

Geofences and MMT requirements

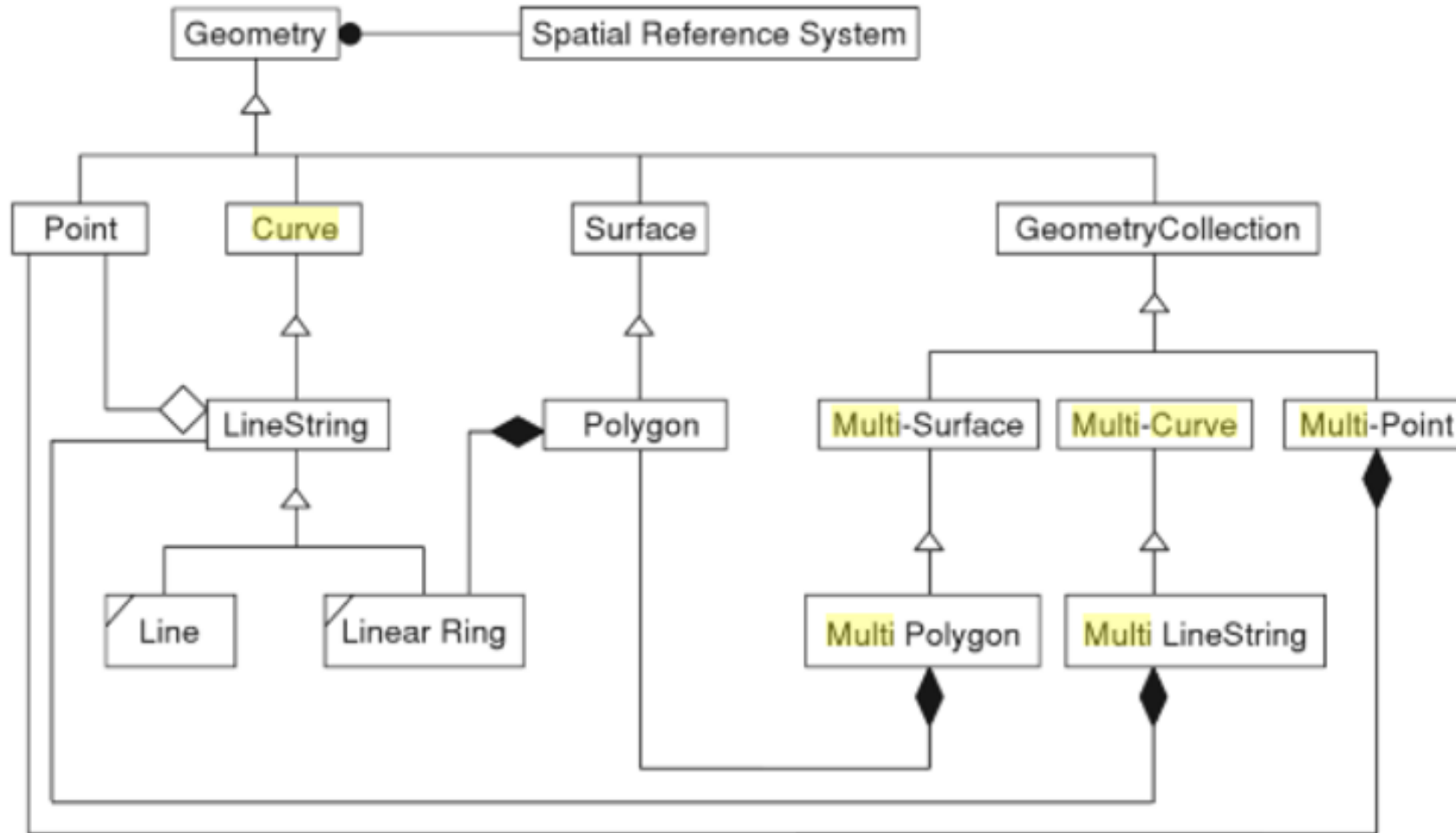
Interim Meeting 4th February – 5th February 2020
Transport and Logistics Domain

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Lead Editor Supply Chain Reference Data Model
Member Editing Team Library Maintenance

