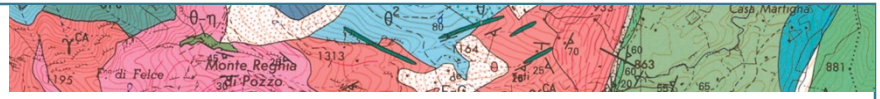
QGIS / GDAL GML application schema support update : use case on French Groundwater Information Network (GIN)

Sylvain Grellet



QGIS / GDAL GML application schema support update : use case on French Groundwater Information Network (GIN)

BRGM – S.Grellet

French GIN – linked data use case

> Objectives

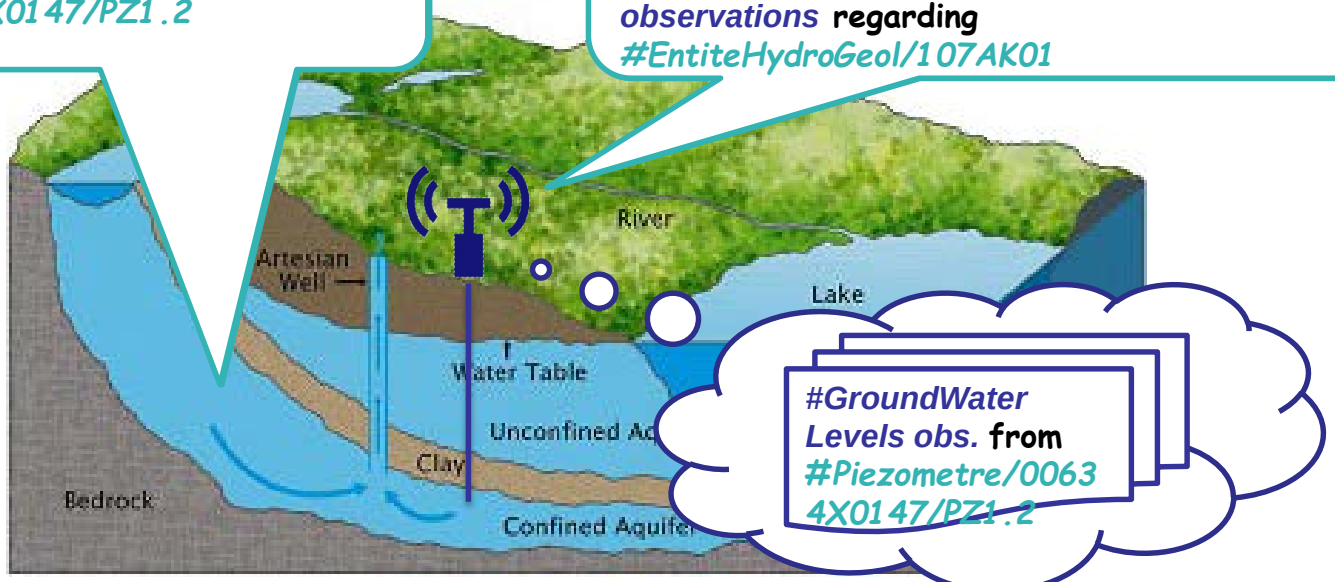
- To provide stable and resolvable links to resources
- To allow reference / data citation
- Independant from underlying technologies used to provide data

