OCF 2.0 – Location Services – Data Model WG CR 1781

Legal Disclaimer

Change 1 – Add the following to the T&Ds

1.1 Terms and definitions

1.1.1
Distance Service
set of Resources that provide the distance in metres between a reference entity and a tracked entity

1.1.2
Geofence Service
set of Resources that define a geofence and indicate whether a tracked entity is inside or outside of the geofence

1.1.3
Location Services
one or more of the location based services that a Device supports.

Position Service
set of Resources that define the current known position of an entity either as a geolocation or in a known coordinate space

1.1.4
Presence Service
set of Resources that define whether an entity is determined to be present or otherwise

~~**1.1.5**~~
~~**Tracker**~~
~~Resource containing the set of entities selected by a Client to be tracked~~

Change 2

1.2 Location Services

1.2.1 Introduction

~~Location service~~Location Services present location information about the physical world to applications. Location services is composed of five services, Presence Service, Position Service, Geofence Service, Distance Service, and Entity Catalogue. A Device that supports a ~~location service~~Location Service then exposes one or more of the ~~location service~~Location Service Resources via instances of a location collection (“oic.r.location.collection”) through which a Client can interact.

1.2.2 Entities

~~The Core Specification~~Reference [X] defines an entity as “~~an aspect of the physical world that is exposed through a Device~~a thing having a distinct existence”. For ~~location service~~Location Services an entity is further refined to include the location aspect of the ~~physical world~~thing exposed through ~~location service~~Location Services.

Thus an entity is a representation of the thing that is tracked by ~~location service~~Location Services; they are defined by specializations of an entity Resource (“oic.r.location.entity”). An entity may be added to a device to show location information. The tracked physical thing can be Device, a Bluetooth beacon, RFID tag, facial recognition or other technologies. At a minimum, an instance of an entity Resource consists of a globally unique ID, and a description. The format of the globally unique ID is dependent on the technology of the thing that the entity represents. The description is a human readable string that allows applications to display a context for the entity and allows entities to be grouped for easier searching.

The relationship between the "oic.r.location.entity" and the physical thing it represents is shown in Figure XX

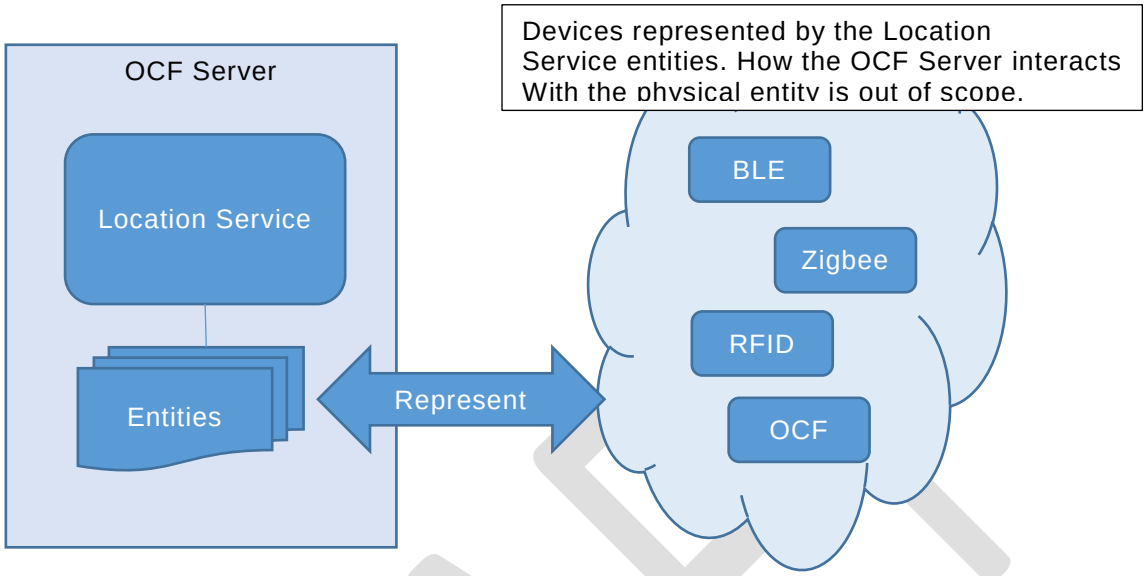

Figure 1 – Entity and relationship to physical thing

Each service creates a service specific specialization of the entity to convey the service specific information. The entity Resources defined herein may be exposed within an instance of a location collection ~~as defined in section 1.1.3~~ or they may be directly exposed by a Device that has knowledge of the entity.

1.2.3 Service Definitions

1.2.3.1 Presence Service

~~1.2.3.1.1~~

The Presence Service announces on the OCF Network whether an entity is present or absent A Device that supports the Presence Service may expose an instance of “oic.r.location.collection” with the “supportedlocationservices” Property including “presence”. If a Device includes "presence" within the " supportedlocationservices" Property then that instance of a location collection shall contain at least one Presence Entity Resource. ~~. A Device that supports the Presence Service may expose an instance of “oic.r.location.collection” with the “supportedlocationservices” Property set to “presence”. The instance of a location collection shall contain Presence Entity Resources.~~ The Presence Entity Resource (“oic.r.location.entity.presence”) is a specialisation of the Entity Resource that additionally has a timestamp of the last measurement and a Boolean value.