UN/CEFACT CCL supports the OpenGIS model

Open Geographic Information Systems



OGIS building blocks of the two dimensional spatial geometry represented in UML

OpenGIS building blocks in UN/CEFACT CCL 19B

Specified_Geographical_Feature. Details

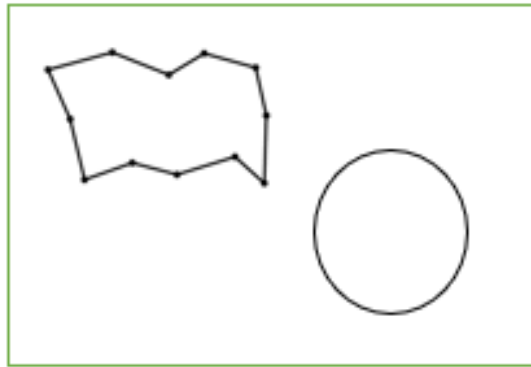
C Based on "Main::Geographical_Feature. Details"

- A_r Specified_Geographical_Feature. Description. Text
- A_r Specified_Geographical_Feature. Name. Text
- A_r Specified_Geographical_Feature. Coordinate Reference System. Identifier
- C_r Specified_Geographical_Feature. Included. Specified_Geographical_Point
- C_r Specified_Geographical_Feature. Included. Specified_Geographical_Line
- C_r Specified_Geographical_Feature. Included. Specified_Geographical_Surface
- C_r Specified_Geographical_Feature. Included. Specified_Geographical_Multi-Point
- C_r Specified_Geographical_Feature. Included. Specified_Geographical_Multi-Curve
- C_r Specified_Geographical_Feature. Included. Specified_Geographical_Multi-Surface
- C_r Specified_Geographical_Feature. Included. Specified_Polygon
- C_r Specified_Geographical_Feature. Included. Specified_Geographical_Grid

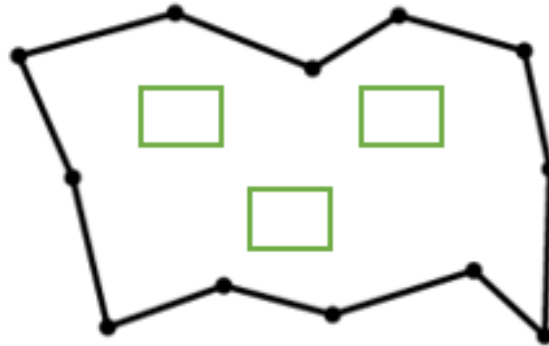
Geographical_Feature:

Enclosing both geometry and properties, thus adding real world metadata or attributes to the shapes defined for a geometry.

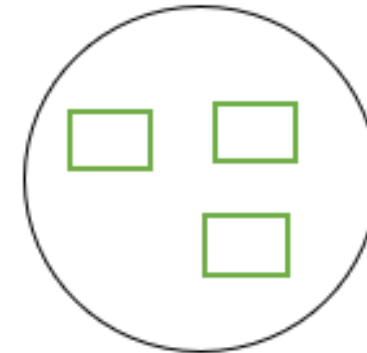
Linking Events - to - Locations - to - Geofences DMRs CCL 20A



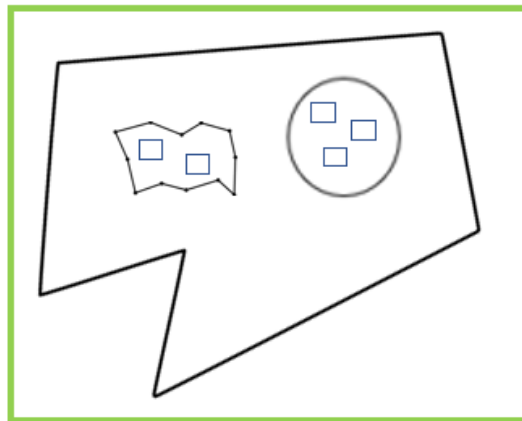
A physical location with geofences shaped as a polygon or circle



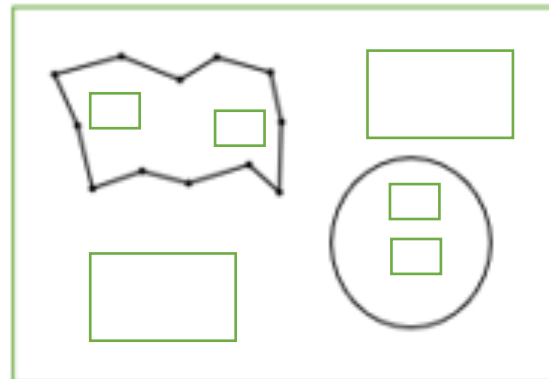
A geofence shaped as a polygon with physical locations



