ENVELOPE

Evaluation and validation of connected mobility in real open systems beyond 5GS

Device Location - Location Reporting (Athens Trial Site) API

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1 Introduction

The present document focuses on a Location Retrieval Service that facilitates the information about location area for a certain device. This document specifies the necessary API with the data model and data format.

The specification follows the same approach of CAMARA Device Location APIs, particularly the Location Retrieval API, sharing the main data model structures.

The objective of the Location Retrieval API is to provide location area information about a certain Device to CAMARA applications running on the network side.

2 API Overview

API name	Description	Modules Involved	Use Cases
Name of the API	Short summary of the API	List of 5GS or other modules interacting with this API	List of Use Cases using the API
Location Retrieval	Information (i.e., on-demand query) about the location area of a certain device	NEF MonitoringEvent API	Generic usage. Various use cases applied

3 Sequence Diagrams

3.1.1 Device Location – Location Retrieval

The Location Retrieval from Device Location API family is the procedure for applications to acquire location area of a certain device in the form of a polygon scheme.

The Location Retrieval procedure is illustrated in *Figure* 1.

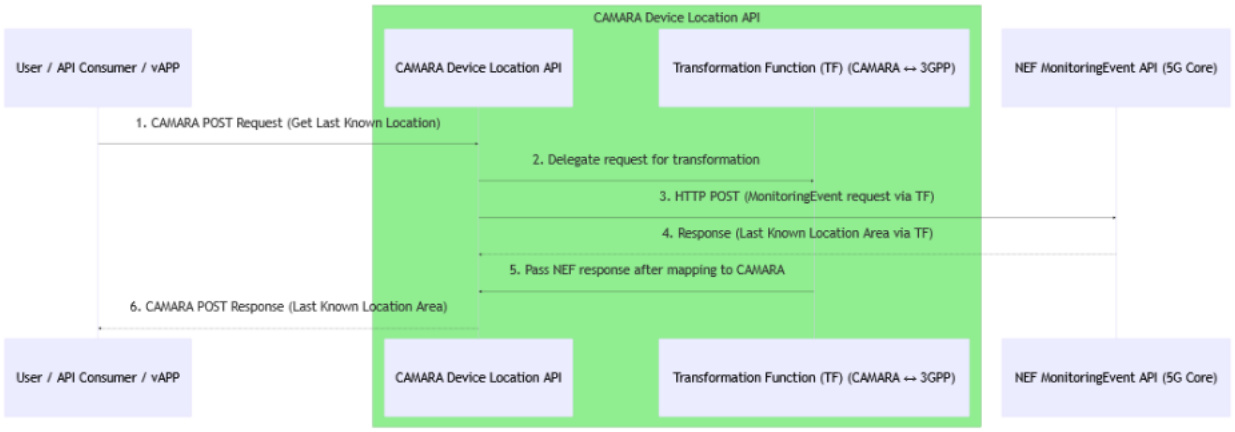

Figure 2 – Flow of Device Location – Location Retrieval API

1. The process is initiated by an API consumer(vAPP) issuing a HTTP POST request to the CAMARA Device Location - Location Retrieval API to obtain the last known location area of a target device.
2. In the Location Retrieval API, a Transformation Function (TF) is used internally to handle protocol and payload adaptation. This function translates the CAMARA - compliant request into the required 3GPP - compliant MonitoringEvent request body.
3. CAMARA API issues a HTTP POST request to the NEF MonitoringEvent API with the translated 3GPP compliant request body.
4. The NEF processes this request by querying its subscriber database and, if the device is found, returns the corresponding last known location area.
5. The response is then passed back into the CAMARA TF, where the 3GPP payload is transformed into the standardized CAMARA response schema.
6. Finally, the CAMARA API delivers the response data via HTTP response to the consumer.

4 API definition

4.1 Resource structure

4.1.1 Resource URIs

The root of the resource URIs of this API shall be:

{apiRoot}/{apiName}/{apiVersion}/

where *apiName* shall be set to *location-retrieval*, and *apiVersion* shall be set to *v0.5* for the current version of the present document.

The resource URI structure of this API is introduced in *Figure 2*.

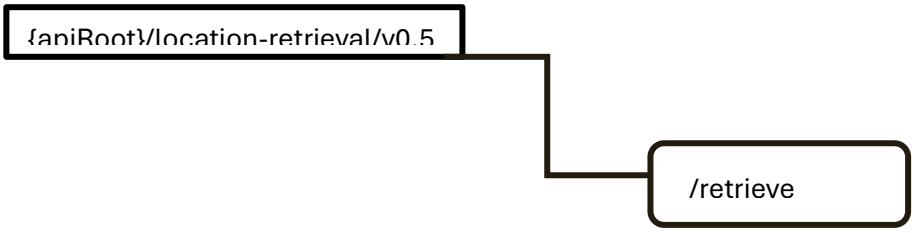

Figure 3 - Resource URI structure for the Location Retrieval API

Table 1 introduces an overview of the resources and the methods.