See XYZ for details on the model and the associated Resource definitions.

1.2.3.2 Geofence Service

The Geofence Service announces whether an entity is inside or outside a sphere around a reference entity. A Device that supports the Geofence Service may expose an instance of

"oic.r.location.collection" with the "supportedlocationservices" Property including "geofence". ". If a Device includes "geofence" within the " supportedlocationservices" Property then that instance of a location collection shall contain at least one Geofence Entity and/or Geofence Entity Report Resource. The Geofence Entity ("oic.r.location.entity.geofence") defines the Geofence by means of a reference entity and a radius around that reference entity (in metres). ~~A Device that supports the Geofence Service may expose an instance of "oic.r.location.collection" with the "supportedlocationservices" Property set to "geofence". The instance of a location collection shall contain Geofence Entity and/or Geofence Entity Report Resources. The Geofence Entity ("oic.r.location.entity.geofence") defines the Geofence by means of a reference entity and a radius around the Geofence (in metres). The Geofence Entity Report ("oic.r.location.entity.geofence.report") defines whether a particular tracked entity is inside or outside the Geofence that is defined by the Geofence entity itself.~~ The Geofence Entity Report additionally provides the accuracy of the measurement, a timestamp of the last measurement, and a Boolean on whether the entity is inside or outside the Geofence.

See XYZ for details on the model and the associated Resource definitions.

1.2.3.3 Position Service.

The Position Service announces the position of an Entity within a coordinate system. ~~.~~A Device that supports the Position Service may expose an instance of "oic.r.location.collection" with the "supportedlocationservices" Property including "position". If a Device includes "position" within the " supportedlocationservices" Property then that instance of a location collection shall contain at least one Position Entity Resource. ~~A Device that supports the Position Service may expose an instance of "oic.r.location.collection" with the "supportedlocationservices" Property set to "position". The instance of a location collection shall contain Position Entity Resources.~~ The Position Entity ("oic.r.location.entity.position") supports two coordinate systems, the WGS84 GPS coordinates and an Origin X/Y/Z coordinate system. The Origin X/Y/Z coordinates are generally used indoors where the origin is set to an arbitrary position within the building. The Position Entity contains the coordinate data, and a timestamp on the last measurement.

See XYZ for details on the model and the associated Resource definitions.

1.2.3.4 Distance Service

The Distance Service exposes a Distance Entity ("oic.r.location.entity.distance") that provides the distance between itself and a Reference Entity A Device that supports the Distance Service may expose an instance of "oic.r.location.collection" with the "supportedlocationservices" Property including "distance". If a Device includes "distance" within the " supportedlocationservices" Property then that instance of a location collection shall contain at least one Distance Entity Resource. ~~. . A Device that supports the Distance Service may expose an instance of "oic.r.location.collection" with the "supportedlocationservices" Property set to "distance". The instance of a location collection shall contain Distance Entity Resources.~~ The Distance Entity therefore contains a Reference Entity, the distance between the reference entity and the Distance Entity (in metres) that may be calculated, measured, or estimated, the accuracy of the measurement and a timestamp on the last measurement. If the Position of the Distance Entity and Reference Entity are ~~known~~known, then the distance may be the calculated distance between the two Positions.

See XYZ for details on the model and the associated Resource definitions.

1.2.3.5 Entity Catalogue Service

The Entity Catalogue is an instance of a location collection with the "supportedlocationservices" Property set to "entitycatalog" that contains all Entities of which a Device that hosts ~~location service~~Location Services has knowledge. A Client ~~may modify~~may modify the description of an Entity, a Client may also create an entity via the "oic.if.create" interface (see OCF Core Specification section XXX).

See XYZ for details on the model and the associated Resource definitions.

1.2.4 Resource Model

1.2.4.1 Conceptual Model

1.2.4.1.1 Conceptual Model Introduction

~~1.2.4.1.1~~

~~Figure 2~~ Figure 2 describes the overall conceptual Resource Model for all ~~location service~~Location Services. The "LocationService" is an instance of a location collection ("oic.r.locationcollection") specific to one of the Location Services defined herein.