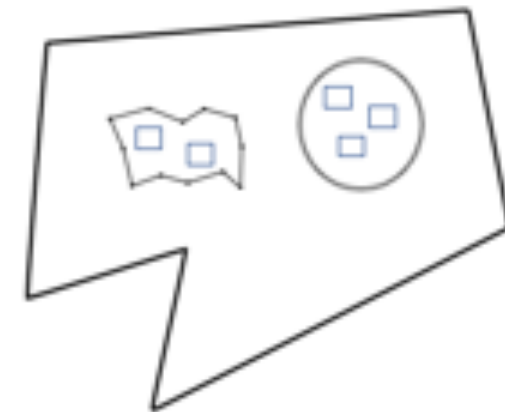
A geofence shaped as a circle with physical locations



A physical location with multiple geofences shaped as polygons, with multiple locations

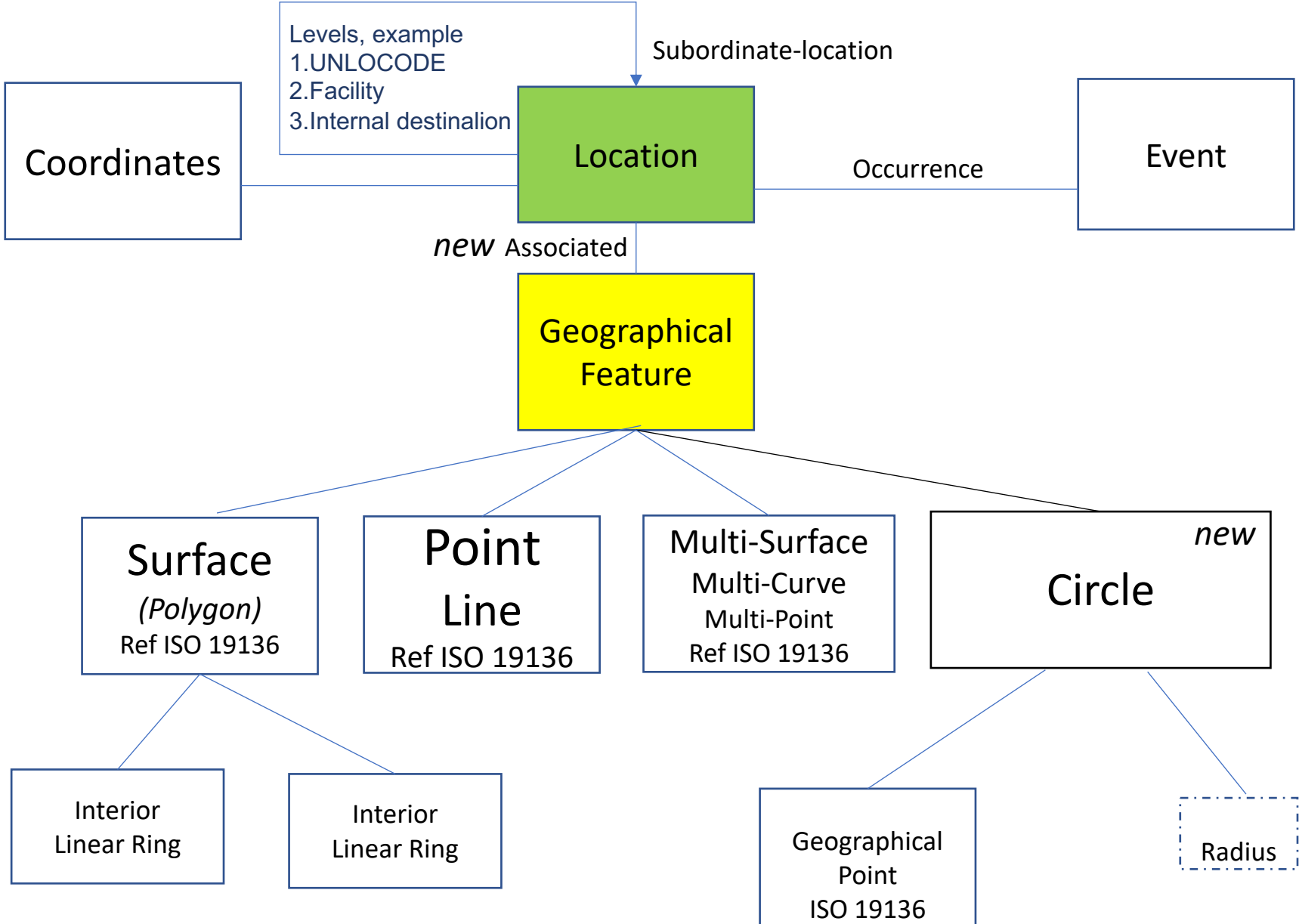


A physical location with subordinate locations and multiple geofences with multiple locations.



