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QGIS GML application schema toolbox guided tour-use case on French Groundwater Information Network (GIN)

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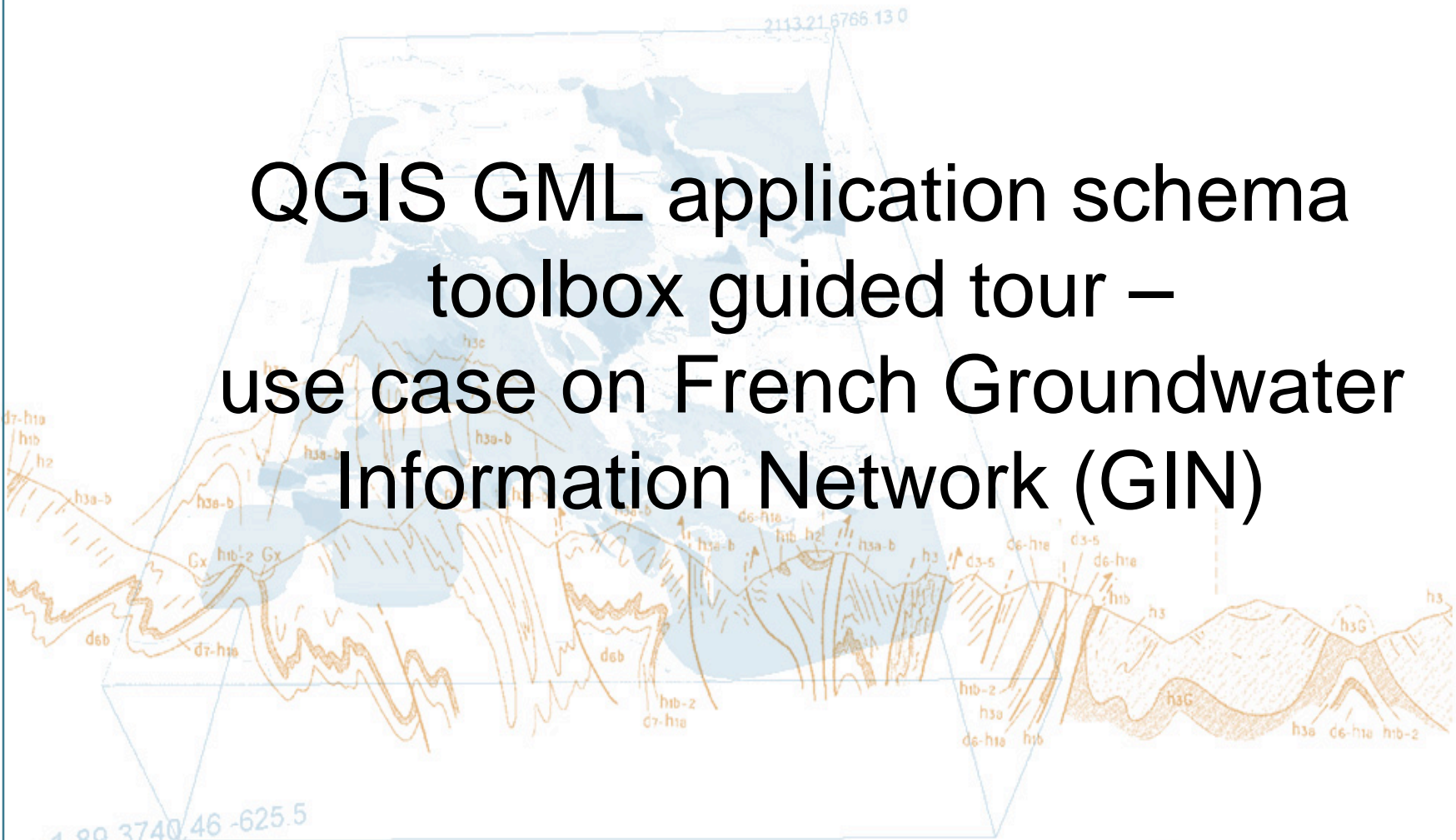
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QGIS GML application schema toolbox guided tour – use case on French Groundwater Information Network (GIN)



S.Grellet – BRGM / H.Mercier – Oslandia

French GIN – linked data use case

> Objectives

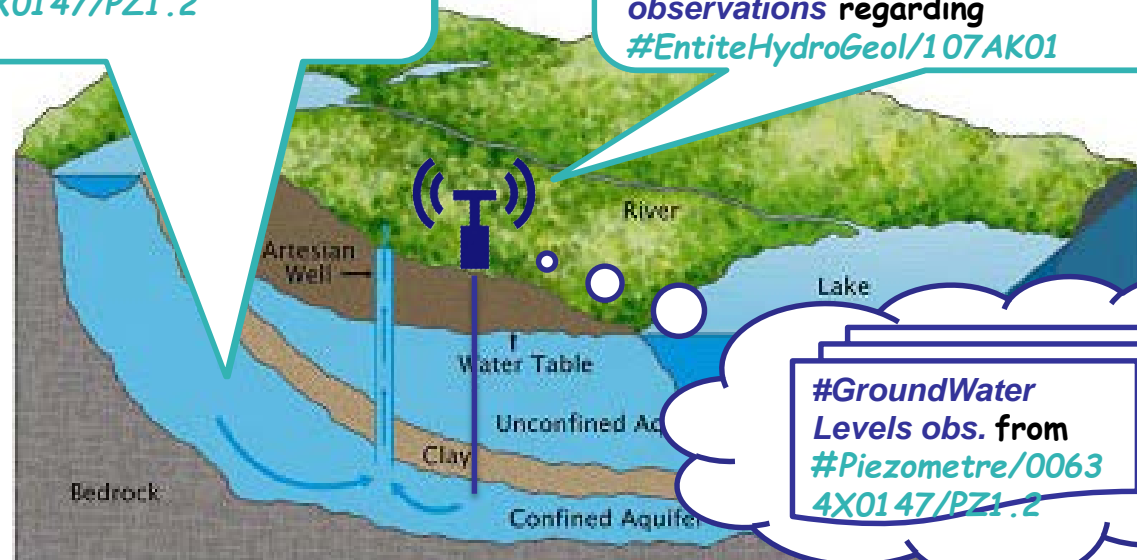
- To provide stable and resolvable links to resources
- To allow reference / data citation
- Independant from underlying technologies used to provide data

I am [#EntiteHydroGeol/107AK01](#)

I am monitored by
[#Piezometre/00634X0147/PZ1.2](#)

I am [#Piezometre/00634X0147/PZ1.2](#)
attached to [#Borehole/00634X0147/PZ1.2](#)

