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The consumption of INSPIRE harmonised data made easy with the QGIS GML Application Schema Toolbox

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Supporting GML application compliant complex features in QGIS and beyond

Developments needed to break the circle
“no data / no software to use the data”



Presenters



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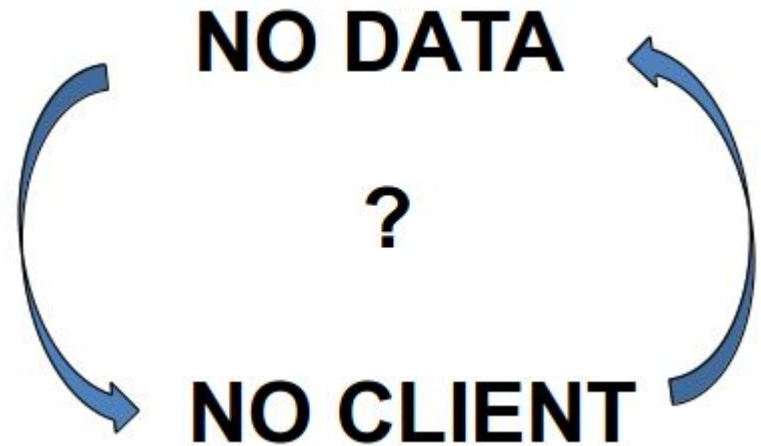
Christian Ansorge

Break the circle “no data / no software to use the data”

« another approach to demonstrate the usefulness of interoperable standards »

or

« having something to show to those who consider XML is not sexy »



Quick history

2015

INSPIRE Data Specification Working groups

2016

[Study](#) on how to improve GML support in QGIS ?

Scenario 1
Read GML

Scenario 2
Convert to DB

2017

POC QGIS Plugin

GML App Schema OGR Driver and QGIS integration



Technological challenges

Create database structure based on specification (XSD) ...
keeping in mind to have something usable

Reusable work (eg. avoid hardcoded configurations, identify
core functionalities)

Technological choices



Based on open source projects



Create reader and writer for GML App Schema in a well-known and used library: **GDAL**

