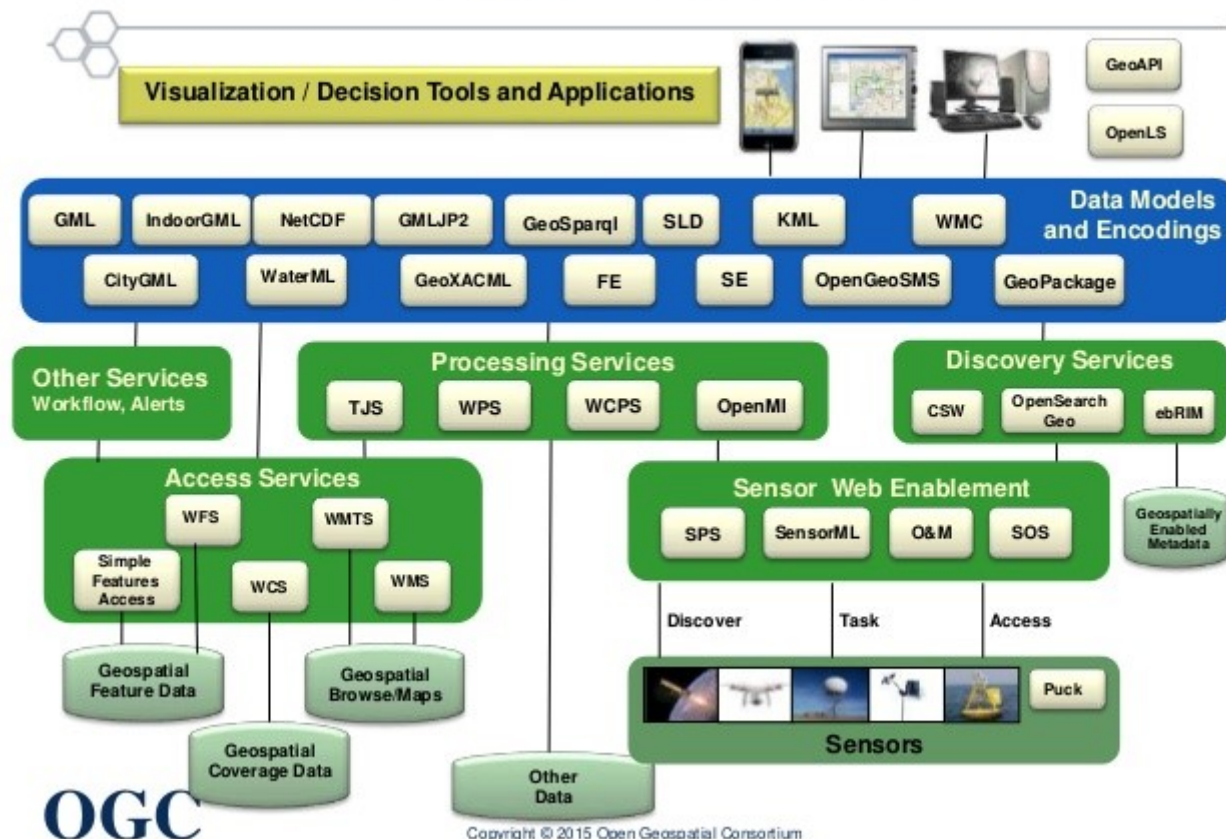




## OGC Standards

## OGC Services Architecture



### Geospatial Feature data :

An object that can have a geographic location and other properties

### Geospatial Coverage data :

Digital geospatial information representing space/time-varying phenomena

### Geospatial Browse/Maps :

Representation of a 3D World on a 2D map



# Definitions

## Some definitions

**Conceptual model** : Type of data model that defines **WHAT** the system contains independent of HOW it will be implemented.

**Logical model** : Type of data model that defines **HOW** the system should be implemented. A logical data model is a fully-attributed data model that is independent of technology, data storage or organizational constraints. It typically describes data requirements from the business point of view. The logical Data Model adds further information to the Conceptual Data Model elements. The advantage of using a Logical Data Model is to provide a foundation to form the base for the Physical Model. However, the modeling structure remains generic.

**Physical model** : Type of data model that describes **HOW** the system is implemented using a specific file format. A Physical Data Model is a fully-attributed Data Model that is dependent upon a specific version of a data persistence technology. It describes a format-specific implementation of the Data Model.

---

## Web Services

**Web services are functionalities exposed on intranet or internet to automate synchronous exchanges between computer systems.**

- **intranet or internet: http protocol and open formats**
- **synchronous exchanges: request and response in a short period of time (flow)**

**Web services facilitate interoperability between computer systems by providing solutions to constraints of distance, availability, formats,**

# Protocoles HTTP

The HyperText Transfer Protocol (HTTP) is the client/server communication protocol at the origin of the World Wide Web. The best known HTTP clients are web browsers. HTTP offers several access methods: GET, POST, PUT, DELETE, ...

## HTTP - compose a GET

- HTTP-GET request allows to specify in the URL the call parameters
  - ? signals the beginning of the parameter sequence
  - & is the separator between parameters (key=value)
  - + replaces <space>
- example `http://api.itimeteo.com/getMetar.ims?icao=LFRN&format=xml`

## HTTP - composing a POST

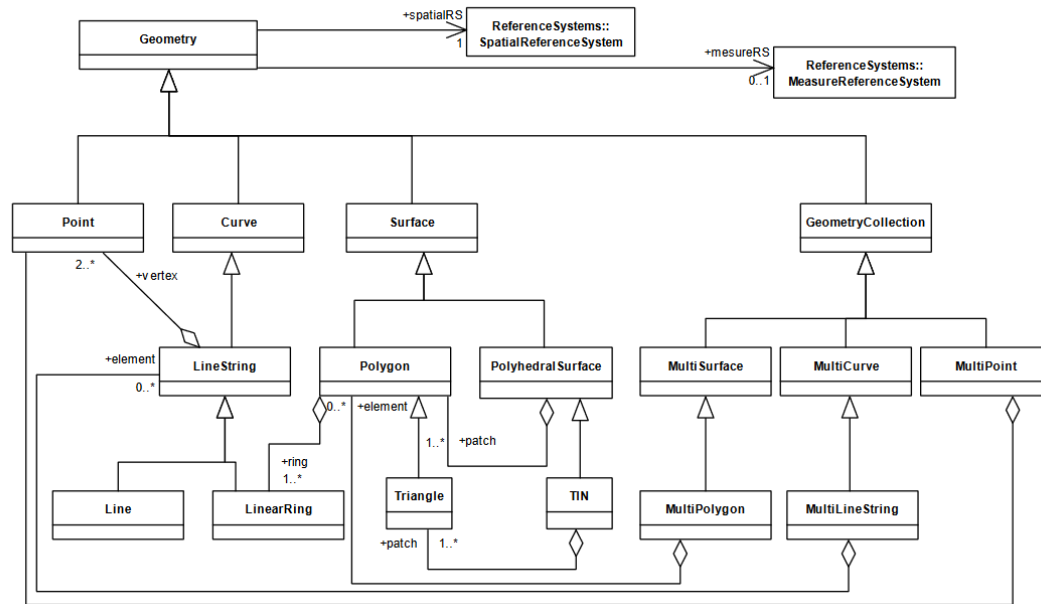
- HTTP-GET request is limited because you can't put everything you want in the URL. HTTP-POST allows you to overcome this constraint:
  - to send the server many parameters
  - to send files
  - ○...
- To compose an HTTP POST request, you need a web form, a program or a browser extension