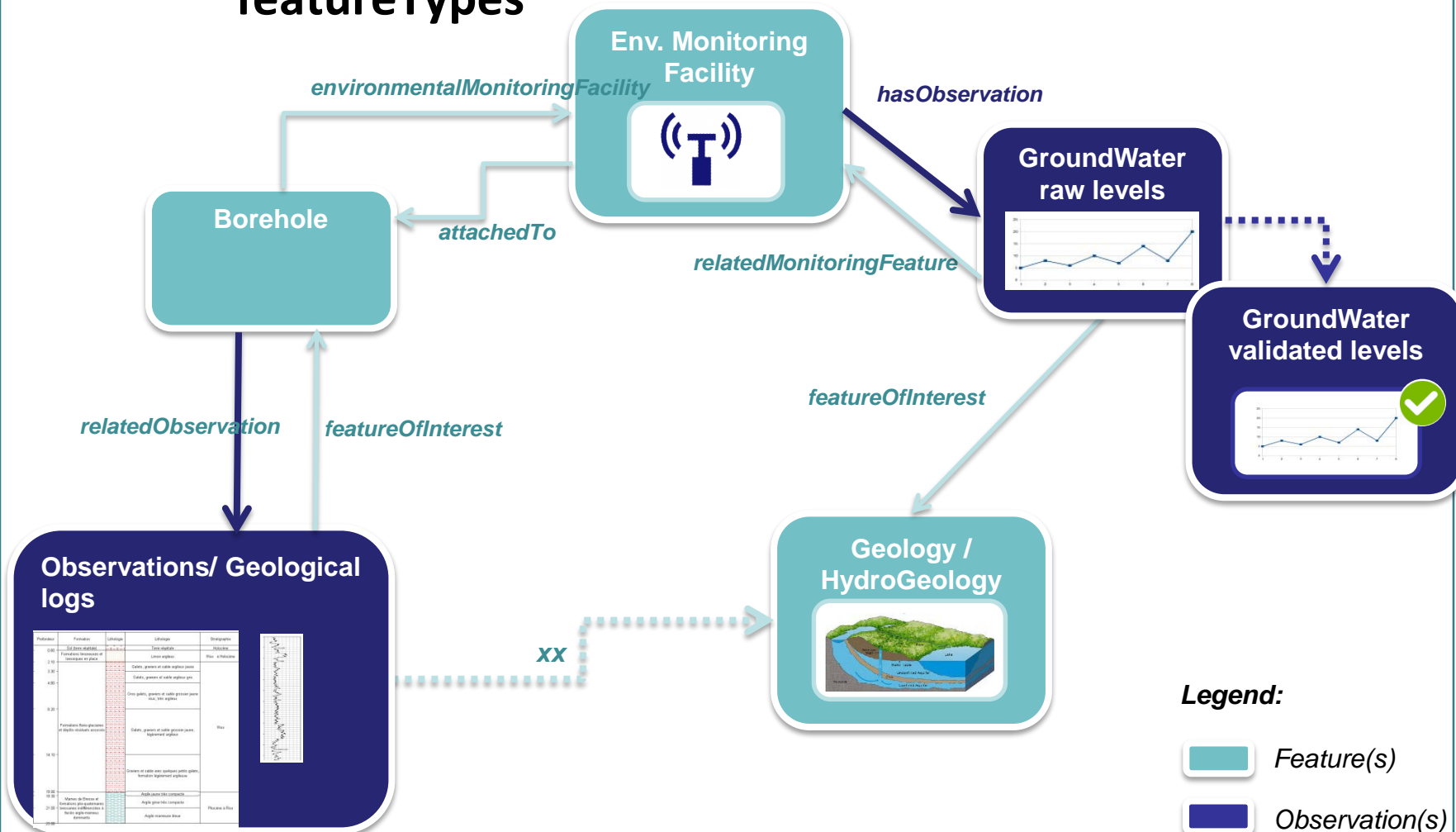
I have a lot of [#GroundWater Levels](#)
observations regarding
[#EntiteHydroGeol/107AK01](#)



[#GroundWater Levels obs. from #Piezometre/00634X0147/PZ1.2](#)