I am *#EntiteHydroGeol/107AK01*

I am monitored by *#Piezometre/00634X0147/PZ1.2*

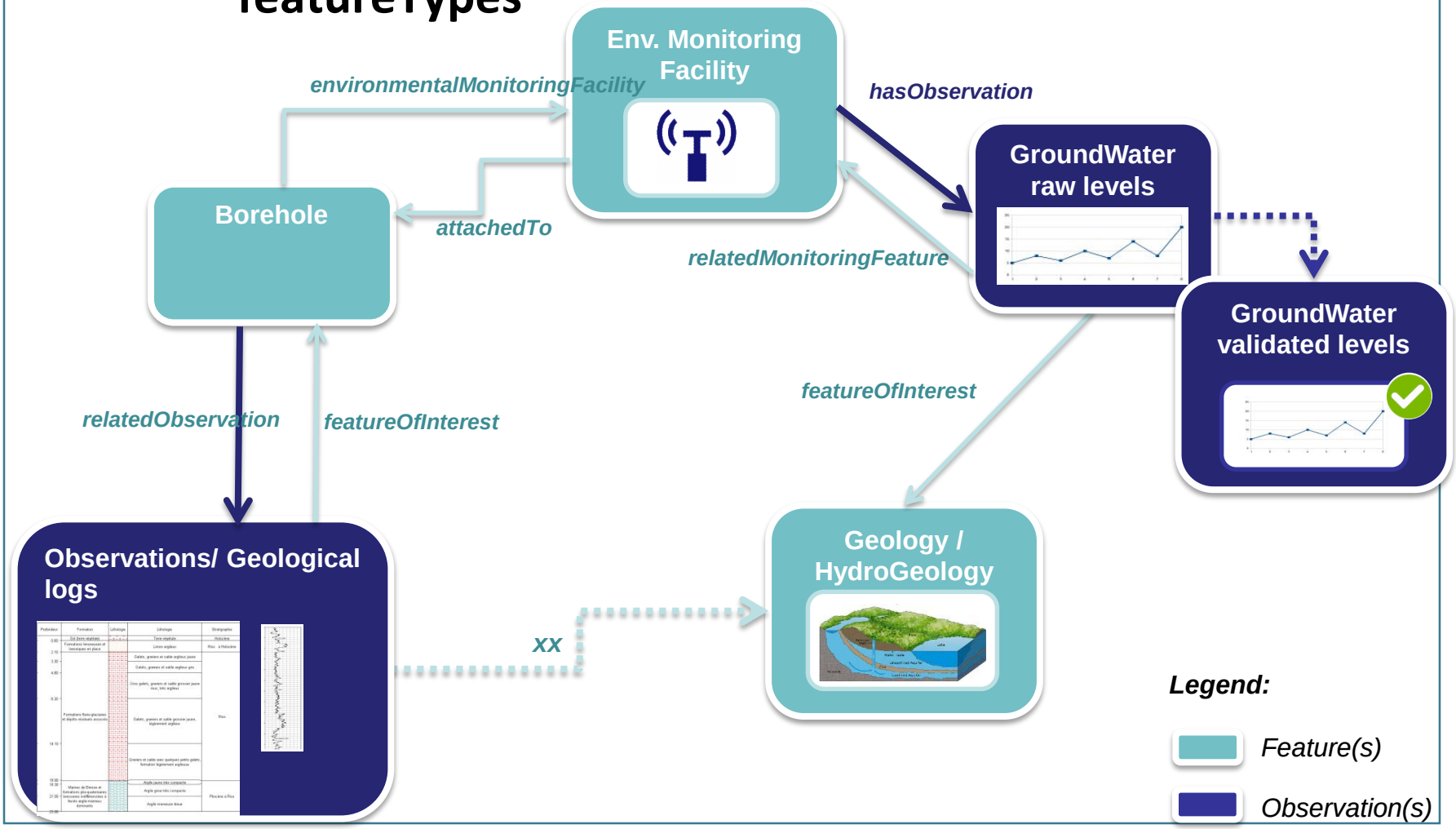
I am *#Piezometre/00634X0147/PZ1.2* attached to #*Borehole/00634X0147/PZ1.2*

I have a lot of *#GroundWater Levels observations* regarding *#EntiteHydroGeol/107AK01*