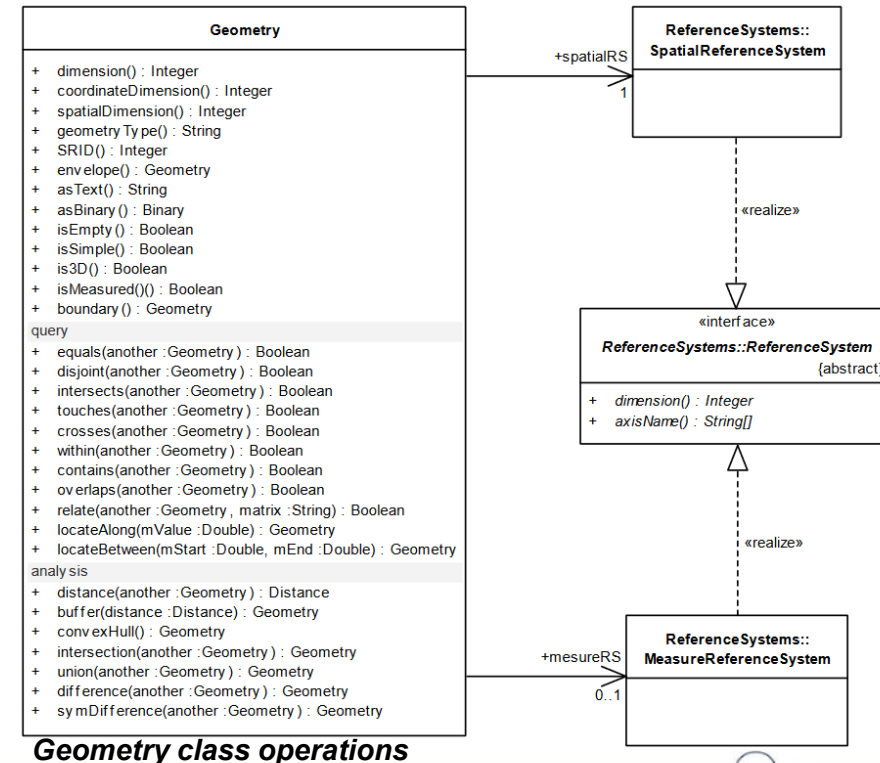
# Access Service

# Simple Feature Access <https://www.ogc.org/standards/sfa>

**Description:** set of standards that specify a common storage and access model of geographic feature made of mostly two-dimensional geometries (point, line, polygon, multi-point, multi-line, etc.) used by geographic information systems.



**Geometry class hierarchy**





# Simple Feature Access

From the conceptual model, three logical models:

## - Well-known Text Representation for Geometry

can be used both to construct new instances of the type and to convert existing instances to textual form for alphanumeric display

## - Well-known Binary Representation for Geometry

provides a portable representation of a geometric object as a contiguous stream of bytes. It permits geometric object to be exchanged between an SQL/CLI client and an SQL-implementation in binary form.

## - Well-known Text Representation of Spatial Reference System:

<https://www.ogc.org/standards/wkt-crs>

## - GeoJson (subset of SFA)

Geometry Type	Text Literal Representation	Comment
Point	Point (10 10)	a Point
LineString	LineString ( 10 10, 20 20, 30 40)	a LineString with 3 points
Polygon	Polygon ((10 10, 10 20, 20 20, 20 15, 10 10))	a Polygon with 1 exteriorRing and 0 interiorRings
Multipoint	MultiPoint ((10 10), (20 20))	a MultiPoint with 2 points
MultiLineString	MultiLineString ( (10 10, 20 20), (15 15, 30 15) )	a MultiLineString with 2 linestrings
MultiPolygon	MultiPolygon ( ((10 10, 10 20, 20 20, 20 15, 10 10)), ((60 60, 70 70, 80 60, 60 60)) )	a MultiPolygon with 2 polygons
GeomCollection	GeometryCollection ( POINT (10 10), POINT (30 30), LINESTRING (15 15, 20 20) )	a GeometryCollection consisting of 2 Point values and a LineString value

EXAMPLE 2 The geographic coordinate system string for UTM zone 10 on NAD83 is

```
GEOGCS["GCS_North_American_1983",
  DATUM["D_North_American_1983",
    ELLIPSOID["GRS_1980",6378137,298.257222101]],
  PRIMEM["Greenwich",0],
  UNIT["Degree",0.0174532925199433]]
```

EXAMPLE 3 The full string representation of UTM Zone 10N is

```
PROJCS["NAD_1983_UTM_Zone_10N",
  GEOGCS["GCS_North_American_1983",
    DATUM[ "D_North_American_1983",ELLIPSOID["GRS_1980",6378137,298.257222101]],
    PRIMEM["Greenwich",0],UNIT["Degree",0.0174532925199433]],
  PROJECTION["Transverse_Mercator"],PARAMETER["False_Easting",500000.0],
  PARAMETER["False_Northing",0.0],PARAMETER["Central_Meridian",-123.0],
  PARAMETER["Scale_Factor",0.9996],PARAMETER["Latitude_of_Origin",0.0],
  UNIT["Meter",1.0]]
```

---

## Simple Feature Access

Some implementations:

- GEOS (Geometry Engine Open Source) CGO wrapper (C++)
- JTS (Java, Python wrapper)
- Gdal (C/C++, Python wrapper)
- OpenLayers (JavaScript)
- PostGIS (database)
- GeoPandas (Python)
- ...