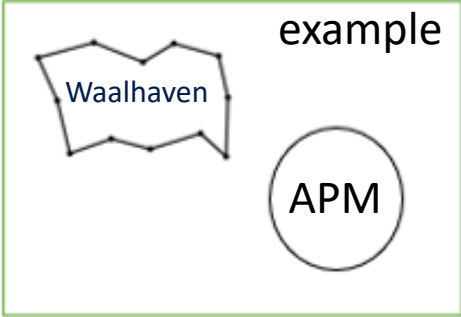
A geofence being a multi-polygon with physical locations

Linking Location(s) - to - Geofence(s)

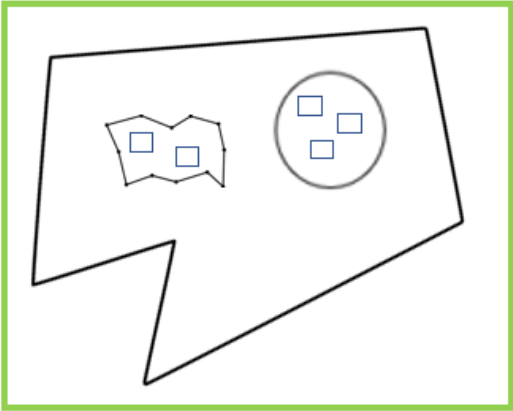


Examples

Location RTM (Rotterdam) example

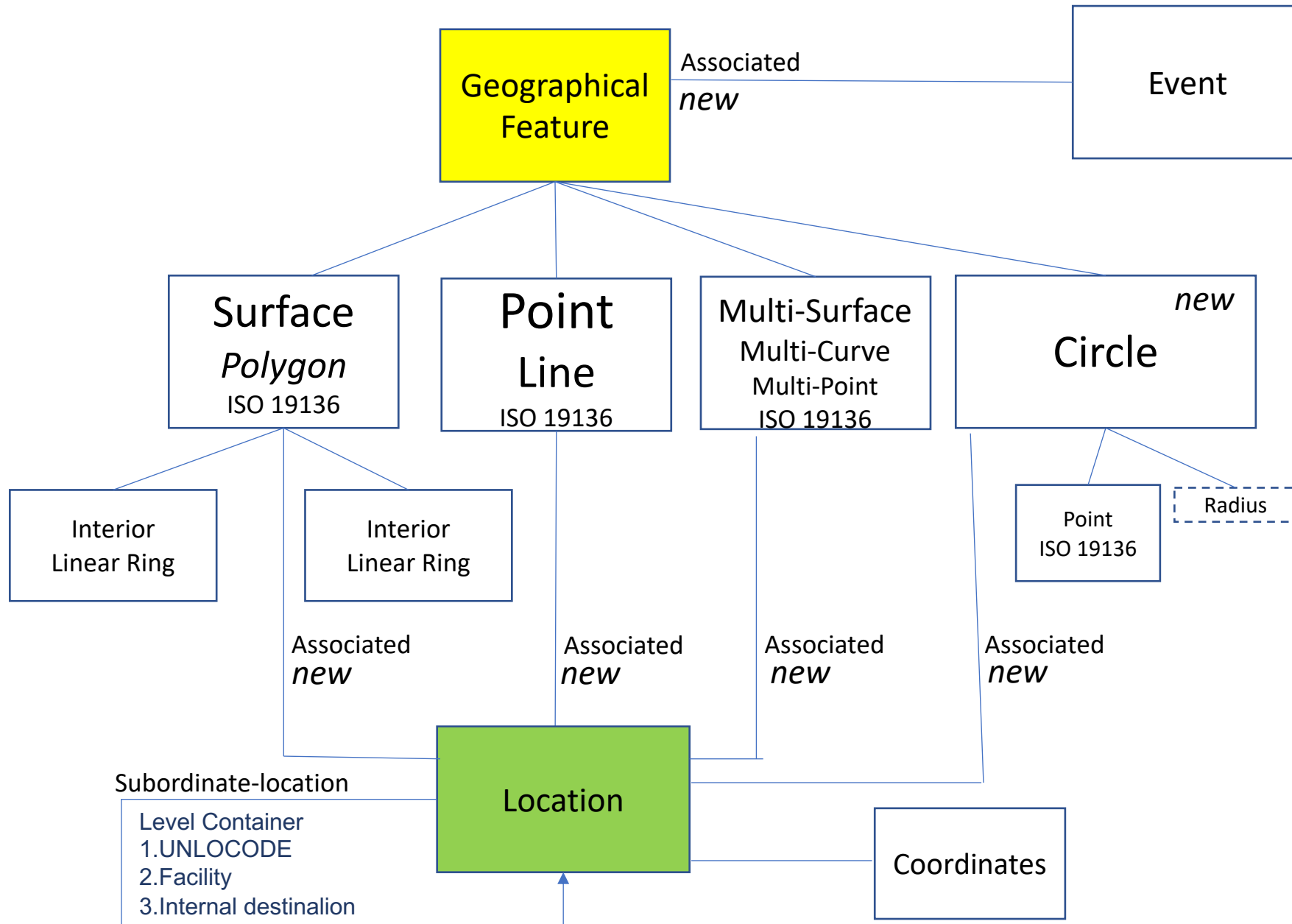


A physical location with geofences shaped as a polygon or circle

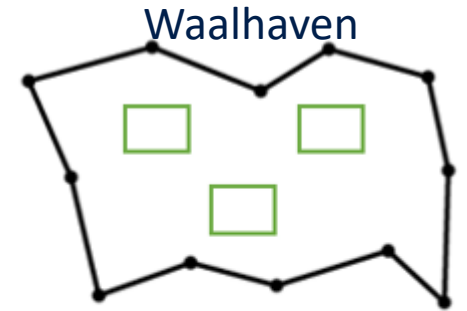


A physical location with multiple geofences shaped as polygons, with multiple locations

Linking Geofence(s) - to - Location(s)

