



## *TM Forum Specification*

# Geographic Location API REST Specification

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## INTRODUCTION

The following document is the specification of the REST API for geographic location management. It includes the model definition as well as all available operations.

A Geographic Location is a point, a surface or a volume defined by geographic point(s). These points should be associated with accuracy and a spatial reference.

The geographic location API provides a standardized client interface to a location management system.

## SAMPLE USE CASES

Reader will find example of use cases using Usage API in “Open Digital Business Scenarios and Use Cases” document.

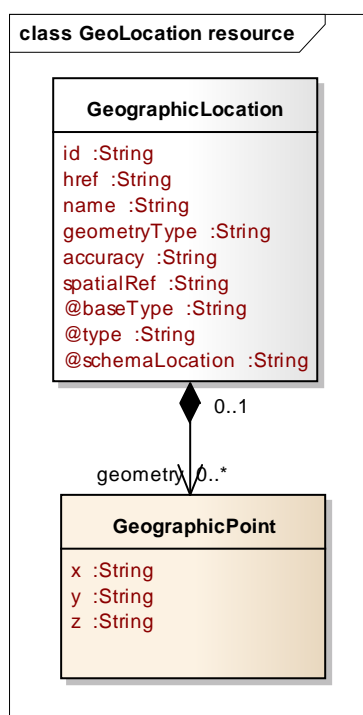
## RESOURCE MODEL

### Managed Entity and Task Resource Models

#### GEOGRAPHIC LOCATION RESOURCE

Structured textual way of describing a geographic location. A geographic location allows describing through coordinate(s), a point, a line or a space.

##### Resource model



##### Field descriptions

###### GeographicLocation fields

Field	Description
<b>id</b>	A string. Unique identifier of the geographic location.
<b>href</b>	A string. An URI used to access to the geographic location resource.
<b>name</b>	A string. Name of the geo location.
<b>geometryType</b>	A string. Type of the geographic location - one of: point, line, graph, ring polygon.
<b>accuracy</b>	A string. Accuracy of the coordinate specified.
<b>spatialRef</b>	A string. Geocoding referential.
<b>geometry</b>	A list of geographic points (GeographicPoint [*]). A GeoPoint defines a geographic point through coordinates.
<b>@baseType</b>	A string. Indicates the base type of the resource. Here can be 'geographicLocation'.
<b>@type</b>	A string. Indicates the type of the resource.
<b>@schemaLocation</b>	A string. A link to the schema describing this REST Resource.



### GeographicPoint sub-resource

A GeoPoint defines a geographic point through coordinates.

Field	Description
<b>x</b>	A string. x coordinate (usually latitude).
<b>y</b>	A string. y coordinate (usually longitude).
<b>z</b>	A string. z coordinate (usually elevation).

### Json representation sample

We provide below the json representation of an example of a 'GeographicLocation' resource object

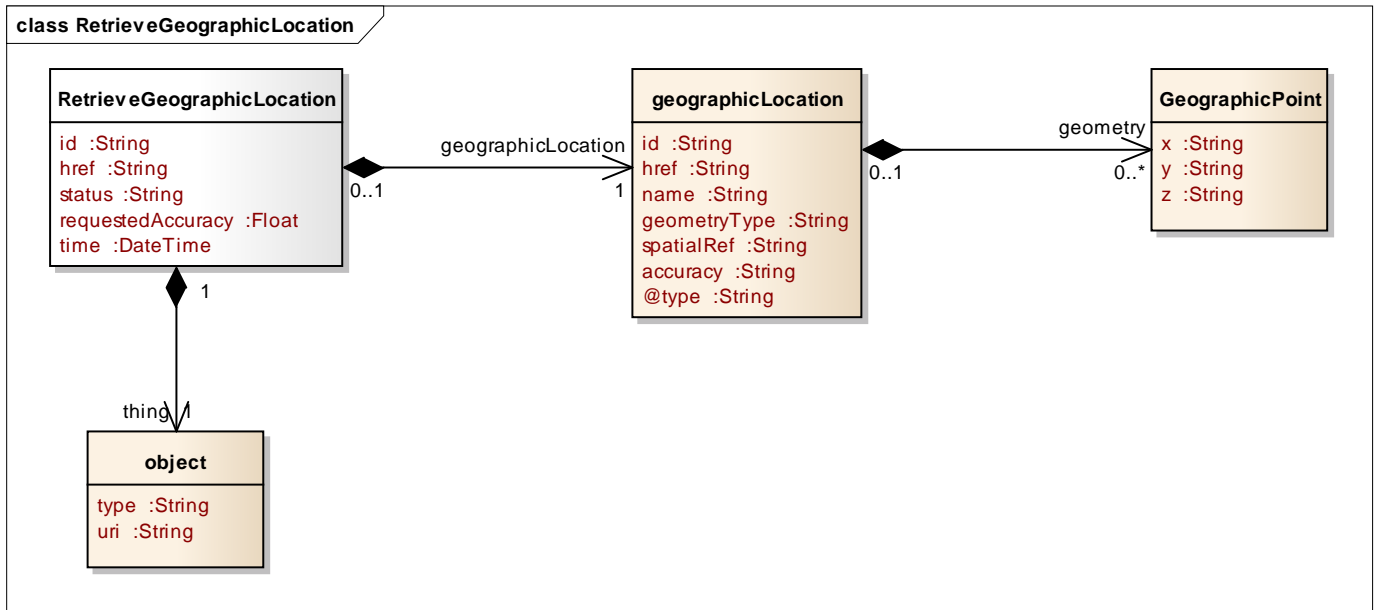
```
{
  "id": "8980",
  "href": "https://host:port/location/geographicLocation/4164",
  "name": "London",
  "geometryType": "polygon",
  "accuracy": "",
  "spatialRef": "WGS84",
  "geometry": [
    {
      "x": "1.430937",
      "y": "43.597208",
      "z": ""
    },
    {
      "x": "22.65899",
      "y": "43.597208",
      "z": ""
    },
    {
      "x": "13.26589",
      "y": "53.236589",
      "z": ""
    },
    {
      "x": "1.430937",
      "y": "53.597208",
      "z": ""
    }
  ]
}
```