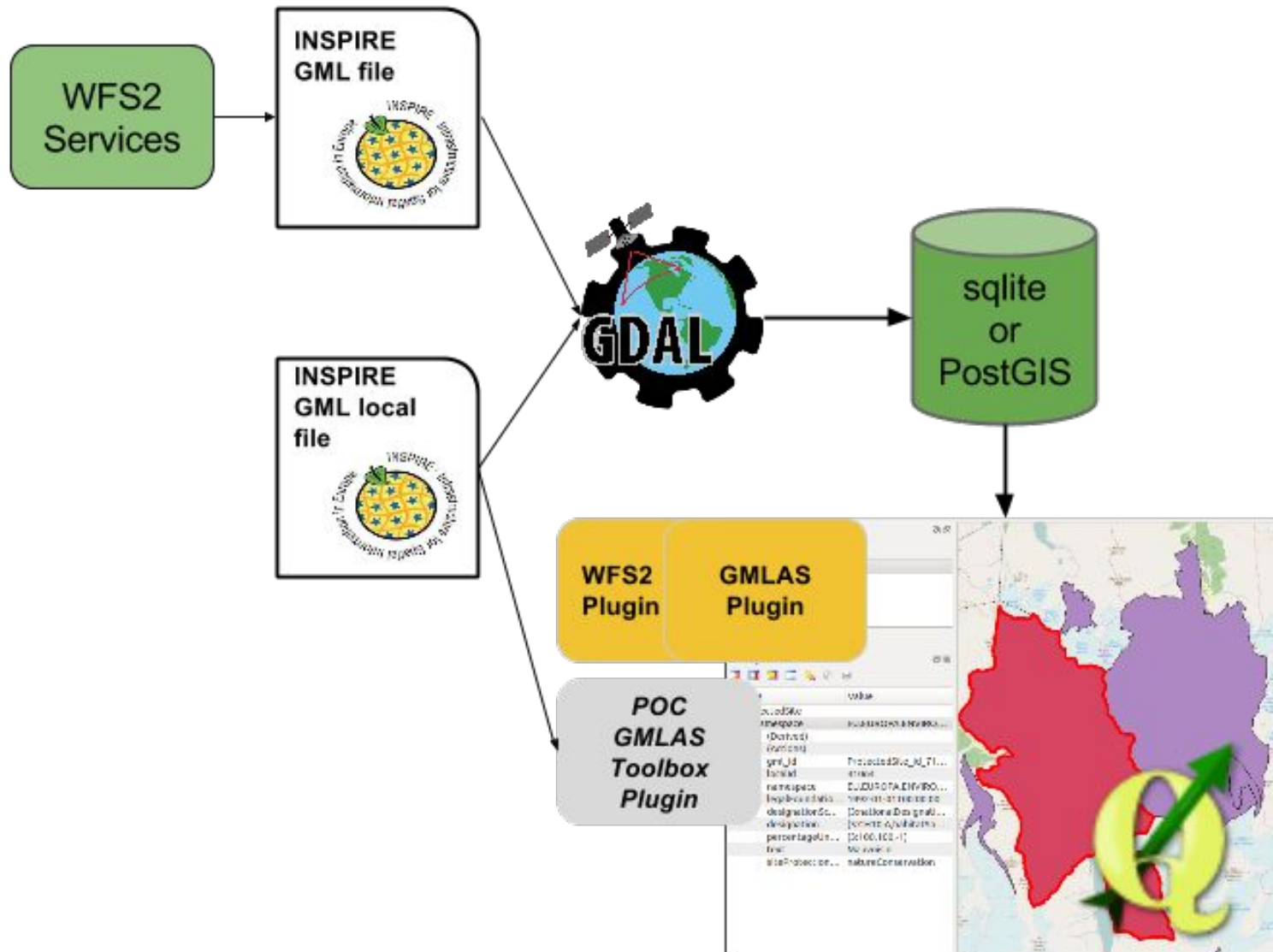


Use the GML App Schema driver in a desktop GIS: **QGIS**

Identify generic GIS/DB concepts which could be reused: Improve table join support, Add array types, Add custom editing widgets

Create a plugin dedicated to specialized tasks: Convert INSPIRE GML to DB

Technological choices



A new driver (GMLAS) in



Reading GML App Schema

A new driver added to GDAL OGR: [GMLAS driver](#)

- How-to list GML file feature types?

```
ogrinfo -ro GMLAS:cddaDesignatedArea.gml
INFO: Open of `GMLAS:cddaDesignatedArea.gml'
      using driver `GMLAS' successful.
1: DesignatedArea (Unknown (any), Point)
2: DesignatedArea_metaDataProperty (None)
3: DesignatedArea_name (None)
4: DesignatedArea_legalFoundationDocument_CI_Citation_alternateTitle (None)
```

- How-to convert from GML to spatialite?

```
ogr2ogr cdda.sqlite GMLAS:cddaDesignatedArea.gml \
-f sqlite -dsco spatialite=yes -oo EXPOSE_METADATA_LAYERS=YES
```

Reading GML App Schema

XSD > Object model conversion based on Xerces

Respect application schema type

Model simplification eg. use Array db types

Exclude unused elements eg. xlink:role

XSD caching

XML validation : well-formed and/or XSD

GML geometry parsing (OGR)

XLink support

Reading GML

Configuration ...

```
<Configuration xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:noNamespaceSchemaLocation="gmlasconf.xsd">
  <AllowRemoteSchemaDownload>true</AllowRemoteSchemaDownload>
  <SchemaCache enabled="true">
    <Directory/> <!-- empty: use $HOME/.gdal/gmlas_xsd_cache by default -->
  </SchemaCache>
  <Validation enabled="false">
    <FailIfError>false</FailIfError>
  </Validation>
  <ExposeMetadataLayers>false</ExposeMetadataLayers>
  <LayerBuildingRules>
    <UseArrays>true</UseArrays>
    <GML>
      <IncludeGeometryXML>true</IncludeGeometryXML>
      <InstantiateGMLFeaturesOnly>true</InstantiateGMLFeaturesOnly>
    </GML>
  </LayerBuildingRules>
  <IgnoredXPathes>
    <WarnIfIgnoredXPathFoundInDocInstance>true</WarnIfIgnoredXPathFoundInDocInstance>
    <Namespaces>
      <Namespace prefix="gml" uri="http://www.opengis.net/gml"/>
      <Namespace prefix="gml32" uri="http://www.opengis.net/gml/3.2"/>
    </Namespaces>
    <XPath warnIfIgnoredXPathFoundInDocInstance="false">gml:boundedBy</XPath>
    <XPath warnIfIgnoredXPathFoundInDocInstance="false">gml32:boundedBy</XPath>
    <XPath>gml:priorityLocation</XPath>
    <XPath>gml32:priorityLocation</XPath>
    <XPath>gml32:descriptionReference/@owns</XPath>
    <XPath>@xlink:show</XPath>
    <XPath>@xlink:type</XPath>
    <XPath>@xlink:role</XPath>
    <XPath>@xlink:arcrole</XPath>
    <XPath>@xlink:actuate</XPath>
    <XPath>@gml:remoteSchema</XPath>
  </IgnoredXPathes>
</Configuration>
```

All applications using
GDAL can benefit
from this.