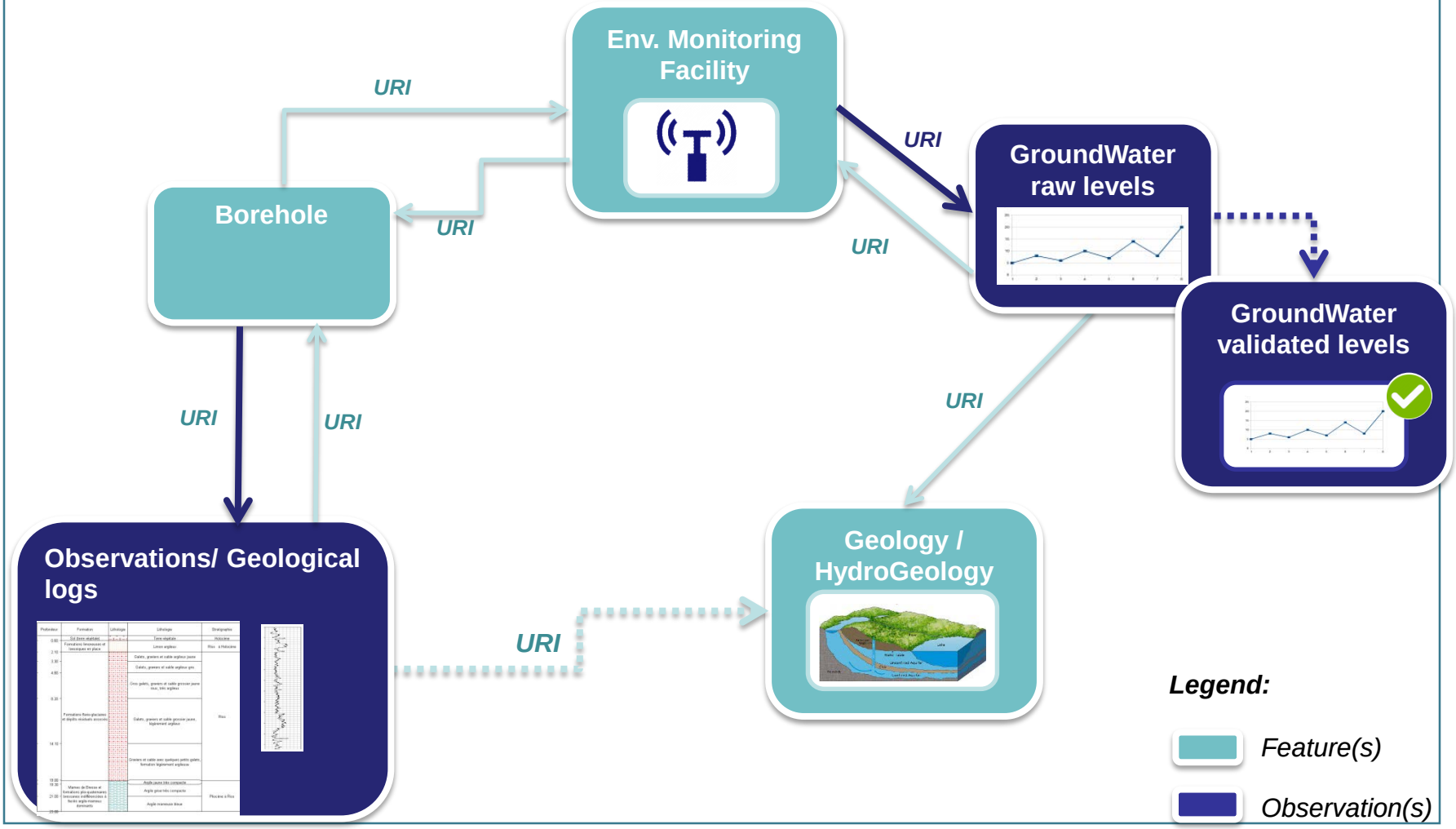
French GIN – linked data use case

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



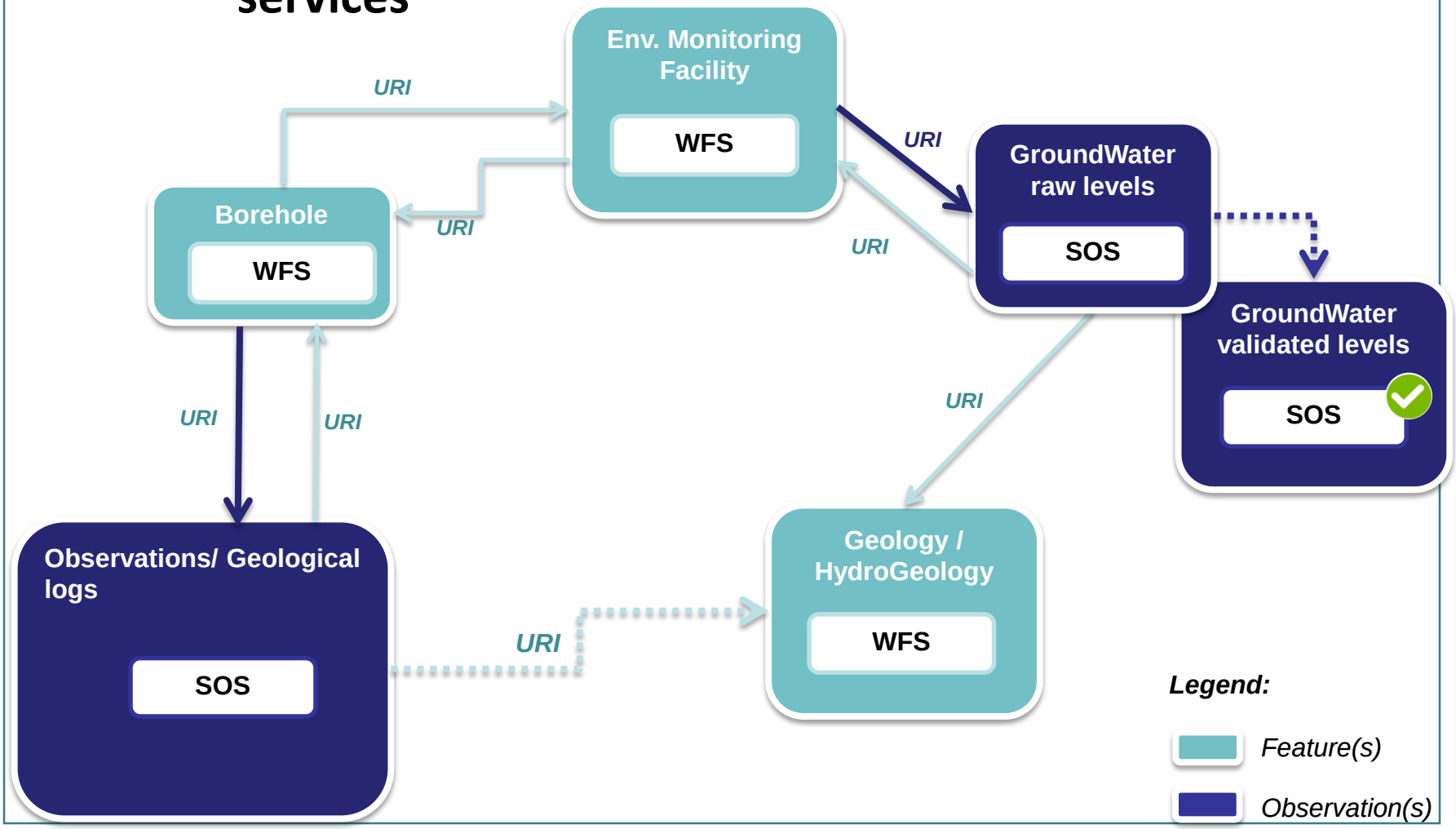
French GIN – linked data use case

> **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 - overall context

> Initial idea

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

