

cyclomedia

Atlas WFS Recordings Service



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1. Introduction

1.1 Purpose

This document describes the Application Programmer's Interface (API) offered by the Atlas WFS Recordings service.

1.2 Audience

This document is intended for developers that want to use the Atlas Recordings service.

1.3 References

- [1] OGC 04-094, Web Feature Service Implementation Specification, version 1.1.0
 - o <http://www.opengeospatial.org/standards/wfs>
- [2] OGC 04-095, OpenGIS Filter Encoding Implementation Specification, version 1.1.0
 - o <http://www.opengeospatial.org/standards/filter>
- [3] OGC 05-008, OpenGIS Web Services Common Specification, version 1.0.0
 - o <http://www.opengeospatial.org/standards/common>
- [4] OGC 03-105r1, OpenGIS Geography Markup Language Implementation Specification, version 3.1.1.
 - o <http://www.opengeospatial.org/standards/gml>
- [5] RFC 7946 - The GeoJSON Format
 - o <https://tools.ietf.org/html/rfc7946>
 - o <http://geojson.org/>

2. Requests

2.1 Authentication

The HTTP Basic Authentication method is used to authenticate requests to the WFS service. A username and password can be obtained from CycloMedia.

2.2 Request format

The service is available from <https://atlas.cyclomedia.com/recordings/>. The HTTPS protocol is used to provide encrypted communication and secure identification of the web server.

The service is a WFS service as defined in [1] and supports the following operations:

- GetCapabilities
- DescribeFeatureType
- GetFeature

Both HTTP GET request and HTTP POST requests are supported.

All operations mentioned support the following output formats:

- text/xml; subtype=gml/3.1.1 (default, GML 3.1.1, see [4])
- application/json (GeoJSON, see [5])

These can be requested using the 'outputformat' parameter.

Filter capabilities

The possible filter capabilities are listed below. Filter specifications are encoded as described in the OGC Filter Encoding Implementation Specification [2].

Geometry operands:

- gml:Point
- gml:Envelope

Spatial operators:

- BBOX
- DWithin

Comparison operators:

- EqualTo
- NotEqualTo
- LessThan
- GreaterThan
- LessThanEqualTo
- GreaterThanEqualTo
- NullCheck
- Between

3. Responses

3.1 Features

Features are expressed in the GML format version 3.1.1 (see [4]) or GeoJSON (see [5]):

- The XML schema for the GML can be found in Chapter 5.
- The GeoJSON schema can be found in Chapter 6.

There is only one feature type supported: Recording.

A feature of type Recording has the following properties:

Property name	Type	Description
imageld	string	Readable identification of the recording
recordedAt	dateTime	Timestamp and offset to UTC of the recording.
location	gml:pointPropertyType	Spatial field that holds the geographic longitude, latitude and height of the recording location in a specified spatial reference system (SRS). The longitude and latitude coordinates are in degrees or in meters (depending on the SRS), the height is in meters.
height	float	Height of the recording location (in meters). The height system is included in the system attribute. This property is only included when the specified coordinate system is two dimensional and when a height value is available.
latitudePrecision	float	Precision of the latitude coordinate (in meters). If the value is null, this precision is not known.
longitudePrecision	float	Precision of the longitude coordinate (in meters). If the value is null, this precision is not known.
heightPrecision	float	Precision of the height (in meters). If the value is null, this precision is not known.
orientation	float	Orientation of the recording relative to the geographic north (in degrees).
orientationPrecision	float	Precision of the orientation (in degrees).

groundLevelOffset	float	Offset of the camera above the ground level (in meters).
recorderDirection	float	The direction of the recorder (e.g. the car) relative to the geographic north (in degrees).
expiredAt	dateTime	Date when the recording is expired.
productType	atlas:ProductType	Type of the recording (Cyclorama, Aquarama or Aerorama). <i>This property is added in version 1.1.</i>
viewerURL	xlink:simpleLink	Link to an external viewer to view the image (only filled in when productType is Aerorama). <i>This property is added in version 1.1.</i>
Images	atlas:ImageType	List of additional images related to the recording. <i>This property is added in version 1.2.</i>
isAuthorized	boolean	Indicates whether the user is authorized to view this recording. <i>This property is added in version 1.2.</i>
tileSchema	string	The authorized tileschema of this recording (NoTiling, Dcr9Tiling, Dcr10Tiling or Dcr11Tiling) <i>This property is added in version 1.3.</i> <i>This property is deprecated and only for legacy purposes. You should migrate to panoramaTileSchema and panoramaMaxResolutionAllowed</i>
year	int	The year associated with this recording <i>This property is added in version 1.5.</i>
hasDepthMap	boolean	Indicates whether the recording has associated depth maps <i>This property is added in version 1.7.</i>