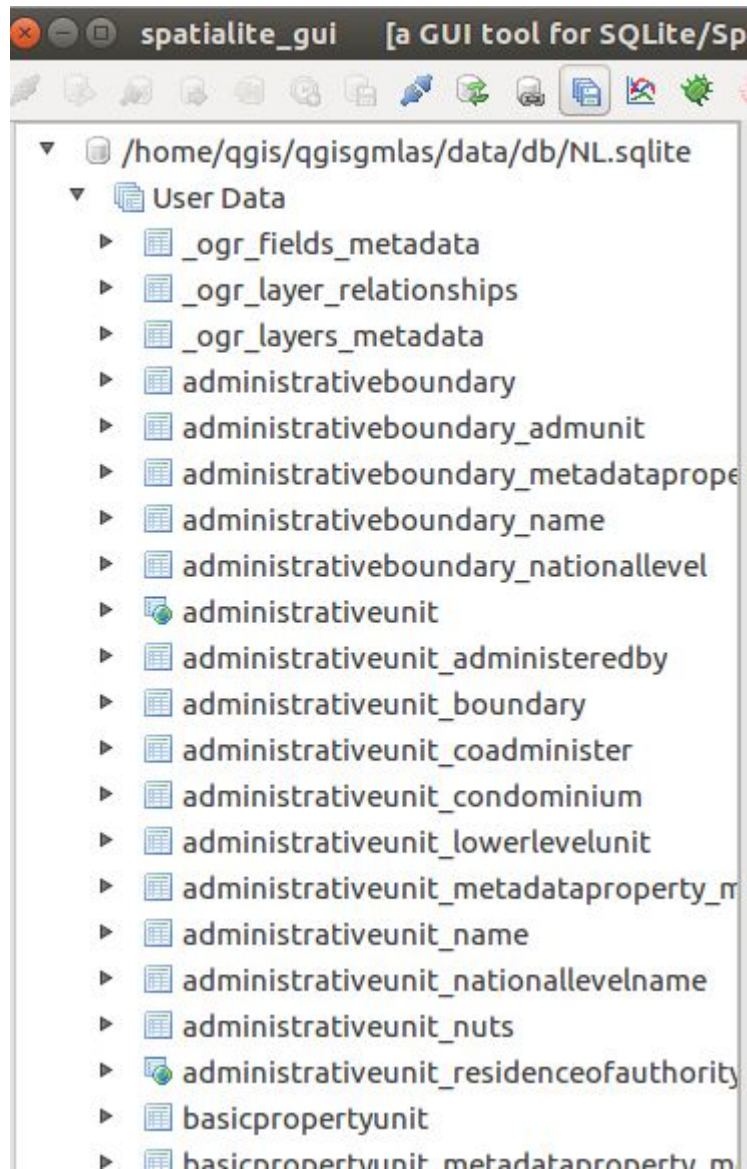
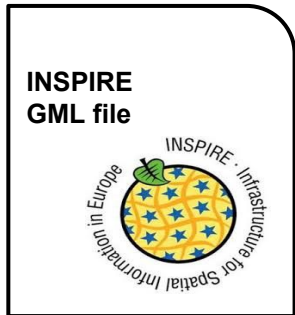
A new driver (GMLAS) in