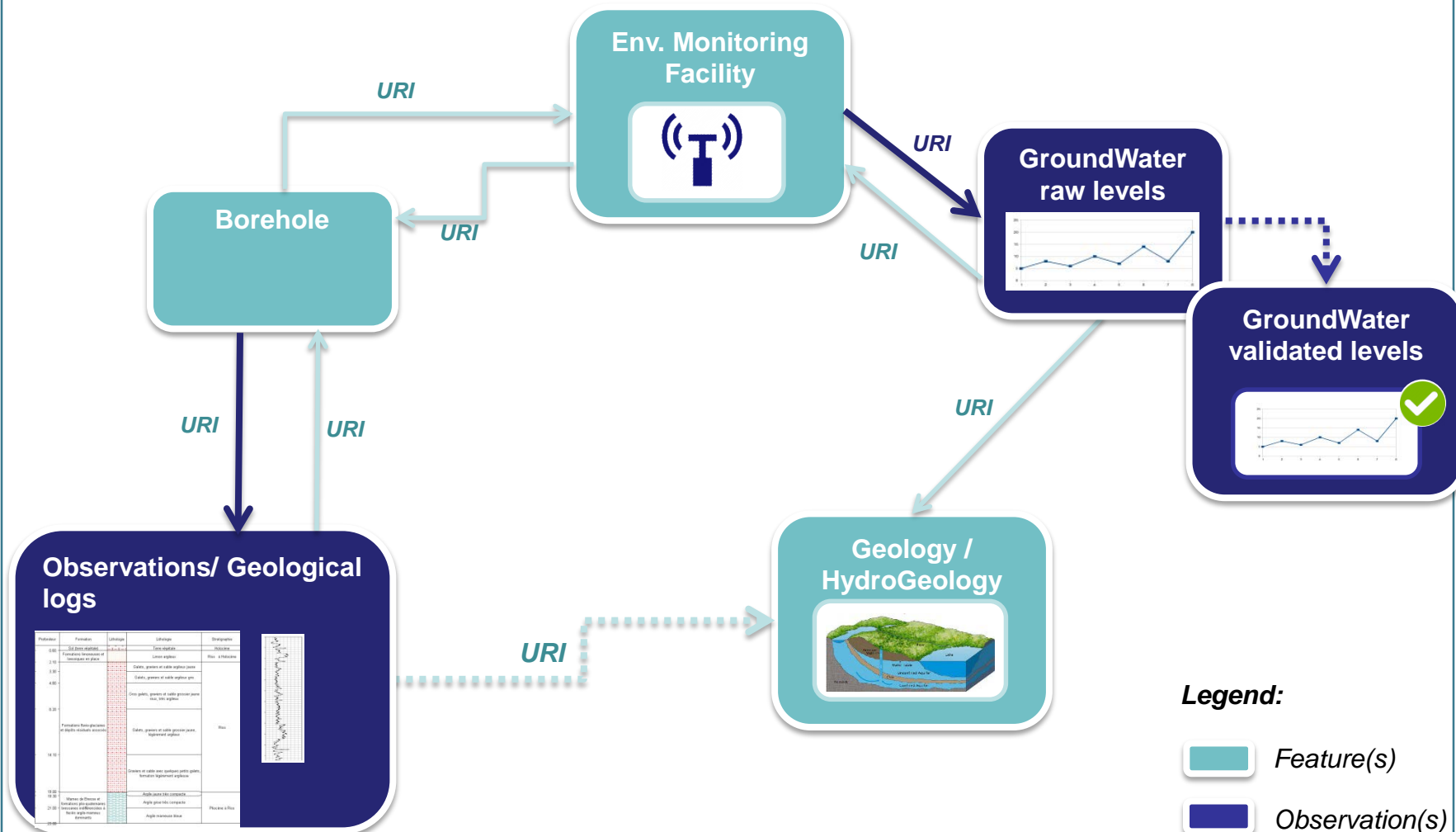
French GIN – linked data use case

> Flows based on OGC and INSPIRE defined featureTypes



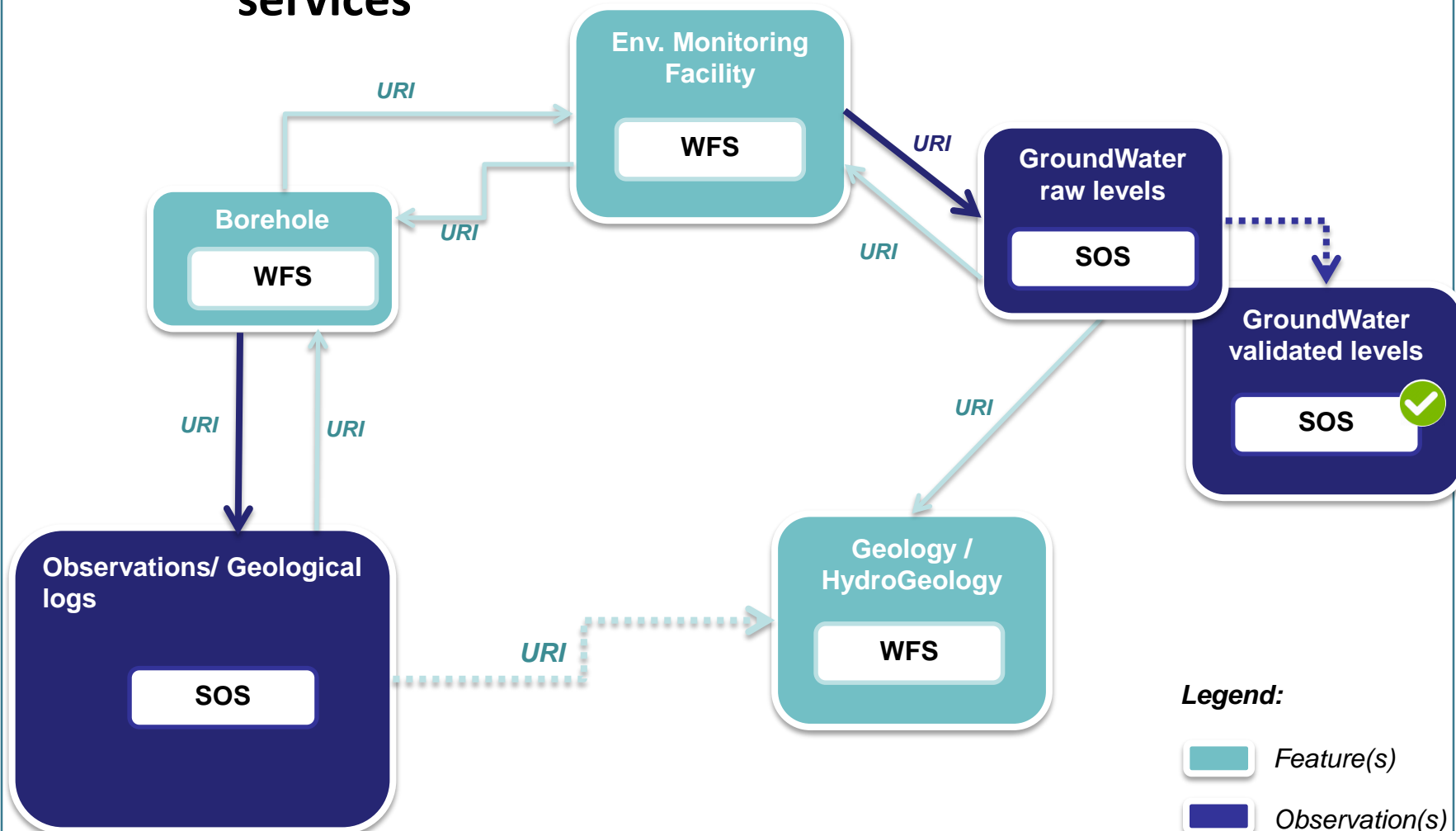
French GIN – linked data use case

> Object instances are associated by their URI



French GIN – linked data use case

- URI allowing to dereference content exposed by OGC services



GML application schema toolbox - overview

> Initial idea

- Reuse information available in XML compliant to xsd(s) to handle this content with no hardcoded configuration -> XML aware and database generation on the fly.

> Retrieve objects of interest described according to an interoperable standard

- = semantic and geographical representation
- interacts with the content (XML and Database). Database -> plug other tools

> Resolve XLinks to add more content

- vocabulary registry definitions (multilinguism is handled)
- linked domain features / observation

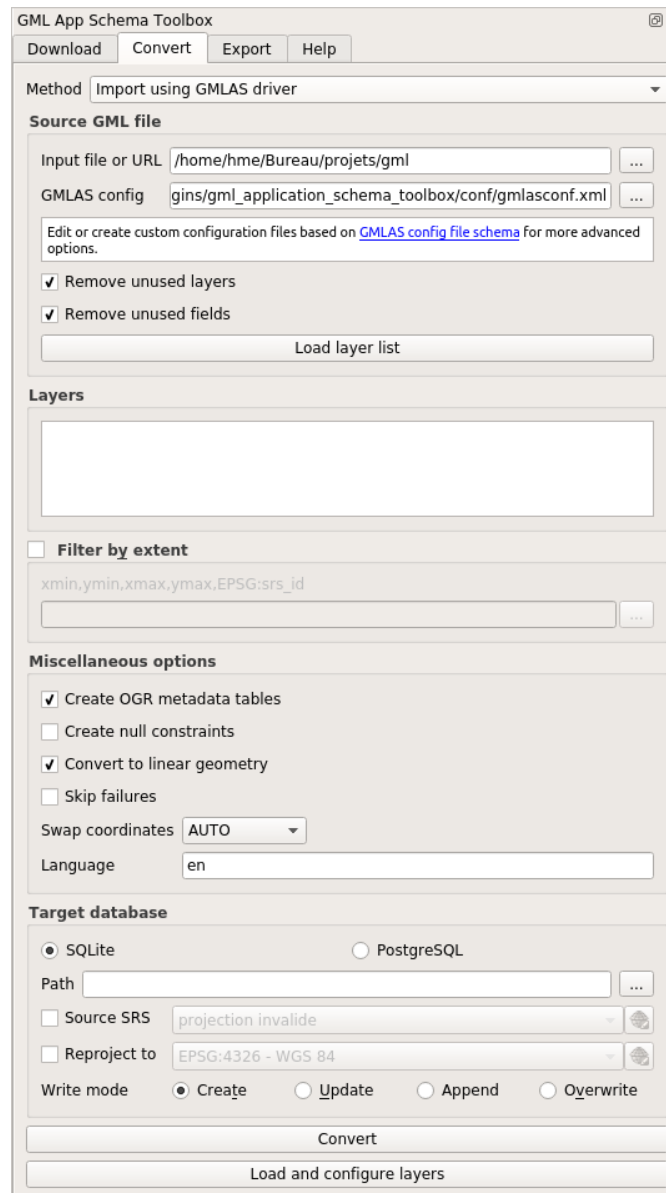
GML application schema toolbox - overview