> Retrieve objects of interest described according to a standard

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

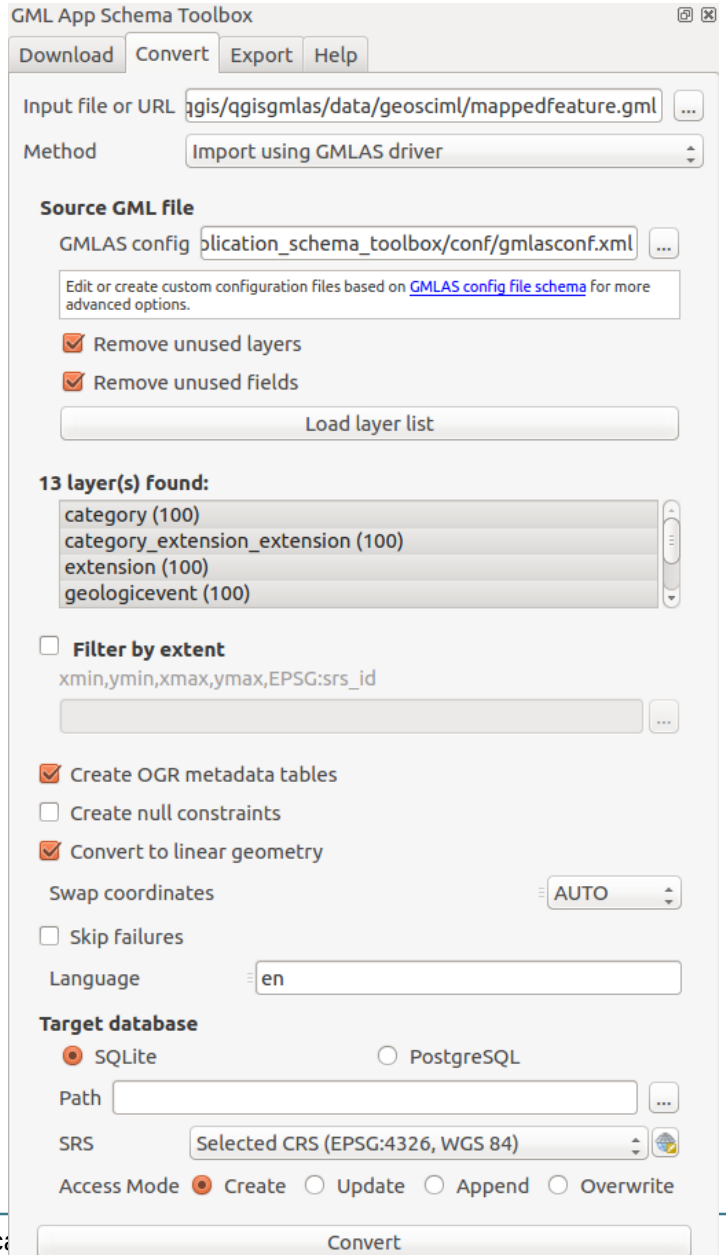
> Resolve XLinks to add more content

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

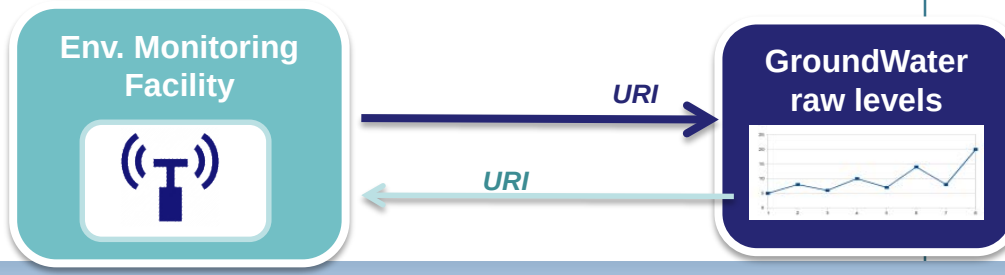
GML application schema toolbox - overall context

