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

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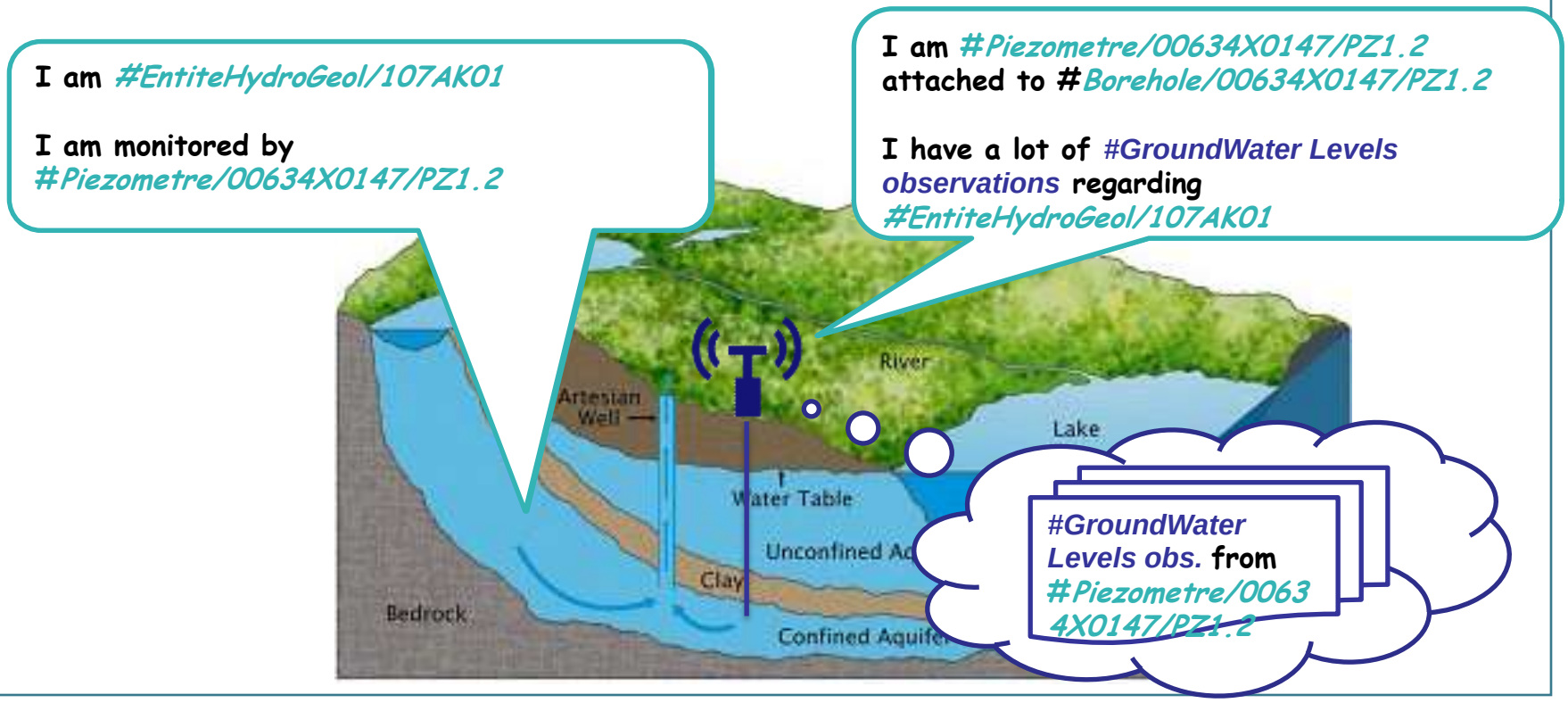
French GIN – linked data use case