---

## RETRIEVE GEOGRAPHIC LOCATION RESOURCE

This resource is used to manage the request and response to retrieve a thing (any object).

### Resource model



### Lifecycle

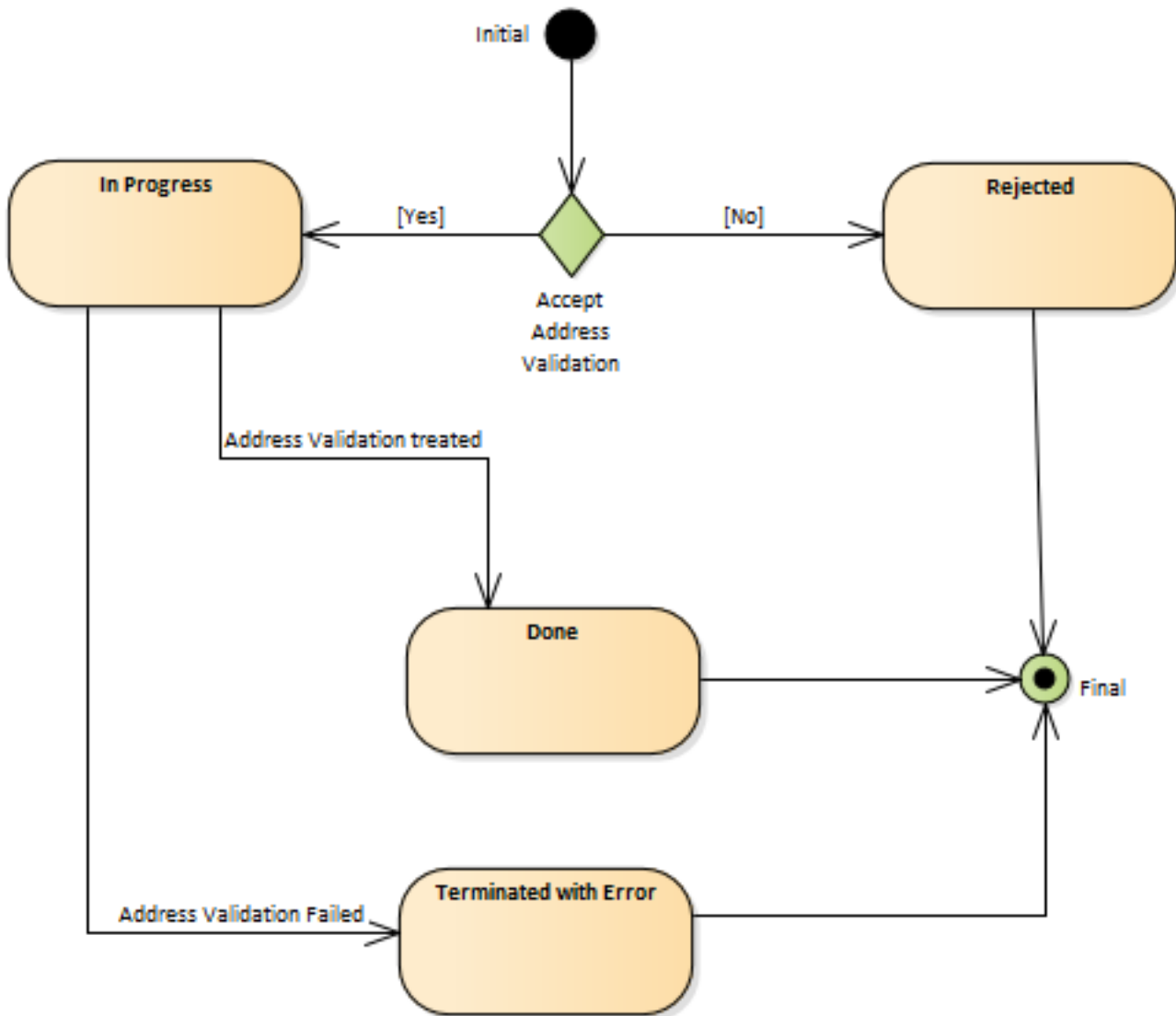
Rejected: Task request is rejected - data provided in the request do not fit API structure

In Progress: Task execution has begun and it is in progress

Done: Task has been done and the result could be a successor a fail

Terminated with Error: Task has not been executed correctly and no response is provided. This status do not means a 'fail' status.