---

## **WFS (Web Feature Service)** <https://www.ogc.org/standards/wfs>

**Description :** It allows a client to retrieve and update geospatial data encoded in the Geography Markup Language (GML)

Operations :

- GetCapabilities describes the service
- GetFeature retrieves the objects
- DescribeFeatureType describes the objects

## WFS (Web Feature Service) - GetCapabilities

Parameter	R/O	Description
VERSION = version	R	Version of the service
SERVICE = WFS	R	Type of the service (WFS)
REQUEST = GetCapabilities	R	Name of the operation

We get back a XML document describing the available services and data

<http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=GetCapabilities&service=WFS&version=1.0.0>

In the XML response:

**<Service>** describes the service and the conditions of access

**<Capability><Request>** describes the operations and formats supported

**<FeatureTypeList><Operations>** describes the error messages

**<FeatureTypeList>**

**<FeatureType>**

**<Name>** identifier of the layer

**<Title> <Abstract> <Keywords>** description of the layer

**<SRS>** Coordinate Reference System of the source

**<LatLonBoundingBox>** Bounding box of the data

**<ogc:FilterCapabilities>** spatial and scalar filters available for queries

## WFS (Web Feature Service) - DescribeFeatureType

Parameter	R/O	Description
VERSION = version	R	Version of the service
SERVICE = WFS	R	Type of the service (WFS)
REQUEST = DescribeFeatureType	R	Name of the operation

We get an XML document describing the schema of object type (FeatureType)

[http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=DescribeFeatureType&service=wfs&version=1.1&typename=massgis:GISDATA.SCHOOLS\\_PT\\_M\\_LDT](http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=DescribeFeatureType&service=wfs&version=1.1&typename=massgis:GISDATA.SCHOOLS_PT_M_LDT)

## WFS (Web Feature Service) - GetFeature

Parameter	R/O	Description
VERSION = version	R	Version of the service
SERVICE = WFS	R	Type of the service (WFS)
REQUEST = GetFeature	R	Name of the operation
TYPENAME = typename_list	R	List of object types to query, separator « , »
MAXFEATURES=n	O	maximum number of objects returned
PROPERTYNAME=property_list	O	List of attributes returned
FILTER=filter_list	O	list of filters on objects, comma separator (OGC Filter Encoding) - Mutually exclusive with FEATUREID and BBOX
FEATUREID=id_list	O	filter by identifier of returned objects, mutually exclusive with FILTER and BBOX
BBOX=xmin,ymin,xmax,ymax	O	filtering of returned objects. Mutually exclusive with FEATUREID and FILTER

## WFS (Web Feature Service) - Examples

Get a count of the number of schools in the massgis:GISDATA.SCHOOLS\_PT layer (without and with geometry)

[http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=GetFeature&service=wfs&version=1.1&typeName=massgis:GISDATA.SCHOOLS\\_PT&resultType=hits](http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=GetFeature&service=wfs&version=1.1&typeName=massgis:GISDATA.SCHOOLS_PT&resultType=hits)

[http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=getfeature&version=1.1&service=wfs&typename=massgis:GISDATA.SCHOOLS\\_PT&CQL\\_FILTER=BBOX%28shape,45004,909195,55684,932912%29&resultType=hits](http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=getfeature&version=1.1&service=wfs&typename=massgis:GISDATA.SCHOOLS_PT&CQL_FILTER=BBOX%28shape,45004,909195,55684,932912%29&resultType=hits)

Get all the attribute (column, field) names of the layer GISDATA.TOLLBOOTHES\_PT

[http://giswebservices.massgis.state.ma.us/geoserver/wfs?SERVICE=wfs&VERSION=1.0.0&REQUEST=describefeaturetype&TYPENAME=massgis:GISDATA.TOLLBOOTHES\\_PT](http://giswebservices.massgis.state.ma.us/geoserver/wfs?SERVICE=wfs&VERSION=1.0.0&REQUEST=describefeaturetype&TYPENAME=massgis:GISDATA.TOLLBOOTHES_PT)

[http://giswebservices.massgis.state.ma.us/geoserver/wfs?SERVICE=wfs&VERSION=1.0.0&REQUEST=describefeaturetype&TYPENAME=massgis:GISDATA.TOLLBOOTHES\\_PT&outputformat=text/javascript](http://giswebservices.massgis.state.ma.us/geoserver/wfs?SERVICE=wfs&VERSION=1.0.0&REQUEST=describefeaturetype&TYPENAME=massgis:GISDATA.TOLLBOOTHES_PT&outputformat=text/javascript)

# WFS (Web Feature Service) - Examples

Get all the values of all the attributes of all the features of the layer GISDATA.TOLLBOOTHES\_PT

[http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=GetFeature&version=1.0.0&typeName=massgis:GISDATA.TOLLBOOTHES\\_PT](http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=GetFeature&version=1.0.0&typeName=massgis:GISDATA.TOLLBOOTHES_PT)

Get all the values of all the attributes of all the features of the layer GISDATA.TOLLBOOTHES\_PT, sorted by an attribute

[http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=GetFeature&version=1.1.0&typeName=massgis:GISDATA.TOLLBOOTHES\\_PT&sortBy=town+A](http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=GetFeature&version=1.1.0&typeName=massgis:GISDATA.TOLLBOOTHES_PT&sortBy=town+A)

Get all the values of the feature with OBJECTID = 1 in the layer GISDATA.TOWNS\_POLY

[http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=GetFeature&service=wfs&version=1.1&featureId=GISDATA.TOWNS\\_POLY.1](http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=GetFeature&service=wfs&version=1.1&featureId=GISDATA.TOWNS_POLY.1)

Download all the values all (or some) the attributes for the layer GISDATA.TOWNS\_POLY

[http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=GetFeature&service=wfs&version=1.0.0&typename=massgis:GISDATA.TOWNS\\_POLY&outputformat=SHAPE-ZIP](http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=GetFeature&service=wfs&version=1.0.0&typename=massgis:GISDATA.TOWNS_POLY&outputformat=SHAPE-ZIP)

[http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=getfeature&version=1.0.0&outputformat=SHAPE-ZIP&service=wfs&typename=massgis:GISDATA.OPENSOURCE\\_POLY&filter=OWNER ABRVM165](http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=getfeature&version=1.0.0&outputformat=SHAPE-ZIP&service=wfs&typename=massgis:GISDATA.OPENSOURCE_POLY&filter=OWNER ABRVM165)

Download all the values all the attributes for the layer GISDATA.TOWNS\_POLY in CSV format

[http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=GetFeature&service=wfs&version=1.0.0&typename=massgis:GISDATA.TOWNS\\_POLY&outputformat=csv](http://giswebservices.massgis.state.ma.us/geoserver/wfs?request=GetFeature&service=wfs&version=1.0.0&typename=massgis:GISDATA.TOWNS_POLY&outputformat=csv)

More an more examples : <https://wiki.state.ma.us/display/massgis/GeoServer+-+WFS+-+Examples>