- > Trigger custom widgets based on interoperability standards**
 - working: Waterml 2 timeseries, Inspire PointTimeSeries
 - drafty: GW_GeologyLogCoverage
 - on-going EU AirqualityDirective timeseries

- > Writes content (file not WFS-T)**

- > Standalone OGR/GDAL driver -> reuse**

GML application schema toolbox use – QGIS 3



GML application schema toolbox - overview

> Two modes

- XML mode
- “relational” mode, thanks to GMLAS GDAL driver
 - QGIS project automatic configuration (layers / relations / editor widgets)
 - navigation in the model through standard QGIS forms

measurementtimeseries :: Features total: 1, filtered: 1, selected: 0

Expression

defaulttvpmetadata_defaulttvpmeasurementmetadata_pkid

ogr_pkid: A9F79F_DefaultTVPMeasurementMetadata_1

uom_code: m

interpolationtype_href: def/timeseriesType/WaterML/2.0/continuous

interpolationtype_title: Instantaneous

▼ measurementtimeseries_point

Expression

1: N links

ogc_fid: 1

ogr_pkid: timeseries.927B7F661CE9CF931A87E119E524A5B328F_point_1

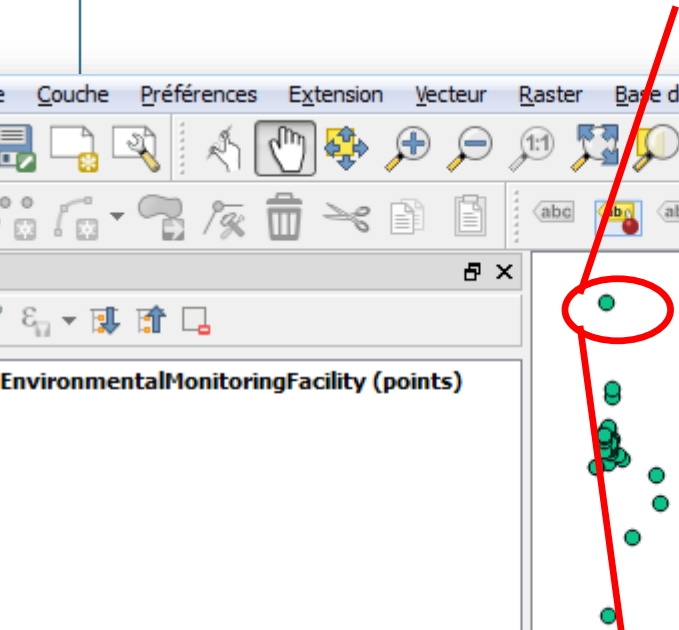
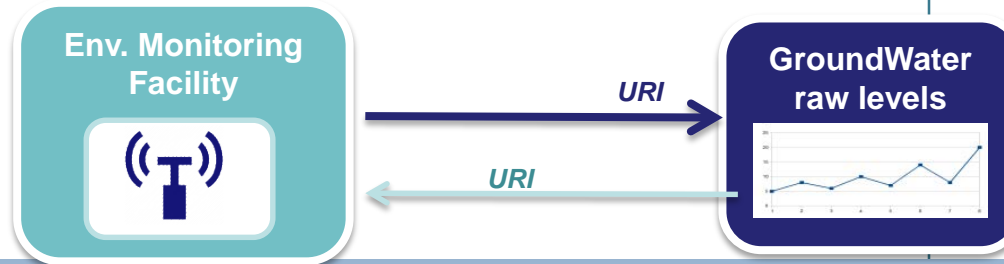
parent_id: 1

measurementvp_time: 2015-12-31T09:00:00.000Z

measurementvp_value: 45.47

Montrer toutes les entités

GML application schema toolbox use – XML



EnvironmentalMonitoringFacility (points) - Attributs d'entités

fid <http://ressource.brgm-rec.fr/data/Piezometre/06988C0281/F.2>

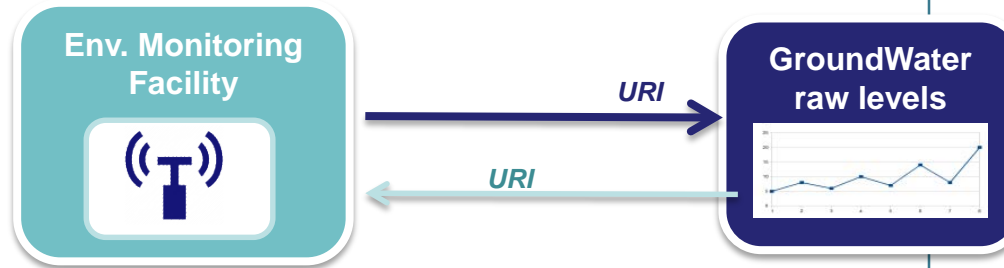
Element	Value
@gml:id	Piezometre.06988C0281.F.2
gml:description	Water well from national BSS (Banque du Sous-Sol) Data database. Piezometer monitoring ground water level
gml:identifier	http://ressource.brgm-rec.fr/data/Piezometre/06988C0281/F.2
@codeSpace	http://www.ietf.org/rfc/rfc2616
ef:inspireId	
ef:name	Piézomètre molasse piscine Chassieu - 69
ef:additionalDescription	
ef:mediaMonitored	
@xlink:href	http://inspire.ec.europa.eu/codelist/MediaValue/water
@xlink:title	water
ef:legalBackground	
ef:geometry	
gml:Point	
@srsName	urn:ogc:def:crs:EPSG:4326
@gml:id	Piezometre.geom.2.06988C0281-F
@srsDimension	2
gml:pos	45.7423745780909 4.96918640527985
ef:onlineResource	http://fichebseau.brgm.fr/bss_eau/fiche.jsf?code=06988C0281/F
ef:purpose	
@xlink:href	http://www.sandre.eaufrance.fr/?urn=urn:sandre:donnees:148::CdElement:2::referentiel:3.1:xml
@xlink:title	Ground water level measurement
ef:broader	
ef:supersedes	
ef:supersededBy	
ef:reportedTo	
ef:hasObservation	
@xlink:href	http://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06988C0281/F.2&responseFormat=http://www.openqgis.net/waterml/2.0&temporalFilter=om%3Aphenomenon
@xlink:title	Latest value (WaterML 2.0 format): Raw groundwater level measurement from piezometer 06988C0281/F.2
ef:hasObservation	
@xlink:href	http://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06988C0281/F.2&responseFormat=application/json&temporalFilter=om%3Aphenomenon
@xlink:title	Latest value (JSON format): Raw groundwater level measurement from piezometer 06988C0281/F.2
ef:hasObservation	
@xlink:href	http://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06988C0281/F.2&responseFormat=http://www.openqgis.net/waterml/2.0
@xlink:title	All observations (WaterML 2.0 format): Raw groundwater level measurement from piezometer 06988C0281/F.2
ef:hasObservation	
@xlink:href	http://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06988C0281/F.2&MergeObservationsIntoDataArray=true
@xlink:title	All observations (WaterML 2.0 format): Raw groundwater level measurement from piezometer 06988C0281/F.2
ef:involvedIn	
ef:representativePoint	