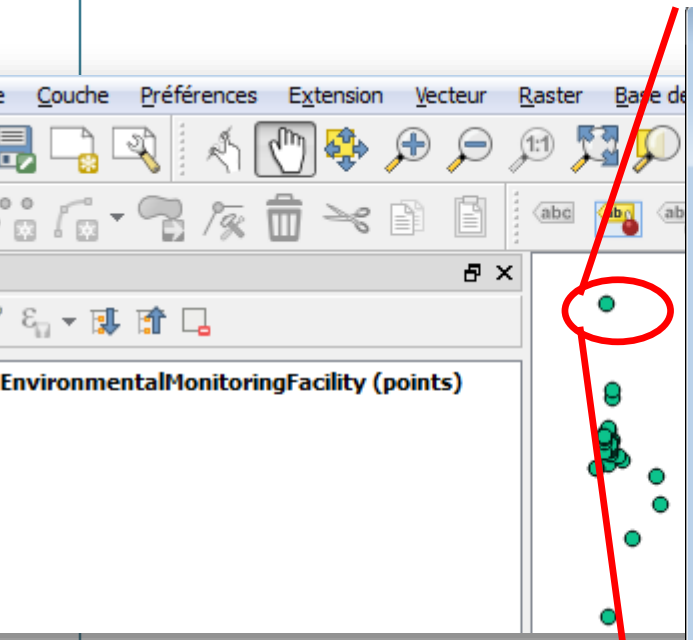
- **Trigger custom widgets based on standards**
  - working: Waterml 2 timeseries, Inspire PointTimeSeries
  - drafty: GW_GeologyLogCoverage
  - on-going EU AirqualityDirective timeseries
- **Writes content (file not WFS-T)**
- **Standalone OGR/GDAL driver -> reuse**
- **Previously presented during last year workshop**
  - Koblenz 2016 Hydro DWG Workshop presentation of the Proof Of Concept QGIS plugin

GML application schema toolbox use – QGIS 3



GML application schema toolbox use – XML





1

EnvironmentalMonitoringFacility (points) - Attributs d'entités

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

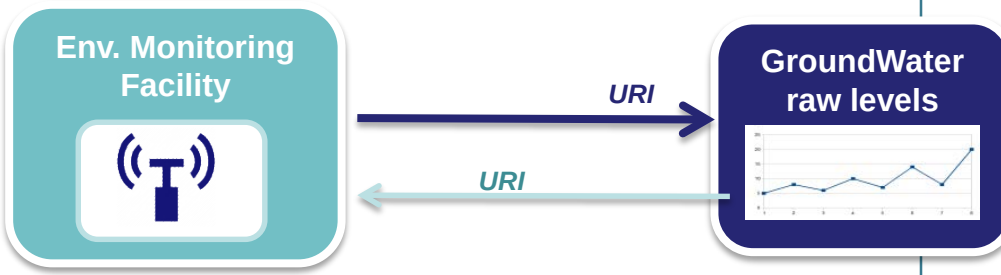
Element	Value
@gml:id	Piezometre.06988C0281.F.2
gml:description	Water well from national BSS (Banque du Sous-Sol) Data database. Piezometer monitoring ground water level
gml:identifier	http://ressource.brgm-rec.fr/data/Piezometre/06988C0281/F.2
@codeSpace	http://www.ietf.org/rfc/rfc2616
ef:inspireId	
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	
@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	

XML

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_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/1289.xml

@xlink:title GroundWaterLevel

om:featureOfInter...

wml2:Monitori...