Table 1. Resources and methods overview.

Resource name	Resource URI	HTTP method	Description
Location Retrieval	/retrieve	POST	Retrieve the area where a certain user device is localized.

4.1.2 Request Headers

All API requests must include the *x-correlator* header. Each third party should generate its own unique identifier using **UUIDv4** format and include it in every request. A fallback mechanism has been implemented to ensure that the *x-correlator* header exists.

This header is used for resource ownership management across different services. Thus, filtering options can be available for request tracing and logging.

Example:

x-correlator: *550e8400-e29b-41d4-a716-446655440000*

4.2 Data model

4.2.1 RetrievalLocationRequest data type

Table 2. RetrievalLocationRequest data type

Field	Data Type	Cardinality	Description

device	Device	1	End-user device able to connect to a mobile network that a location area needs to be found.
maxSurface	integer	0..1	**(Not Supported)** Maximum surface in square meters which is accepted by the client for the location retrieval. If present, only device in that surface is returned.
maxAge	integer	0..1	***(*Not Supported*)*** Maximum age of the location information which is accepted for the location retrieval (in seconds). If present, only device with location data not older than this threshold are returned.

4.2.2 Device data type

Table 3. Device data type

Field	Data Type	Cardinality	Description
phoneNumber	PhoneNumber	0..1	Phone Number of a certain device to retrieve location area. According to E.164 standard, prefixed by '+' and MSISDN for mobile networks.
networkAccessIdentifier	NetworkAccessIdentifier	0..1	Network Access Identifier of a certain device to retrieve location area. **Not used from CAMARA**.
ipv4Address	DeviceIpv4Addr	0..1	**(Not Supported)** (public IPv4, public port) or (public IPv4, private Ipv4) pair of a certain device to retrieve location area.
ipv6Address	DeviceIpv6Address	0..1	**(Not Supported)** IPv6 address of a certain device to retrieve location area.

4.2.3 DeviceResponse data type

Table 4. DeviceResponse data type

Field	Data Type	Cardinality	Description
device	Device	0..1	**(Not Supported)** An identifier for the end-user equipment able to connect to the network that the response refers to. This is relevant when more than one device identifier is specified in the request while only one identifier is allowed in the response.

4.2.4 Location data type

Table 5. Location data type.

Field	Data Type	Cardinality	Description
lastLocationTime	date-time	1	Last date and time when the device was localized. Must adhere to RFC 3339 and must have time zone.
Area	Area	1	Base Schema for Area data type.
device	DeviceResponse	0..1	**(Not Supported)** Device Response identifier based on DeviceResponse data type.

4.2.5 Area data type

Table 6. Area data type.

Field	Data Type	Cardinality	Description
areaType	string	1	Type of this area. Only “POLYGON” area is supported.
pointList	PointList	1	List of Points.
Point	Point	1	Coordinates (latitude, longitude) defining a point of the polygon area.
latitude	Number (Float)	1	Latitude component of the point. Allowed value range: [-90, 90]
longitude	Number (Float)	1	Longitude component of the point. Allowed value range: [-180, 180]

4.2.6 ErrorInfo data type

Table 7. ErrorInfo data type.

Field	Data Type	Cardinality	Description
status	integer	1	HTTP status code returned along with the error response
code	string	1	Code given to this error
message	string	1	Detailed error description

4.3 API operations

4.3.1 Resource: retrieve

The resource URI is: {apiRoot}/location-retrieval/v0.5/retrieve

The content of the methods requests and response is JSON, and it is indicated by setting the content type "application/json".

4.3.1.1 Resource methods

4.3.1.1.1 POST

The POST method is used to retrieve the location area of a certain device.

Parameters: *x-correlator Header*

Table 8. Data structures supported by the POST request on this resource

	Data type	Cardinality	Notes
Request body	RetrievalLocationRequest	1	

Table 9. Data structures supported by the POST response on this resource

	Data type	Cardinality	Response Codes	Notes
Response body	Location	1	200	Upon success, a response body containing the location area of the requested device is returned.
	ErrorInfo	0..1	400	Problem with the client request (Bad Request)
	ErrorInfo	0..1	401	Authentication problem with the client request (UNAUTHORIZED)
	ErrorInfo	0..1	403	Client does not have sufficient permission (FORBIDDEN)
	ErrorInfo	0..1	404	Not found (NOT FOUND)
	ErrorInfo	0..1	422	Validation Error
	ErrorInfo	**0..1**	**500**	Internal server error