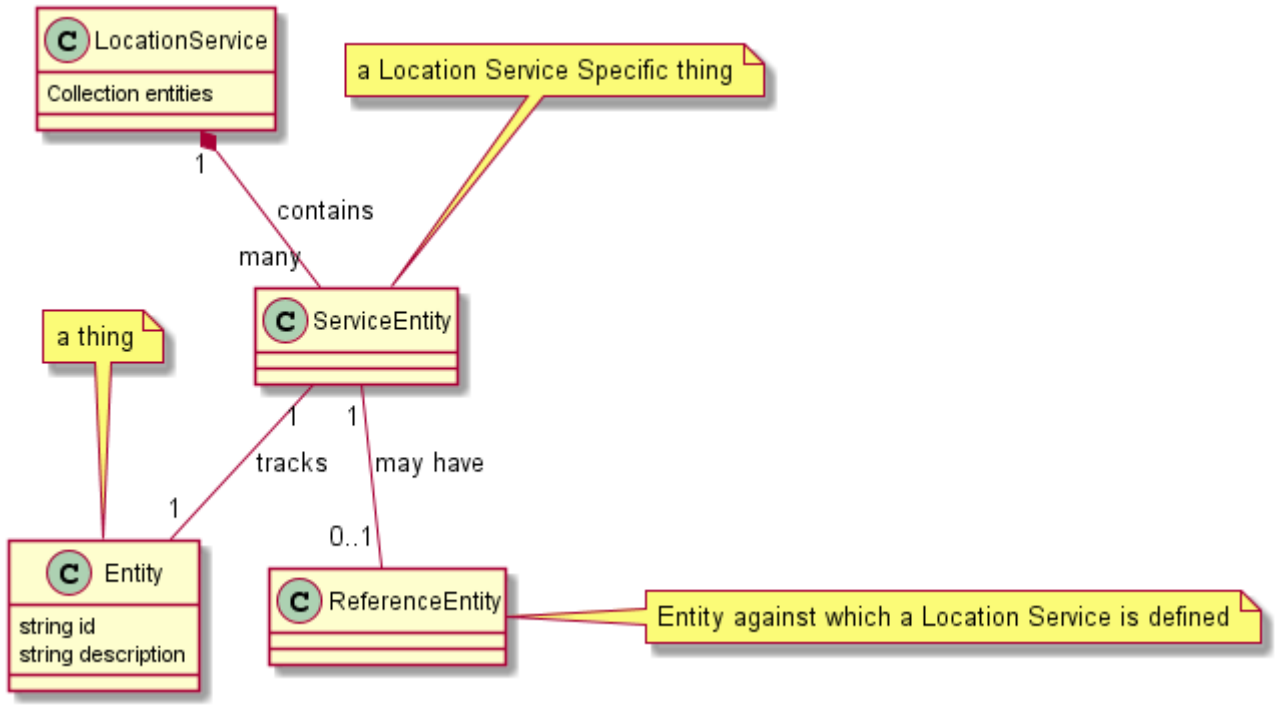

Figure 2 – Generalised Location Service Model

1.2.4.1.2 Conceptual Model Resource Definitions

Table 1 lists the Resources that are define a Location Service. Table 2 lists the Properties for the "oic.r.locatoincollection" Resource, Table 3 lists the Properties for the "oic.r.location.entity" Resource.

Table 1. Location Service Resources

Example URI	Resource Type Title	Resource Type ID ("rt" value)	Interfaces	Description	Related Functional Interaction
"example/locationcolelectionURI"	Location Collection	"oic.r.locationcollection"	"oic.if.ll" "oic.if.baseline", "oic.if.create"	This Resource is a Collection of Location Service specific entities. The Properties exposed by Resource Type "oic.r.locationcollection" are listed in Table 2.	Location Services

"example/locationentityURL"	Location Entity	"oic.r.location.entity"	"oic.if.s", "oic.if.baseline"	This Resource defines the entity that is tracked or that is defined as a reference against which an entity is tracked. The Properties exposed by Resource Type "oic.r.location.entity" are listed in Table 3	Location Services

Table 2. "oic.r.locationcollection" Resource Type definition

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Links	links	Array	See OCF Core Specification Table 9		R	yes	See OCF Core Specification Table 9
Resource	rt	array	["oic.r.location collection"]		R	yes	See OCF Core Specification Table 4.
Resource Types	rts	array	Any of the defined Location Service entities		R	yes	See OCF Core Specification Table 9
Supported Location Services	supportedlocationservices	string	enum		R	yes	Location Service(s) supported by this instance of a location collection

Table 3. "oic.r.location.entity" Resource Type definition

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Entity ID	entityid	string	Max length 128		RW	yes	Globally unique identifier for the entity
Entity Description	entitydescription	string	Max length 128		RW	yes	Human readable description of the entity (e.g. "Mom")

1.2.4.2 Presence Service Model

~~1.2.4.1.2~~1.2.4.2.1 Presence Service Model Introduction ~~(Presence Service)~~

Figure 3 describes an example Resource Model for an instance of the Presence service