depthMapVersion	float	The version of the depth maps This property is only included when the recording has depth maps. <i>This property is added in version 1.7.</i>
depthMapPrecision	float	The precision of the depth maps This property is only included when the recording has depth maps. <i>This property is added in version 1.7.</i>
ownerInfo	atlas:OwnerInfo	The owner of the recording (for copyright purposes) <i>This property is added in version 1.8.</i>
isBlurred	boolean	Indicates whether the recording is blurred <i>This property is added in version 1.8.</i>
pointCloud	string	The unique identifier of the point cloud data in PointScene <i>This property is added in version 1.9.</i>
panoramaTileSchema	string	The tileschema of this recording (TS_11, TS_100, TS_100_PLUS or TS_250) <i>This property is added in version 1.9.</i>
panoramaMaxResolutionAllowed	string	The maximum resolution allowed for the user for this recording (MaxResolution20MP, MaxResolution100MP or MaxResolution250MP) <i>This property is added in version 1.9.</i>



A feature of type ImageType has the following properties (added in version 1.2):

Property name	Type	Description
imageId	string	Readable identification of the image
location	gml:pointPropertyType	Spatial field that holds the geographic longitude, latitude and height of the image location in a specified spatial reference system (SRS). The longitude and latitude coordinates are in degrees or in meters (depending on the SRS), the height is in meters.
height	float	Height of the image location (in meters). The height system is included in the system attribute. This property is only included when the specified spatial reference system is two dimensional and when a height value is available.
latitudeStDev	float	The standard deviation of the latitude coordinate (in meters). If the value is null, this standard deviation is not known.
longitudeStDev	float	The standard deviation of the longitude coordinate (in meters). If the value is null, this standard deviation is not known.
heightStDev	float	The standard deviation of the height coordinate (in meters). If the value is null, this standard deviation is not known.
yaw	float	The yaw of the centre of the image in the specified spatial reference system (in degrees).
yawStDev	float	The standard deviation of the yaw (in degrees).
pitch	float	The pitch of the centre of the image in the specified spatial reference system (in degrees).
pitchStDev	float	The standard deviation of the pitch (in degrees).
roll	float	The roll of the centre of the image in the specified spatial reference system (in degrees).
rollStDev	float	The standard deviation of the roll (in degrees).
focalLength	float	The focal length (in pixels) of the image. This is only applicable for a PiP image.

principalPointX	float	The x-coordinate (in pixels) of the principal point.
principalPointY	float	The y-coordinate (in pixels) of the principal point.
imageType	atlas:ImageTypeType	Type of the image. Can be one of Panorama, AdditionalImageFront, AdditionalImageRear or SinglePip.
imageHeight	int	Height of the image in pixels.
imageWidth	int	Width of the image in pixels.
isAuthorized	boolean	Indicates whether the user is authorized to view this image.

A feature of type OwnerInfo has the following properties (added in version 1.8):

Property name	Type	Description
name	string	The name of the owner
url	xlink:simpleLink	The url of the owner

3.2 Exception reporting

When the WFS Recordings service encounters an error while processing a request or when it receives an unrecognized request, this will be returned as an exception report in the response.

The format of the XML response is described in OWS Common Implementation Specification [3]:

```
<ows:ExceptionReport version="1.1.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:ows="http://www.opengis.net/ows"
  xsi:schemaLocation="http://www.opengis.net/ows">
  <ows:Exception exceptionCode="{the exception code}">
    <ows:ExceptionText>
      {the error message}
    </ows:ExceptionText>
  </ows:Exception>
</ows:ExceptionReport>
```

For GeoJSON the format is:

```
{
  "exception": {
    "code": null,
    "locator": null,
    "text": "<the error message>"
  }
}
```

4. Examples

Some example requests are described below.

4.1 Get Capabilities and describe feature type

Returns the capabilities of the WFS service.