Note that an implementation of the specification may enrich the list of states depicted in the diagram. The state machine specifying the typical state change transitions is provided below.



**Field descriptions**

RetrieveGeographicLocation fields

Field	Description
<b>id</b>	A string. Unique identifier of the task.
<b>href</b>	A string. An URI used to access to the task resource.
<b>status</b>	A string. Status of the task (inProgress, terminatedWithError, done).
<b>requestedAccuracy</b>	A float. Requested accuracy of the retrieval.
<b>time</b>	A date time (DateTime). Timestamp of end of task execution.
<b>geographicLocation</b>	A geographic location (GeographicLocation). A geographic location allows describing through coordinate(s), a point, a line or a space.
<b>thing</b>	An object (Object). the location is retrieved for.

GeographicLocation sub-resource

Structured textual way of describing a geographic location. A geographic location allows describing through coordinate(s), a point, a line or a space.

Field	Description
<b>id</b>	A string. Unique identifier of the geographic location.
<b>href</b>	A string. An URI used to access to the geographic location resource.
<b>name</b>	A string. Name of the geo location.
<b>geometryType</b>	A string. Type of the geographic location - one of: point, line, graph, ring polygon.
<b>accuracy</b>	A string. Accuracy of the coordinate specified.
<b>spatialRef</b>	A string. Geocoding referential.
<b>geometry</b>	A list of geographic points (GeographicPoint [*]). A GeoPoint defines a geographic point through coordinates.
<b>@type</b>	A string. Indicates the type of the resource.

### GeographicPoint sub-resource

A GeoPoint defines a geographic point through coordinates.

Field	Description
<b>x</b>	A string. x coordinate (usually latitude).
<b>y</b>	A string. y coordinate (usually longitude).
<b>z</b>	A string. z coordinate (usually elevation).

### Object sub-resource

Object, the location is retrieved for.

Field	Description
<b>type</b>	A string.
<b>uri</b>	A string.

### Json representation sample

We provide below the json representation of an example of a 'RetrieveGeographicLocation' resource object

```
{
  "id": "2008",
  "href": "https://host:port/location/geographicLocation/4264",
  "status": "done",
  "requestedAccuracy": 34.78,
  "time": "2017-07-18T00:00",
  "geographicLocation": {
    "id": "3488",
    "href": "https://host:port/location/geographicLocation/4164",
    "name": "London",
    "geometryType": "point",
    "accuracy": "0.01",
    "spatialRef": "WGS84",
    "geometry": [
      {
```

```

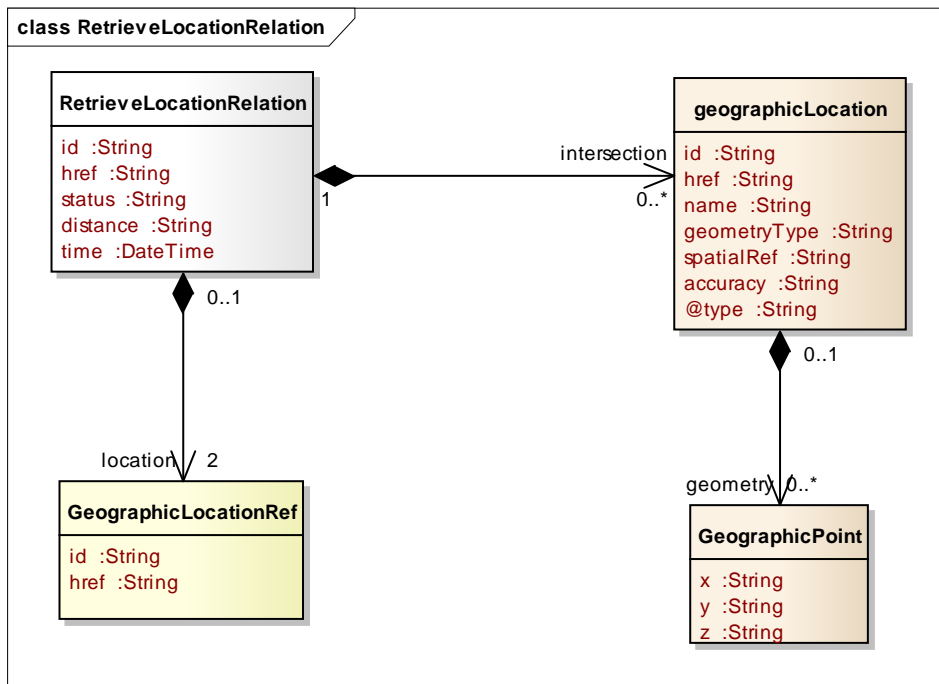
        "x": "1.430937",
        "y": "43.597208",
        "z": ""
    }
]
},
"thing": {
  "type": "tel",
  "uri": "00447572116425"
}
}

```

## RETRIEVE LOCATION RELATION RESOURCE

This resource is used to manage the request and response to retrieve the relation between two geographic locations.