INSPIREd database



Database



A new driver (GMLAS) in **GDAL**



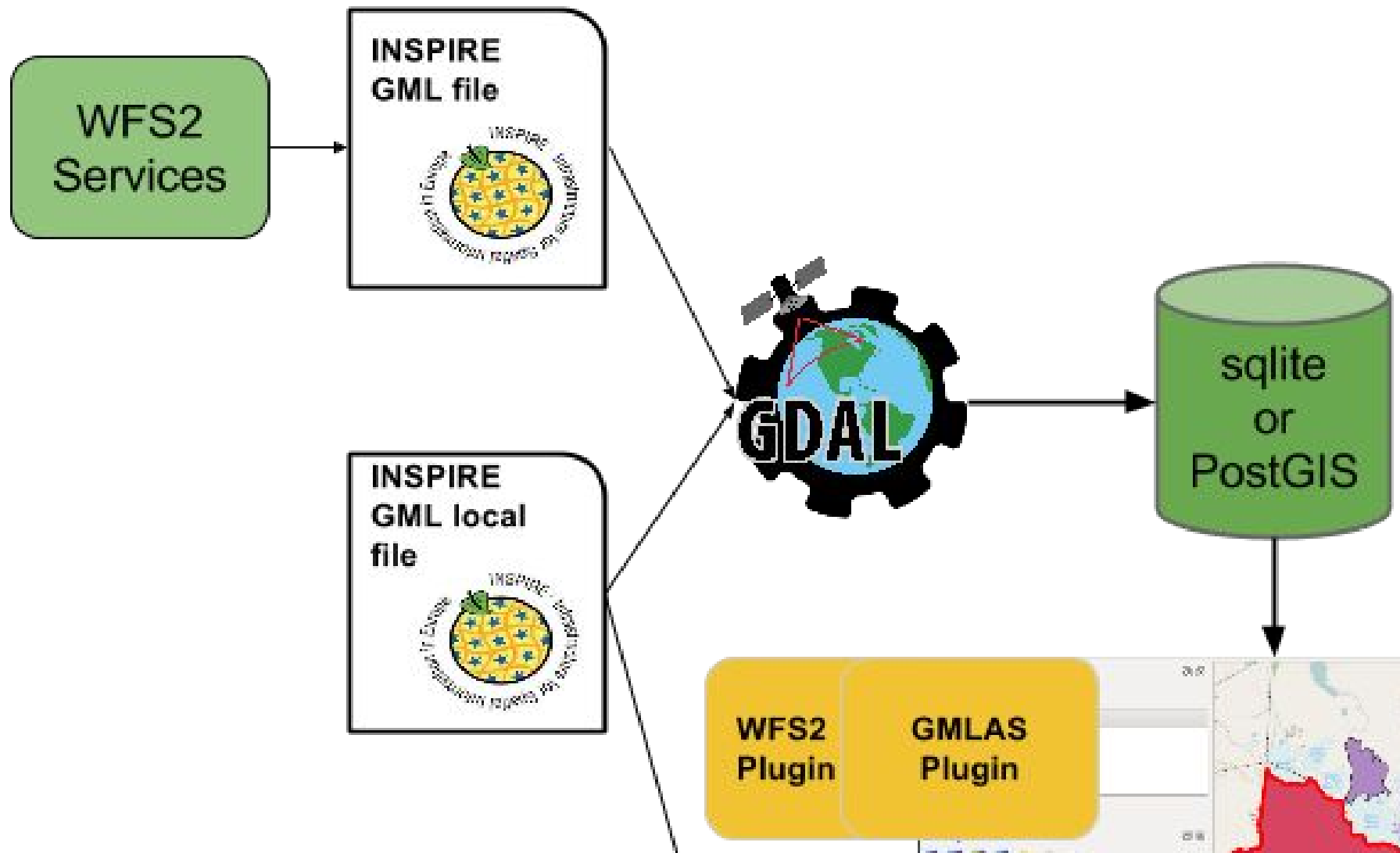
INSPIREd database



Used in



Usage in QGIS



Usage in QGIS / Download and convert

(optional) Download from WFS

(based on [WFS2 plugin](#) made by Juergen Weichand)

GMLAS

Download Convert

WFS 2 Server

WFS2 server

Username

Password

GetCapabilities

Filter by extent
xmin,ymin,xmax,ymax

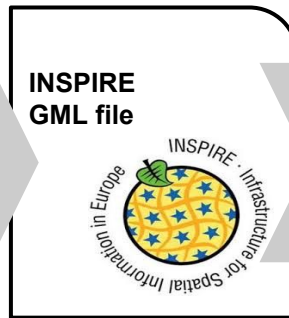
Request options

Feature limit 1000

Output

Path Create temporary file

Download



Convert to database

GMLAS

Download Convert

Source GML file

Path

XLink depth 0

Validate

Datasets

Filter by extent
xmin,ymin,xmax,ymax

Target

Provider

Database

Schema

SRS

Append Overwrite

24%

Convert



Browser Panel

- PostGIS
 - inspire
 - BR
 - GE
 - LC
 - PS
 - _ogr_layer_relationships
 - _ogr_layers_metadata
 - ci_citation
 - ci_citation_alternatetitle
 - ci_citation_date
 - designatedarea_metadat
 - designatedarea_name
 - designatedarea_sitedesig
 - designatedarea_sitenam
 - designatedarea_siteprote
 - designatedarea.geometry
 - designatedarea.represen
 - md_identifier
 - public
- SpatiaLite
 - array_type_test.sqlite
 - BR.sqlite
 - GE.sqlite
 - LC.sqlite
 - NL.sqlite
 - administrativeunit