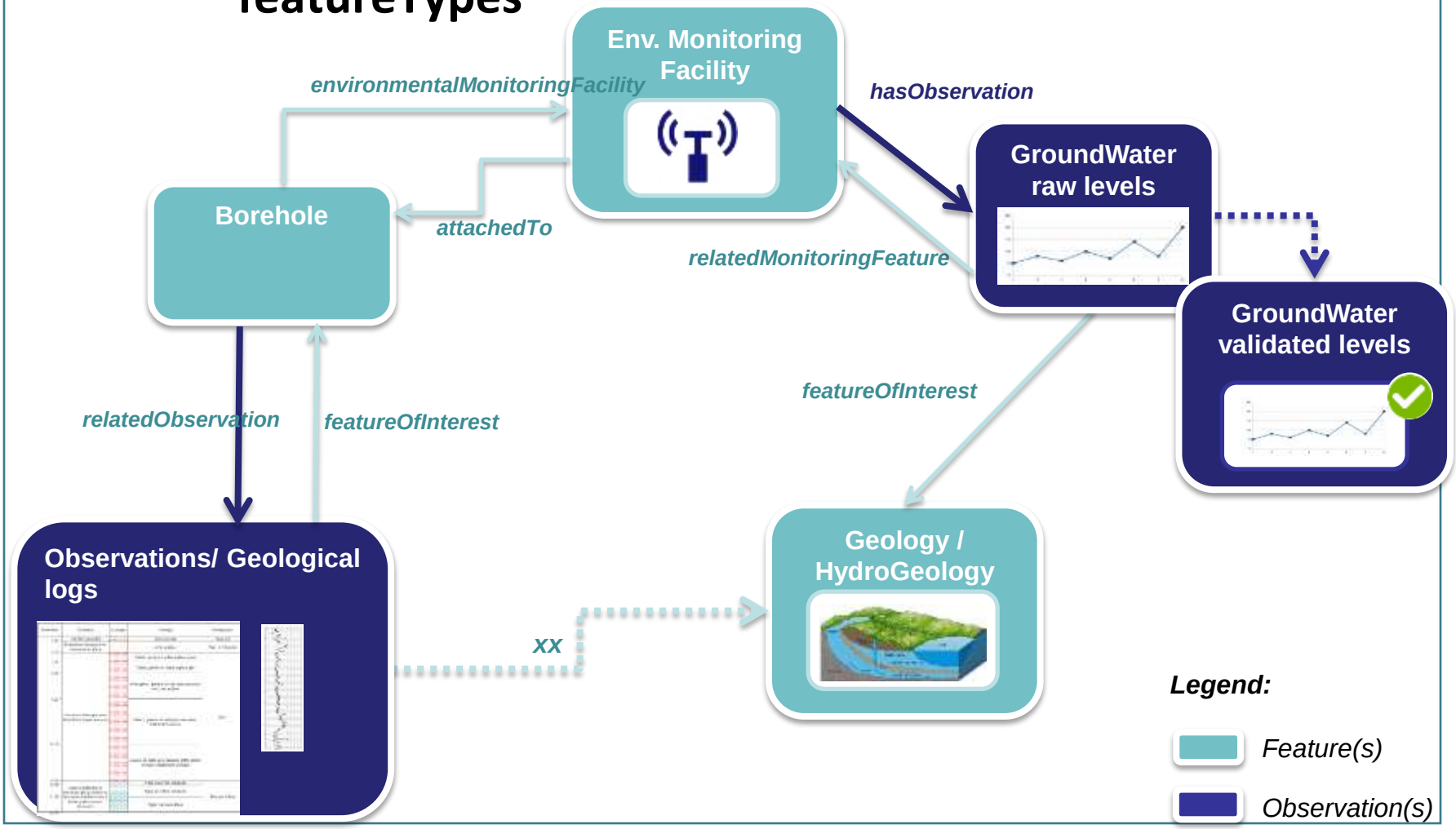
> Objectives

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



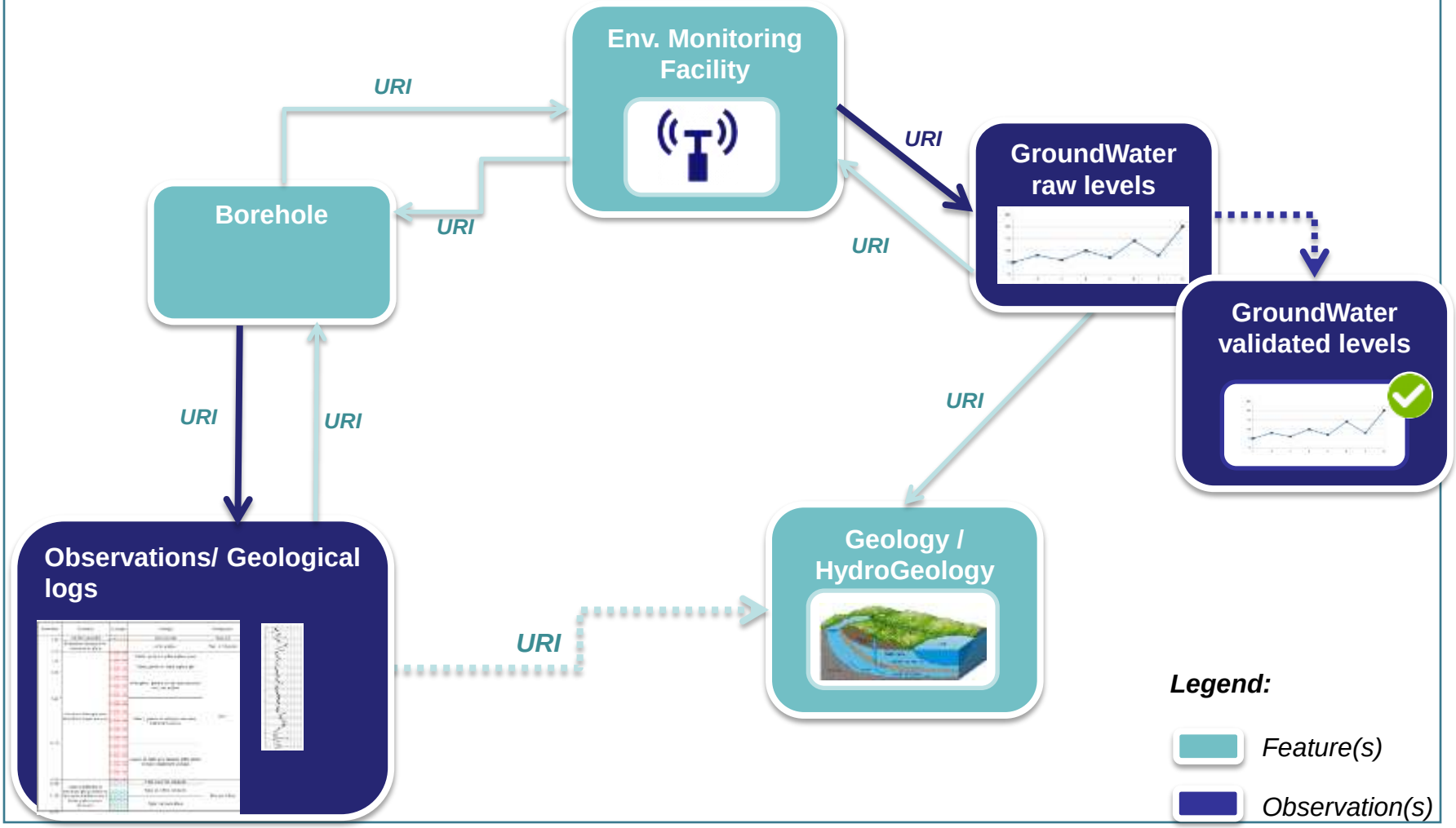
French GIN – linked data use case

> **Flows based on OGC and INSPIRE defined featureTypes**



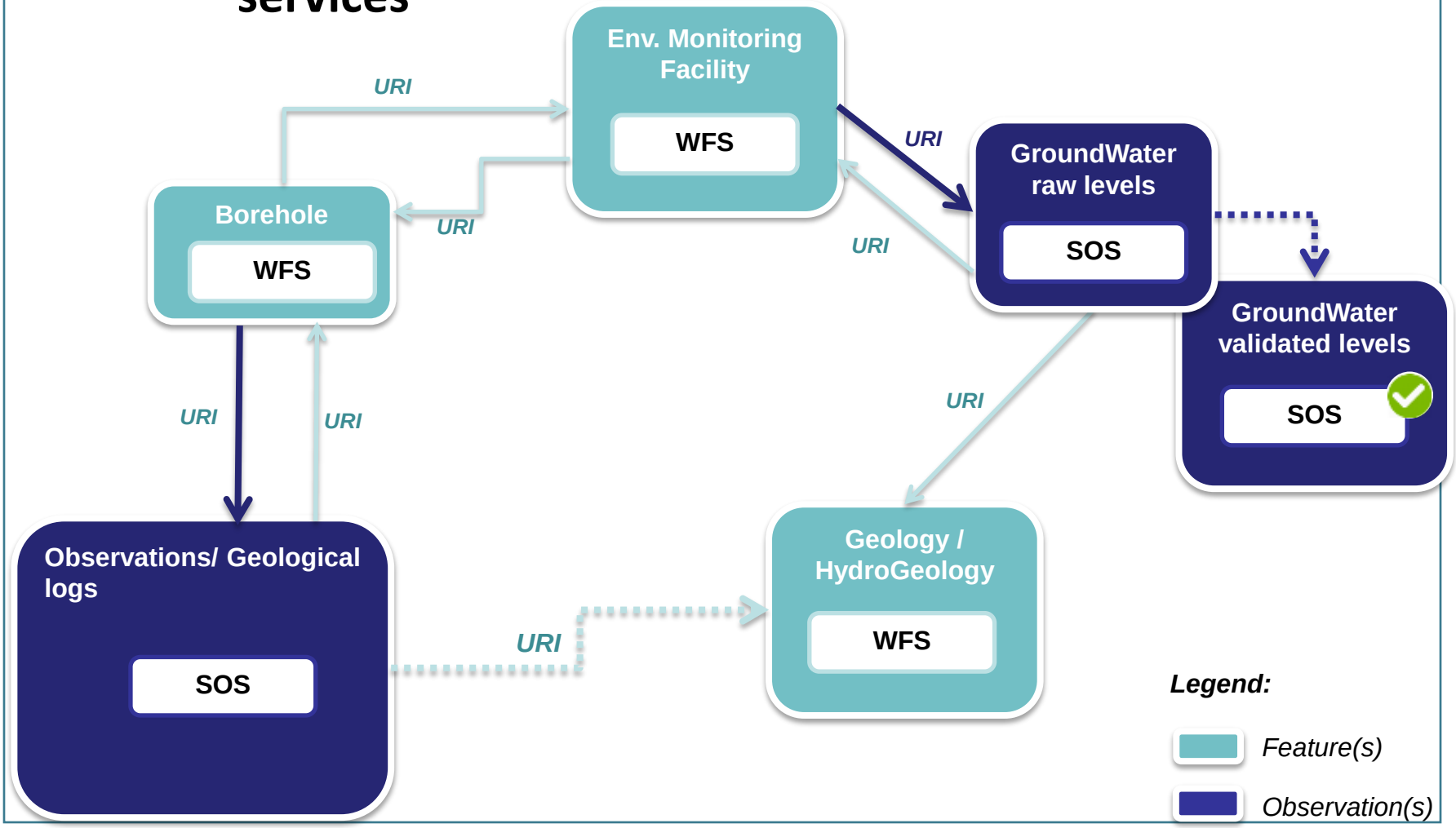
French GIN – linked data use case

> **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

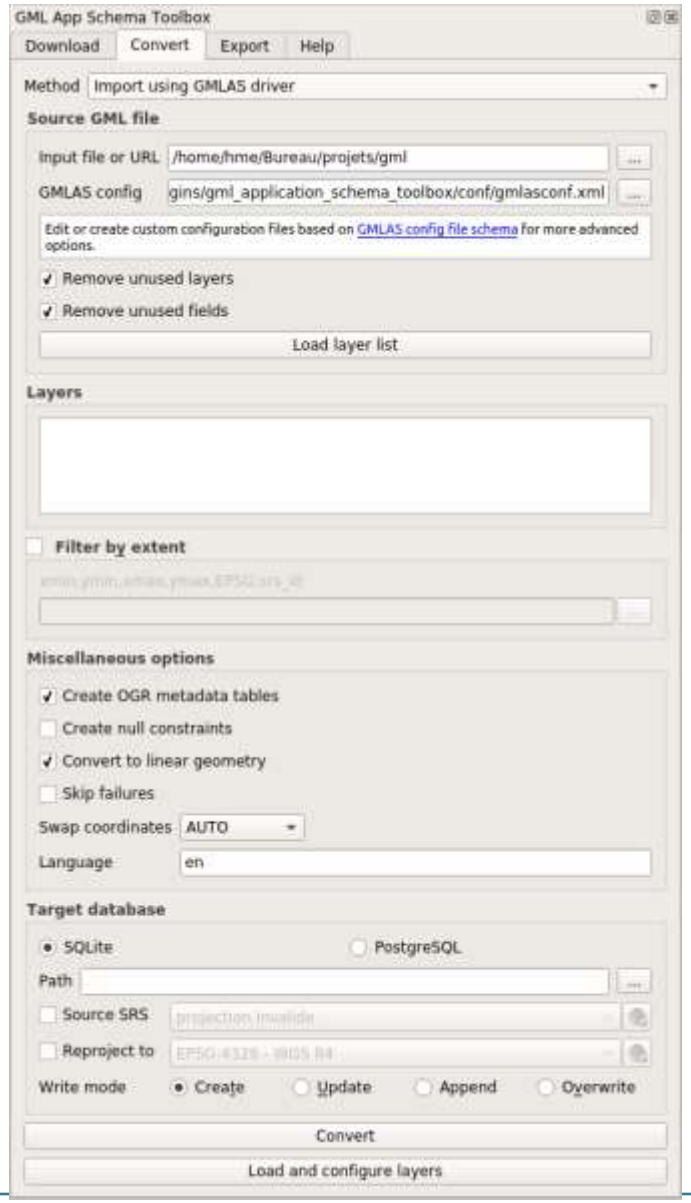
> Resolve XLinks to add more content

- 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**

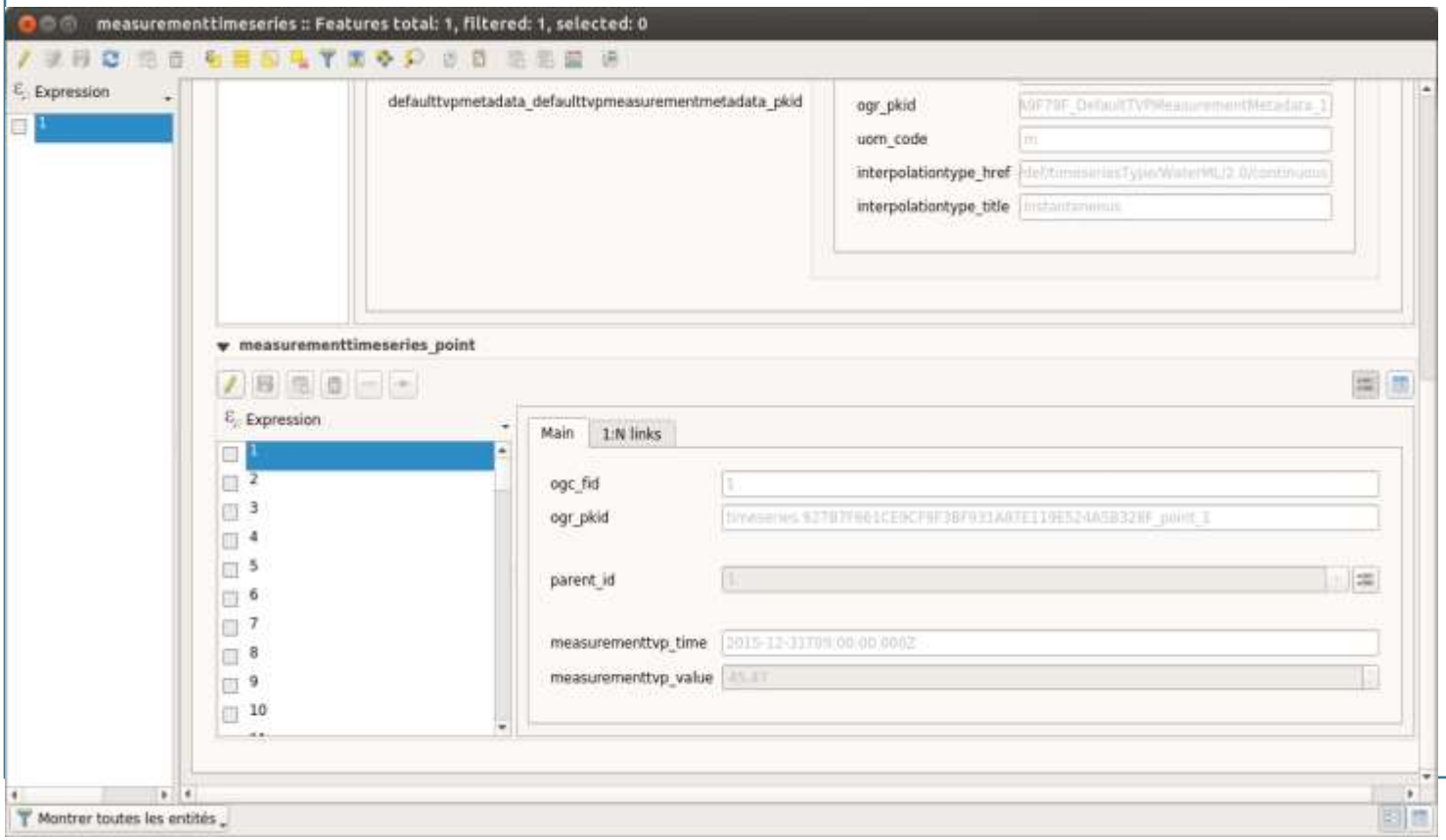
GML application schema toolbox use – QGIS 3



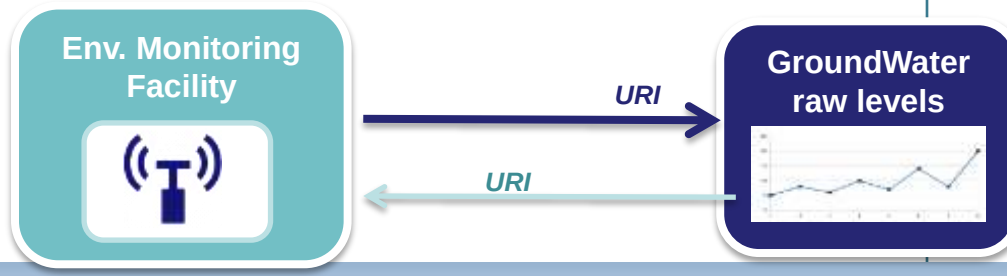