### Resource model



### Lifecycle

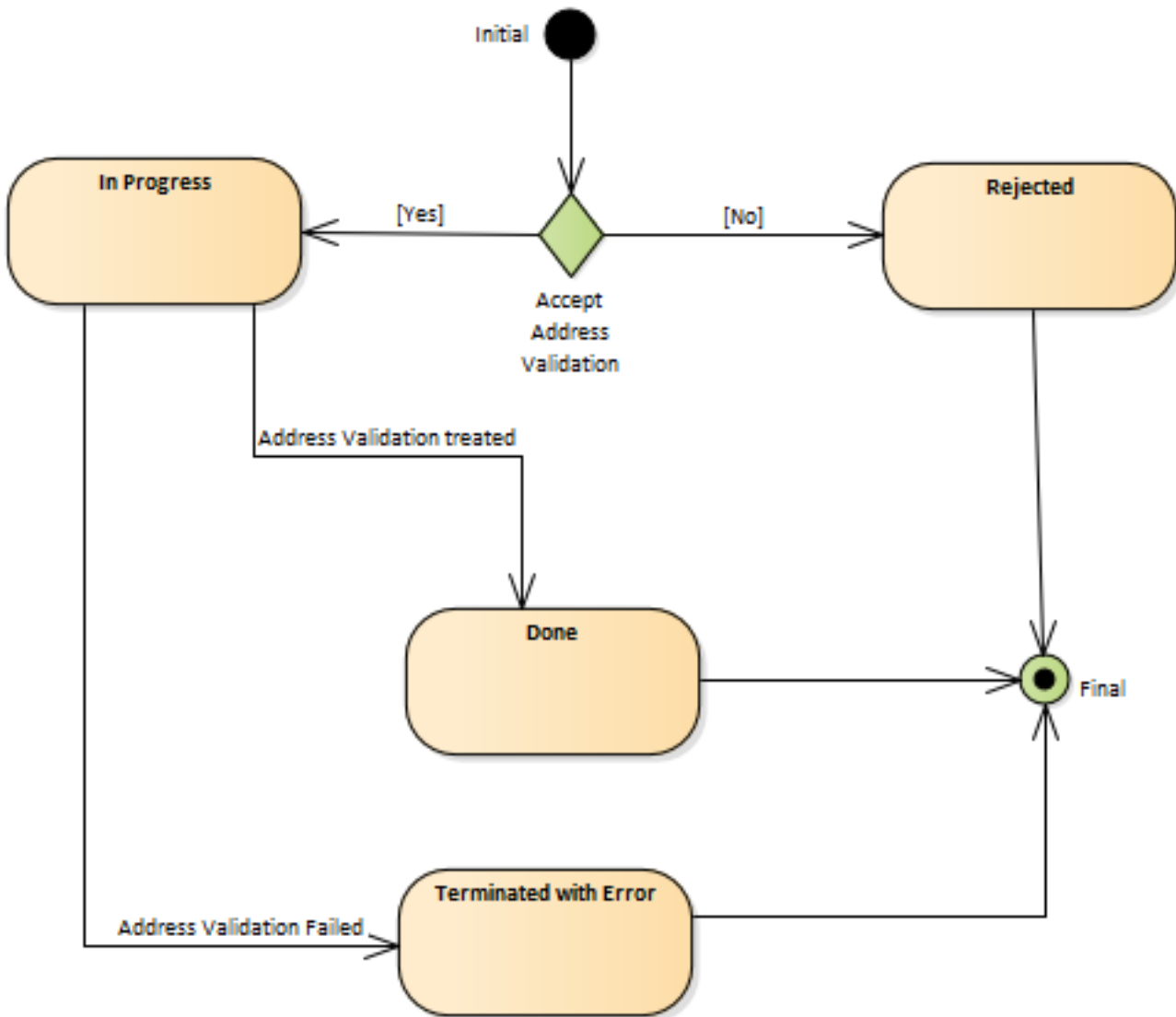
Rejected: Task request is rejected - data provided in the request do not fit API structure

In Progress: Task execution has begun and it is in progress

Done: Task has been done and the result could be a successor a fail

Terminated with Error: Task has not been executed correctly and no response is provided. This status do not means a 'fail' status.

Note that an implementation of the specification may enrich the list of states depicted in the diagram. The state machine specifying the typical state change transitions is provided below.



**Field descriptions**

RetrieveLocationRelation fields

Field	Description
<b>id</b>	A string. Unique identifier of the task.
<b>href</b>	A string. An URI used to access to the task resource.
<b>status</b>	A string. Status of the task (inProgress, terminatedWithError, done).
<b>distance</b>	A string. Calculated distance between location A and location B.
<b>time</b>	A date time (DateTime). Timestamp of end of task execution.
<b>intersection</b>	A list of geographic locations (GeographicLocation [*]). Structured textual way of describing a geographic location. A geographic location allows describing through coordinate(s), a point, a line or a space.
<b>geographicLocation</b>	A list of geographic location references (GeographicLocationRef [2..2]). Defines a geographic location and/or identifies an existing geographic location entity A geographic Location allows describing through coordinate(s) a point, a line or a space.