XML

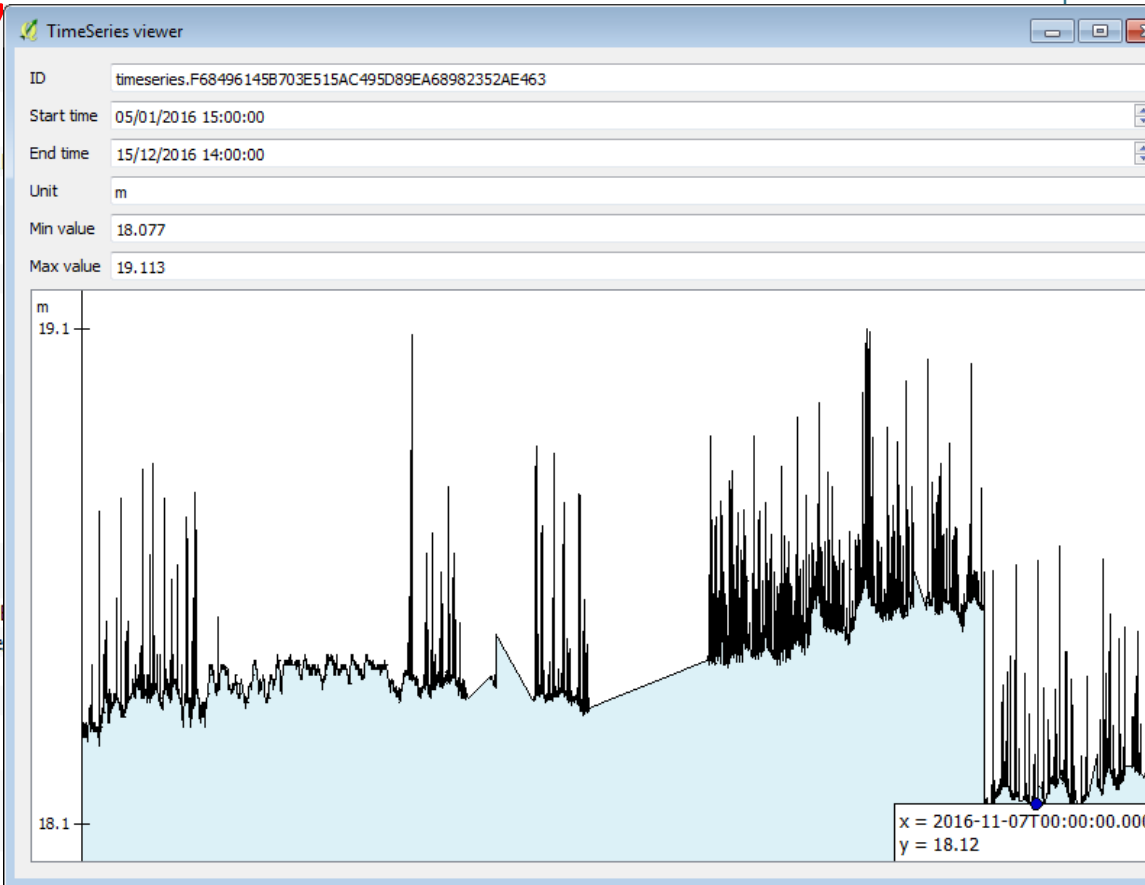
2

A context menu is open over the XML data, showing options: "Copy value", "Copy XPath", "Resolve external", "Embedded", "As a new layer", and "Add to layer". The "Embedded" option is selected.

