| AsSessionWithQoS | - The "EthAsSessionQoS\_5G" and "MacAddressRange\_5G" features as described in subclause 5.14.4 of 3GPP TS 29.122 [4] may only be supported in 5G.- The events (i.e. LOSS\_OF\_BEARER, RECOVERY\_OF\_BEARER and RELEASE\_OF\_BEARER) do not apply for 5G. |
| MsisdnLessMoSms |  |
| NpConfiguration | The "NpExpiry\_5G” feature as described in subclause 5.13.4 of 3GPP TS 29.122 [4] may only be supported in 5G. |
| NIDD |  |
| RacsParameterProvisioning |  |
| ECRControl |  |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Next change\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

## 5.x LocationService API

### 5.x.1 Custom Operation without associated resource

5.x.1.1 Overview

Custom operations used for this API are summarized in table 5.x.1.1-1. "apiRoot" is set as described in subclause 5.2.4 of 3GPP TS 29.122 [4].

**Table 5.x.1.1-1: Custom operations without associated resources**

|  |  |  |
| --- | --- | --- |
| **Custom operation URI** | **Mapped HTTP method** | **Description** |
| {apiRoot}/3gpp-location-service/v1/provide-location | POST | Request or subscribe the geodetic and optionally civic location of a target UE or a group of UE |

5.x.1.2 Operation: provide-location

5.x.1.2.1 Description

The custom operation allows a service consumer to request or subscribe the geodetic and optionally civic location of a target UE or a group of UE via the NEF.

5.x.1.2.2 Operation Definition

This operation shall support the response data structures and response codes specified in tables 5.x.1.2.2-1 and 5.x.1.2.2-2.

**Table 5.x.1.2.2-1: Data structures supported by the POST Request Body on this resource**

|  |  |  |  |
| --- | --- | --- | --- |
| **Data type** | **P** | **Cardinality** | **Description** |
| LocRequestData | M | 1 | Input parameters to the "provide-location" operation. |

**Table 5.6.1a.2.2-2: Data structures supported by the POST Response Body on this resource**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data type** | **P** | **Cardinality** | **Response****codes** | **Description** |
| LocResponseData | 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.Upon success, a response body is returned containing the different parameters of the location data if obtained. |
| NOTE: The manadatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. |

### 5.x.2 Notifications

#### 5.x.2.1 Introduction

Upon receipt of an EventNotify or LocationUpdateNotify from the GMLC, the NEF may send an HTTP POST message in order to notify the AF of the occurrence of periodic or triggered location event for a target UE or the updated UE location procedure.

#### 5.x.2.2 Event Notification

URI: **{notificationUrI}**

The operation shall support the URI variables defined in table 5.x.2.2-1.

Table 5.x.2.2-1: URI variables

|  |  |
| --- | --- |
| Name | Definition |
| notificationDestination | A URI indicating the notification destination where N33 notification requests shall be delivered to.This URI shall be preconfigured in the NEF. |

#### 5.x.2.3 Operation Definition

##### 5.x.2.3.1 Notification via HTTP POST

This method shall support the request data structures specified in table 5.x.2.3.1-1 and the response data structures and response codes specified in table 5.x.2.3.1-2.

Table 5.x.2.3.1-1: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| EventNotifyData | O | 0..1 | The EventNotifyData is only included if the Notification is triggered by periodic or triggered location event for a target UE. |
| LocUpdateData | O | 0..1 | The LocUpdateData is only included if the Notification is triggered to deliver UE location to AF during MO-LR procedure |

Table 5.x.2.3.1-2: Data structures supported by the POST Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Responsecodes | Description |
| N/A |  |  | 204 No Content | The notification is received successfully. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply. |

##### 5.x.2.3.2 Notification via Websocket

Not specified in the present specification.

### 5.x.3 Data Model

#### 5.x.3.1 General

This subclause specifies the application data model supported by the LocationService API.

#### 5.x.3.2 Reused data types

The data types reused by the LocationService API from other specifications are listed in table 5.x.3.2-1.