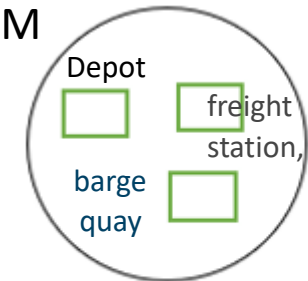


S

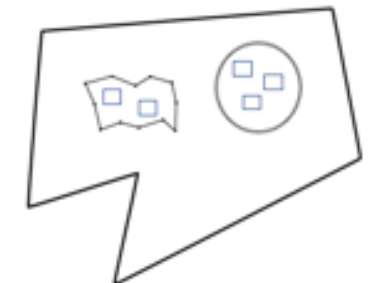


A geofence shaped as a polygon with physical locations

APM

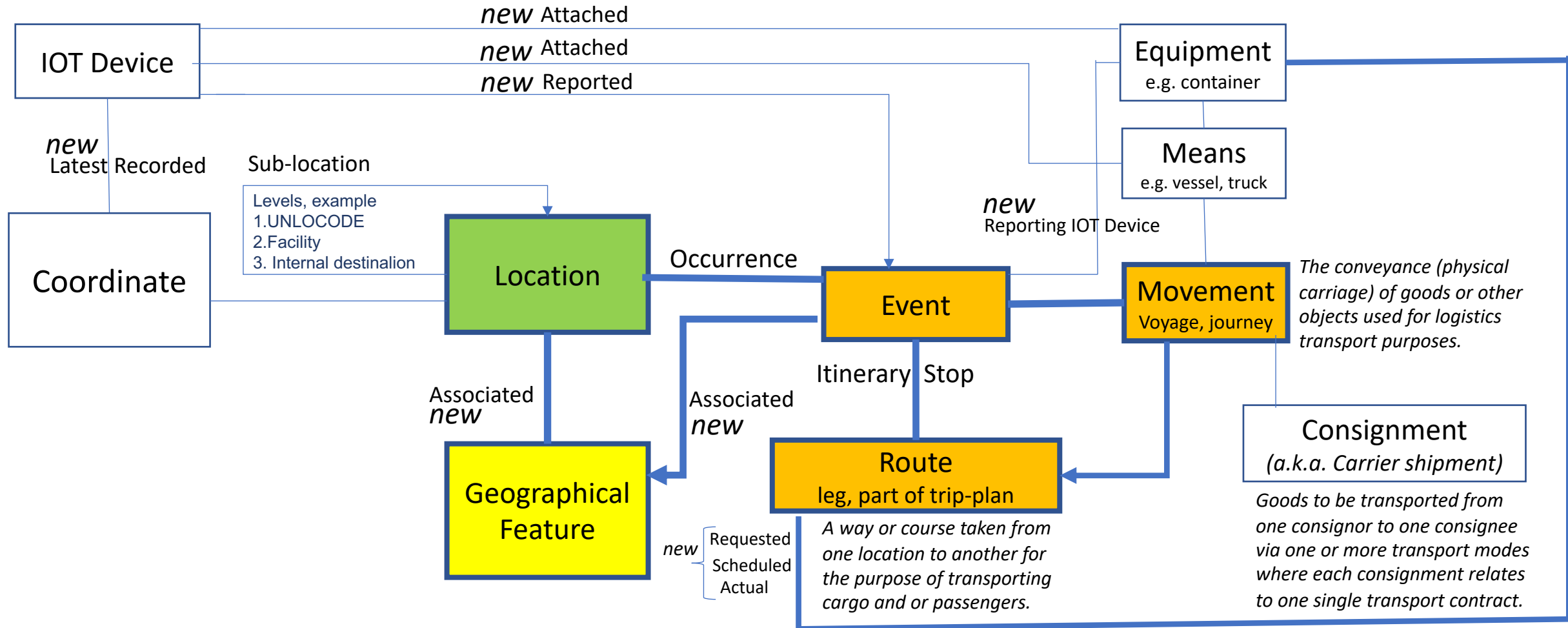


A geofence shaped as a circle with physical locations



A geofence being a multi-polygon each with multiple locations

Linking Trip-Plan (route) – to - Event - to - Location - to - Geofences



Remark:
IoT devices record continuous measurements of various sensors which we can easily read out, such as GPS coordinates. Metadata of locations and geofences can be stored on a platform which matches the received GPS coordinates. Platforms may offer an API for getting metadata of locations and geofences.

What about the DMR “Circle” ?

A circle is a round, two-dimensional shape. All points on the edge of the circle are at the same distance from the center.

Can we use geometry type “Surface” (polygon)? No

- A **circle** is not a polygon as it **does not have straight sides**. As the number of sides increase, the internal angle can come **very close to 180°**, and the shape of the polygon approaches that of a circle. However the polygon can never become a circle.