GML application schema toolbox use – XML

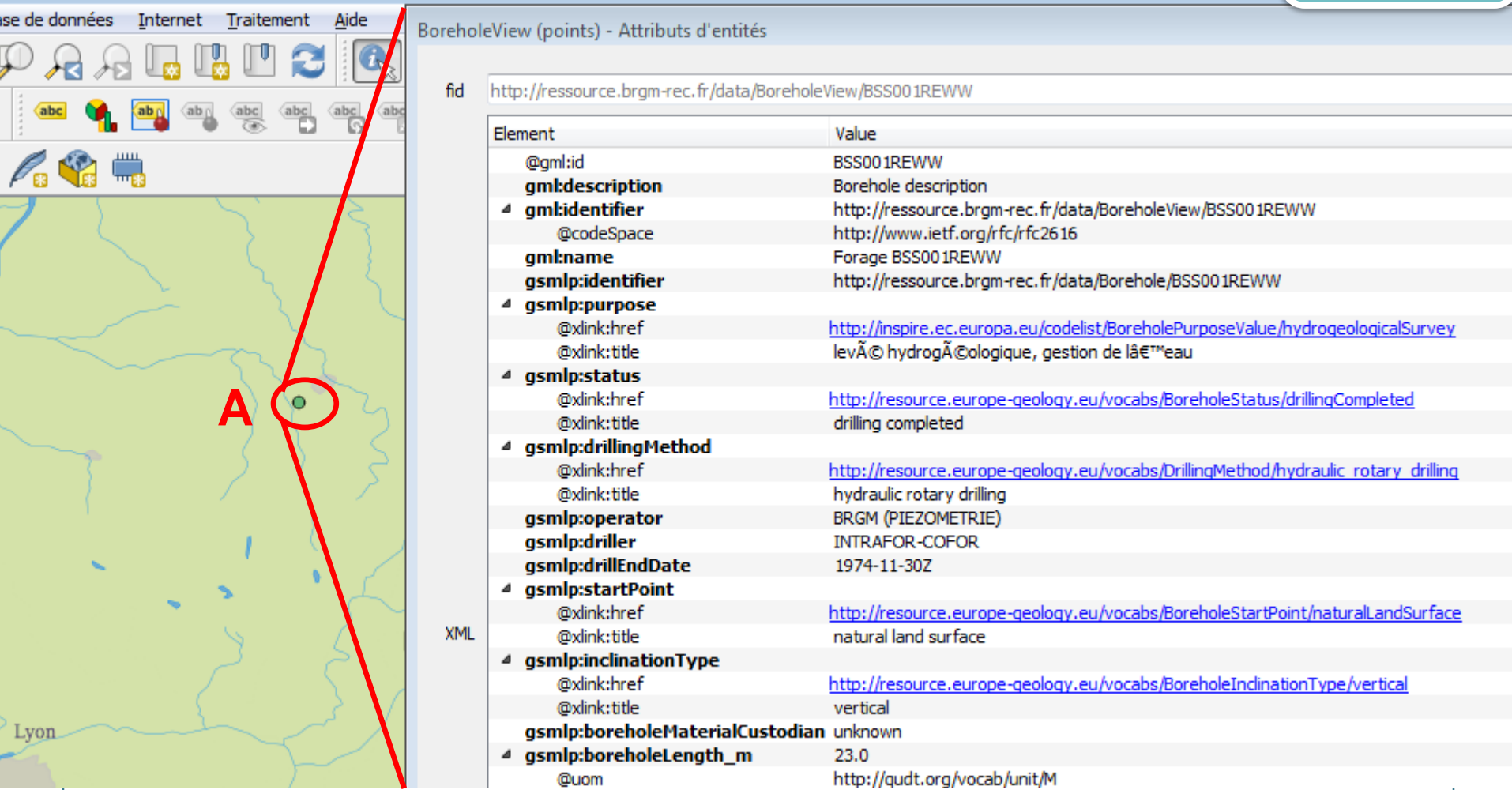


- om:resultTime
 - gml:TimeInstant
 - @gml:id ti_A5B605235028277DAC699731065C39B5E0F1
 - gml:timePo... 2016-12-15T14:00:00.000Z
 - om:procedure
 - @xlink:href <http://id.eaufrance.fr/met/403.xml>
 - @xlink:title Electronic piezometric probe
 - om:parameter
 - om:observedPrope...
 - @xlink:href <http://id.eaufrance.fr/par/1639.xml>
 - @xlink:title GroundWaterLevel
 - om:featureOfInter...
 - wml2:Monitori...
 - @gml:id mp_4C6129829F7C1C2DE4A2FB853F56C5B1A
 - gml:identifi... <http://ressourc...brgm-rec.fr/data/Piezometre>
 - gml:name Piezo 06988C0281/F.2
 - sf:sampledF...
 - sams:shape
 - om:result
 - wml2:Measure...  3



GML application schema toolbox use – XML

Borehole



The screenshot displays a GIS application interface. On the left, a map shows a green area with a red circle and the letter 'A' around a specific point. A red line connects this point to the XML metadata table on the right. The table, titled 'BoreholeView (points) - Attributs d'entités', lists various GML elements and their values for the borehole identified by the URL 'http://ressource.brgm-rec.fr/data/BoreholeView/BSS001REWW'.

Element	Value
@gml:id	BSS001REWW
gml:description	Borehole description
▲ gml:identifier	http://ressource.brgm-rec.fr/data/BoreholeView/BSS001REWW
@codeSpace	http://www.ietf.org/rfc/rfc2616
gml:name	Forage BSS001REWW
gsmlp:identifier	http://ressource.brgm-rec.fr/data/Borehole/BSS001REWW
▲ gsmlp:purpose	
@xlink:href	http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/hydrogeologicalSurvey
@xlink:title	levÃ© hydrogÃ©ologique, gestion de lâ€™eau
▲ gsmlp:status	
@xlink:href	http://resource.europe-geology.eu/vocabs/BoreholeStatus/drillingCompleted
@xlink:title	drilling completed
▲ gsmlp:drillingMethod	
@xlink:href	http://resource.europe-geology.eu/vocabs/DrillingMethod/hydraulic_rotary_drilling
@xlink:title	hydraulic rotary drilling
gsmlp:operator	BRGM (PIEZOMETRIE)
gsmlp:driller	INTRAFOR-COFOR
gsmlp:drillEndDate	1974-11-30Z
▲ gsmlp:startPoint	
@xlink:href	http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface
@xlink:title	natural land surface
▲ gsmlp:inclinationType	
@xlink:href	http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical
@xlink:title	vertical
gsmlp:boreholeMaterialCustodian	unknown
▲ gsmlp:boreholeLength_m	23.0
@uom	http://qudt.org/vocab/unit/M

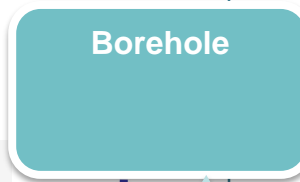
GML application schema toolbox use – XML

Element	Value
gsmlp:drillEndDate	1974-11-30Z
▾ gsmlp:startPoint	
@xlink:href	http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface
@xlink:title	natural land surface
▾ gsmlp:inclinationType	
@xlink:href	http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical
@xlink:title	vertical
gsmlp:boreholeMaterialCustodian	unknown
▾ gsmlp:boreholeLength_m	23.0
@uom	http://qudt.org/vocab/unit/M
▾ gsmlp:elevation_m	223.87
@uom	http://qudt.org/vocab/unit/M
gsmlp:elevation_srs	http://www.opengis.net/def/crs/EPSS/0/5720
gsmlp:source	http://ficheinfoterre.brgm.fr/InfoterreFiche/ficheBss.action?id=06512X0037/STREMY
gsmlp:metadata_uri	http://www.geocatalogue.fr/Detail.do?fileIdentifier=BR_BSS_BAA
gsmlp:genericSymbolizer	Not provided
▾ gsmlp:shape	
▾ gml:Point	
@srsDimension	2
@srsName	urn:ogc:def:crs:EPSG::4326
@gml:id	gsmlp.shape.BSS001REWW
gml:pos	46.1909541655103 5.18713262971692
gsmlp:cored	false
gsmlp:accessToPhysicalDrillCore	false
▾ gsmlp:boreholeUse	
@xlink:href	http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/groundwaterLevelMonitoring
@xlink:title	surveillance du niveau de la nappe phrÃ©atique
▾ gsmlp:detailedDescription	
@xlink:href	http://www.opengis.net/def/nil/OGC/0/template
@xlink:title	template
▾ gsmlp:geophysicalLogs	
@xlink:href	http://www.opengis.net/def/nil/OGC/0/unknown
@xlink:title	unknown
▾ gsmlp:geologicalDescription	
@xlink:href	http://ressource.brgm-rec.fr/obs/RawGeologicLogs/BSS001REWW
@xlink:title	Borehole BSS001REWW geologic log available.
▾ gsmlp:groundWaterLevel	
@xlink:href	http://ressource.brgm-rec.fr/data/Piezometre/06512X0037/STREMY.2
@xlink:title	Description of Piezometer attached to BSS001REWW. Provides link to SensorObservationService offering

Borehole

GML application schema toolbox use – XML

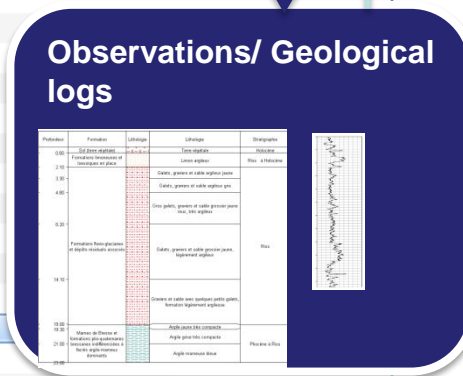
<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> gsmlp:shape <ul style="list-style-type: none"> gml:Point @srsDimension: 2 @srsName: urn:ogc:def:crs:EPSG::4326 @gml:id: gsmlp.shape.BSS001REWW gml:pos: 46.1909541655103 5.18713262971692 gsmlp:cored: false gsmlp:accessToPhysicalDrillCore: false gsmlp:boreholeUse @xlink:href: http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/groundwaterLevelMonitoring @xlink:title: surveillance du niveau de la nappe phrÃ©atique gsmlp:detailedDescription @xlink:href: http://www.openqis.net/def/nil/OGC/0/template @xlink:title: template gsmlp:geophysicalLogs @xlink:href: http://www.openqis.net/def/nil/OGC/0/unknown @xlink:title: unknown gsmlp:geolo @xlink:href: http://ressource.brgm-rec.fr/obs/RawGeologicLogs/BSS001REWW @xlink:title: Borehole BSS001REWW geologic log available. gsmlp:grou @xlink:href: http://data.piezometre.06512X0037/STREMY.2 @xlink:title: Described as related to BSS001REWW. Provides link to SensorObservationService offering gsmlp:groundWaterChemistry @xlink:href: http://www.openqis.net/def/nil/OGC/0/unknown @xlink:title: unknown gsmlp:rockGeochemistry @xlink:href: http://www.openqis.net/def/nil/OGC/0/unknown @xlink:title: unknown gsmlp:poreGasChemistry @xlink:href: http://www.openqis.net/def/nil/OGC/0/inapplicable @xlink:title: inapplicable gsmlp:geoTechnicalInfo @xlink:href: http://www.openqis.net/def/nil/OGC/0/unknown @xlink:title: unknown
--