Table 5.x.3.2-1: Re-used Data Types

|  |  |  |
| --- | --- | --- |
| Data type | Reference | Comments |
| ExternalGroupId | 3GPP TS 29.122 [4] | External Group Identifier for a user group. |
| Accuracy | 3GPP TS 29.122 [4] | The desired granularity of accuracy of the requested location information |
| SupportedFeatures | 3GPP TS 29.571 [8] | Used to negotiate the applicability of the optional features defined in table 5.x.4-1. |
| Supi | 3GPP TS 29.571 [8] | Subscription Permanent Identifier |
| Gpsi | 3GPP TS 29.571 [8] | Identifies a GPSI. |
|  |  |  |
| GeographicArea | 3GPP TS 29.572 [xx] | Identifies the geographical information of the user(s). |
| CivicAddress | 3GPP TS 29.572 [xx] | Identifies the civic address information of the user(s). |
| LocationQoS | 3GPP TS 29.572 [xx] | Requested location QoS including accuracy, response time and LCS QoS Class |
| LdrType | 3GPP TS 29.572 [xx] | Location deferred requested event type |
| LcsServiceType | 3GPP TS 29.572 [xx] | The LCS service type |
| VelocityRequested | 3GPP TS 29.572 [xx] | Velocity of the target UE requested |
| LcsPriority | 3GPP TS 29.572 [xx] | Priority of the location request |
| AgeOfLocationEstimate | 3GPP TS 29.572 [xx] | Age of the locatin estimate |
| AccuracyFulfilmentIndicator | 3GPP TS 29.572 [xx] | The indication whether the obtained location estimate satisfies the requested accuracy or not |
| VelocityEstimate | 3GPP TS 29.572 [xx] | Responsed UE velocity, if requested and available |
| AgeOfLocationEstimate | 3GPP TS 29.572 [xx] | The age of location estimate |
| PositioningMethodAndUsage | 3GPP TS 29.572 [xx] | 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. |
| GnssPositioningMethodAndUsage | 3GPP TS 29.572 [xx] | 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. |
| LdrReference | 3GPP TS 29.572 [xx] | Notification correlation ID |
| TerminationCause | 3GPP TS 29.572 [xx] | the IE shall be included if event reporting has been terminated |
| PseudonymOfUe | 3GPP TS 29.515 [yy] | Pseudonym of the target UE |
| ExternalClientType | 3GPP TS 29.515 [yy] | External client type |
| SupportedGADShapes | 3GPP TS 29.515 [yy] | Supported Geographical Area Description shapes |
| ServiceIdentiy | 3GPP TS 29.515 [yy] | Service identity |
| CodeWord | 3GPP TS 29.515 [yy] | Code word |
| E164CountryCode OfGeographicArea | 3GPP TS 29.515 [yy] | The combination of one, two or three digits identifying a specific country, countries in an integrated numbering plan, or a specific geographic area |
| PeriodicEventInfo | 3GPP TS 29.515 [yy] | Periodic event information of the location request for a target UE |
| MotionEventInfo | 3GPP TS 29.515 [yy] | Motion event information of the location request for a target UE |
| LocationTypeRequested | 3GPP TS 29.515 [yy] | The location type requested by the LCS client indicating requesting current location,current or last known location, or initial location |
| EventNotifyDataType | 3GPP TS 29.515 [yy] | the type of event that triggers event notification |
| LocationArea5G | 3GPP TS 29.122 [4] | user location area which is sent from the AF to the NEF |
| OccurrenceInfo | 3GPP TS 29.572 [xx] | user location area which is sent from the AF to the NEF |
| MinimumInterval | 3GPP TS 29.572 [xx] | Minimum interval between event reports. |
| MaxmumInterval | 3GPP TS 29.572 [xx] | Maxmum interval between event reports. |
| SamplingInterval | 3GPP TS 29.572 [xx] | Maximum time interval between consecutive evaluations by a UE of a trigger event. |
| ReportingDuration | 3GPP TS 29.572 [xx] | Maximum duration of event reporting. |

Editor´s note: The location services details in 5G\_eLCS about applicable data for event configuration and report is FFS

#### 5.x.3.3 Structured data types

##### 5.x.3.3.y1 Introduction

This clause defines the structured data types to be used by the LocationService API.

##### 5.x.3.3.y2 Type: LocRequestData

This type represents the data for the retrieval of the location of target UE or the subscription of periodic or triggered location of the target UE.