### GeographicLocation sub-resource

Structured textual way of describing a geographic location. A geographic location allows describing through coordinate(s), a point, a line or a space.

Field	Description
<b>id</b>	A string. Unique identifier of the geographic location.
<b>href</b>	A string. An URI used to access to the geographic location resource.
<b>name</b>	A string. Name of the geo location.
<b>geometryType</b>	A string. Type of the geographic location - one of: point, line, graph, ring polygon.
<b>accuracy</b>	A string. Accuracy of the coordinate specified.
<b>spatialRef</b>	A string. Geocoding referential.
<b>geometry</b>	A list of geographic points (GeographicPoint [*]). A GeoPoint defines a geographic point through coordinates.

### GeographicPoint sub-resource

A GeoPoint defines a geographic point through coordinates.

Field	Description
<b>x</b>	A string. x coordinate (usually latitude).
<b>y</b>	A string. y coordinate (usually longitude).
<b>z</b>	A string. z coordinate (usually elevation).

### GeographicLocationRef relationship

Defines a geographic location and/or identifies an existing geographic location entity  
A geographic Location allows describing through coordinate(s) a point, a line or a space.

Field	Description
<b>id</b>	A string. A String.
<b>href</b>	A string. A String.

### Json representation sample

We provide below the json representation of an example of a 'RetrieveLocationRelation' resource object

```
{
  "id": "3870",
  "href": "https://host:port/geographicLocation/retrieveLocationRelation/3870",
  "status": "InProgress",
  "distance": 123,
  "time": "2017-07-18T00:00",
  "intersection": [
    {
      "id": "3759",
      "href": "https://host:port/location/geographicLocation/4164",
      "name": "London",
      "geometryType": "line",

```

```
"accuracy": "0.01",
"spatialRef": "WGS84",
"geometry": [
  {
    "x": "1.430937",
    "y": "43.597208",
    "z": ""
  },
  {
    "x": "2.369825",
    "y": "44.2365",
    "z": ""
  }
]
},
"location": [
  {
    "id": "9207",
    "href": "https://host:port/location/geographicLocation/9207"
  },
  {
    "id": "4164",
    "href": "https://host:port/location/geographicLocation/4164"
  }
]
}
```

## Notification Resource Models

4 notifications are defined for this API

Notifications related to RetrieveGeographicLocation:

- RetrieveGeographicLocationCreationNotification
- RetrieveGeographicLocationChangeNotification

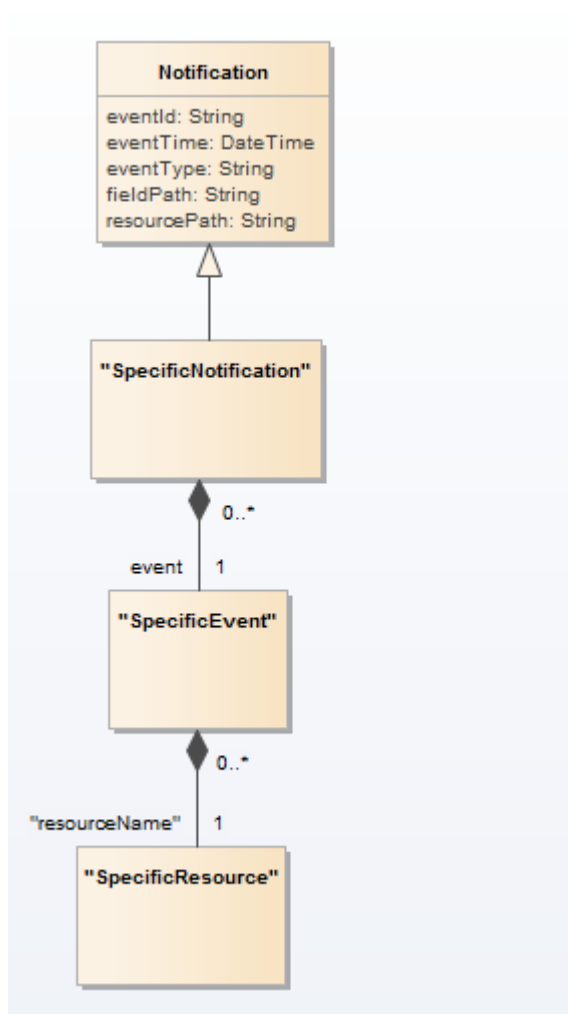
Notifications related to RetrieveLocationRelation:

- RetrieveLocationRelationCreationNotification
- RetrieveLocationRelationChangeNotification

The notification structure for all notifications in this API follow the pattern depicted by the figure below. A notification resource (depicted by "SpecificNotification" placeholder) is a sub class of a generic Notification structure containing an id of the event occurrence (eventId), an event timestamp (eventTime), and the name of the notification resource (eventType).