URI



URI



B

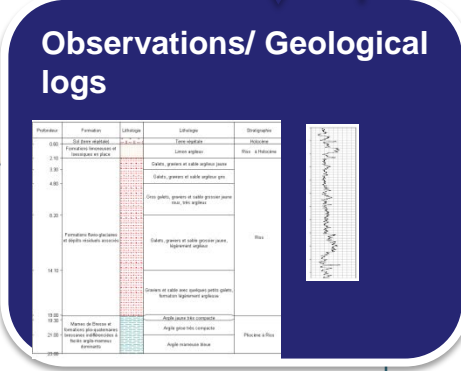
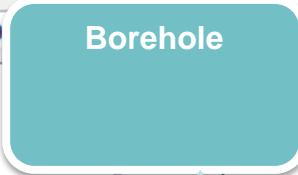
@xlink:href	Copy value	http://ressource.brgm-rec.fr/obs/RawGeologicLogs/BSS001REWW
@xlink:title	Copy XPath	hole BSS001REWW geologic log available.

Resolve external	Embedded
	As a new layer
	Add to layer

GML application schema toolbox use – XML

Geology log viewer

Description Lithologic observation for this level of borehole BSS00



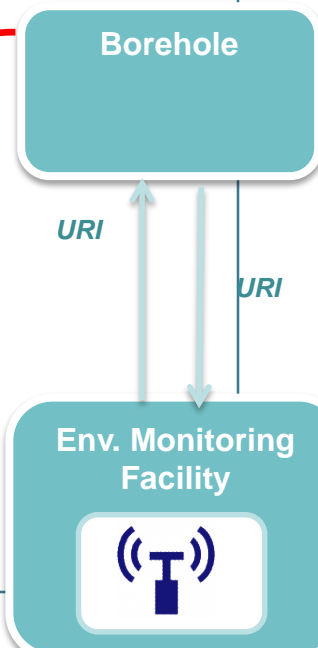
C



http://ressource.brgm-rec.fr/data/BoreholeView/BSS001REWW

Element	Value
gsmlp:drillEndDate	1974-11-30Z
▾ gsmlp:startPoint	
@xlink:href	http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface
@xlink:title	natural land surface
▾ gsmlp:inclinationType	
@xlink:href	http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical
@xlink:title	vertical
gsmlp:boreholeMaterialCustodian	unknown
▾ gsmlp:boreholeLength_m	23.0
@uom	http://qudt.org/vocab/unit/M
▾ gsmlp:elevation_m	223.87
@uom	http://qudt.org/vocab/unit/M
gsmlp:elevation_srs	http://www.opengis.net/def/crs/EPSSG/0/5720
gsmlp:source	http://ficheinfoterre.brgm.fr/InfoterreFiche/ficheBss.action?id=06512X0037/STREMY
gsmlp:metadata_uri	http://www.geocatalogue.fr/Detail.do?fileIdentifier=BR_BSS_BAA
gsmlp:genericSymbolizer	Not provided
▾ gsmlp:shape	
▾ gml:Point	
@srsDimension	2
@srsName	urn:ogc:def:crs:EPSG::4326
@gml:id	gsmlp.shape.BSS001REWW
gml:pos	46.1909541655103 5.18713262971692
gsmlp:cored	false
gsmlp:accessToPhysicalDrillCore	false
▾ gsmlp:boreholeUse	
@xlink:href	http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/groundwaterLevelMonitoring
@xlink:title	surveillance du niveau de la nappe phrÃ©atique
▾ gsmlp:detailedDescription	
@xlink:href	http://www.opengis.net/def/nil/OGC/0/template
@xlink:title	template
▾ gsmlp:geophysicalLogs	
@xlink:href	http://www.opengis.net/def/nil/OGC/0/unknown
@xlink:title	unknown
▾ gsmlp:geologicalDescription	
@xlink:href	http://ressource.brgm-rec.fr/obs/RawGeologicLogs/BSS001REWW
@xlink:title	Borehole BSS001REWW geologic log available.
▾ gsmlp:groundWaterLevel	
@xlink:href	http://ressource.brgm-rec.fr/data/Piezometre/06512X0037/STREMY
@xlink:title	Description of Piezometer attached to BSS001REWW. Provides link to SensorObservationService offering

→ back to slides 9, 10



GML application schema toolbox use – Database

- WaterML2 flow (see slide 10, Timeseries viewer) but client in database mode

The screenshot displays the QGIS interface with the GML application schema toolbox open. The schema diagram shows several entities and their relationships:

- MonitoringPointType_sampledFeature**: Attributes include href, id, title, and MonitoringPointType_id.
- MonitoringPointType_name**: Attributes include codeSpace, id, and MonitoringPoint.
- MeasurementTimeseriesType_point**: Attributes include id, MeasurementTVP_value, MeasurementTVP_time, and MeasurementTimeseriesType_id. This entity is highlighted with a red box.
- MeasurementTimeseriesType**: Attributes include metadata_MeasurementTimeseriesMetadata_temporalExtent_href and id.
- OM_Observation**: Attributes include procedure_href and observedProperty_href.
- MonitoringPointType**: A base entity for the sampled features.

A table view for 'Table attributaire - MeasurementTimeseriesType_point' is overlaid, showing the following data:

MeasurementTVP_value	MeasurementTVP_time	id	MeasurementTimeseriesType_id
45.41	2016-01-10T02:00:00.000Z	233	timeseries.927B7...
45.41	2016-01-10T03:00:00.000Z	234	timeseries.927B7...
45.41	2016-01-10T04:00:00.000Z	235	timeseries.927B7...
45.41	2016-01-10T05:00:00.000Z	236	timeseries.927B7...
45.41	2016-01-10T06:00:00.000Z	237	timeseries.927B7...
45.41	2016-01-10T07:00:00.000Z	238	timeseries.927B7...
45.41	2016-01-10T08:00:00.000Z	239	timeseries.927B7...
45.4	2016-01-10T09:00:00.000Z	240	timeseries.927B7...
45.4	2016-01-10T10:00:00.000Z	241	timeseries.927B7...
45.4	2016-01-10T11:00:00.000Z	242	timeseries.927B7...
45.4	2016-01-10T12:00:00.000Z	243	timeseries.927B7...
45.4	2016-01-10T13:00:00.000Z	244	timeseries.927B7...
45.4	2016-01-10T14:00:00.000Z	245	timeseries.927B7...

FOSS4G-E 2017 workshop – Paris – 2017-07-18

GML application schema toolbox - Custom viewers API

> Custom viewer?