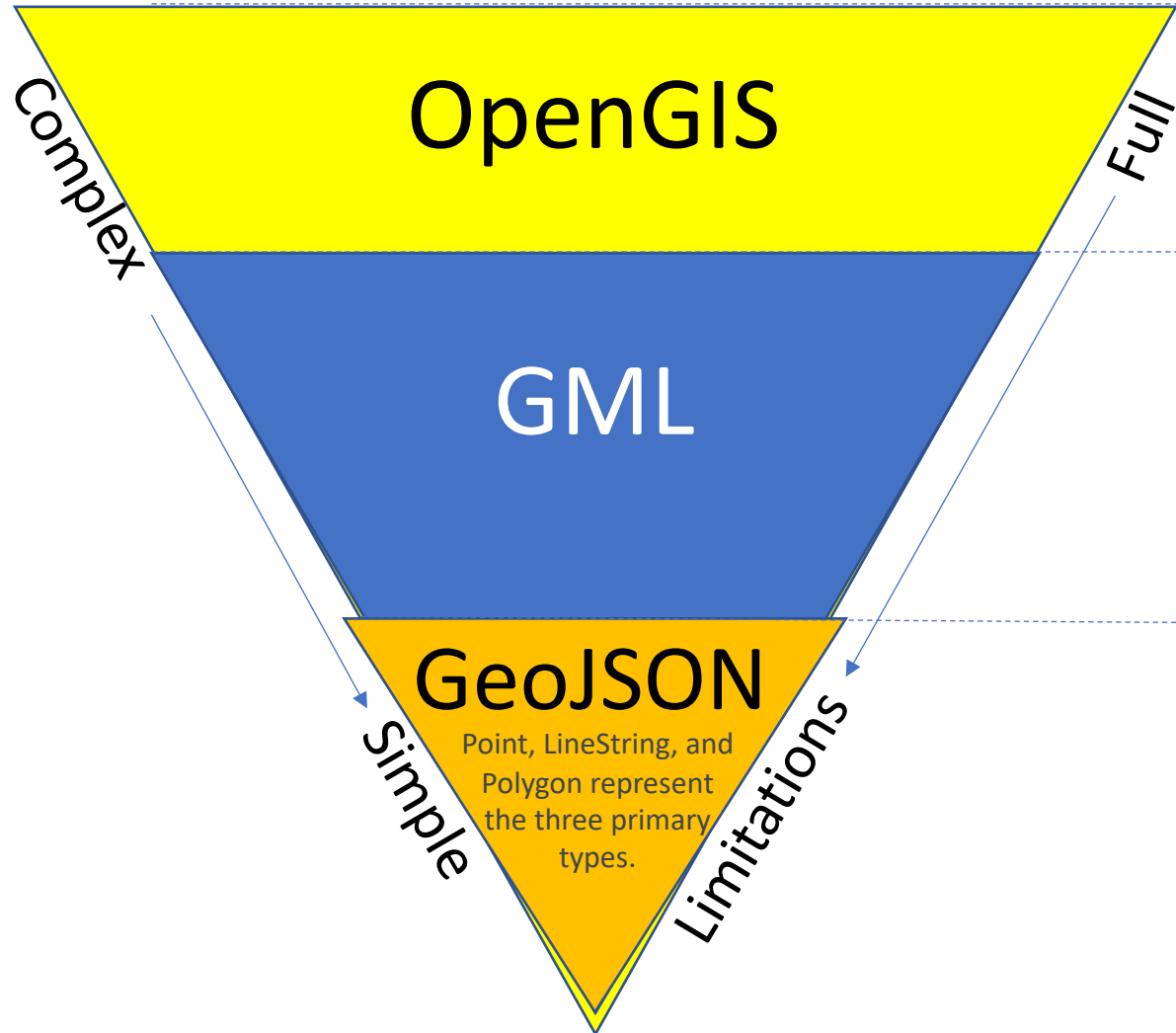
Can we use geometry type “Multi-Curve”? No

- A circle using line strings means we **approximate a circle**.

Can we use geometry type “Multi-Point”? No

- All points **need a center and radius**. A circle is the locus of all points equidistant from a central point. A circle is a round, two-dimensional shape. All points on the edge of the circle are at the same distance from the center. The **radius** of a circle is a line from the centre of the circle to a point on the side. Mathematicians use the letter r for the length of a circle's radius. The **centre of a circle is the point** in the very middle.

OpenGis, GML, GeoJSON and the Circle