Layers Panel

- ne_10m_admin_0_countries
- bio_geographicalregion
 - alpine
 - anatolian
 - arctic
 - atlantic
 - black
 - boreal
 - continental
 - macaronesia
 - mediterranean
 - pannonian
 - steppic
 - [unlabeled]

bio_geographicalregion :: Features total: 11, filtered: 11, selected: 0

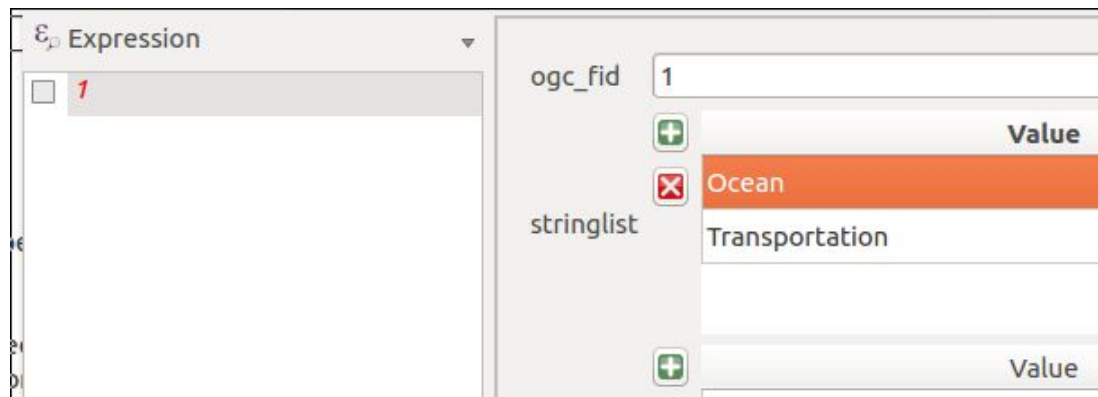
Expression

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11

ogc_fid	1
id	N_368552f1-c9ce-4b1e-b9cb-
description_href	NULL
description_title	NULL
description_nilreason	NULL
description	NULL
descriptionreference_href	NULL
descriptionreference_title	NULL
descriptionreference_nilreason	NULL
identifier_codespace	http://inspire.ec.europa.eu/ic
identifier	aps/data/biogeographical-reg

Usage in QGIS / coming work

- Plugin
 - Download and conversion processing
 - Predefined SQL views by INSPIRE themes to simplify database use
- QGIS Core
 - Autodiscover join between tables in db model
 - Navigation between related tables in attribute table mode



Additional features
made in BRGM POC

XML mode > WFS Flow

The image shows a QGIS 2.14.3 interface with the 'Feature Identification' window open. The main window displays the 'EnvironmentalMonitoringFacility (points)' layer. The 'Feature Identification' window shows the XML structure for a piezometer feature. A context menu is open over the 'ef:additionalDescription' field, with options like 'Copy value', 'Copy XPath', 'Resolve external', 'Embedded', 'As a new layer', and 'Add to layer'. The 'Add to layer' option is selected, and a sub-menu shows 'EnvironmentalMonitoringFacility (points)'.

QGIS 2.14.3 - EF_50piezo_XML

Projet Éditer Vue Couche Préférences Extension Vecteur Raster Base

Couches

- EnvironmentalMonitoringFacility (points)

Feature Identification

id: http://resource.brgm.fr/data/Piezometre/1.01418X0001-F

Element	Value
gml:id	Piezometre.1.01418X0001-F
gml:description	Water well from national BSS (Banque du Sous-Sol) Data database. Piezometer monitoring ground water level
gml:identifier	http://resource.brgm.fr/data/Piezometre/1.01418X0001-F
ef:inspireId	http://www.sit.forg/rlc/rlc2616
base:identifier	
base:localId	1.01418X0001-F
base:namespace	http://resource.brgm.fr/data/Piezometre/
base:versionId	
ef:name	Grès du Trias inférieur (GTI) à WALDHOUSE
ef:additionalDescription	
ef:mediaMonitored	http://inspire.ec.europa.eu/codeList/MediaValue/water
ef:legalBackground	water
ef:geometry	
gml:Point	
gml:srsName	urn:ogc:def:crs:EPSG:4326
gml:id	Piezometre.geom.1.01418X0001-F
gml:srsDimension	2
gml:pos	40.1457509460854 7.468573554213
ef:onlineResource	http://fichebss.eau.brgm.fr/bss_eau/fiche_jf/code-01418X0001-F
ef:purpose	
ef:observingCapability	
ef:broader	
ef:supersededBy	
ef:reportedTo	unpopulated
ef:hasObservation	true
ef:involvedIn	http://www.eau.brgm.fr/rlc/rlc2616/ChroniquePiezometrique
ef:representativePoint	
gml:ef:name	GRÈS DU TRIAS INFÉRIEUR (GTI) à WALDHOUSE
ef:additionalDescription	
ef:mediaMonitored	http://inspire.ec.europa.eu/codeList/MediaValue/water
ef:legalBackground	water
ef:geometry	
gml:Point	
gml:srsName	urn:ogc:def:crs:EPSG:4326
gml:id	Piezometre.geom.1.01418X0001-F
gml:srsDimension	2
gml:pos	40.1457509460854 7.468573554213