Table 5.x.3.3.y2-1: Definition of type LocRequestData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability(NOTE 1) |
| supportedFeatures | SupportedFeatures | M | 1 | Indicates the negotiated supported features |  |
| supi | Supi | O | 0..1 | Subscription Permanent Identifier. | (NOTE 2) |
| pseudonymOfUe | PseudonymOfUe | O | 0..1 | Pseudonym of the target UE | (NOTE 2) |
| gpsi | Gpsi | O | 0..1 | Identifies a GPSI | (NOTE 2) |
| externalGroupId | ExternalGroupId | O | 0..1 | Identifies a user group | (NOTE 2) |
| externalClientType | ExternalClientType | M | 1 | External client type |  |
| locationQoS | LocationQoS | O | 0..1 | Requested location QoS | (NOTE 3) |
| supportedGADShapes | array(SupportedGADShapes) | O | 1..N | Supported Geographical Area Description shapes |  |
| serviceIdentity | ServiceIdentity | O | 0..1 | Service identity |  |
| codeWord | CodeWord | O | 0..1 | codeword |  |
| serviceCoverage | array(E164CountryCode OfGeographicArea) | O | 1..N | a list of E.164 country codes for geographic areas [zz] where the LCS client is permitted to request and receive UE location information. |  |
| ldrType | LdrType | O | 0..1 | Location deferred requested event type |  |
| periodicEventInfo | PeriodicEventInfo | O | 0..1 | periodic event information of the location request for a target UE |  |
| exteranlAreaEventInfo | ExternalAreaEventInfo | O | 0..1 | area event information of the location request from AF for a target UE |  |
| motionEventInfo | MotionEventInfo | O | 0..1 | motion event information of the location request for a target UE |  |
| lcsServiceType | LcsServiceType | O | 0..1 | The LCS service type |  |
| velocityRequested | VelocityRequested | O | 0..1 | Velocity of the target UE requested |  |
| Priority | LcsPriority | O | 0..1 | Priority of the location request |  |
| maximumAgeOfLocationEstimate | AgeOfLocationEstimate | O | 0..1 | Requested maximum age of the locatin estimate |  |
| locationTypeRequested | LocationTypeRequested | O | 0..1 | The location type requested by the LCS client indicating requesting current location,current or last known location, or initial location |  |
| accuracy | Accuracy | O | 0..1 | The desired granularity of accuracy of the requested location information |  |
| NOTE 1: Properties marked with a feature as defined in subclause 5.x.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.NOTE 2: One of pseudonymOfUe, supi, gpsi, externalGroupId should be included to identify the target of location request.NOTE 3: The IE only may be included if the requested location accuracy exceeds cell ID. |

##### 5.x.3.3.y3 Type: LocResponseData

This type represents the successful retrieval of the UE or successful subscription of periodic or triggered location of the UE.

Table 5.x.3.3.y3-1: Definition of type LocResponseData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| pseudonymOfUe | PseudonymOfUe | O | 0..1 | Pseudonym of the target UE  |  |
| gpsi | Gpsi | O | 0..1 | Generic Public Subscription Identitfier |  |
| supi | Supi | O | 0..1 | Subscription Permanent Identifier |  |
| locationEstimate | GeographicArea | O | 0..1 | geographic area of the target UE |  |
| civicAddress | CivicAddress | O | 0..1 | civic address of the target UE |  |
| ageOfLocationEstimate | AgeOfLocationEstimate | O | 0..1 | The age of location estimate |  |
| ueVelocity | VelocityEstimate | O | 0..1 | Responsed UE velocity, if requested and available |  |
| accuracyFulfilmentIndicator | AccuracyFulfilmentIndicator | O | 0..1 | The indication whether the obtained location estimate satisfies the requested accuracy or not |  |
| 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. |  |
| ldrReference | LdrRefence | O | 0..1 | notification correlation ID |  |

##### 5.x.3.3.y4 Type: EventNotifyData

This type represents the notification data of a periodic or triggered location event of the UE.