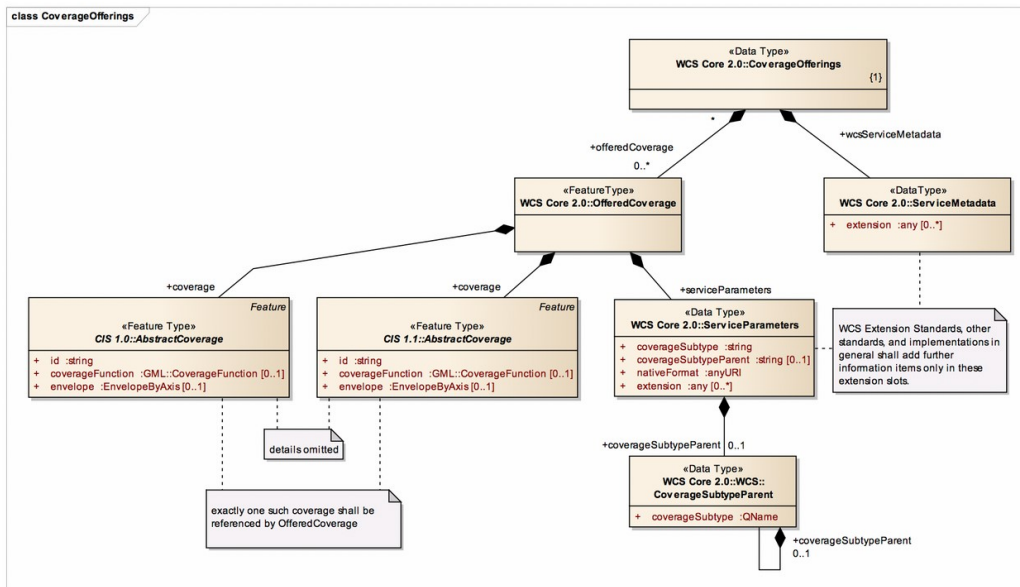


## WCS (Web Coverage Service) - <http://docs.opengeospatial.org/is/17-089r1/17-089r1.html>

Description: It allows you to publish images, maps or geodatabases that contain rasters.

The operations :

- GetCapabilities :  
[http://app.spaceclimateobservatory.org/mapserv?map=WMS\\_SRTM&service=WCS&request=getCapabilities&version=1.0.0](http://app.spaceclimateobservatory.org/mapserv?map=WMS_SRTM&service=WCS&request=getCapabilities&version=1.0.0)
- DescribeCoverage:  
[http://app.spaceclimateobservatory.org/mapserv?map=WMS\\_SRTM&service=WCS&request=DescribeCoverage&version=1.0.0&identifiers=SRTM](http://app.spaceclimateobservatory.org/mapserv?map=WMS_SRTM&service=WCS&request=DescribeCoverage&version=1.0.0&identifiers=SRTM)
- GetCoverage:  
[http://app.spaceclimateobservatory.org/mapserv?map=WMS\\_SRTM&service=WCS&request=GetCoverage&width=33&height=33&crs=EPSG:4326&coverage=SRTM&version=1.0.0&format=image/x-aaigrid&bbox=90,-90,180,0\[&time=...\]](http://app.spaceclimateobservatory.org/mapserv?map=WMS_SRTM&service=WCS&request=GetCoverage&width=33&height=33&crs=EPSG:4326&coverage=SRTM&version=1.0.0&format=image/x-aaigrid&bbox=90,-90,180,0[&time=...])



2.1	Core:		
	<a href="#">OGC® Web Coverage Service (WCS) Interface Standard - Core, version 2.1</a>	17-089r1	IS
2.0	Core:		
	<a href="#">OGC® WCS 2.0 Interface Standard - Core, version 2.0.1</a>	09-110r4	IS
	Service Extensions:		
	<a href="#">OGC® Web Coverage Service Interface Standard – Transaction Extension</a>	13-057r1	IS
	<a href="#">OGC® WCS Interface Standard - Range Subsetting Extension, version 1.0.0</a>	12-040	IS
	<a href="#">OGC® WCS Interface Standard - Scaling Extension, version 1.0.0</a>	12-039	IS
	<a href="#">OGC® WCS Interface Standard – CRS Extension, version 1.0.0</a>	11-053r1	IS
	<a href="#">OGC® WCS Interface Standard - Interpolation Extension, version 1.0.0</a>	12-049	IS
	<a href="#">OGC® WCS Interface Standard - Processing Extension, version 2.0.0</a>	08-059r4	IS
	Protocol Extensions:		
	<a href="#">OGC® WCS Interface Standard - KVP Protocol Binding Extension, version 1.0.1</a>	09-147r3	IS
	<a href="#">OGC® WCS - XML/POST Protocol Binding Extension, version 1.0.0</a>	09-148r1	IS
	<a href="#">OGC® Web Coverage Service 2.0 Interface Standard - XML/SOAP Protocol Binding Extension, version 1.0.0</a>	09-149r1	IS
	Application Profiles:		
	<a href="#">OGC® MetOcean Application profile for WCS2.1: Part 0 MetOcean Metadata</a>	15-045r7	IS
	<a href="#">OGC® MetOcean Application profile for WCS2.1: Part 1 MetOcean GetCorridor Extension v1.0</a>	15-108r3	IS
	<a href="#">OGC® MetOcean Application profile for WCS2.1: Part 2 MetOcean GetPolygon Extension v1.0</a>	17-086r3	IS
	<a href="#">OGC® WCS Interface Standard - Earth Observation Application Profile, version 1.1</a>	10-140r2	IS
	<a href="#">OGC® WCS Interface Standard - Earth Observation Application Profile, version 1.0</a>	10-140r1	IS

# WCS

rasdaman  
raster data manager



## Web Coverage Service (WCS) Suite

- WCS **Core**: access to n-D coverages & subsets

- subset =

trim

|

slice



- Format conversion on the fly

- WCS **Extensions**: optional functionality facets
- WCS **Application Profiles**: domain-oriented bundling (EO, MetOcean, ...)

## WMS (Web Map Service) <https://www.ogc.org/standards/wms>

**Description** : A Web Map Service (WMS) dynamically produces maps of georeferenced data from geographic information. This international standard defines a "map" as a representation of geographic information in the form of an image file suitable for display on a computer screen. A map is not the data itself. Maps produced by WMS are usually produced in an image format such as PNG, FIG or JPEG, or sometimes in a vector format such as SVG

The different operations:

- GetCapabilities
- GetMap
- GetFeatureInfo
- DescribeLayer
- GetLegendGraphic

# WMS (Web Map Service) – GetCapabilities

Table 3 — The parameters of a GetCapabilities request URL

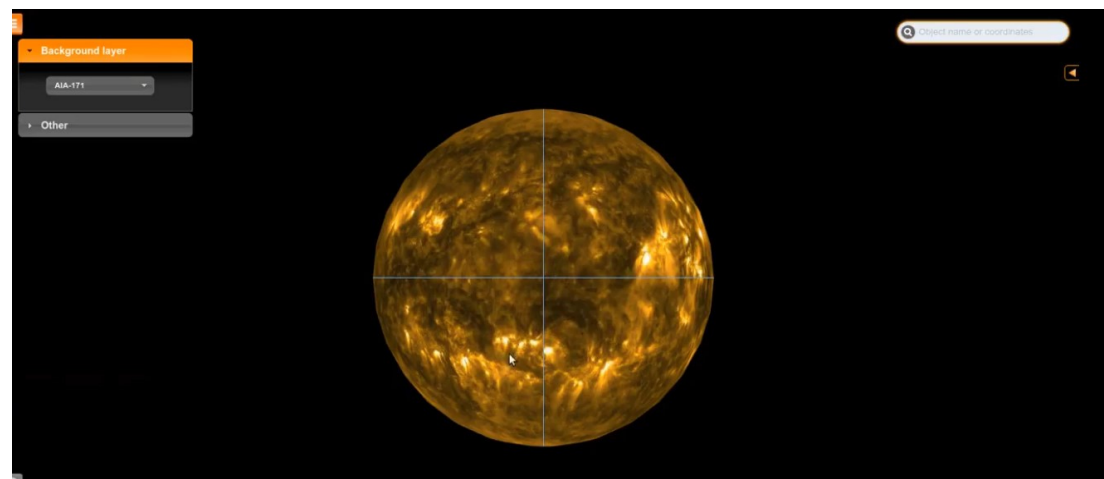
Request parameter	Mandatory/optional	Description
VERSION=version	O	Request version
SERVICE=WMS	M	Service type
REQUEST=GetCapabilities	M	Request name
FORMAT=MIME_type	O	Output format of service metadata
UPDATESEQUENCE=string	O	Sequence number or string for cache control

<http://giswebservices.massgis.state.ma.us/geoserver/wms?request=getcapabilities&version=1.1.0&service=wms>

# WMS (Web Map Service) – GetMap

Table 8 — The Parameters of a GetMap request

Request parameter	Mandatory/optional	Description
VERSION=1.3.0	M	Request version.
REQUEST=GetMap	M	Request name.
LAYERS=layer_list	M	Comma-separated list of one or more map layers.
STYLES=style_list	M	Comma-separated list of one rendering style per requested layer.
CRS=namespace:identifier	M	Coordinate reference system.
BBOX=minx,miny,maxx,maxy	M	Bounding box corners (lower left, upper right) in CRS units.
WIDTH=output_width	M	Width in pixels of map picture.
HEIGHT=output_height	M	Height in pixels of map picture.
FORMAT=output_format	M	Output format of map.
TRANSPARENT=TRUE FALSE	O	Background transparency of map (default=FALSE).
BGCOLOR=color_value	O	Hexadecimal red-green-blue colour value for the background color (default=0xFFFFFF).
EXCEPTIONS=exception_format	O	The format in which exceptions are to be reported by the WMS (default=XML).
TIME=time	O	Time value of layer desired.
ELEVATION=elevation	O	Elevation of layer desired.
Other sample dimension(s)	O	Value of other dimensions as appropriate.



---

## **WMS (Web Map Service) – GetFeatureInfo**

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## **WMS (Web Map Service) – DescribeLayer**



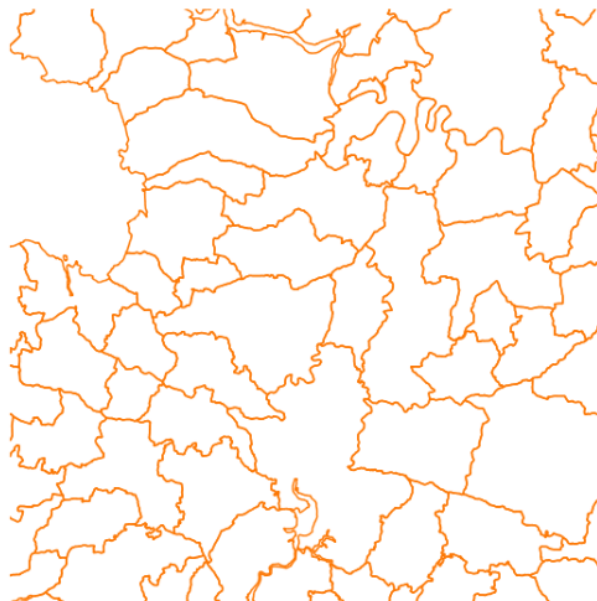
---

## WMS (Web Map Service) – GetLegendGraphic

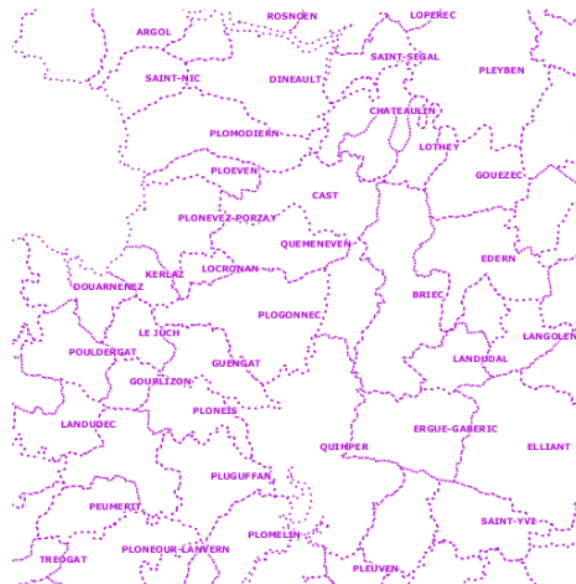
[http://giswebservices.massgis.state.ma.us/geoserver/wms?VERSION=1.1.0&REQUEST=GetLegendGraphic&LAYER=massgis:GISDATA.COUNTIES\\_POLY&STYLE=GISDATA.COUNTIES\\_POLY::Default&WIDTH=16&HEIGHT=200&FORMAT=image/png](http://giswebservices.massgis.state.ma.us/geoserver/wms?VERSION=1.1.0&REQUEST=GetLegendGraphic&LAYER=massgis:GISDATA.COUNTIES_POLY&STYLE=GISDATA.COUNTIES_POLY::Default&WIDTH=16&HEIGHT=200&FORMAT=image/png)

# WMS (Web Map Service) – Style et SLD

[http://geobretagne.fr/geoserver/bzh/wms?LAYERS=bzh:commune\\_bdcarto&TRANSPARENT=true&VERSION=1.1.1&FORMAT=image/png&SERVICE=WMS&REQUEST=GetMap&SRS=EPSG:2154&BBOX=150941,6780587,190077,6819722&WIDTH=512&HEIGHT=512](http://geobretagne.fr/geoserver/bzh/wms?LAYERS=bzh:commune_bdcarto&TRANSPARENT=true&VERSION=1.1.1&FORMAT=image/png&SERVICE=WMS&REQUEST=GetMap&SRS=EPSG:2154&BBOX=150941,6780587,190077,6819722&WIDTH=512&HEIGHT=512)