Context Menu:

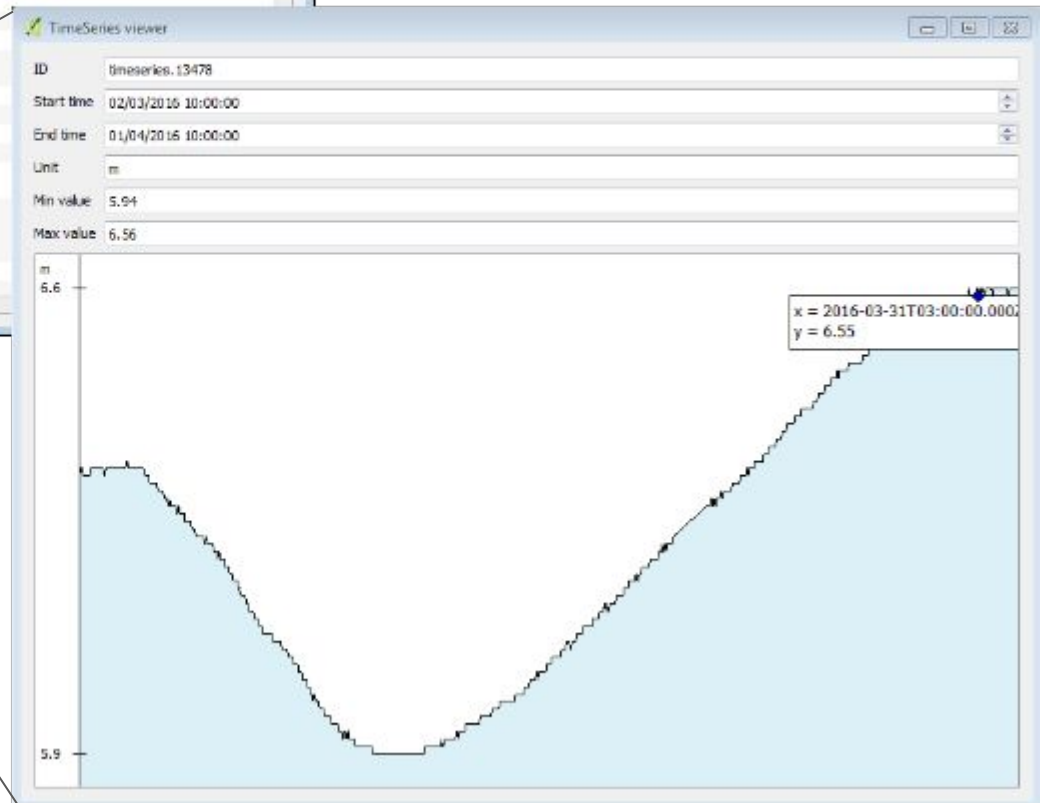
- Copy value
- Copy XPath
- Resolve external
- Embedded
- As a new layer
- Add to layer

Sub-menu for 'Add to layer':