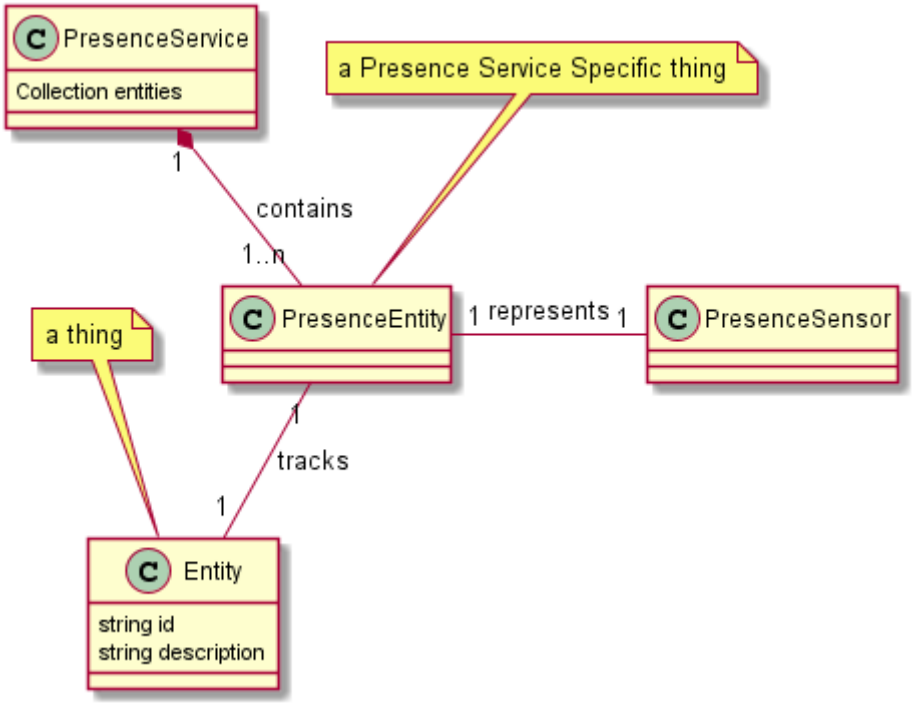

Figure 3 – Presence Service Model

1.2.4.2.2 Presence Service Resource Definitions

Table 4 lists the Resources that are exposed by the Presence Service. Table 5 lists the Properties for the "oic.r.location.entity.presence" Resource, Table 6 lists the Properties for the "oic.r.sensor.presence" Resource

Table 4. Presence Service Resources

Example URI	Resource Type Title	Resource Type ID ("rt" value)	Interfaces	Description	Related Functional Interaction
"example/locationentitypresenceURI"	Presence Entity	"oic.r.location.entity.presence"	"oic.if.s" "oic.if.baseline"	This Resource is a specialisation of a location entity for Presence Service entities. The Properties exposed by Resource Type "oic.r.location.entity.presence" are listed in Table 5.	Location Services
"example/presencesensorURL"	Presence Sensor	"oic.r.sensor.presence"	"oic.if.s", "oic.if.baseline"	This Resource defines the sensor that indicates presence or otherwise of a Presence Service entity. The Properties exposed by Resource Type "oic.r.sensor.presence" are listed in Table 6	Location Services

Table 5. "oic.r.location.entity.presence" Resource Type definition

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Entity ID	entityid	string	See Table XX		RW	yes	See Table XX
Entity Description	entitydescription	string	See Table XX		RW	yes	See Table YY
Value	value	boolean	See Table YY		R	yes	See Table YY
Timestamp	timestamp	string	See clause XXX ("oic.r.time.stamp")		R	yes	See clause XZZ ("oic.r.time.stamp")

Table 6. "oic.r.sensor.presence " Resource Type definition

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Value	value	boolean	See clause 6.48 ("oic.r.sensor.presence")		RW	yes	See clause 6.48 ("oic.r.sensor.presence")

1.2.4.3 Geofence Service Model

~~1.2.4.1.3~~1.2.4.3.1 Geofence Service Model Introduction ~~(Geofence Service)~~

Figure 4 describes an example Resource Model for an instance of the Geofence service. Note that a Server that exposes a Geofence Service or associated Entities may also additionally provide Geolocation Service information; as knowledge of an Entity's Geolocation is required in order to make a determination of whether that tracked Entity is in or out of a defined Geofence.