- **OpenGIS®** Implementation specification: **Non-linearly interpolated curves not included.**
- **GML:** though specification allows the use of `gml:Arc`, `gml:Circle` and `gml:CircleByCenterPoint` because of their compact expression of circles and arcs which would otherwise be approximated using line strings and/or polygons. GML supports more **complex** requirements than GeoJSON.
- **GeoJSON:** **doesn't natively have a Circle type.** Circles & curves are relatively tricky to implement, because a circle on a spheroid geoid planet is much more complex than a circle on a sheet of paper.

Adding Circle to UN/CEFACT CCL 20A

DMR CCL Specified_Circle

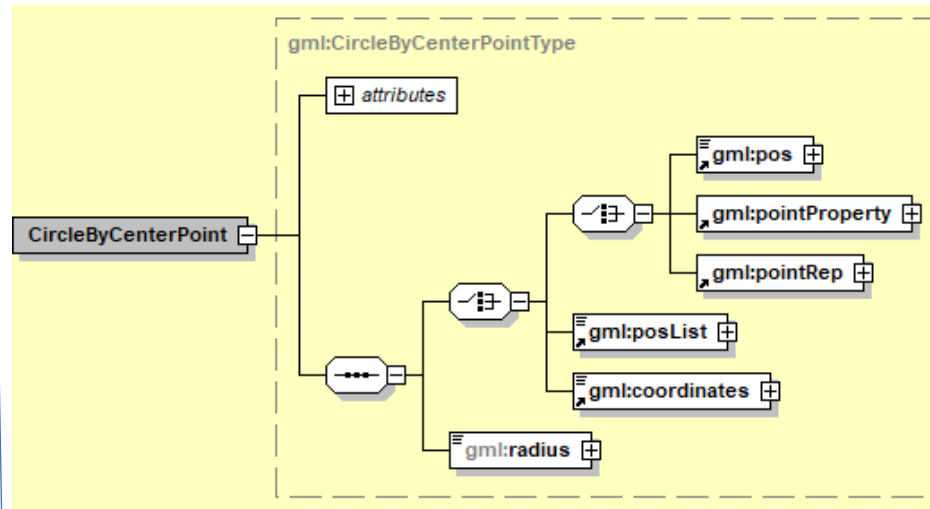
C Specified_Geographical Feature. Details