<https://atlas.cyclomedia.com/recordings/wfs?service=WFS&version=1.1.0&request=GetCapabilities>

or

<https://atlas.cyclomedia.com/recordings/wfs?service=WFS&version=1.1.0&request=GetCapabilities&outputFormat=application/json>

Returns the schema description of feature type atlas:Recording. This schema is listed in Chapters 5 (GML) and 6 (GeoJSON).

<https://atlas.cyclomedia.com/recordings/wfs?service=WFS&version=1.1.0&request=DescribeFeatureType&typename=atlas:Recording>

or

<https://atlas.cyclomedia.com/recordings/wfs?service=WFS&version=1.1.0&request=DescribeFeatureType&typename=atlas:Recording&outputFormat=application/json>

4.2 Get features (GET request)

Returns all recording features that are located within the specified bounding box and that are actual (not yet expired). The spatial reference system of the bounding box is EPSG:28992, which is Amersfoort / RD New. The spatial reference system of the coordinates of the returned recordings is also EPSG:28992.

```
https://atlas.cyclomedia.com/recordings/wfs?
service=WFS&version=1.1.0&
request=GetFeature&srsname=EPSG:28992&typename=atlas:Recording&
filter=<Filter><And>
  <BBOX>
    <gml:Envelope srsName='EPSG:28992'>
      <gml:lowerCorner>161038.68865966797
      441675.2805709839</gml:lowerCorner><gml:upperCorner>161131.4239501953
      441742.23804473877</gml:upperCorner>
    </gml:Envelope>
  </BBOX>
  <PropertyIsNull><PropertyName>expiredAt</PropertyName></PropertyIsNull>
</And></Filter>
```

The same as above except that now the historic recordings in the specified period are retrieved.

```
https://atlas.cyclomedia.com/recordings/wfs?
service=WFS&VERSION=1.1.0&
request=GetFeature&SRSNAME=EPSG:28992&typename=atlas:Recording&
filter=<Filter><And>
  <BBOX>
    <gml:Envelope srsName='EPSG:28992'>
      <gml:lowerCorner>161022.96257019043%20441703.2470703125</gml:lowerCorner>
      <gml:upperCorner>161156.55326843262%20441826.4617919922</gml:upperCorner>
    </gml:Envelope>
  </BBOX>
  <PropertyIsGreaterThanOrEqualTo><PropertyName>recordedAt</PropertyName>
    <Literal>1991-12-31T23:00:00-00:00</Literal>
  </PropertyIsGreaterThanOrEqualTo>
  <PropertyIsLessThanOrEqualTo><PropertyName>recordedAt</PropertyName>
    <Literal>2010-10-13T07:49:05-00:00</Literal>
  </PropertyIsLessThanOrEqualTo>
</And></Filter>
```

Returns the feature with id 5B06QSKL and use EPSG:28992 as the spatial reference system for the point coordinates.

```
https://atlas.cyclomedia.com/recordings/wfs?
service=WFS&version=1.1.0&
request=GetFeature&srsname=EPSG:28992&typename=atlas:Recording&
featureid=5B06QSKL
```

And the same for a recording with picture-in-picture images:

```
https://atlas.cyclomedia.com/recordings/wfs?
service=WFS&version=1.1.0&
request=GetFeature&srsname=EPSG:28992&typename=atlas:Recording&
featureid=5D0HH7DR
```

4.3 Get features (POST request)

It is also possible to use HTTP POST requests. An example which returns actual recordings in a bounding box is:

Request: <https://atlas.cyclomedia.com/recordings/wfs>

Body:

```
<wfs:GetFeature service="WFS" version="1.1.0" resultType="results" outputFormat="text/xml;
subtype=gml/3.1.1" xmlns:wfs="http://www.opengis.net/wfs">
  <wfs:Query typeName="atlas:Recording" srsName="EPSG:28992"
xmlns:atlas="http://www.cyclomedia.com/atlas">
    <ogc:Filter xmlns:ogc="http://www.opengis.net/ogc">
      <ogc:And>
        <ogc:BBOX>
          <gml:Envelope srsName="EPSG:28992" xmlns:gml="http://www.opengis.net/gml">
            <gml:lowerCorner>122882.49397277832 452226.43280029297</gml:lowerCorner>
            <gml:upperCorner>123420.42350769043 452363.26599121094</gml:upperCorner>
          </gml:Envelope>
        </ogc:BBOX>
        <ogc:PropertyIsNull>
          <ogc:PropertyName>expiredAt</ogc:PropertyName>
        </ogc:PropertyIsNull>
      </ogc:And>
    </ogc:Filter>
  </wfs:Query>
</wfs:GetFeature>
```

Note: to request GeoJSON with an HTTP POST request, use `outputFormat="application/json"` in the `GetFeature` root element in the example above. GeoJSON as input is not supported.