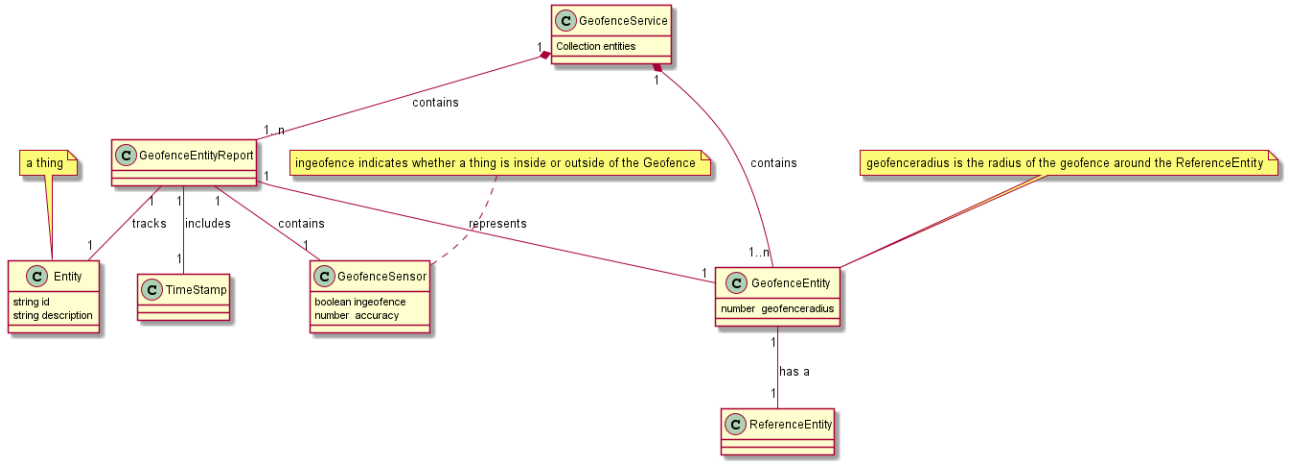

Figure 4 – Geofence Service Model

1.2.4.3.2 Geofence Service Model Resource Definitions

Table 7 lists the Resources that are exposed by the Geofence Service. Table 8 lists the Properties for the "oic.r.location.entity.geofence" Resource, Table 9 lists the Properties for the "oic.r.location.entity.geofence.report" Resource, Table 10 lists the Properties for the "oic.r.sensor.geofence" Resource.

Table 7. Geofence Service Resources

Example URI	Resource Type Title	Resource Type ID ("rt" value)	Interfaces	Description	Related Functional Interaction
"example/locationentity geofenceURI"	Geofence Entity	"oic.r.location.entity.geofence"	"oic.if.s" "oic.if.baseline"	This Resource is a specialisation of a location entity for Geofence Service entities. The Properties exposed by Resource Type "oic.r.location.entity.geofence" are listed in Table 8.	Location Services
"example/locationentity geofencereportURI"	Geofence Entity Report	"oic.r.location.entity.geofence.report"	"oic.if.s" "oic.if.baseline"	This Resource provides a reporting layer for a Geofence Entity. The Properties exposed by Resource Type "oic.r.location.entity.geofence.report" are listed in Table 9.	Location Services
"example/geofencesensorURL"	Geofence Sensor	"oic.r.sensor.geofence"	"oic.if.s", "oic.if.baseline"	This Resource defines the sensor that indicates whether something is inside of a geofence. The Properties exposed by Resource Type "oic.r.sensor.geofence" are listed in Table 10	Location Services

Table 8. "oic.r.location.entity.geofence" Resource Type definition

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Reference Entity	referenceentity	object	See Table 3		R	yes	Instance of "oic.r.location.entity"
Geofence Radius	geofenceradius	number		Metres	R	yes	Radius of the Geofence around the reference entity

Table 9. "oic.r.location.entity.geofence.report" Resource Type definition

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Entity	entity	object	See Table 3		R	yes	Instance of "oic.r.location.entity"
Reference Entity	referenceentity	object	See Table 3		R	yes	See Table 3

Geofence Radius	geofenceradius	number	See Table 8		R	yes	See Table 8
Inside Geofence	ingeofence	boolean	See Table 10		R	yes	See Table 10
Accuracy	accuracy	number	See Table 10		R	no	See Table 10
Measurement Method	measurement method	string	See Table 10		R	no	See Table 10
Timestamp	timestamp	string	See clause 6.86 ("oic.r.time.stamp")		R	yes	See clause 6.86 ("oic.r.time.stamp")

Table 10. "oic.r.sensor.geofence" Resource Type definition

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Inside Geofence	ingeofence	boolean			R	yes	Indicates whether or not an entity is inside this geofence
Accuracy	accuracy	number		metres	R	no	68% confidence distance
Measurement Method	measurement method	string			R	no	Descriptive indicator of the method used to determine that the entity is inside the geofence

1.2.4.4 Position Service Model

~~1.2.4.1.4~~1.2.4.4.1 Position Service Model Introduction ~~(Position Service)~~

Figure 5 describes an example Resource Model for an instance of the Position service