GML application schema toolbox - overview

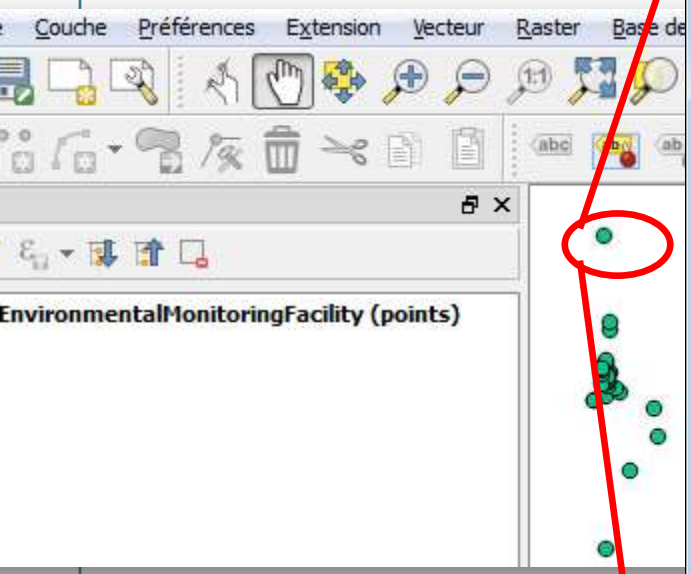
> Two modes

- 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



GML application schema toolbox use – XML





1

EnvironmentalMonitoringFacility (points) - Attributs d'entités

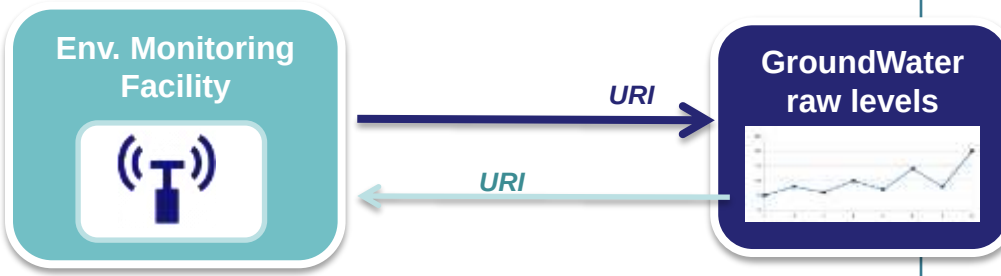
fid http://ressource.brgm-rec.fr/data/Piezometre/06988C0281/F.2

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://fichebsseau.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	
XML @xlink:href	http://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06988C0281/F.2&responseFormat=http://www.opengis.net/waterml/2.0&temporalF
@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%3Aphenom
@xlink:title	Latest value (JSON format): Raw groundwater level measurement from piezometer 06988C0281/F.2
ef:has	
@x	tp://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06988C0281/F.2&responseFormat=http://www.opengis.net/waterml/2.0
@x	ll observations (WaterML 2.0 format): Raw groundwater level measurement from piezometer 06988C0281/F.2
ef:has	
@xlink:href	/obs/RawOfferingPiezo/06988C0281/F.2&MergeObservationsIntoDataArray=true
@xlink:title	w groundwater level measurement from piezometer 06988C0281/F.2
ef:involvedIn	
ef:representativePoint	