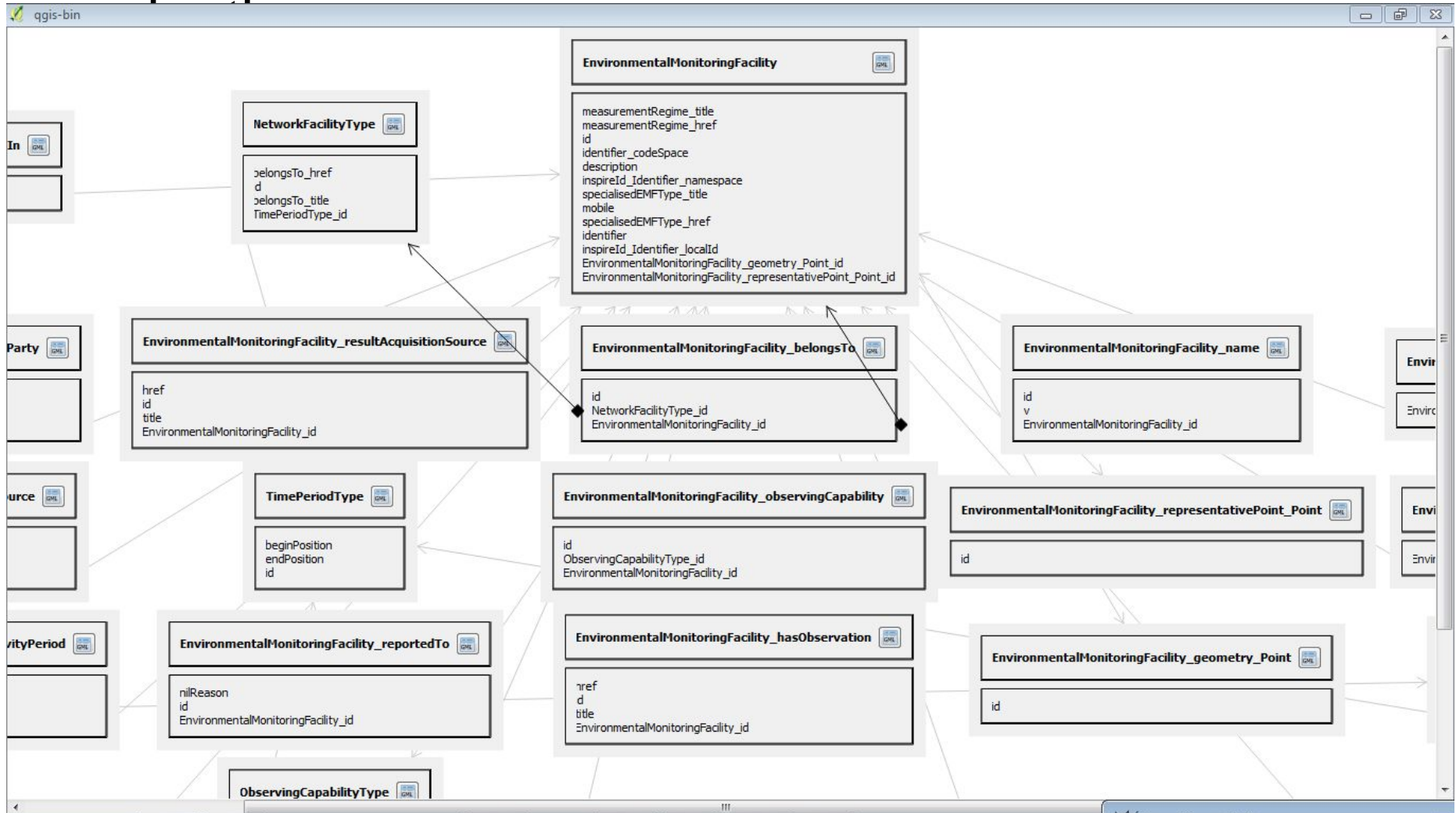
- EnvironmentalMonitoringFacility (points)

XML Mode > SOS Flow

@gmlid	e_13478
om:phenomenonTime	
gml:TimePeriod	
@gmlid	phenomenonTime_13478
gml:beginPosition	2016-03-02T10:00:00.000Z
gml:endPosition	2016-04-01T10:00:00.000Z
om:resultTime	
gml:TimeInstant	
@gmlid	b_C48BD2D22687DFDC1A0D481B11CEB9CE723A690D
gml:timePosition	2016-03-02T10:00:00.000Z
om:procedure	
@link:href	urn:sandre:donnees:MET:FRA:codes:03:referentiel:2.xml
om:parameter	
om:observedProperty	
@link:href	urn:ogc:def:property:OGC:GroundWaterLevel
om:featureOfInterest	
@link:href	02/13/X0132
om:result	
wml2:MeasurementTimeseries	
@gmlid	timeseries_13478



Schema representation with QGIS to ease



What's next ?

Testing

INSPIRE datasets, GeoSciML, ...