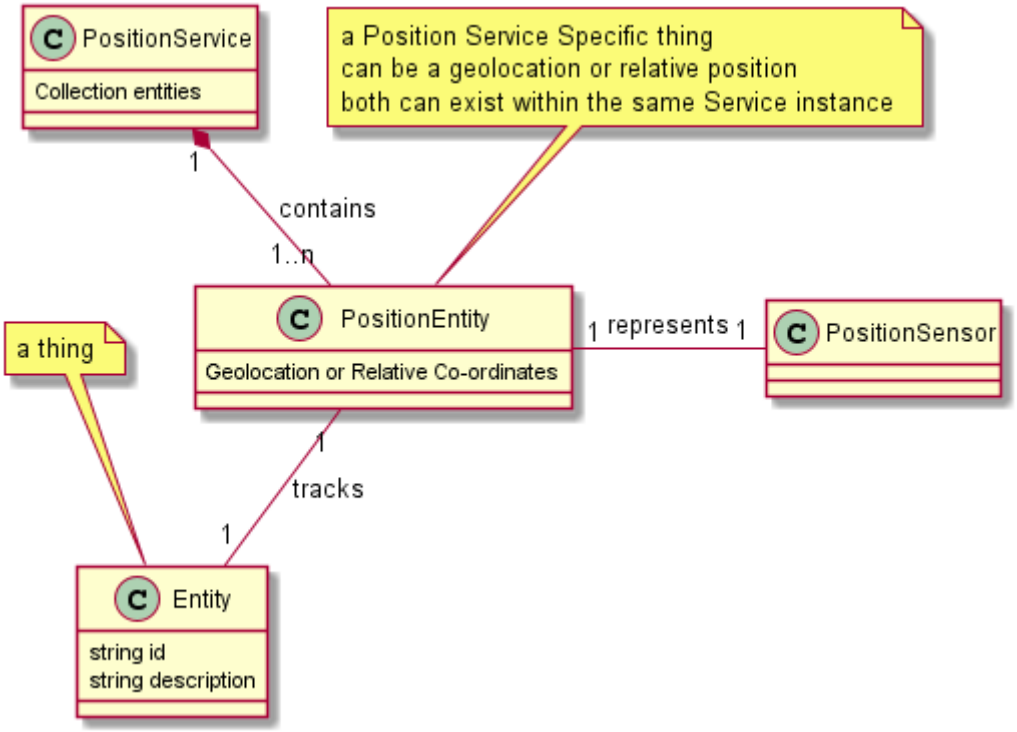

Figure 5 – Position Service Model

1.2.4.4.2 Position Service Resource Definitions

Table 11 lists the Resources that are exposed by the Position Service. Table 12 lists the Properties for the "oic.r.location.entity.position" Resource, Table 13 lists the Properties for the "oic.r.sensor.position" Resource

Table 11. Position Service Resources

Example URI	Resource Type Title	Resource Type ID ("rt" value)	Interfaces	Description	Related Functional Interaction
"example/locationentitypositionURI"	Position Entity	"oic.r.location.entity.position"	"oic.if.s" "oic.if.baseline"	This Resource is a specialisation of a location entity for Position Service entities. The Properties exposed by Resource Type "oic.r.location.entity.position" are listed in Table 12.	Location Services
"example/positionsensorURL"	Position Sensor	"oic.r.sensor.position"	"oic.if.s", "oic.if.baseline"	This Resource defines the sensor that defines an entities position. The Properties exposed by Resource Type "oic.r.sensor.position" are listed in Table 13	Location Services

Table 12. "oic.r.location.entity.position" Resource Type definition

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Entity ID	entityid	string	See Table 3		RW	yes	See Table 3
Entity Description	entitydescription	string	See Table 3		RW	yes	See Table 3
Measurement Method	measurement method	string			R	no	Descriptive indicator of the method used to determine that the entity is inside the geofence
Timestamp	timestamp	string	See clause 6.86 ("oic.r.time.stamp")		R	yes	See clause 6.86 ("oic.r.time.stamp")
One of the Properties of "oic.r.sensor.position" defined in Table 13 or "oic.r.sensor.geolocation" defined in clause 6.62							

Table 13. "oic.r.sensor.position" Resource Type definition

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Origin	origin	string			R	no	A description of the [0,0,0] point
X Coordinate	x	number		metres	R	no	The current X coordinate (metres from origin)
Y Coordinate	y	number		metres	R	no	The current Y coordinate (metres from origin)
Z Coordinate	z	number		metres	R	no	The current Z coordinate (metres from origin)
Accuracy	accuracy	number		metres	R	no	Accuracy level of the x and y coordinates
Altitude Accuracy	altitudeaccuracy	number		metres	R	no	Accuracy level of the z coordinates

1.2.4.5 Distance Service Model

~~1.2.4.1.5~~1.2.4.5.1 Distance Service Model Introduction ~~(Distance Service)~~

Figure 6 describes an example Resource Model for an instance of the Distance Service