This notification structure owns an event structure ("SpecificEvent" placeholder) linked to the resource concerned by the notification using the resource name as access field ("resourceName" placeholder).





## RETRIEVE GEOGRAPHIC LOCATION CREATION NOTIFICATION

Notification sent when a new RetrieveGeographicLocation resource is created.

### Json representation sample

We provide below the json representation of an example of a 'RetrieveGeographicLocationCreationNotification' notification object

```

{
  "eventId":"00001",
  "eventTime":"2015-11-16T16:42:25-04:00",
  "eventType":"RetrieveGeographicLocationCreationNotification",
  "event": {
    "retrieveGeographicLocation" :
      [-- SEE RetrieveGeographicLocation RESOURCE SAMPLE --]
  }
}
  
```

## RETRIEVE GEOGRAPHIC LOCATION CHANGE NOTIFICATION

Notification sent when changing a RetrieveGeographicLocation resource.

### Json representation sample

We provide below the json representation of an example of a 'RetrieveGeographicLocationChangeNotification' notification object

```
{
  "eventId":"00001",
  "eventTime":"2015-11-16T16:42:25-04:00",
  "eventType":"RetrieveGeographicLocationChangeNotification",
  "event": {
    "retrieveGeographicLocation" :
      {-- SEE RetrieveGeographicLocation RESOURCE SAMPLE --}
  }
}
```

---

## RETRIEVE LOCATION RELATION CREATION NOTIFICATION

Notification sent when a new RetrieveLocationRelation resource is created.

### Json representation sample

We provide below the json representation of an example of a 'RetrieveLocationRelationCreationNotification' notification object

```
{
  "eventId":"00001",
  "eventTime":"2015-11-16T16:42:25-04:00",
  "eventType":"RetrieveLocationRelationCreationNotification",
  "event": {
    "retrieveLocationRelation" :
      {-- SEE RetrieveLocationRelation RESOURCE SAMPLE --}
  }
}
```

---

## RETRIEVE LOCATION RELATION CHANGE NOTIFICATION

Notification sent when changing a RetrieveLocationRelation resource.

### Json representation sample

We provide below the json representation of an example of a 'RetrieveLocationRelationChangeNotification' notification object

```
{
  "eventId":"00001",
  "eventTime":"2015-11-16T16:42:25-04:00",
  "eventType":"RetrieveLocationRelationChangeNotification",
  "event": {
    "retrieveLocationRelation" :
      {-- SEE RetrieveLocationRelation RESOURCE SAMPLE --}
  }
}
```

```
}  
}
```

## API OPERATIONS

Remember the following Uniform Contract:

Operation on Entities	Uniform API Operation	Description
Query Entities	GET Resource	GET must be used to retrieve a representation of a resource.
Create Entity	POST Resource	POST must be used to create a new resource
Partial Update of an Entity	PATCH Resource	PATCH must be used to partially update a resource
Complete Update of an Entity	PUT Resource	PUT must be used to completely update a resource identified by its resource URL
Remove an Entity	DELETE Resource	DELETE must be used to remove a resource
Execute an Action on an Entity	POST on TASK Resource	POST must be used to execute Task Resources
Other Request Methods	POST on TASK Resource	GET and POST must not be used to tunnel other request methods.

Filtering and attribute selection rules are described in the TMF REST Design Guidelines.

Notifications are also described in a subsequent section.

## OPERATIONS ON GEOGRAPHIC LOCATION

### LIST GEOGRAPHIC LOCATIONS

**GET** /geographicLocation?fields=...&{filtering}

#### Description

This operation list geographic location entities.

Attribute selection is enabled for all first level attributes.

Filtering may be available depending on the compliance level supported by an implementation.

**Providing filtering criteria is mandatory** to avoid too many answers retrieved. To provide example it could filtering on name or on geographic point(s) plan/volume.

#### Usage Samples

Here's an example of a request for retrieving GeographicLocation resources.

Request
<pre>GET /geographicLocationManagement/geographicLocation?name=London Accept: application/json</pre>
Response
<pre>200  [   {     "id": "8980",     "href": "https://host:port/location/geographicLocation/4164",     "name": "London",     "geometryType": "point",     "accuracy": "0.1",     "spatialRef": "WGS84",     "geometry": [       {         "x": "1.430937",         "y": "43.597208",         "z": ""       }     ]   } ]</pre>

### RETRIEVE GEOGRAPHIC LOCATION

**GET /geographicLocation/{id}?fields=...&{filtering}****Description**

This operation retrieves a geographic location entity.

Attribute selection is enabled for all first level attributes.

Filtering on sub-resources may be available depending on the compliance level supported by an implementation.

**Usage Samples**

Here's an example of a request for retrieving a GeographicLocation resource.