5. GML application schema

<https://atlas.cyclomedia.com/recordings/wfs?service=WFS&version=1.1.0&request=DescribeFeatureType&typename=atlas:Recording>

```
<?xml version="1.0" encoding="utf-8"?>
<xsd:schema
  xmlns:xsd=http://www.w3.org/2001/XMLSchema
  xmlns:atlas=http://www.cyclomedia.com/atlas
  xmlns:gml=http://www.opengis.net/gml
  xmlns:xlink=http://www.w3.org/1999/xlink
  targetNamespace=http://www.cyclomedia.com/atlas
  elementFormDefault="qualified" version="1.8">

  <xsd:import namespace=http://www.opengis.net/gml
    schemaLocation="http://schemas.opengis.net/gml/3.1.1/base/gml.xsd" />
  <!-- =====
    define global elements
    ===== -->
```

```

<xsd:element name="Recording" type="atlas:RecordingType"
substitutionGroup="gml:_Feature" />

<!-- =====
define complex types (classes)
===== -->
<xsd:complexType name="RecordingType">
  <xsd:complexContent>
    <xsd:extension base="gml:AbstractFeatureType">
      <xsd:sequence>
        <xsd:element maxOccurs="1" minOccurs="1" name="imageId"
type="xsd:string"/>
        <xsd:element maxOccurs="1" minOccurs="0" name="recordedAt"
type="xsd:dateTime"/>
        <xsd:element maxOccurs="1" minOccurs="1" name="location"
type="gml:PointPropertyType"/>
        <xsd:element maxOccurs="1" minOccurs="0" name="height"
type="atlas:HeightType"/>

      <!--
- The next 5 elements will become obsolete in a next version of the schema. -->
        <xsd:element maxOccurs="1" minOccurs="0"
name="latitudePrecision" type="xsd:float"/>
        <xsd:element maxOccurs="1" minOccurs="0"
name="longitudePrecision" type="xsd:float"/>
        <xsd:element maxOccurs="1" minOccurs="0"
name="heightPrecision" type="xsd:float"/>
        <xsd:element maxOccurs="1" minOccurs="0"
name="orientation" type="xsd:float"/>
        <xsd:element maxOccurs="1" minOccurs="0"
name="orientationPrecision" type="xsd:float"/>

        <xsd:element maxOccurs="1" minOccurs="0"
name="groundLevelOffset" type="xsd:float"/>
        <xsd:element maxOccurs="1" minOccurs="0"
name="recorderDirection" type="xsd:float"/>
        <xsd:element maxOccurs="1" minOccurs="0"
name="expiredAt" type="xsd:dateTime"/>
        <xsd:element maxOccurs="1" minOccurs="0"
name="productType" type="atlas:ProductType"/>
      <!-- =====
viewerURL is only included for aeroramas
===== -->
        <xsd:element maxOccurs="1" minOccurs="0" name="viewerURL"
type="atlas:OnlineResourceType"/>

      <!-- =====
version 1.2
fields added in december 2011 to return the Picture-in-
Picture images of
the recording and the authorized flag.
===== -->
        <xsd:element ref="atlas:Images" minOccurs="0" maxOccurs="1"/>
        <xsd:element maxOccurs="1" minOccurs="0" name="isAuthorized"
type="xsd:boolean"/>