@gml:id mp_4C6129829FDC1C2DE4A2FB853F56C5B1A

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

gml:name Piezo 06988C0281/F.2

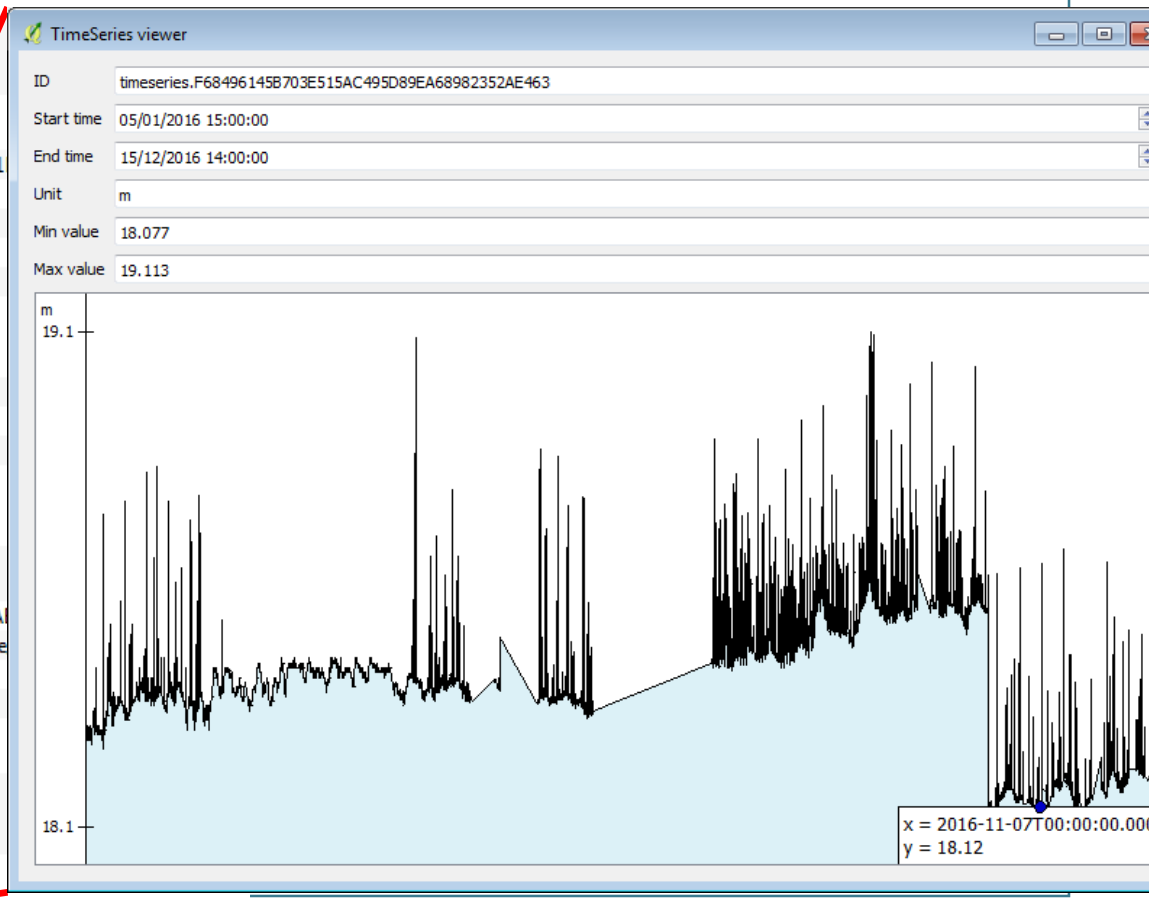
sf:sampledF...

sams:shape

om:result

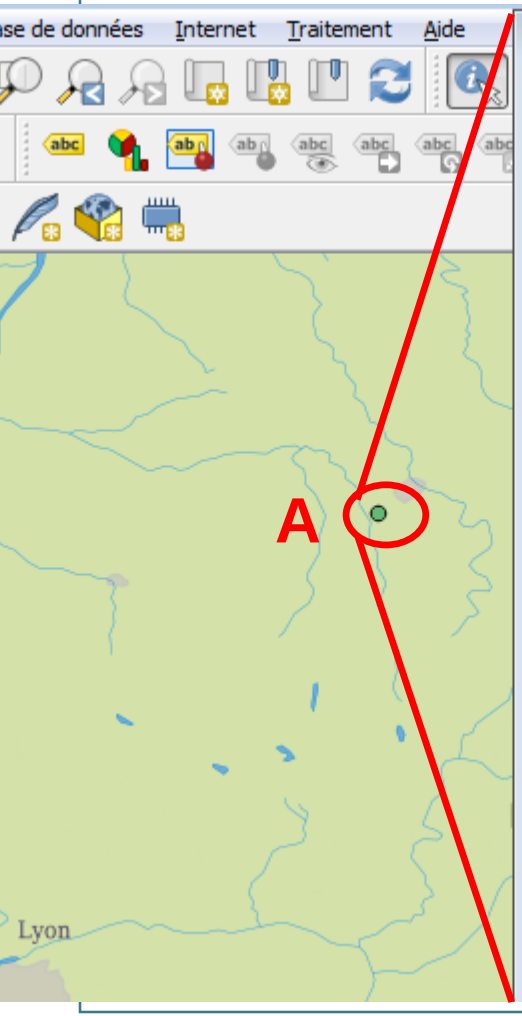
wml2:Measure...

3



GML application schema toolbox use – XML

Borehole



BoreholeView (points) - Attributs d'entités

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

XML

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

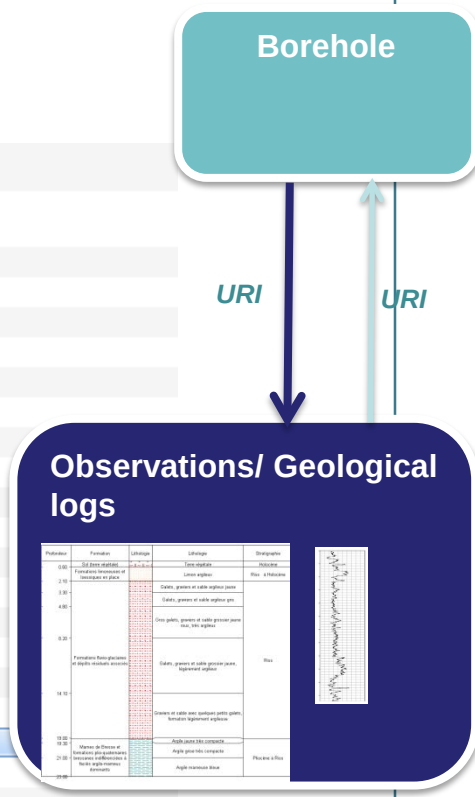
GML application schema toolbox use – XML