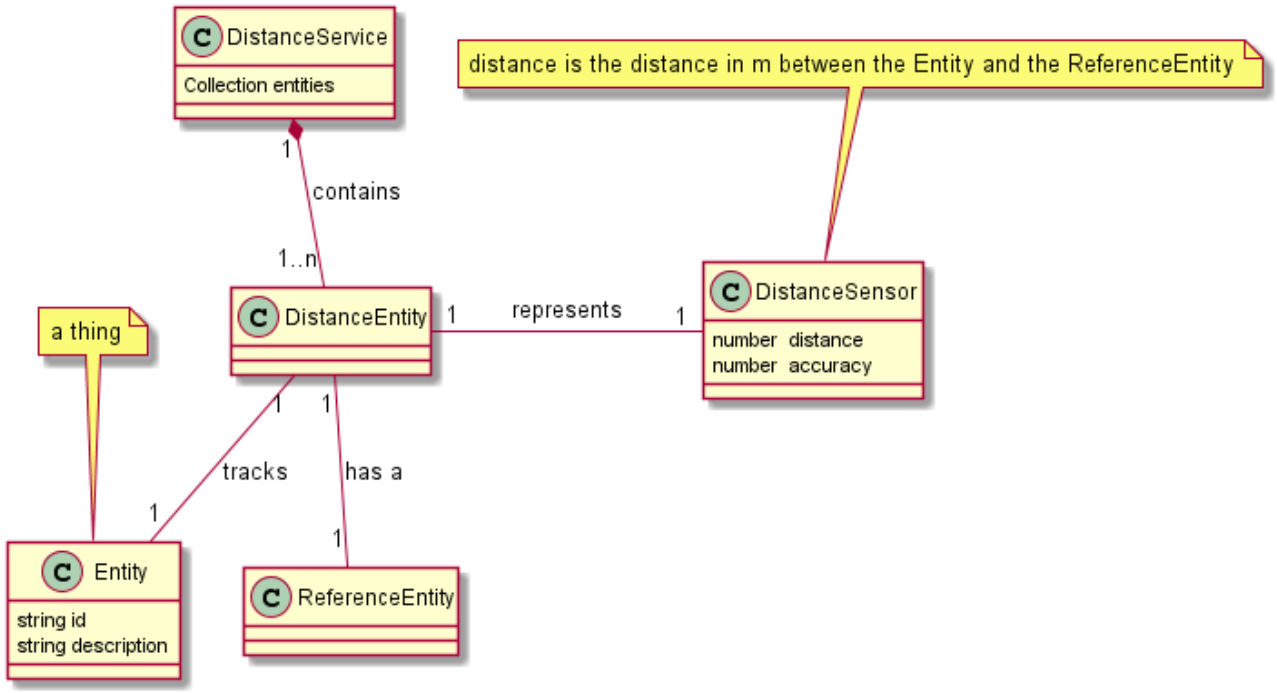

Figure 6 – Distance Service Model

1.2.4.5.2 Distance Service Resource Description

Table 14 lists the Resources that are exposed by the Distance Service. Table 15 lists the Properties for the "oic.r.location.entity.distance" Resource, Table 16 lists the Properties for the "oic.r.sensor.distance" Resource

Table 14. Distance Service Resources

Example URI	Resource Type Title	Resource Type ID ("rt" value)	Interfaces	Description	Related Functional Interaction
"example/locationentitydistanceURI"	Distance Entity	"oic.r.location.entity.distance"	"oic.if.s" "oic.if.baseline"	This Resource is a specialisation of a location entity for Distance Service entities. The Properties exposed by Resource Type "oic.r.location.entity.distance" are listed in Table 15.	Location Services
"example/distancesensorURL"	Distance Sensor	"oic.r.sensor.distance"	"oic.if.s", "oic.if.baseline"	This Resource defines the sensor that captures the distance between two entities. The Properties exposed by Resource Type "oic.r.sensor.distance" are listed in Table 16	Location Services

Table 15. "oic.r.location.entity.distance" Resource Type definition

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Reference Entity	referenceentity	object	See Table 3		R	yes	Instance of "oic.r.location.entity"
Entity	entity	object	See Table 3		R	yes	Instance of "oic.r.location.entity"
Timestamp	timestamp	string	See clause 6.86 ("oic.r.time.stamp")		R	yes	See clause 6.86 ("oic.r.time.stamp")
Distance	distance	number	See Table 16		R	yes	See Table 16
Accuracy	accuracy	number	See Table 16		R	no	See Table 16

Table 16. "oic.r.sensor.distance" Resource Type definition

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Distance	distance	number		metres	R	yes	Distance between the sensor and a reference point
Accuracy	accuracy	number		metres	R	no	68% confidence distance

~~1.2.5 The lifecycle of a Tracker~~

~~A Tracker is an instance of a location collection that contains entities. It is useful to applications that want to monitor the membership of a group of entities. Entities can be grouped by any of the entity properties. For instance, a Tracker could be created for all entities that had the string OCF in their entity description. By observing the Tracker, an application can determine when a change in the group membership occurs.~~

~~Each Tracker is assigned a time to live. After the time to live expires, the Tracker is destroyed. A Client can UPDATE a Tracker's time to live before it expires to set a new time to live.~~

~~The Server has a maximum time to live property. This is the time to live that is set on a Tracker's creation. The Client can request a lesser value on the CREATE request.~~

~~A Tracker is created by the Client by sending a CREATE to the Server. The Server then creates the Collection of all entities that were requested by the Client. The Client can use any of the Properties of the entity in the create request. The Server assembles the set of entities that match the query. These entities are hosted on the Server.~~

~~On receipt of the CREATE operation, the Server creates a Tracker. The Tracker contains the Collection of URI's to the entities that match the parameters requested on the CREATE. The Server returns the path of the Tracker to the Client.~~

~~The Client can RETRIEVE and OBSERVE both the Tracker and the entities within Tracker's Collection of entities.~~

~~If a Tracker's time to live nears expiration, the Client should UPDATE the time to live with an amount of time, not greater than the maximum time to live, if the application wants to retain the Tracker.~~

~~The Client is NOTIFIED of changes in an entities Property(-ies).~~

~~If there is a change in the Tracker's Collection of entities, due to the addition or removal of an entity that matches the parameters used to create the Tracker, the Tracker NOTIFIES the Client of this change.~~

~~When a Client is finished using a tracker it should destroy it by sending a DELETE to the Server, otherwise when the Tracker's time to live expires, the Server will delete the Tracker.~~

~~1.2.6~~1.2.5 Security Considerations

Each service has an ACL that limits which applications can use the service.