```

```

<!-- =====
version 1.3
field added in may 2013 to return the TileSchema of the recording.
===== -->
<xsd:element maxOccurs="1" minOccurs="0" name="tileSchema"
type="xsd:string"/>

<!-- =====
version 1.5
field added in nov 2015 to return the Year of the recording.
===== -->
<xsd:element maxOccurs="1" minOccurs="0" name="year" type="xsd:int"/>
<!-- =====
version 1.7
field added in oct 2016 to return the whether a recording has a dep
th map or
not, including standard deviation and versioning
===== -->
<xsd:element maxOccurs="1" minOccurs="0" name="hasDepthMap"
type="xsd:boolean"/>
<xsd:element maxOccurs="1" minOccurs="0" name="depthMapVersion"
type="xsd:float"/>
<xsd:element maxOccurs="1" minOccurs="0" name="depthMapPrecision"
type="xsd:float"/>
<!-- =====
version 1.8
fields added in oct 2017 to:
- return the ownerInfo of the recording
- return if the recording is blurred
===== -->
<xsd:element name="ownerInfo" maxOccurs="1" minOccurs="0"
type="atlas:OwnerInfo" />
<xsd:element name="isBlurred" maxOccurs="1" minOccurs="0"
type="xsd:boolean"/>
<!-- =====
version 1.9
field added in mar 2018 to:
- return if the dataset has cloud point data
field added in nov 2018 to:
- return the actual panorama tileschema without permission adaption
- return the max resolution allowed of the panorama
===== -->
<xsd:element name="pointCloud" maxOccurs="1" minOccurs="0"
type="xsd:string"/>
<xsd:element name="panoramaTileSchema" maxOccurs="1" minOccurs="0"
type="xsd:string"/>
<xsd:element name="panoramaMaxResolutionAllowed" maxOccurs="1"
minOccurs="0" type="xsd:string"/>
</xsd:sequence>
</xsd:extension>
</xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="OwnerInfo">

```



```

<xsd:sequence>
  <!-- Data owner name, e.g.CycloMedia, Here -->
  <xsd:element minOccurs="1" maxOccurs="1" name="name" type="xsd:string"/>
  <!-- URL for data owner, e.g. https://cyclomedia.com/ -->
  <xsd:element minOccurs="1" maxOccurs="1" name="url"
type="atlas:OnlineResourceType"/>
</xsd:sequence>
</xsd:complexType>

```

```

<xsd:element name="Images">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element minOccurs="0" maxOccurs="unbounded" name="Image"
type="atlas:ImageType"/>
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>

```

```

<xsd:complexType name="ImageType">
  <xsd:sequence>
    <xsd:element maxOccurs="1" minOccurs="1" name="imageId"
type="xsd:string"/>
    <xsd:element maxOccurs="1" minOccurs="1" name="location"
type="gml:PointPropertyType"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="height"
type="atlas:HeightType"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="latitudeStDev"
type="xsd:float"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="longitudeStDev"
type="xsd:float"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="heightStDev"
type="xsd:float"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="yaw"
type="xsd:float"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="yawStDev"
type="xsd:float"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="pitch"
type="xsd:float"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="pitchStDev"
type="xsd:float"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="roll"
type="xsd:float"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="rollStDev"
type="xsd:float"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="focalLength"
type="xsd:float"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="principalPointX"
type="xsd:float"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="principalPointY"
type="xsd:float"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="imageType"
type="atlas:ImageTypeType"/>
    <xsd:element maxOccurs="1" minOccurs="0" name="imageHeight"
type="xsd:int"/>

```

```

    <xsd:element maxOccurs="1" minOccurs="0" name="imageWidth"
type="xsd:int"/>
    <!-- =====
    version 1.2
    field added in december 2011 to return the authorized flag.
    ===== -->
    <xsd:element maxOccurs="1" minOccurs="0" name="isAuthorized"
type="xsd:boolean"/>
  </xsd:sequence>
</xsd:complexType>

<xsd:simpleType name="ProductType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="Cyclorama"/>
    <xsd:enumeration value="Aquarama"/>
    <xsd:enumeration value="Aerorama"/>
  </xsd:restriction>
</xsd:simpleType>

<xsd:simpleType name="ImageTypeType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="Panorama"/>
    <xsd:enumeration value="AdditionalImageFront"/>
    <xsd:enumeration value="AdditionalImageRear"/>
    <xsd:enumeration value="SinglePip"/>
  </xsd:restriction>
</xsd:simpleType>

<xsd:complexType name="HeightType">
  <xsd:simpleContent>
    <xsd:extension base="xsd:float">
      <xsd:attribute name="system" type="xsd:string" use="optional" />
    </xsd:extension>
  </xsd:simpleContent>
</xsd:complexType>

<xsd:complexType name="OnlineResourceType">
  <xsd:attributeGroup ref="xlink:simpleAttrs"/>
</xsd:complexType>
</xsd:schema>

```

6. GeoJSON application schema

<https://atlas.cyclomedia.com/recordings/wfs?service=WFS&version=1.1.0&request=DescribeFeatureType&typename=atlas:Recording&outputformat=application/json>