Borehole

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

GML application schema toolbox use – XML

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/observedPro
        - @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. Provides link to SensorObservationService offering

C

Geology log viewer

Description: Lithologic observation for this level of borehole BSS00

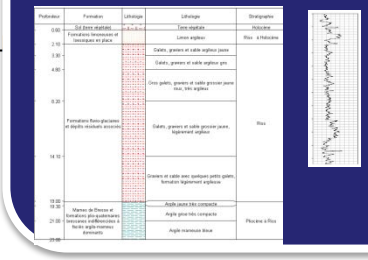
0.0	SUPERF: TERRE
0.6	LIMON, ARGILEUX
2.1	
	MEL/GALET/GRAVIER/SABLE, ARGILEU
19.0	ARGILE, JAUNE COMPACT
19.3	ARGILE, GRIS COMPACT
21.0	ARGILE, BLEU
23.0	

Borehole

URI

URI

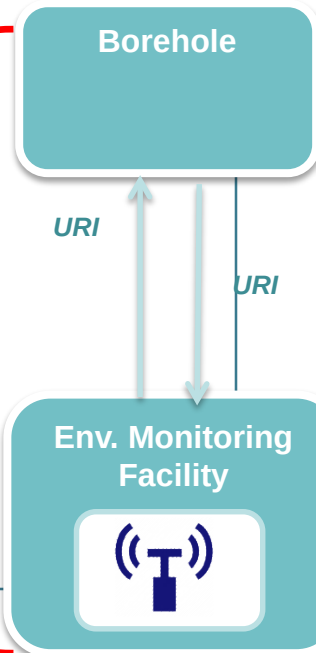
Observations/ Geological logs



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

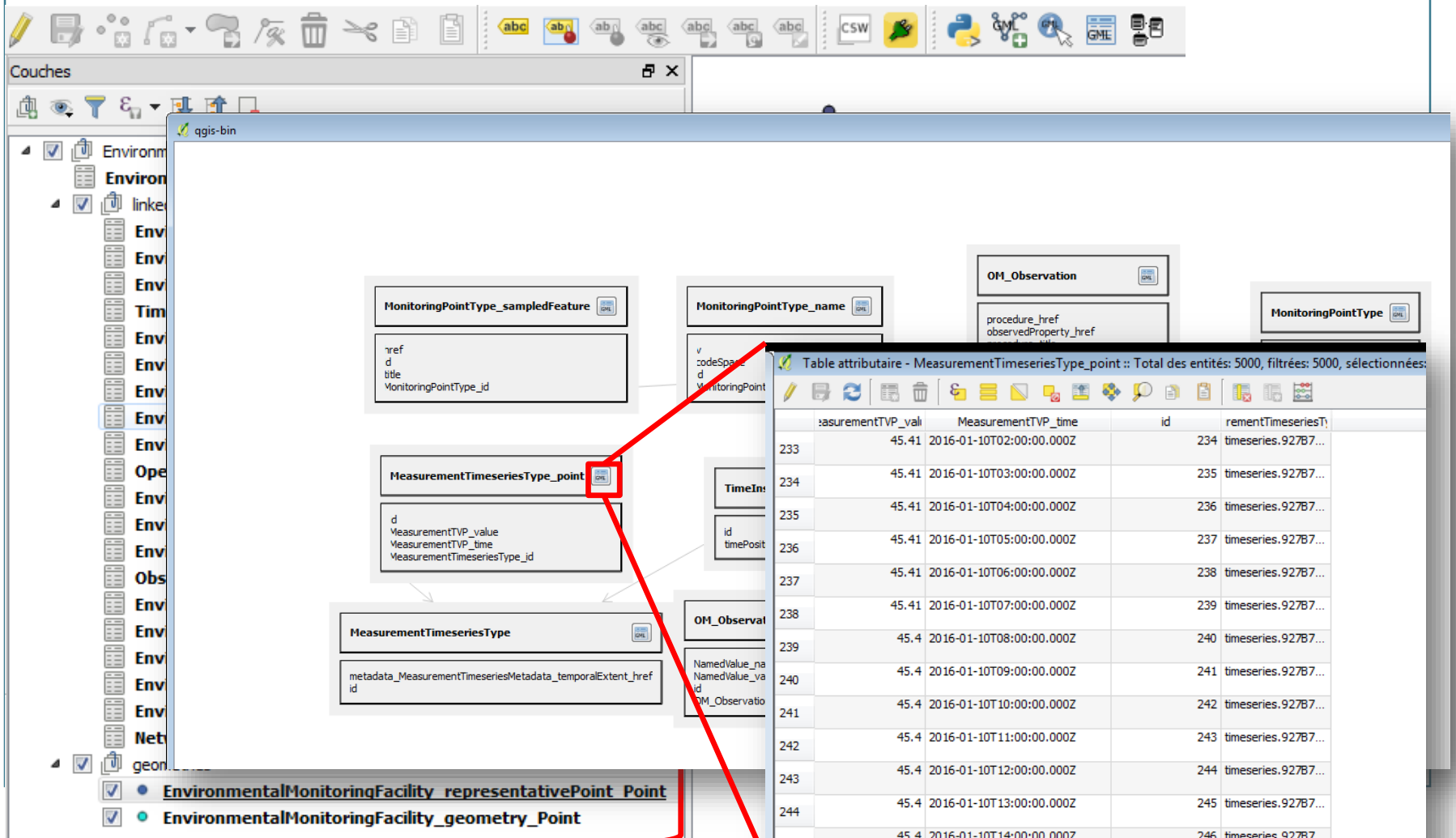
Element	Value
gsmlp:drillEndDate	1974-11-30Z
gsmlp:startPoint	
@xlink:href	http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface
@xlink:title	natural land surface
gsmlp:inclinationType	
@xlink:href	http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical
@xlink:title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