Each entity has an ACL that can limit which applications can access Entity data, which services can present entity data and when an ACE in the ACL contains both an application and a ~~location service~~Location Service entry, can limit which service can present the entity data to which applications.

While individual devices can expose a location entity to give positioning information, the services are designed to be aggregators of location information. The service is Device instance.

~~1.2.7~~1.2.6 Example Sequence Diagram

Figure 7 is an illustrative example sequence showing how a Client can interact with a Server that supports ~~location service~~Location Services.

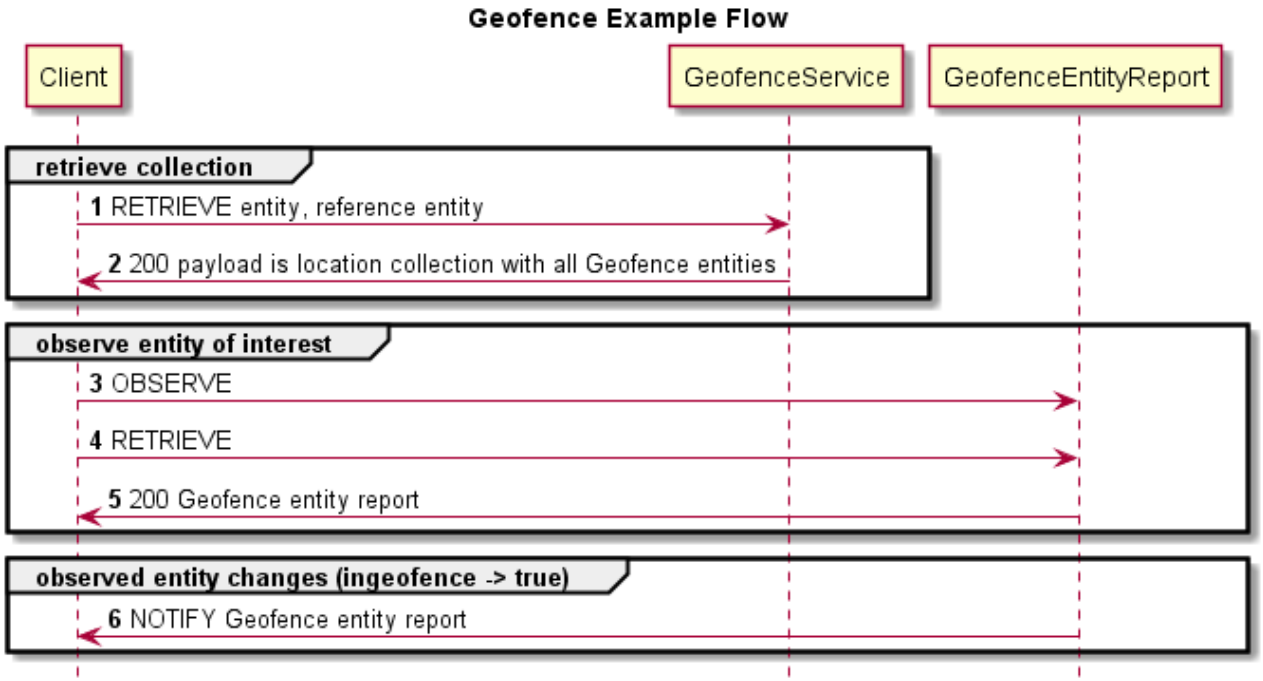

Figure 7 – Example Interaction with an instance of a Geofence Service

In this example, the Client retrieves all the matching entities by passing the "entity", "referenceentity", and "geofenceradius" Properties as query parameters. Any missing Property is treated as a wildcard

and matches all entities. To get all known Geofence Service entitles, a RETRIEVE with no parameters can be issued.

The service responds with a collection of Geofence Service entities that match the requested parameters.

If the Client wants to track a specific set of entities, it sends an UPDATE operation to the service with parameters describing the entities it is interested in.

~~On receiving the UPDATE operation, the service creates a Tracker, a Tracker is an instance of a location collection which contains all the Geofence Service entities that matched the query parameters in the UPDATE, and returns the Tracker's URI.~~

~~When the Client sends a RETRIEVE to the Tracker the Tracker returns a Collection of Geofence Service entities.~~

~~The Tracker will NOTIFY the client when changes to the membership of the Collection of Geofence Service entities occur if the Client has Observed the Tracker.~~

The Client sends an Observe request to the entities it is interested in. The Client also sends a RETRIEVE to the interesting entities to get the initial state of the Geofence Service entities.

The entity will NOTIFY the Client any time it enters or leaves the Geofence.