[http://geobretagne.fr/geoserver/bzh/wms?LAYERS=bzh:commune\\_bdcarto&TRANSPARENT=true&VERSION=1.1.1&FORMAT=image/png&SERVICE=WMS&REQUEST=GetMap&SRS=EPSG:2154&BBOX=150941,6780587,190077,6819722&WIDTH=512&HEIGHT=512](http://geobretagne.fr/geoserver/bzh/wms?LAYERS=bzh:commune_bdcarto&TRANSPARENT=true&VERSION=1.1.1&FORMAT=image/png&SERVICE=WMS&REQUEST=GetMap&SRS=EPSG:2154&BBOX=150941,6780587,190077,6819722&WIDTH=512&HEIGHT=512)  
[&SLD=http://geobretagne.fr/mapfishapp/ws/sld/geodoc6211521421358206358.sld](http://geobretagne.fr/mapfishapp/ws/sld/geodoc6211521421358206358.sld)

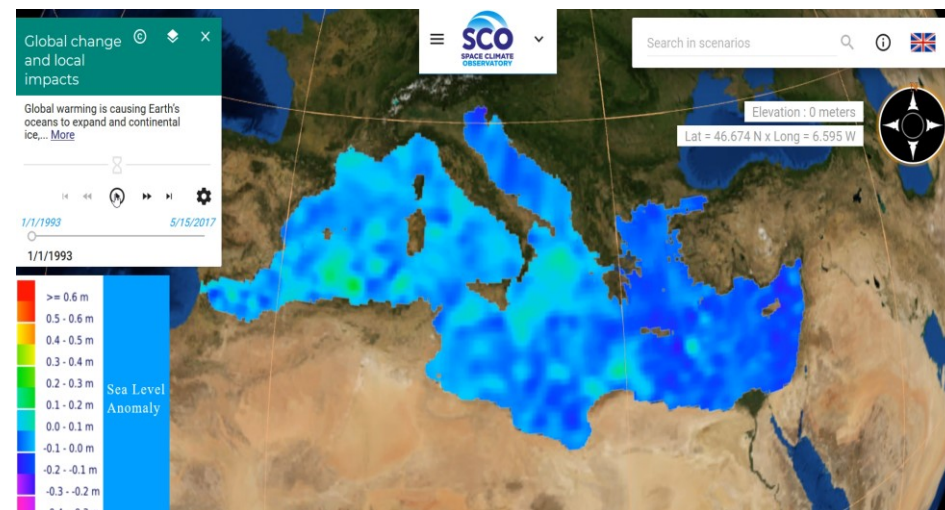


# WMS (Web Map Service) – Time

## Temporal capabilities with TIME parameter

- Specifying a time as yyyy-MM-ddThh:mm:ss.SSSZ
- Specifying an absolute interval : 2002-09-01T00:00:00.0Z/2002-09-30T23:59:59.999Z
- Specifying a relative interval : 2002-09-01T00:00:00.0Z/P1M
- Reduced accuracy time : 2002-09
- Reduced accuracy time with ranges : 2002-09/2002-12
- Specifying a list of time : TIME=2012-08-12T12:00:00.0Z,2012-08-13T12:00:00.0Z,2012-08-14T12:00:00.0Z
- Specifying a periodicity: PT1H

<http://localhost/wms?request=GetMap&service=WMS&version=1.3.0&layers=solar&styles=colormap&crs=IAU2000:1000&bbox=15.15104058007,21.731919794922,57.154894212888,58.96105864257&width=78&height=330&format=image/png&TIME=2018-10-18>