A virtual box is available with GDAL+GMLAS
driver + QGIS3 + samples

Open source projects version used and roadmap



GDAL 2.2 April 2017



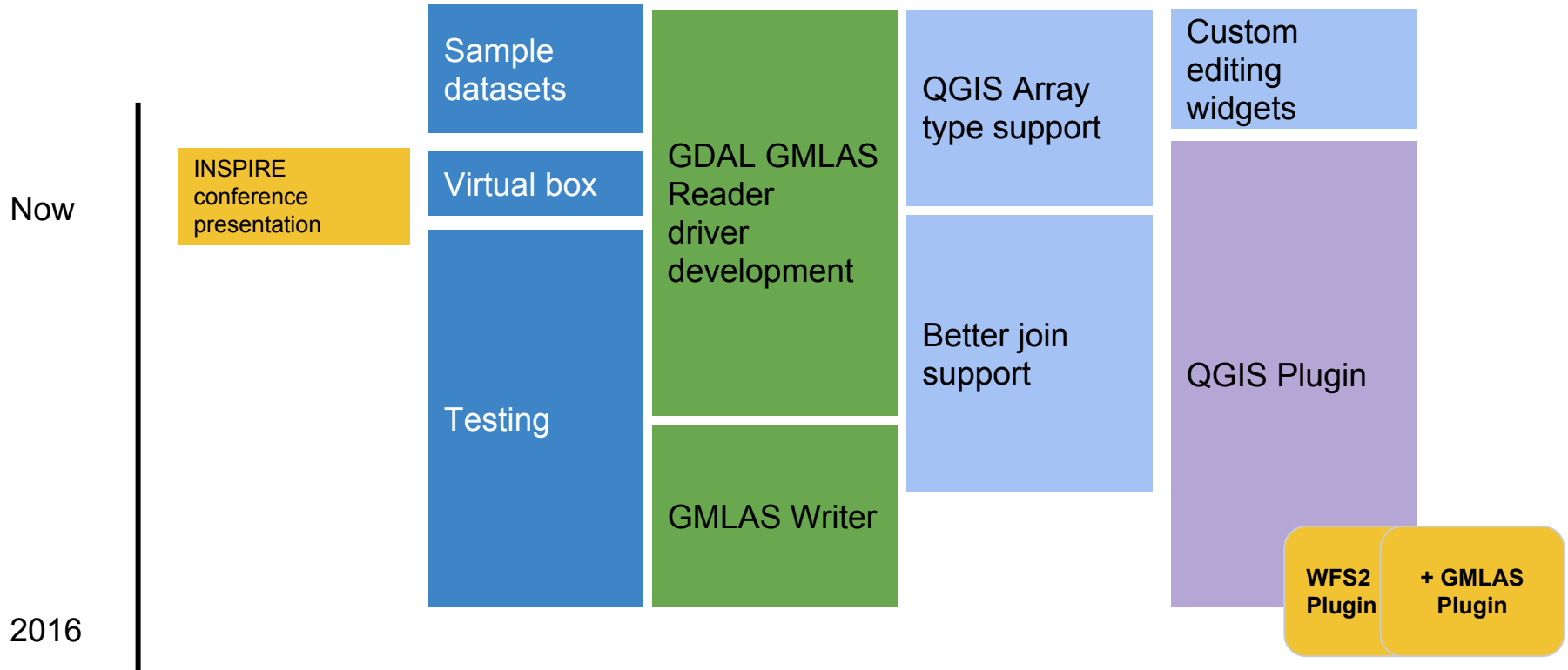
QGIS 3 - 2017

- 2.x series is now a maintenance release (ie. no major changes).
- QGIS 3 was announced in February 2016
- Development will be supported on the long term
- No resources to duplicate the work in 2.x and 3.x series (major changes for Python and QT).
- Contributions to 3.x by adding core functionalities, testing it, migrating plugin (eg. WFS2), which will benefit for the QGIS community



Planning

*POC
GMLAS
Toolbox
Plugin*



Next steps

Finalize the work (2016)

Support publication of GDAL2.2 and QGIS3 + QGIS plugins in QGIS official repository (BRGM POC is already available and work with QGIS2)

Develop a user and developer community

- Have people use it & report usage ...

Enhance the work

- Combine work made in the POC and the current implementation
- Add domain useful widget (Hydrogeologists, ...)
- This work is not INSPIRE specific so it can be useful to the overall OGC community

Links



<https://github.com/rouault/gdal2/tree/gmlas>



<https://github.com/pvalsecc/QGIS/tree/gmlas>

https://plugins.qgis.org/plugins/gml_application_schema_toolbox/
(BRGM POC)



<https://github.com/INSPIRE-MIF/qgis-ogr-gmlas>



<http://files.titellus.net/vbox/> for testing