Request
GET /geographicLocationManagement/geographicLocation/8980 Accept: application/json
Response
200 <pre>{   "id": "8980",   "href": "https://host:port/location/geographicLocation/4164",   "name": "London",   "geometryType": "graph",   "accuracy": "0.1",   "spatialRef": "WGS84",   "geometry": [     {       "x": "1.430937",       "y": "43.597208",       "z": ""     },     {       "x": "2.36589",       "y": "44.597208",       "z": ""     },     {       "x": "3.25698",       "y": "42.597208",       "z": ""     }   ] }</pre>

## OPERATIONS ON RETRIEVE GEOGRAPHIC LOCATION

### LIST RETRIEVE GEOGRAPHIC LOCATIONS

**GET** /retrieveGeographicLocation?fields=...&{filtering}

#### Description

This operation list retrieveGeographicLocation entities.  
Attribute selection is enabled for all first level attributes.  
Filtering may be available depending on the compliance level supported by an implementation.

#### Usage Samples

Here's an example of a request for retrieving RetrieveGeographicLocation resources.

Request
<pre>GET /geographicLocationManagement/retrieveGeographicLocation?name=London Accept: application/json</pre>
Response
<pre>200  [ {   "id": "2008",   "href": "https://host:port/location/geographicLocation/4264",   "status": "done",   "requestedAccuracy": 34.78,   "time": "2017-07-18T00:00",   "geographicLocation": {     "id": "3488",     "href": "https://host:port/location/geographicLocation/4164",     "name": "London",     "geometryType": "polygon",     "accuracy": "0.1",     "spatialRef": "WGS84",     "geometry": [       {         "x": "1.430937",         "y": "43.597208",         "z": ""       },       {         "x": "1.430937",         "y": "53.597208",</pre>

```

    "z": ""
  },
  {
    "x": "2.430937",
    "y": "53.597208",
    "z": ""
  }
]
},
"thing": {
  "type": "tel",
  "uri": "00447572116425"
}
}
]

```

## RETRIEVE RETRIEVE GEOGRAPHIC LOCATION

**GET** /retrieveGeographicLocation/{id}?fields=...&{filtering}

### Description

This operation retrieves a retrieve geographic location entity.

Attribute selection is enabled for all first level attributes.

Filtering on sub-resources may be available depending on the compliance level supported by an implementation.

### Usage Samples

Here's an example of a request for retrieving a RetrieveGeographicLocation resource.

Request
GET /geographicLocationManagement/retrieveGeographicLocation/2008 Accept: application/json
Response
200  <pre> {   "id": "2008",   "href": "https://host:port/location/geographicLocation/4264",   "status": "done",   "requestedAccuracy": 1.0,   "time": "2017-07-18T00:00",   "geographicLocation": {     "id": "3488", </pre>



```

    "href": "https://host:port/location/geographicLocation/4164",
    "name": "London",
    "geometryType": "point",
    "accuracy": "",
    "spatialRef": "WGS84",
    "geometry": [
      {
        "x": "1.430937",
        "y": "43.597208",
        "z": ""
      }
    ]
  },
  "thing": {
    "type": "tel",
    "uri": "00447572116425"
  }
}

```

## CREATE RETRIEVE GEOGRAPHIC LOCATION

### POST /retrieveGeographicLocation

#### Description

This operation creates a retrieve geographic location entity.

#### Mandatory and Non Mandatory Attributes

The following tables provides the list of mandatory and non mandatory attributes when creating a RetrieveGeographicLocation, including any possible rule conditions and applicable default values. Notice that it is up to an implementer to add additional mandatory attributes.

Mandatory Attributes	Rule
creation	
change	

Non Mandatory Attributes	Default Value	Rule
status		
requestedAccuracy		
time		
geographicLocation		
thing		

#### Usage Samples

Here's an example of a request for creating a RetrieveGeographicLocation resource. In this example the request only passes mandatory attributes.

<b>Request</b>
POST /geographicLocationManagement/retrieveGeographicLocation Content-Type: application/json  {}
<b>Response</b>
201  { "id": "2008", "href": "https://host:port/location/geographicLocation/4264" }

## OPERATIONS ON RETRIEVE LOCATION RELATION

### LIST RETRIEVE LOCATION RELATIONS

**GET /retrieveLocationRelation?fields=...&{filtering}**

#### Description

This operation list retrieve location relation entities.

Attribute selection is enabled for all first level attributes.

Filtering may be available depending on the compliance level supported by an implementation.

#### Usage Samples

Here's an example of a request for retrieving RetrieveLocationRelation resources.

<b>Request</b>
GET /geographicLocationManagement/retrieveLocationRelation Accept: application/json
<b>Response</b>
200  [ { "id": "3870",

```

"href": "https://host:port/geographicLocation/retrieveLocationRelation/3870",
"status": "InProgress",
"locationA": {
  "href": "/DSGeographicLocation/api/geographiclocation/geographiclocation/1"
},
"locationB": {
  "href": "/DSGeographicLocation/api/geographiclocation/geographiclocation/2"
},
"distance": 123,
"time": "2017-07-18T00:00",
"intersection": [
  {
    "id": "3759",
    "href": "https://host:port/location/geographicLocation/4164",
    "name": "London",
    "geometryType": "point",
    "accuracy": "0.1",
    "spatialRef": "WGS84",
    "geometry": [
      {
        "x": "1.430937",
        "y": "43.597208",
        "z": ""
      }
    ]
  }
]
},
"geographicLocation": {
  "id": "9207",
  "href": "https://host:port/location/geographicLocation/4164"
}
}
]

```

---

## RETRIEVE RETRIEVE LOCATION RELATION

**GET** `/retrieveLocationRelation/{id}?fields=...&{filtering}`

### Description

This operation retrieves a retrieve location relation entity.