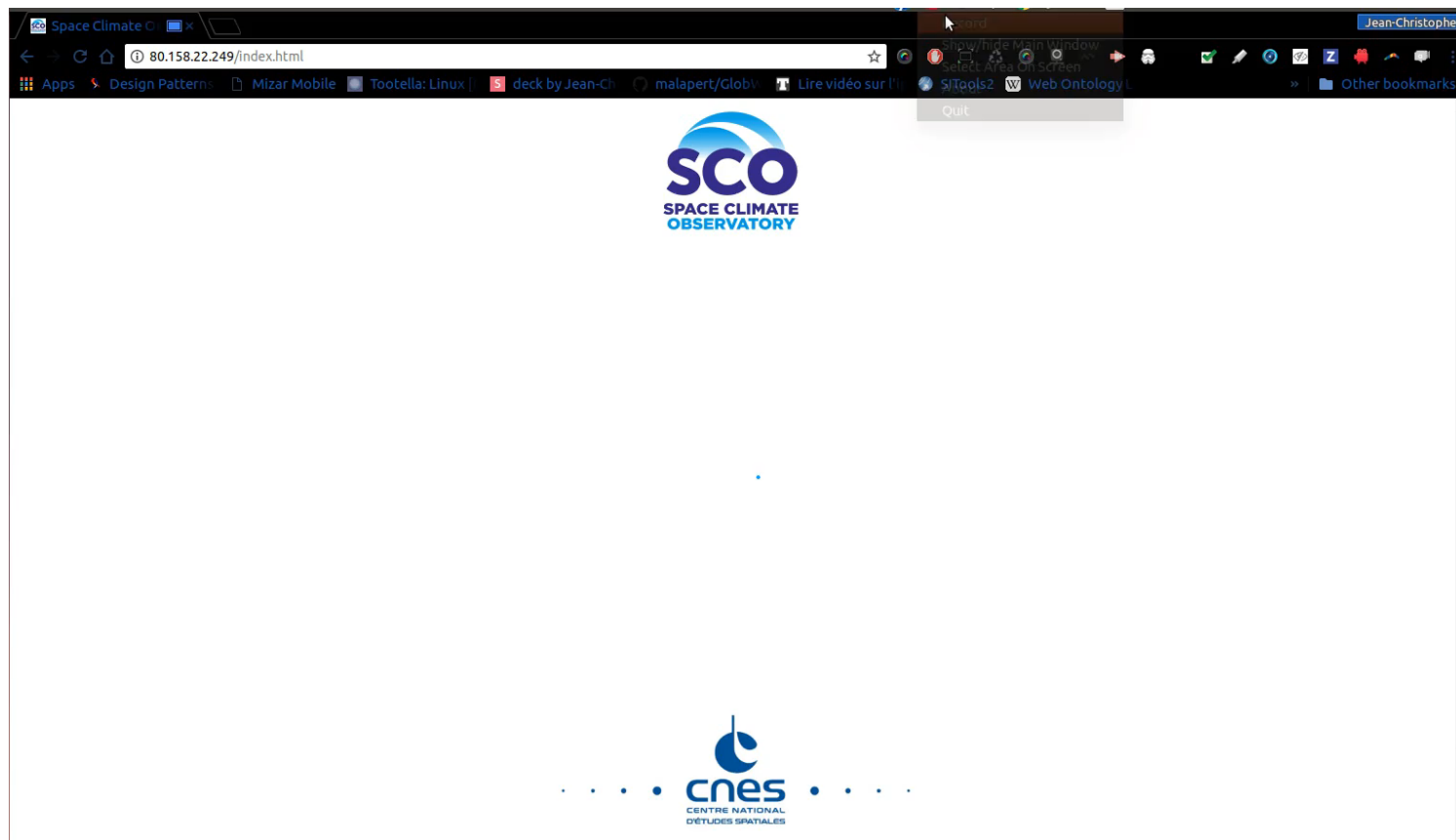


# WMS (Web Map Service) - Examples

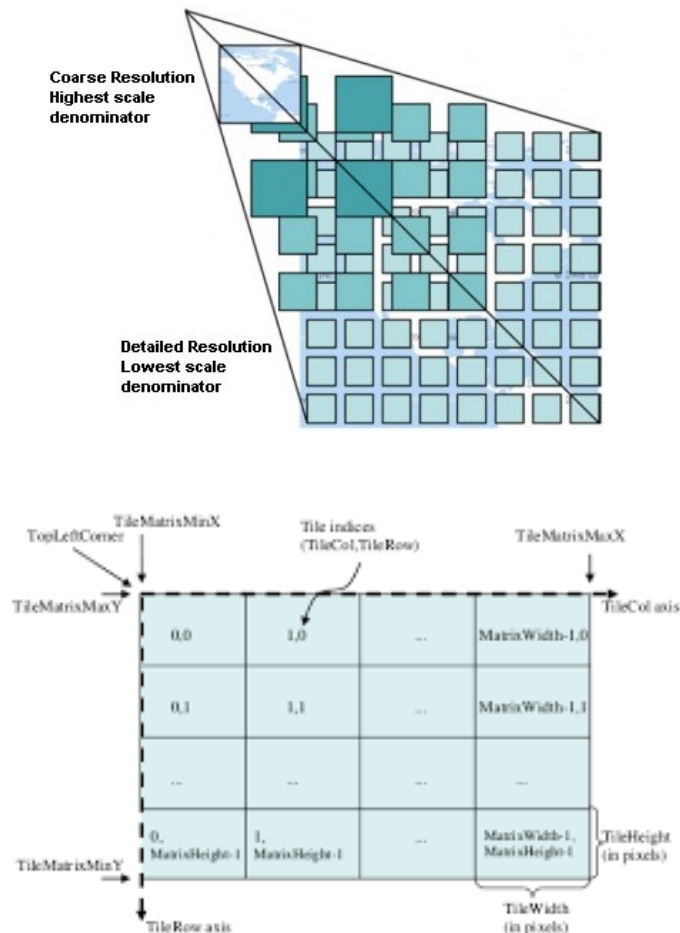




# WMS & WFS & WCS



# WMTS



Query with a pre-defined tessellation related to a projection to have a fast access

The operations :

- **GetCapabilities :**  
<http://localhost/wmts?service=WMTS&version=1.0.0&request=GetCapabilities>  
or <http://localhost/wmts/1.0.0/WMTSCapabilities.xml>
- **GetTile:**  
[http://localhost/wmts?service=WMTS&request=GetTile&version=1.0.0&layer=etopo2&style=default&format=image/png&TileMatrixSet=WholeWorld\\_CRS\\_84&TileMatrix=10m&TileRow=1&TileCol=3](http://localhost/wmts?service=WMTS&request=GetTile&version=1.0.0&layer=etopo2&style=default&format=image/png&TileMatrixSet=WholeWorld_CRS_84&TileMatrix=10m&TileRow=1&TileCol=3) or  
[http://localhost/wmts/default/WholeWorld\\_CRS\\_84/10m/1/3.png](http://localhost/wmts/default/WholeWorld_CRS_84/10m/1/3.png)
- **GetTile with time:** <http://map1.vis.earthdata.nasa.gov/wmts-geo/{Product}/{Style}/{Time}/{TileMatrixSet}/{TileMatrix}/{TileRow}/{TileCol}.jpg>
- **GetFeatureInfo:**  
[http://localhost/wmts?service=WMTS&request=GetFeatureInfo&version=1.0.0&layer=coastlines&style=default&format=image/png&TileMatrixSet=WholeWorld\\_CRS\\_84&TileMatrix=10m&TileRow=1&TileCol=3&J=86&I=132&InfoFormat=application/gml+xml](http://localhost/wmts?service=WMTS&request=GetFeatureInfo&version=1.0.0&layer=coastlines&style=default&format=image/png&TileMatrixSet=WholeWorld_CRS_84&TileMatrix=10m&TileRow=1&TileCol=3&J=86&I=132&InfoFormat=application/gml+xml) or  
[http://localhost/wmts/default/WholeWorld\\_CRS\\_84/10m/1/3/86/132.xml](http://localhost/wmts/default/WholeWorld_CRS_84/10m/1/3/86/132.xml)



# Processing Service

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## WPS (Web Processing Service)

**Description :** WFS can return subsets of data but cannot return any changed data. A WPS on the other hand, can modify returned data. A WPS could perform buffer, reproject, simplify, etc.

**GetCapabilities:** Provides access to general information about the WPS and lists the operations and access methods supported by the WPS

<http://giswebservices.massgis.state.ma.us/geoserver/wps?service=WPS&version=1.0.0&request=GetCapabilities>

**Dscribeprocess:** Allows WPS clients to request a full description of one more processes that can be executed by the service. The description includes the input and output parameters and formats

**Execute:** Allows PWS clients to run a specified process



# WCSP (Web Coverage Processing Service)

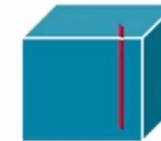
**Description:** high-level grid coverage filtering & processing language

**Poor :** minimise data transfer as well as [client-side] processing

- As in WCS Core: subsetting = **trim** | **slice**
  - Trim: 2 coordinates → **interval** along axis (axis retained in result)
  - Slice: 1 coordinate → **slice point** on axis (axis removed from result)
  - Axes not mentioned: retained in full extent



- Axis name defined in CRS („axis abbreviation“)
  - Ex: Lat, Long, AnsiDate, ...