- a piece of code able to present some data in a visually appealing way
e.g. : timeseries as plot rather than list of (x,y) values

> Main ideas

- a simple and common way to express access to data: **XPath** on the xsd
- a common graphical API: **PyQT**
- a simple way to add new viewers for specific application schemas (targeted to Python dev audience for now)
 - Just create a new .py file in a given directory
 - With a common base Python class

GML application schema toolbox - Custom viewers API

example.py

Raw

```
1 class GeologyLogViewer(QWidget):
2     @classmethod
3     def name(cls):
4         return "GW Geology log"
5
6     @classmethod
7     def xml_tag(cls):
8         # the XML tag (with namespace) this widget is meant for
9         # the second element of the tuple is an XPath filter
10        return ("{http://www.opengis.net/om/2.0}OM_Observation",
11              ".:/om:type[@xlink:href='http://www.opengis.net/def/observationType/OGC-GWML/2.2/GW_GeologyLog']")
12
13    @classmethod
14    def icon(cls):
15        return QIcon(os.path.join(os.path.dirname(__file__), "drill.svg"))
16
17    @classmethod
18    def init_from_xml(cls, xml_tree):
19        # parse data
20        data = []
21        description = resolve_xpath(xml_tree, "description/text()")
22        logs = resolve_xpath(xml_tree, "result/GW_GeologyLogCoverage/element/LogValue")
23        data = []
24        for log in logs:
25            fromDepth = float(resolve_xpath(log, "fromDepth/Quantity/value/text()"))
26            toDepth = float(resolve_xpath(log, "toDepth/Quantity/value/text()"))
27            value_text = resolve_xpath(log, "value/DataRecord/field/Text/value/text()")
28            value_cat = resolve_xpath(log, "value/DataRecord/field/Category/value/text()")
29            value = value_text if value_text is not None else value_cat
30            data.append((fromDepth, toDepth, value))
31        return cls(description, data)
32
33    def __init__(self, title, data, parent = None):
34        QWidget.__init__(self, parent)
35        # ...
```

Useful links

- > https://plugins.qgis.org/plugins/gml_application_schema_toolbox/
- > https://github.com/BRGM/gml_application_schema_toolbox
 - Documentation, GUI presentation
- > **Multilinguism handling**
 - INSPIRE registry: same flow asking for English then Greek definitions
<https://www.youtube.com/watch?v=EeAyyUOykVE>
- > **How to test under QGIS3 until its official release**
 - [OSGeo4W](#)
 - Use [OSGeo4W](#) installer
 - Advanced install \ Desktop -> add qgis-dev
 - Then install the plugin from QGIS repository
 - Virtualbox : http://hekla.oslandia.net/qgis_gmlas_box/

Conclusion

> **Generic work successfully tested on**

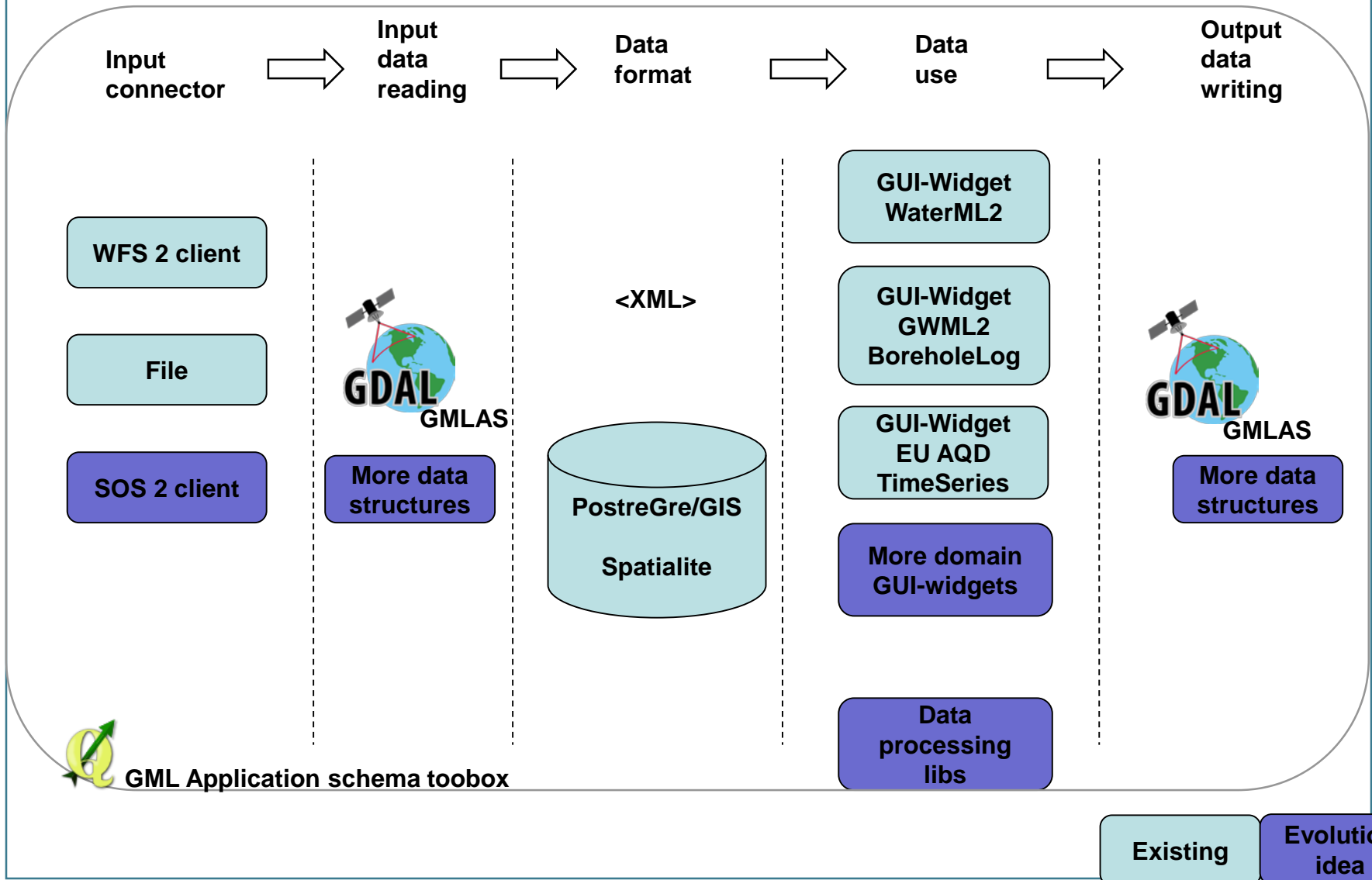
- OGC : GroundWaterML2, GeoSciML4, WaterML2
- INSPIRE : EnvironmentalMonitoringFacilities, BioGeographicalRegions, LandCover, ProtectedSites, MineralResources, PointTimeSeriesObservation

> **Our domain colleagues can now finally make use of standardized content 😊**

> **Next steps**

- Address (some) SWE specificities
- Have more domain widgets
- Handle other content type (JSON-LD ?)
- Workshop at Foss4G-E : [github ticket](#) to gather content to play with
- Feel free to use, test, enhance it, propose evolutions

Conclusion - wishlist



Thank you

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