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

2

GML application schema toolbox use – XML



om:resultTime

gml:TimeInstant

@gml:id ti_A5B605235028277DAC699731065C3985E0F1

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_4C6129829FDC1C2DE4A2FB853F56C5B1AE

gml:identifier http://ressource.brgm-rec.fr/data/Piezometre

gml:name Piezo 06988C0281/F.2

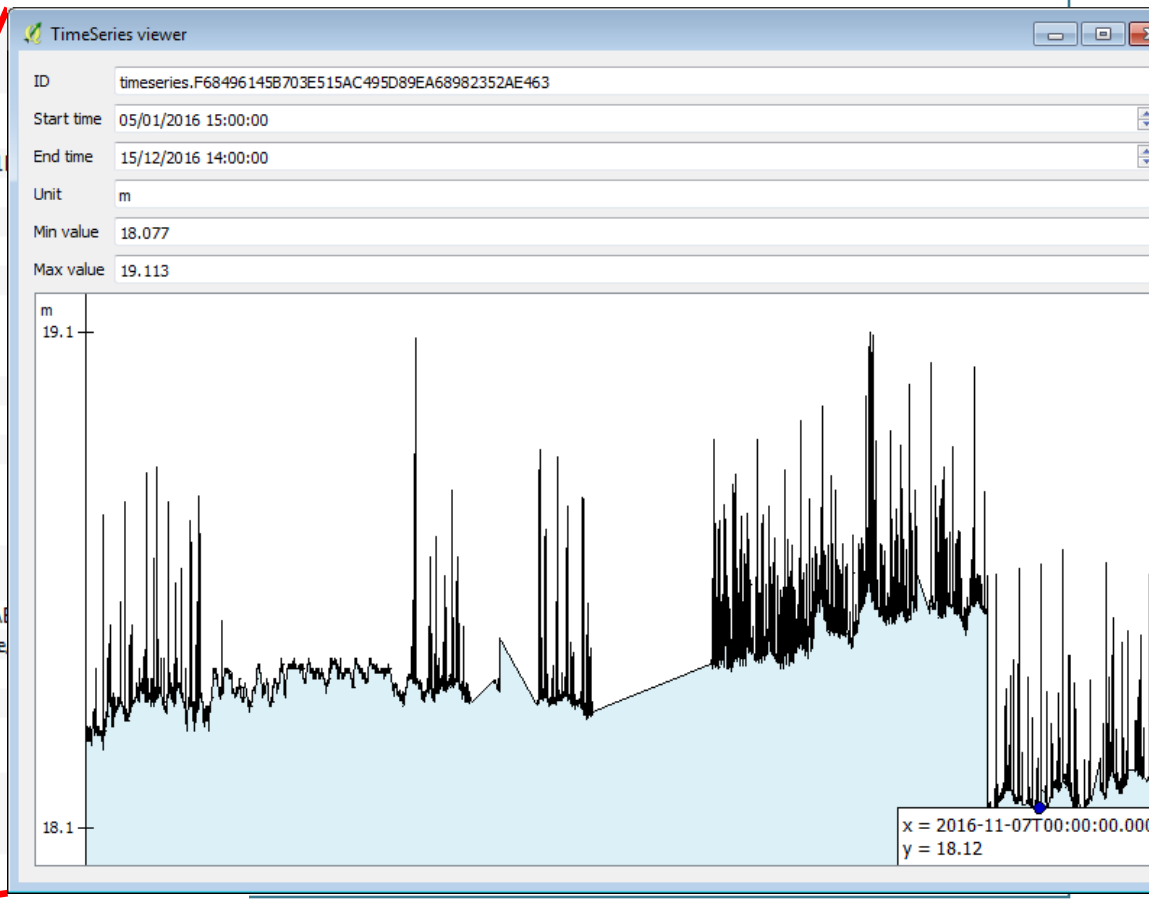
sf:sampledF...

sams:shape

om:result

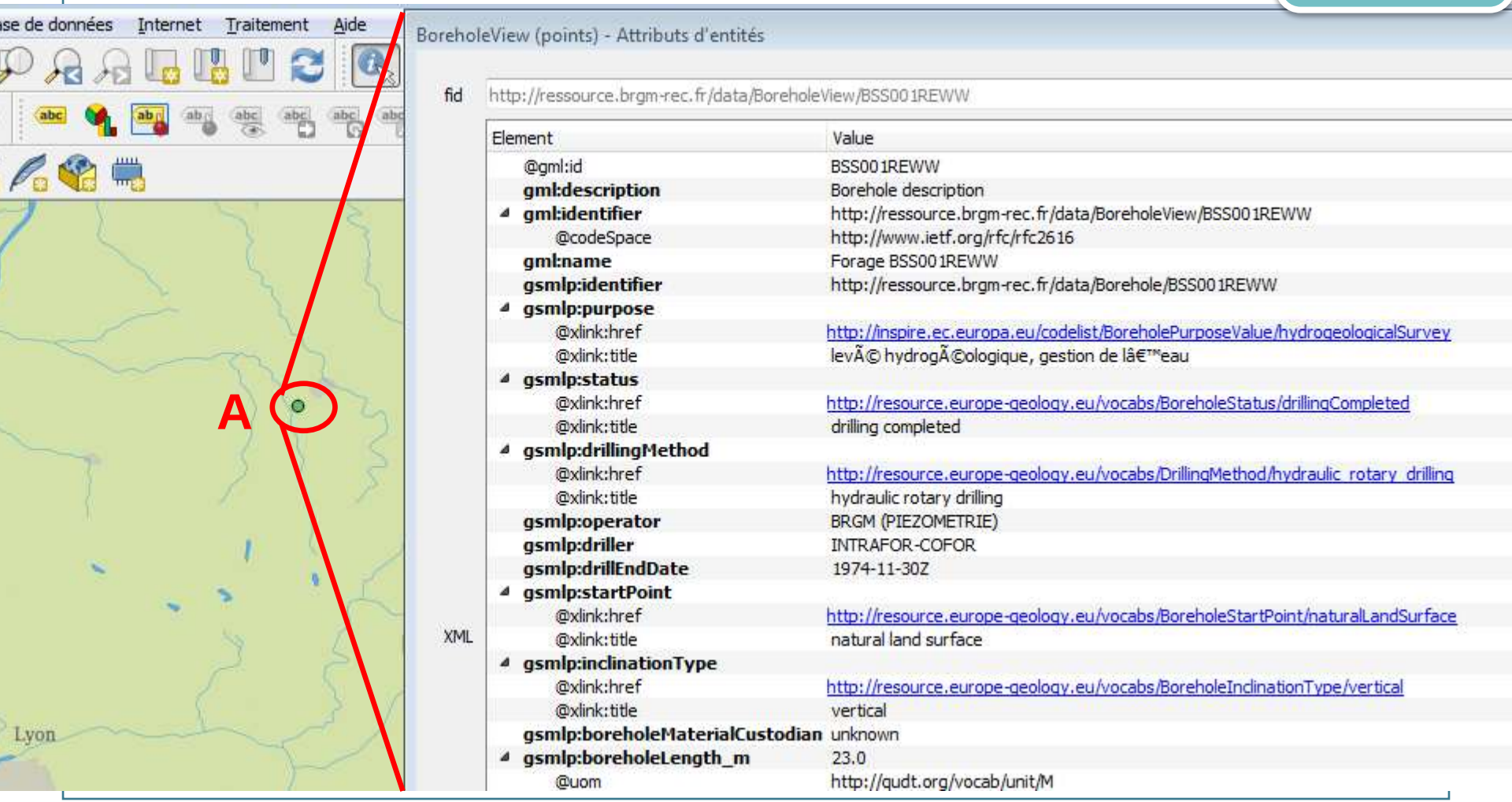
wml2:Measure...