Table 5.x.3.3.y4-1: 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 Identitfier |  |
| ldrReference | LdrReference | O | 0..1 | notification correlation ID |  |
| eventNotifyDataType | EventNotifyDataType | M | 1 | the type of event that triggers event notification |  |
| locationEstimate | GeographicArea | O | 0..1 | geographic area of the target UE |  |
| civicAddress | civicAddress | O | 0..1 | civic address of the target UE |  |
| ageOfLocationEstimate | AgeOfLocationEstimate | O | 0..1 | age of location estimate |  |
| positioningDataList | array(PositioningMethodAndUsage) | O | 1..N | If present, this IE shall indicate the usage of each non-GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully. |  |
| gnssPositioningDataList | array(GnssPositioningMethodAndUsage) | O | 1..N | If present, this IE shall indicate the usage of each GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully. |  |
| terminationCause | TerminationCause | C | 0..1 | the IE shall be included if event reporting has been terminated |  |

##### 5.x.3.3.y5 Type: LocUpdateData

This type represents the notification data of a MO-LR of a UE from NEF to AF.

Table 5.x.3.3.y5-1: 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 |  |
| pseudonymOfUe | PseudonymOfUe | O | 0..1 | pseudonym of the target UE |  |
| locationRequestType | LocationRequestType | M | 1 | event causing the location estimate (5GC-MO-LR) |  |
| locationEstimate | GeographicArea | M | 1 | geographic area of the target UE |  |
| ageOfLocationEstimate | AgeOfLocationEstimate | M | 1 | age of location estimate |  |
| accuracyFulfilmentIndicator | AccuracyFulfilmentIndicator | M | 1 | the indication whether the obtained location estimate satisfies the requested accuracy or not |  |
| locationQoS | LocationQoS | M | 1 | the QoS requested by the target UE |  |
| serviceIdentity | ServiceIdentity | O | 0..1 | service Identity specified by the UE |  |

##### 5.x.3.3.y6 Type: ExternalAreaEventInfo

This type represents the data of user location area event from AF to NEF.

Table 5.x.3.3.y6-1: Definition of type ExternalAreaEventInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| locationArea5G | LocationArea5G | M | 1 | user location area of area event which is sent from the AF to the NEF |  |
| occurrenceInfo | OccurrenceInfo | O | 0..1 | One time only report indication |  |
| minimumInterval | MinimumInterval | O | 0..1 | Minimum interval between event reports.This IE shall not be included if occurrenceInfo is present and set to one time event. |  |
| maximumInterval | MaximumInterval | O | 0..1 | Maximum interval between event reports.This IE shall not be included if occurrenceInfo is present and set to one time event. |  |
| samplingInterval | SamplingInterval | O | 0..1 | Maximum time interval between consecutive evaluations by a UE of a trigger event. |  |
| reportingDuration | ReportingDuration | O | 0..1 | Maximum duration of event reporting. |  |
| reportingLocationReq | boolean | O | 0..1 | This IE shall be present and set to true if a location estimate is required for each event report. |  |

#### 5.x.3.4 Simple data types and enumerations

##### 5.x.3.4.1 Introduction

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

##### 5.x.3.4.2 Simple data types

The simple data types defined in table 5.x.3.4.2-1 shall be supported.

Table 5.x.3.4.2-1: Simple data types

|  |  |  |  |
| --- | --- | --- | --- |
| Type Name | Type Definition | Description | Applicability |
|  |  |  |  |

### 5.x.4 Used Features

The table below defines the features applicable to the LocationService API. Those features are negotiated as described in subclause 5.2.7 of 3GPP TS 29.122 [4].

Table 5.x.4-1: Features used by LocationService API

|  |  |  |
| --- | --- | --- |
| Feature number | Feature Name | Description |
|  |  |  |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Next change\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# A.y LocationService API

openapi: 3.0.0

info:

 title: 3gpp-location-service

 version: 1.0.0.alpha-1

 description: |

 API for location services.