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "description": "Represents an atlas recording.",
  "allOf": [
    {
      "properties": {
        "properties": {
          "type": "object",
          "properties": {
            "imageId": {
              "type": "string"
            },
            "recordedAt": {
              "type": "string"
            },
            "latitudePrecision": {
              "type": "number"
            },
            "longitudePrecision": {
              "type": "number"
            },
            "heightPrecision": {
              "type": "number"
            },
            "orientation": {
              "type": "number"
            },
            "orientationPrecision": {
              "type": "number"
            },
            "groundLevelOffset": {
              "type": "number"
            },
            "recorderDirection": {
              "type": "number"
            },
            "expiredAt": {
              "type": "string"
            },
            "type": {
              "type": "string"
            },
            "Images": {
              "type": "object",
              "properties": {
                "type": {
                  "type": "string"
                }
              }
            }
          }
        }
      }
    }
  ]
}
```

```

"features": {
  "type": "array",
  "items": {
    "type": "object",
    "properties": {
      "type": {
        "type": "string"
      },
      "id": {
        "type": "string"
      },
      "geometry": {
        "type": "object",
        "properties": {
          "type": {
            "type": "string"
          },
          "coordinates": {
            "type": "array",
            "items": {
              "type": "number"
            }
          }
        }
      },
      "required": [
        "type",
        "coordinates"
      ]
    },
    "properties": {
      "type": "object",
      "properties": {
        "imageId": {
          "type": "string"
        },
        "latitudeStDev": {
          "type": "number"
        },
        "longitudeStDev": {
          "type": "number"
        },
        "heightStDev": {
          "type": "number"
        },
        "yaw": {
          "type": "number"
        },
        "yawStDev": {
          "type": "number"
        },
        "pitch": {
          "type": "number"
        },
        "pitchStDev": {
          "type": "number"
        }
      },
    }
  }
}

```

```

    "roll": {
      "type": "number"
    },
    "rollStDev": {
      "type": "number"
    },
    "focallength": {
      "type": "number"
    },
    "principalPointX": {
      "type": "number"
    },
    "principalPointY": {
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    },
    "imageType": {
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    },
    "imageHeight": {
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    },
    "imageWidth": {
      "type": "integer"
    },
    "isAuthorized": {
      "type": "boolean"
    }
  },
  "required": [
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    "latitudeStDev",
    "longitudeStDev",
    "heightStDev",
    "yaw",
    "yawStDev",
    "pitch",
    "pitchStDev",
    "roll",
    "rollStDev",
    "focallength",
    "principalPointX",
    "principalPointY",
    "imageType",
    "imageHeight",
    "imageWidth",
    "isAuthorized"
  ]
},
"required": [
  "type",
  "id",
  "geometry",
  "properties"
]
}

```

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    },
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      "properties": {
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          "type": "string"
        },
        "properties": {
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          "properties": {
            "name": {
              "type": "string"
            }
          }
        },
        "required": [
          "name"
        ]
      }
    },
    "required": [
      "type",
      "properties"
    ]
  }
},
"required": [
  "type",
  "features",
  "crs"
]
},
"isAuthorized": {
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},
"tileSchema": {
  "type": "string"
},
"year": {
  "type": "integer"
},
"hasDepthMap": {
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},
"depthMapVersion": {
  "type": "number"
},
"depthMapPrecision": {
  "type": "number"
},
"ownerInfo": {
  "type": "object",
  "properties": {
    "name": {
      "type": "string"
    }
  },
  "url": {

```



```

        "type": "string"
      },
    },
    "required": ["name", "url"]
  },
  "isBlurred": {
    "type": "boolean"
  },
  "pointCloud": {
    "type": "string"
  },
  "panoramaTileSchema": {
    "type": "string"
  },
  "panoramaMaxResolutionAllowed": {
    "type": "string"
  }
},
"required": [
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  "recordedAt",
  "orientation",
  "groundLevelOffset",
  "type",
  "isAuthorized",
  "tileSchema",
  "year"
],
"additionalProperties": false
}
},
"required": [
  "properties"
]
},
{
  "description" : "Conforms to the generic GeoJSON feature.",
  "$ref": "#/definitions/cyclomedia/definitions/feature"
}
]
}

```

**Visualize a
better world**