3



GML application schema toolbox use – XML

Borehole



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/EPSG/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

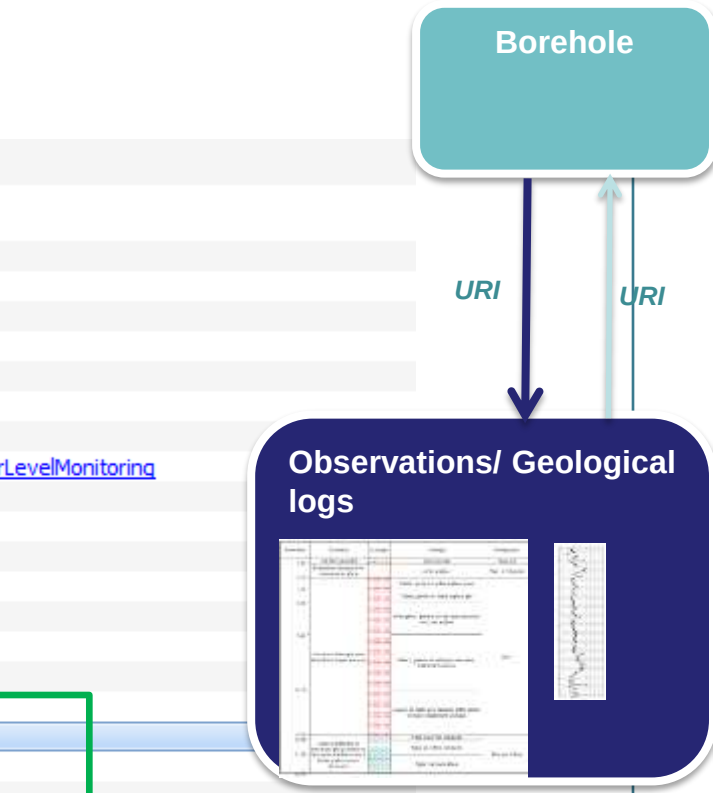
Borehole

GML application schema toolbox use – XML

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:geolo	
@xlink:hre	/ressource.brgm-rec.fr/obs/RawGeologicLogs/BSS001REWW
@xlink:titl	hole BSS001REWW geologic log available.
gsmlp:grour	
@xlink:hre	ata/Piezometre/06512X0037/STREMY.2
@xlink:title	Des hed to BSS001REWW. Provides link to SensorObservationService offering
gsmlp:groundWaterChemistry	
@xlink:href	http /OGC/0/unknown
@xlink:title	unknown
gsmlp:rockGeochemistry	
@xlink:href	http://www.opengis.net/def/nil/OGC/0/unknown
@xlink:title	unknown
gsmlp:poreGasChemistry	
@xlink:href	http://www.opengis.net/def/nil/OGC/0/inapplicable
@xlink:title	inapplicable
gsmlp:geoTechnicalInfo	
@xlink:href	http://www.opengis.net/def/nil/OGC/0/unknown
@xlink:title	unknown