Attribute selection is enabled for all first level attributes.

Filtering on sub-resources may be available depending on the compliance level supported by an implementation.

### Usage Samples

Here's an example of a request for retrieving a RetrieveLocationRelation resource.

**Request**

```
GET /geographicLocationManagement/retrieveLocationRelation/3870
Accept: application/json
```

**Response**

200

```
{
  "id": "3870",
  "href": "https://host:port/geographicLocation/retrieveLocationRelation/3870",
  "status": "InProgress",
  "distance": 123,
  "time": "2017-07-18T00:00",
  "intersection": [
    {
      "id": "3759",
      "href": "https://host:port/location/geographicLocation/4164",
      "name": "London",
      "geometryType": "line",
      "accuracy": "0.1",
      "spatialRef": "WGS84",
      "geometry": [
        {
          "x": "1.430937",
          "y": "43.597208",
          "z": ""
        },
        {
          "x": "1.8956",
          "y": "43.597208",
          "z": ""
        }
      ]
    }
  ],
  "location": [
    {
      "id": "9207",
      "href": "https://host:port/location/geographicLocation/9207"
    },
    {
      "id": "4164",
      "href": "https://host:port/location/geographicLocation/4164"
    }
  ]
}
```

**CREATE RETRIEVE LOCATION RELATION**

## POST /retrieveLocationRelation

### Description

This operation creates a retrieve location relation entity.

### Mandatory and Non Mandatory Attributes

The following tables provides the list of mandatory and non-mandatory attributes when creating a RetrieveLocationRelation, including any possible rule conditions and applicable default values. Notice that it is up to an implementer to add additional mandatory attributes.

Mandatory Attributes	Rule
creation	
change	

Non Mandatory Attributes	Default Value	Rule
status		
locationA		
locationB		
distance		
time		
intersection		
geographicLocation		

### Usage Samples

Here's an example of a request for creating a RetrieveLocationRelation resource. In this example the request only passes mandatory attributes.

Request
POST /geographicLocationManagement/retrieveLocationRelation Content-Type: application/json  <pre> {   "location": [     {       "id": "9207",       "href": "https://host:port/location/geographicLocation/9207"     },     {       "id": "4164",       "href": "https://host:port/location/geographicLocation/4164"     }   ] }</pre>

**Response**

201

```
{  
  "id": "3870",  
  "href": "https://host:port/geographicLocation/retrieveLocationRelation/3870"  
}
```

## API NOTIFICATIONS

For every single of operation on the entities use the following templates and provide sample REST notification POST calls.

It is assumed that the Pub/Sub uses the Register and UnRegister mechanisms described in the REST Guidelines reproduced below.

### REGISTER LISTENER

#### POST /hub

##### Description

Sets the communication endpoint address the service instance must use to deliver information about its health state, execution state, failures and metrics. Subsequent POST calls will be rejected by the service if it does not support multiple listeners. In this case DELETE /api/hub/{id} must be called before an endpoint can be created again.

##### Behavior

Returns HTTP/1.1 status code 204 if the request was successful.

Returns HTTP/1.1 status code 409 if request is not successful.

##### Usage Samples

Here's an example of a request for registering a listener.

Request
POST /api/hub Accept: application/json  {"callback": "http://in.listener.com"}
Response
201 Content-Type: application/json Location: /api/hub/42  {"id": "42", "callback": "http://in.listener.com", "query": null}

## UNREGISTER LISTENER

**DELETE** /hub/{id}

### Description

Clears the communication endpoint address that was set by creating the Hub.

### Behavior

Returns HTTP/1.1 status code 204 if the request was successful.

Returns HTTP/1.1 status code 404 if the resource is not found.

### Usage Samples

Here's an example of a request for un-registering a listener.

<b>Request</b>
DELETE /api/hub/42 Accept: application/json
<b>Response</b>
204

## PUBLISH EVENT TO LISTENER

**POST** /client/listener

### Description

Clears the communication endpoint address that was set by creating the Hub.

Provides to a registered listener the description of the event that was raised. The /client/listener url is the callback url passed when registering the listener.

### Behavior

Returns HTTP/1.1 status code 201 if the service is able to set the configuration.

### Usage Samples

Here's an example of a notification received by the listener. In this example "EVENT TYPE" should be replaced by one of the notification types supported by this API (see Notification Resources Models section) and EVENT BODY refers to the data structure of the given notification type.



<b>Request</b>
POST /client/listener Accept: application/json  { "event": { EVENT BODY }, "eventType": "EVENT_TYPE" }
<b>Response</b>
201

For detailed examples on the general TM Forum notification mechanism, see the TMF REST Design Guidelines.

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### RELEASE HISTORY

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Release 17.5.0 Version 1.0.1	04-Dec-2017	Ludovic Robert	Aligned with Guidelines 3.0 taking into account Patrick Huls comments
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