- Ex: 2-D Lat/Long image from 2-D Lat/Long/AnsiDate image timeseries

```
for $timeseries in ( LandsatTimeseries )
return encode( $timeseries[ Long(100,120), Lat(50,60), AnsiDate("2009-11-06T23:20:52") ],
               "image/tiff" )
```

## WCS & WCPS & WPS

OGC standards cover full range from data-intensive to processing-intensive  
"big data" coverage services

WCS

data access

WCPS

ad-hoc analytics

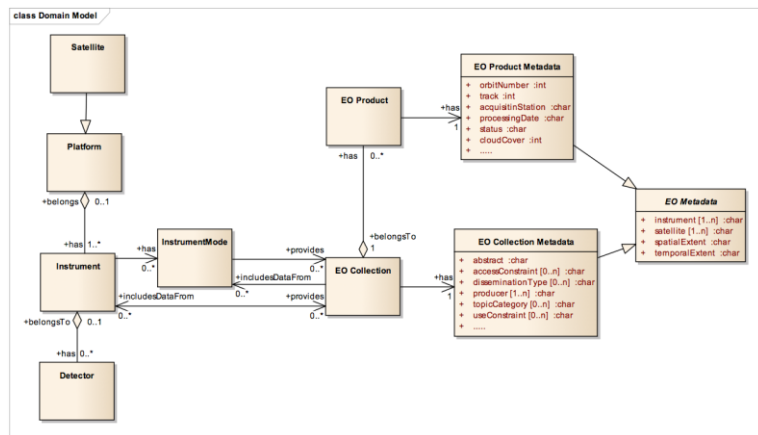
WPS

predefined process



## Discovery services

# OpenSearch & parameter extension & Geo/Time extension + EO profile



OpenSearch consists in :

- A getCapabilities file that contains :
  - Metadata about the service (attribution, logo, name, description, rights, ...)
  - The URL template

<Url

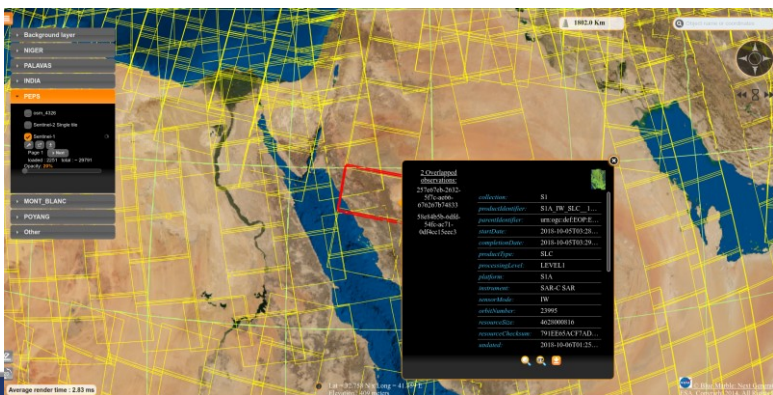
template="https://peps.cnes.fr/resto/api/collections/S1/search.json?q={searchTerms?}&maxRecords={count?}&index={startIndex?}&page={startPage?}&lang={language?}&identifier={geo:uid?}&geometry={geo:geometry?}&box={geo:box?}&location={geo:name?}&lon={geo:lon?}&lat={geo:lat?}&radius={geo:radius?}&startDate={time:start?}&completionDate={time:end?}&parentIdentifier={eo:parentIdentifier?}&productType={eo:productType?}&processingLevel={eo:processingLevel?}&platform={eo:platform?}&instrument={eo:instrument?}&resolution={eo:resolution?}&organisationName={eo:organisationName?}&orbitDirection={eo:orbitDirection?}&orbitNumber={eo:orbitNumber?}&sensorMode={eo:sensorMode?}&cloudCover={eo:cloudCover?}&snowCover={eo:snowCover?}&cultivatedCover={resto:cultivatedCover?}&desertCover={resto:desertCover?}&floodedCover={resto:floodedCover?}&forestCover={resto:forestCover?}&herbaceousCover={resto:herbaceousCover?}&iceCover={resto:iceCover?}&urbanCover={resto:urbanCover?}&waterCover={resto:waterCover?}&updated={dc:date?}&publishedBegin={resto:publishedBegin?}&publishedEnd={resto:publishedEnd?}&isNrt={resto:isNrt?}&realtime={resto:realtime?}&relativeOrbitNumber={resto:relativeOrbitNumber?}&polarisation={eo:polarisation?}&swath={eo:swath?}&cycleNumber={resto:cycleNumber?}" rel="results" type="application/json">

- For each parameter : description, the possible values (enumeration, range)
- The output is a GeoJSON (JSON where geometry (as WKT) is specified)

The thematic data model/vocabulary is defined in EO profile ([OGC® OpenSearch Extension for Earth Observation](#))

More :

- <http://www.opensearch.org/Specifications/OpenSearch/Extensions/Parameter/1.0>
- [https://portal.openeospatial.org/files/?artifact\\_id=56866](https://portal.openeospatial.org/files/?artifact_id=56866) (OGC® OpenSearch Geo and Time Extensions)
- <http://docs.openeospatial.org/is/13-026r8/13-026r8.html> (OGC® OpenSearch Extension for Earth Observation)



# CSW & Geonetwork

My GeoNetwork catalogue
Search
Map
Contribute
Admin console
admin admin (Administrator)
Sign out
English

Search ...

Sorted by relevancy- 1 - 6 on 6 -

**TYPE OF RESOURCES**

- Dataset 3
- Maps and graphics 1
- Collection session 1
- Service 1

**TOPICS**

- Geoscientific information 1
- Boundaries 1
- Inland waters 1

**KEYWORDS**

- Polar ecosystem 1
- Physiography, soil 1
- Eurasia 1
- Geoscientific information 1
- BOUNDARIES-Administrative 1

[10 more](#)

**CONTACT FOR THE RESOURCE**

- FAO - Land and Water Development Division 1
- Department of Sustainability and Environment (DSE) 1

**YEARS**

- 2010 1
- 2007 1
- 2000 1

**FORMATS**

- Web page 1

Categories
Hydrological Basins in Africa (Sample record, please remove!)

Categories
Geoscience Australia's Open Day Photographs 26th August 2007

Categories
The Geoffrey's Tube Z3950 Server (Sample Record - Please Delete!)

Categories
Localities in Victoria (VMADMIN.LOCALITY\_PO LYGON) - Comprehensive

Categories
Natural polar ecosystems

Categories
Physio North and (Sample

# GeoAPI & GeoPackage

## **GeoAPI & GeoPackage**

The GeoAPI interfaces provide a layer which separates client code from application code, which implements the API.

The GeoPackage Encoding Standard describes a set of rules and conventions for storing vector features, imagery tile matrix sets, raster map tile matrix sets and non-spatial tabular data in an SQLite database. The standard also describes rules for extending the capabilities of a GeoPackage. (Replace shapefile and GeoPackage has better performance and takes up less space when storing large files.)

Info: <https://si.ecrins-parcnational.com/blog/2020-02-geojson-shapefile-geopackage.html>