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

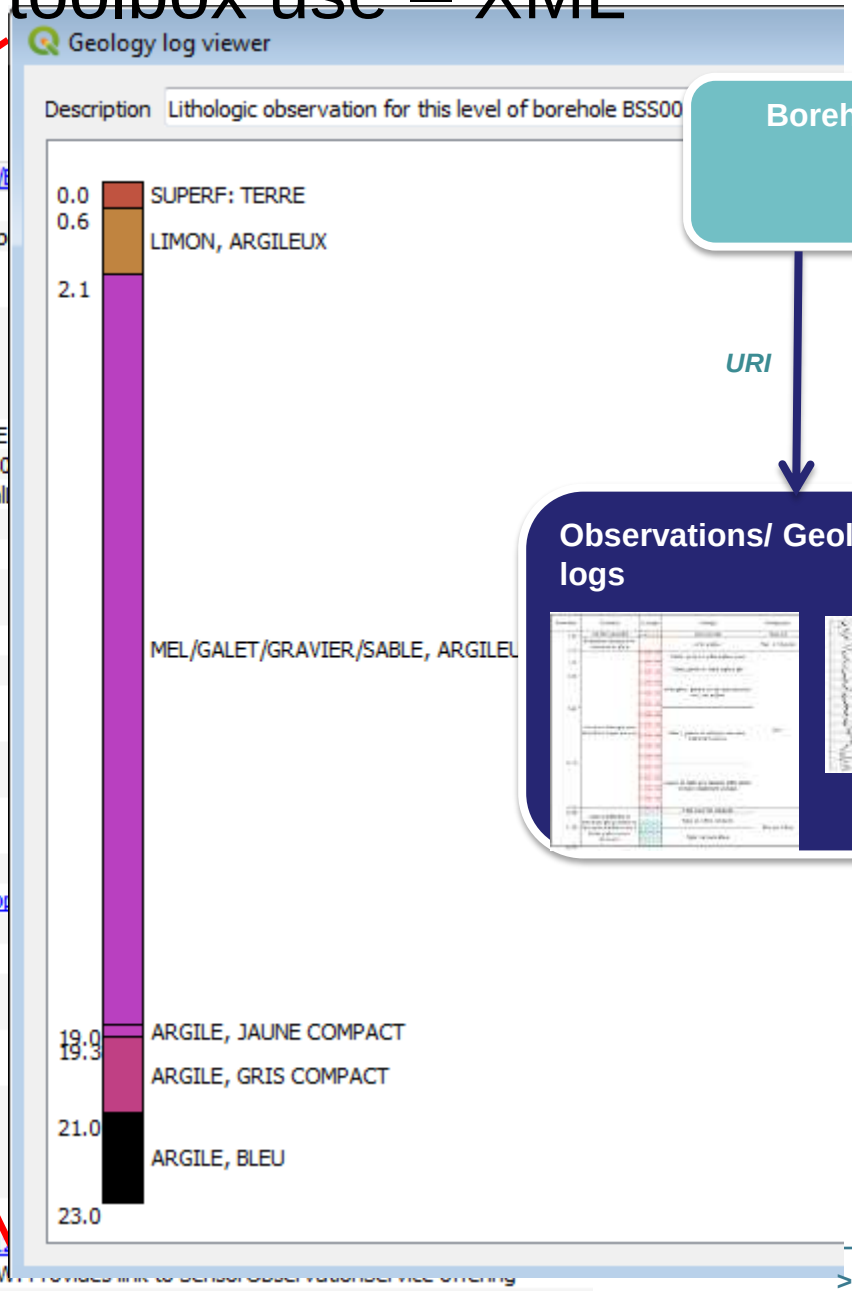
B



GML application schema toolbox use – XML

- sos:GetObservationResponse
  - @xlink:href — http://ressource.brgm-rec.fr/obs/RawGeologicLogs/
  - @xlink:title — Borehole BSS001REWW geologic log available.
  - @xsi:schemaLocation — http://www.opengis.net/sos/2.0 http://schemas.op
  - sos:observationData
    - om:OM_Observation
      - @gml:id — o_B8A57ECD13F439A702FBAD713F09AA17FC951E
      - gml:description — Lithologic observation for this level of borehole BSS0
      - gml:identifier — http://ressource.brgm-rec.fr/obs/RawEarthMaterial
      - gml:name — RawEarthMaterialLogObservation BSS001REWW
      - om:type
      - om:phenomenonTime
      - om:resultTime
      - om:procedure
      - om:parameter
      - om:parameter
      - om:parameter
      - om:observedProperty
        - @xlink:href — http://www.opengis.net/def/gwml/2.0/observedProp
        - @xlink:title — Earth Material
      - om:featureOfInterest
      - om:result
  - sos:observationData
    - om:OM_Observation
- gsmlp:groundWaterLevel
  - @xlink:href — http://ressource.brgm-rec.fr/data/Piezometre/0651
  - @xlink:title — Description of Piezometer attached to BSS001REWW

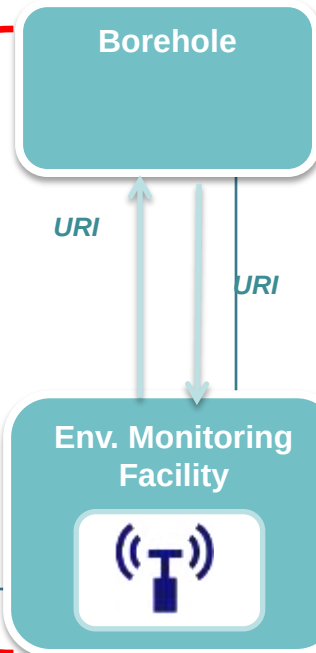
C



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

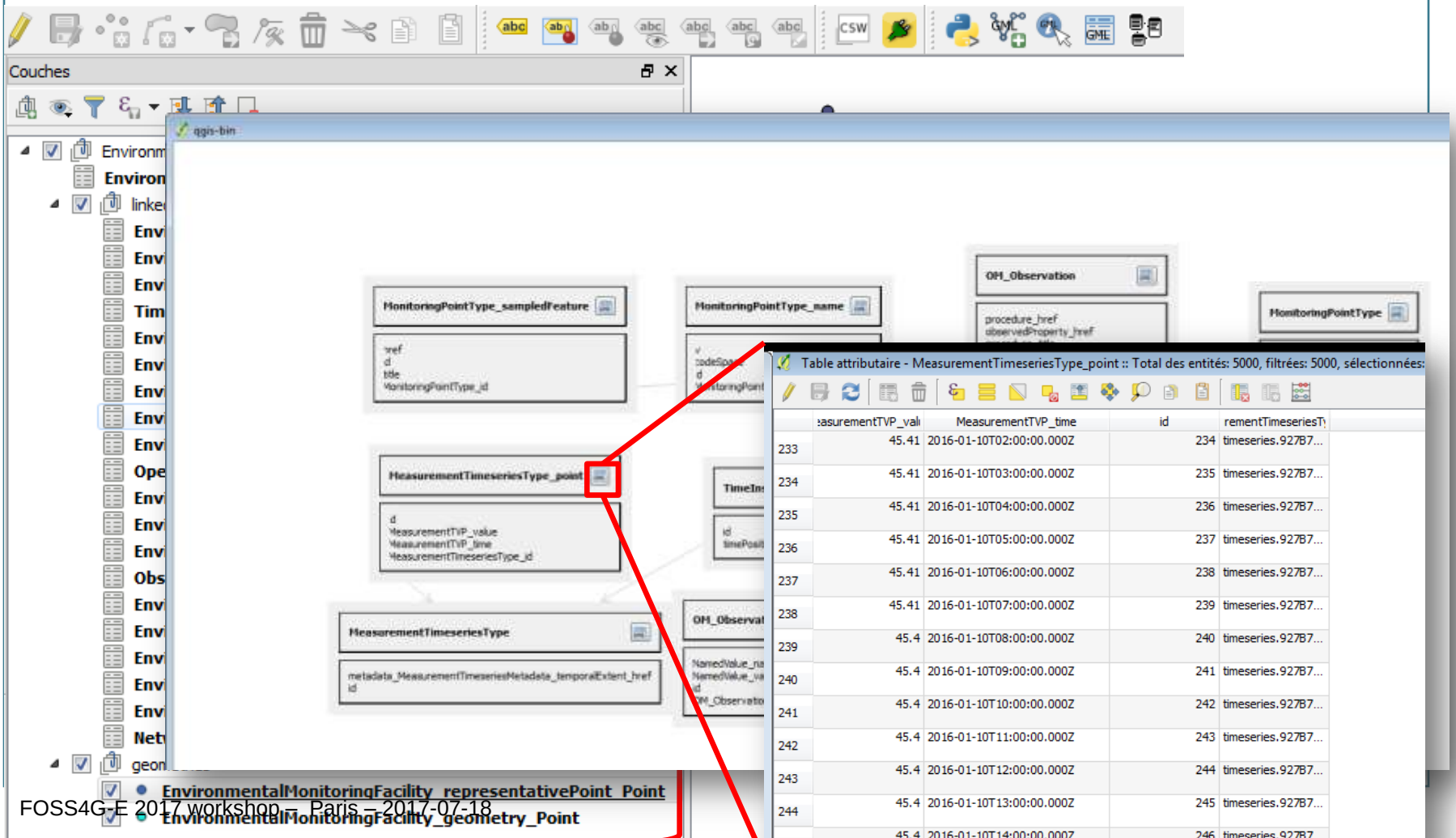
Element	Value
gsmlp:drillEndDate	1974-11-30Z
gsmlp:startPoint	
@xlink:href	http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface
@xlink:title	natural land surface
gsmlp:inclinationType	
@xlink:href	http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical
@xlink:title	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/EPSG/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.7
@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**