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externalDocs:

 description: 3GPP TS 29.522 V16.3.0; 5G System; Network Exposure Function Northbound APIs.

 url: 'http://www.3gpp.org/ftp/Specs/archive/29\_series/29.522/'

security:

 - {}

 - oAuth2ClientCredentials: []

servers:

 - url: '{apiRoot}/3gpp-location-service/v1'

 variables:

 apiRoot:

 default: https://example.com

 description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.

paths:

 /provide-location:

 post:

 summary: request or subscribe the location of a target UE(or group of target UEs)

 tags:

 - AF level Request or Subscribe Location Operation

 requestBody:

 content:

 application/json:

 schema:

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

 responses:

 '200':

 description: Expected response to a valid location request

 content:

 application/json:

 schema:

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

 '400':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/404'

 '411':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/411'

 '413':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/413'

 '415':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/415'

 '429':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/429'

 '500':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/500'

 '503':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/503'

 default:

 $ref: 'TS29122\_CommonData.yaml#/components/responses/default'

 callbacks:

 notification:

 '{request.body#/notifUri}':

 post:

 requestBody: # contents of the callback message

 required: true

 content:

 application/json:

 schema:

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

 responses:

 '204':

 description: No Content (successful notification)

 '400':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/404'

 '411':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/411'

 '413':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/413'

 '415':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/415'

 '429':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/429'

 '500':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/500'

 '503':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/503'

 default:

 $ref: 'TS29122\_CommonData.yaml#/components/responses/default'

 /location-update-notify:

 post:

 summary: update UE location notification

 tags:

 - AF level MO UE location update notify operation

 requestBody:

 content:

 application/json:

 schema:

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

 required: true

 responses:

 '204':

 description: Expected response to successful location context transfer

 '400':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/404'

 '411':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/411'

 '413':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/413'

 '415':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/415'

 '429':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/429'

 '500':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/500'

 '503':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/503'

 '504':

 $ref: 'TS29122\_CommonData.yaml#/components/responses/504'

 default:

 $ref: 'TS29122\_CommonData.yaml#/components/responses/default'

components:

 securitySchemes:

 oAuth2ClientCredentials:

 type: oauth2

 flows:

 clientCredentials:

 tokenUrl: '{nrfApiRoot}/oauth2/token'

 scopes:

 location-service: Access to the Nnef\_LocationService API

 schemas:

#

# COMPLEX TYPES

#

 LocRequestData:

 type: object

 properties:

 supportedFeatures:

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

 gpsi:

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

 supi:

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

 externalGroupId:

 $ref: 'TS29122\_CommonData.yaml#/components/schemas/ExternalGroupId'

 pseudonymOfUe:

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

 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'

 codeWord:

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

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

 motionEventInfo:

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

 externalClientIdentification:

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

 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'

 accuracy:

 $ref: 'TS29122\_CommonData.yaml#/components/schemas/Accuracy'

 required:

 - externalClientType

 - supportedFeatures

 LocResponseData:

 type: object

 properties:

 pseudonymOfUe:

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

 gpsi:

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

 supi:

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

 locationEstimate:

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

 civicAddress:

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

 ageOfLocationEstimate:

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

 ueVelocity:

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

 accuracyFulfilmentIndicator:

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

 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

 ldrReference:

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

 LocUpdateData:

 type: object

 properties:

 gpsi:

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

 supi:

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

 pseudonymOfUe:

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

 locationRequestType:

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

 locationEstimate:

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

 ageOfLocationEstimate:

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

 accuracyFulfilmentIndicator:

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

 locationQoS:

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

 serviceIdentity:

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

 required:

 - locationRequestType

 - locationEstimate

 - ageOfLocationEstimate

 - accuracyFulfilmentIndicator

 - locationQoS

 EventNotifyData:

 type: object

 properties:

 gpsi:

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

 supi:

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

 ldrReference:

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

 eventNotifyDataType:

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

 locationEstimate:

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

 civicAddress:

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

 ageOfLocationEstimate:

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

 positioningDataList:

 type: array

 items:

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

 minItems: 1

 gnssPositioningDataList:

 type: array

 items:

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

 minItems: 1

 terminationCause:

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

 required:

 - eventNotifyDataType

 ExternalAreaEventInfo:

 type: object

 properties:

 locationArea5G:

 $ref: 'TS29122\_CommonData.yaml#/components/schemas/Gpsi'

 occurrenceInfo:

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

 minimumInterval:

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

 maximumInterval:

 $ref: 'TS29572\_Nlmf\_Location#/components/schemas/EventNotifyDataType'

 samplingInterval:

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

 reportingDuration:

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

 reportingLocationReq:

 type: boolean

 description: Identifies whether a location estimate is required or not for each event report.

 required:

 - locationArea5G

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*End of changes\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*