> C Based on "Main::Geographical Feature. Details"

C Specified_Geographical Feature. Included. Specified_Circle

- A Specified_Circle. Relevant Geometry Type. Text
- A Specified_Circle. Identification. Identifier
- A Specified_Circle. Name. Text
- A Specified_Circle. Description. Text
- A Specified_Circle. Colour. Text
- A Specified_Circle. Radius. Measure
- A Specified_Circle. Perimeter. Measure
- C Specified_Circle. Centre. Specified_Geographical Point
 - > ● A Specified_Geographical Point. Relevant Geometry Type. Text
 - > ● A Specified_Geographical Point. Identification. Identifier
 - > ● A Specified_Geographical Point. Name. Text
 - > ● A Specified_Geographical Point. Description. Text
 - > ● A Specified_Geographical Point. Colour. Text
 - > ● C Specified_Geographical Point. Associated. Specified_Direct Position List
 - > ● C Specified_Geographical Point. Associated. Specified_Geographical Object Characteristic
 - > ● C Specified_Geographical Point. Associated. Logistics_Location
- C Specified_Circle. Associated. Specified_Geographical Object Characteristic
- C Specified_Circle. Associated. Logistics_Location

GML CircleByCenterPoint



OASIS example

```
<entry>
  ...
  <oasis:where>
    <gml:CircleByCenterPoint>
      <gml:pos> 45.256 -110.45 </gml:pos>
      <gml:radius> 10 </gml:radius>
    </gml:CircleByCenterPoint>
  </oasis:where>
</entry>
```

NIEM example

Using a restriction of ArcByCenterPoint

```
<gml:ArcByCenterPoint numArc="1">
  <gml:pos>1.0 1.0</gml:pos>
  <gml:radius uom="">1.0</gml:radius>
  <gml:startAngle uom="">1.0</gml:startAngle>
  <gml:endAngle uom="">1.0</gml:endAngle>
</gml:ArcByCenterPoint>
```

GeoJson Custom Shape Circle

Creates a circular fence with a specified radius and center point.

Required `geometry{}` fields

- "radius": radius_in_meters
- "type": "Point"
- "shapeType": "Circle"

JSON example

```
"geometry": {
  "type": "Point",
  "radius": radius_in_meters,
  "shapeType": "Circle",
  "coordinates": [longitude, latitude]
}
```

MMT Requirements

DMRs for MMT RDM

Transport Equipment (e.g. ship container, tank container)

- Manufacturer & Manufacturing date
- Name
- Attached IOT Device (e.g. GPS tracking device, Temp device)

Transport Means (e.g. Vessel, Tank truck)

- Manufacturer & Manufacturing date
- Attached IOT Device (e.g. GPS tracker device, Temp device)
- Tare Weight (e.g. weight of the tanktruck when not loaded).

Supply Chain Consignment

- Consignor provided information (e.g. description of the booking,
- Round Trip Duration (not operational but contractual)
- Related Booking Type (goods shipment, repair, maintenance etc)

Transport Event

- Actual Occurrence Period
- Scheduled Occurrence Period

Transport Movement (voyage, journey)

- Name (e.g. Hamburg – Jarkarta)

Transport Route (itinerary, route step)

- Type (e.g. route step is at 'geofence' or in 'transit')

Transport Monitoring IOT Device (e.g. GPS tracker, temp device)

- Last Recorded Signal Date Time (by the device)
- Last Recorded GPS Coordinate (by the device)
- Attached Asset ID (e.g. ID of ship container or tank truck)
- Positioning Data Service Provider (e.g. VTG, Ovinto)
- Reported Transport Event (e.g. GPS position, Temp excess etc.)

Geographical feature

- Circle

Circle

- ID, name, description, colour
- Point (coordinate for the centre of the circle)
- Geographical Object characteristics (additional properties)
- Associated logistics Locations (e.g. city, plant, warehouse etc)

Polygon

- ID, colour
- Associated logistics location(s) (e.g. city, plant, warehouse etc)

Location

- Associated Geographical feature (e.g. specified, actual, previous)