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

```python
class GeologyLogViewer(QWidget):
    @classmethod
    def name(cls):
        return "GW Geology log"

    @classmethod
    def xml_tag(cls):
        # the XML tag (with namespace) this widget is meant for
        # the second element of the tuple is an XPath filter
        return ("{http://www.opengis.net/om/2.0}OM_Observation",
                "./om:type[@xlink:href='http://www.opengis.net/def/observationType/OGC-GWML/2.2/GW_GeologyLog']")

    @classmethod
    def icon(cls):
        return QIcon(os.path.join(os.path.dirname(__file__), "drill.svg"))

    @classmethod
    def init_from_xml(cls, xml_tree):
        # parse data
        data = []
        description = resolve_xpath(xml_tree, "description/text()")
        logs = resolve_xpath(xml_tree, "result/GW_GeologyLogCoverage/element/LogValue")
        data = []
        for log in logs:
            fromDepth = float(resolve_xpath(log, "fromDepth/Quantity/value/text()"))
            toDepth = float(resolve_xpath(log, "toDepth/Quantity/value/text()"))
            value_text = resolve_xpath(log, "value/DataRecord/field/Text/value/text()")
            value_cat = resolve_xpath(log, "value/DataRecord/field/Category/value/text()")
            value = value_text if value_text is not None else value_cat
            data.append((fromDepth, toDepth, value))
        return cls(description, data)

    def __init__(self, title, data, parent = None):
        QWidget.__init__(self, parent)
        # ...
```

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/

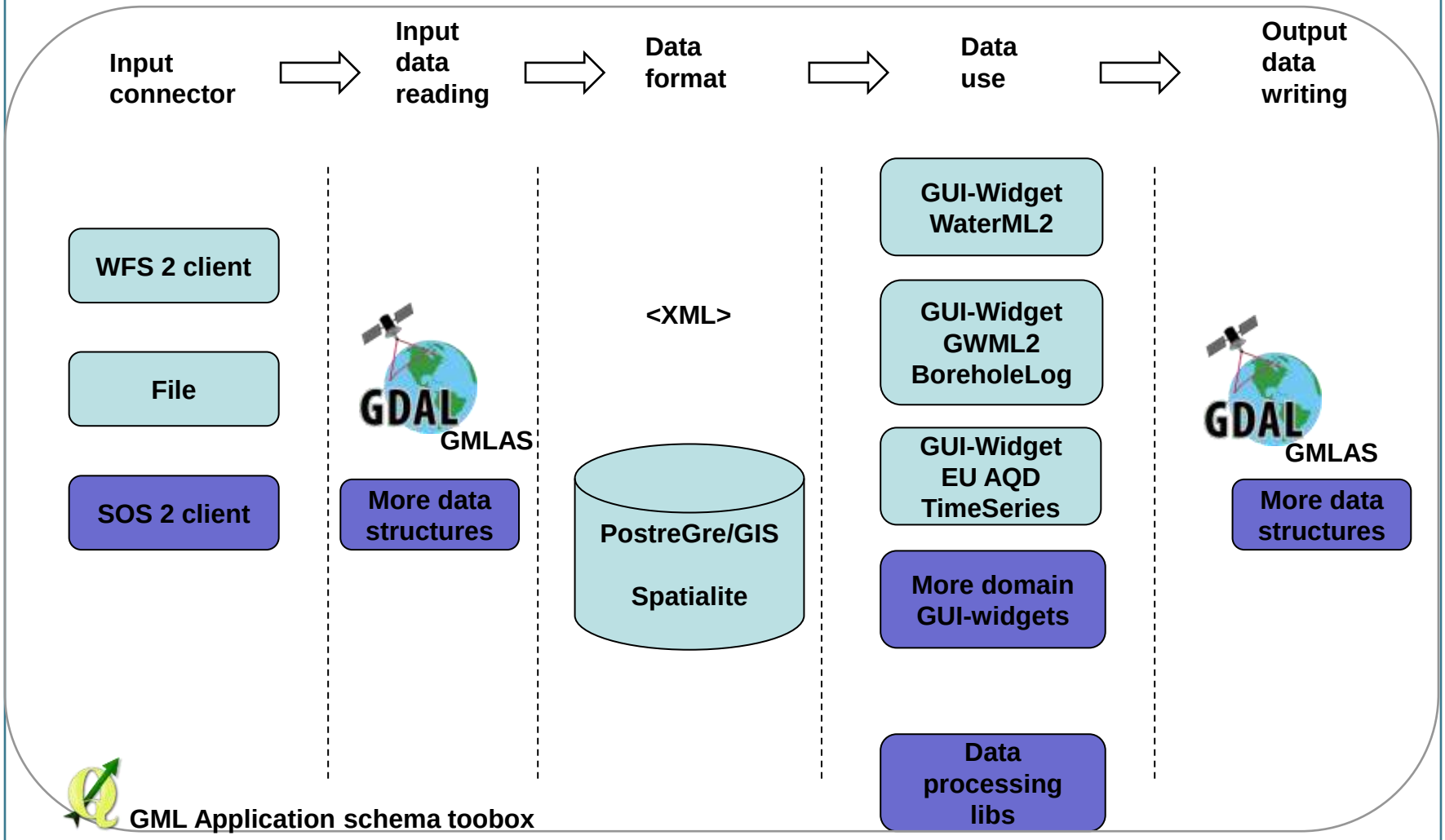
Conclusion

- **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 - whishlist



Thank you

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m.beaufils@brgm.fr

hugo.mercier@oslandia.com