> Ex: direct driver access to GroundWaterML2 GW_Well

```
qgis@qgis-VirtualBox:~/qgisgmlas/data/geology$ ogrinfo -q  GMLAS:GW_Well_BRGM-uc1.xml gw_well

Layer name: gw_well
OGRFeature(gw_well):1
  id (String) = PointEau.01846X0361.P1
  description_href (String) = (null)
  description_title (String) = (null)
  description_nilreason (String) = (null)
  description (String) = Water well from national BSS (Banque du Sous-Sol) Data database
  descriptionreference_href (String) = (null)
  descriptionreference_title (String) = (null)
  descriptionreference_nilreason (String) = (null)
  identifier_codespace (String) = http://www.ietf.org/rfc/rfc2616
  identifier (String) = http://ressource.brgm.fr/data/PointEau/01846X0361/P1
  location_location_pkid (String) = (null)
  type_owns (Integer(Boolean)) = 0
  type_href (String) = (null)
  type_title (String) = (null)
  type_nilreason (String) = (null)
  lineage_pkid (String) = (null)
  shape_href (String) = (null)
  shape_title (String) = (null)
  shape_nilreason (String) = (null)
  gwwellconstructeddepth_href (String) = (null)
  gwwellconstructeddepth_title (String) = (null)
  gwwellconstructeddepth_nilreason (String) = (null)
  gwwellconstructeddepth_om_observation_om_observation_pkid (String) = OM_Observation.1
  gwwellconstructeddepth_om_observation_gw_geologylog_pkid (String) = (null)
  gwwellconstruction_href (String) = (null)
  gwwellconstruction_title (String) = (null)
  gwwellconstruction_nilreason (String) = (null)
  gwwellconstruction_owns (Integer(Boolean)) = 0
  gwwellconstruction_borehole_pkid (String) = Borehole.1
  gwwellstatus_owns (Integer(Boolean)) = 0
  gwwellstatus_href (String) = http://www.sandre.eaufrance.fr/?urn=urn:sandre:donnees:79::CdElement:3:::referentiel:3.1:xml
  gwwellstatus_title (String) = OpÃ©rationnel
  gwwellstatus_nilreason (String) = (null)
  gwwelltotallength_nilreason (String) = (null)
  gwwelltotallength_href (String) = (null)
  gwwelltotallength_title (String) = (null)
```

Overall – development story

« another approach to demonstrate the usefulenessof interoperable standards »

or

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

Overall – development story

> From the ProofOfConcept to an enhanced approach

2016

Run n° 1

QGIS 2.x GML application schema toolbox POC

Run n°2

GML App Schema OGR Driver and QGIS 3 integration

2017

Run n°3 (now)

GML App Schema OGR Driver and QGIS 3 integration enhancements

Overall – development story

> From the ProofOfConcept to an enhanced approach

Run n° 1

QGIS 2.x GML application schema toolbox POC

Run n°2

GML App Schema OGR Driver and QGIS 3 integration

PyXB -> specific OGR/GDAL GMLAS driver (targetting GDAL 2.2), handling both reading and writing
Integration within QGIS 3

Run n°3 (now)

GML App Schema OGR Driver and QGIS 3 integration enhancements

- GDAL GMLAS : addition handling specific SWE types based on GWML2 GW_GeologyLogCoverage and EU Air Quality Reportings (dataArray, dataRecord, …)

2.2

- QGIS 3 : enhanced widgets for timeseries, and borehole logs + some commit to the trunk

3

Useful links

- https://plugins.qgis.org/plugins/gml_application_schema_toolbox/
- https://github.com/BRGM/gml_application_schema_toolbox
  - Documentation, GUI presentation

- **Multilinguism handling**
  - on 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**
  - Use OSGeo4W installer
  - Advanced install \ Desktop -> add qgis-dev
  - Then install the plugin from QGIS repository

Conclusion

> Generic work successfully tested on

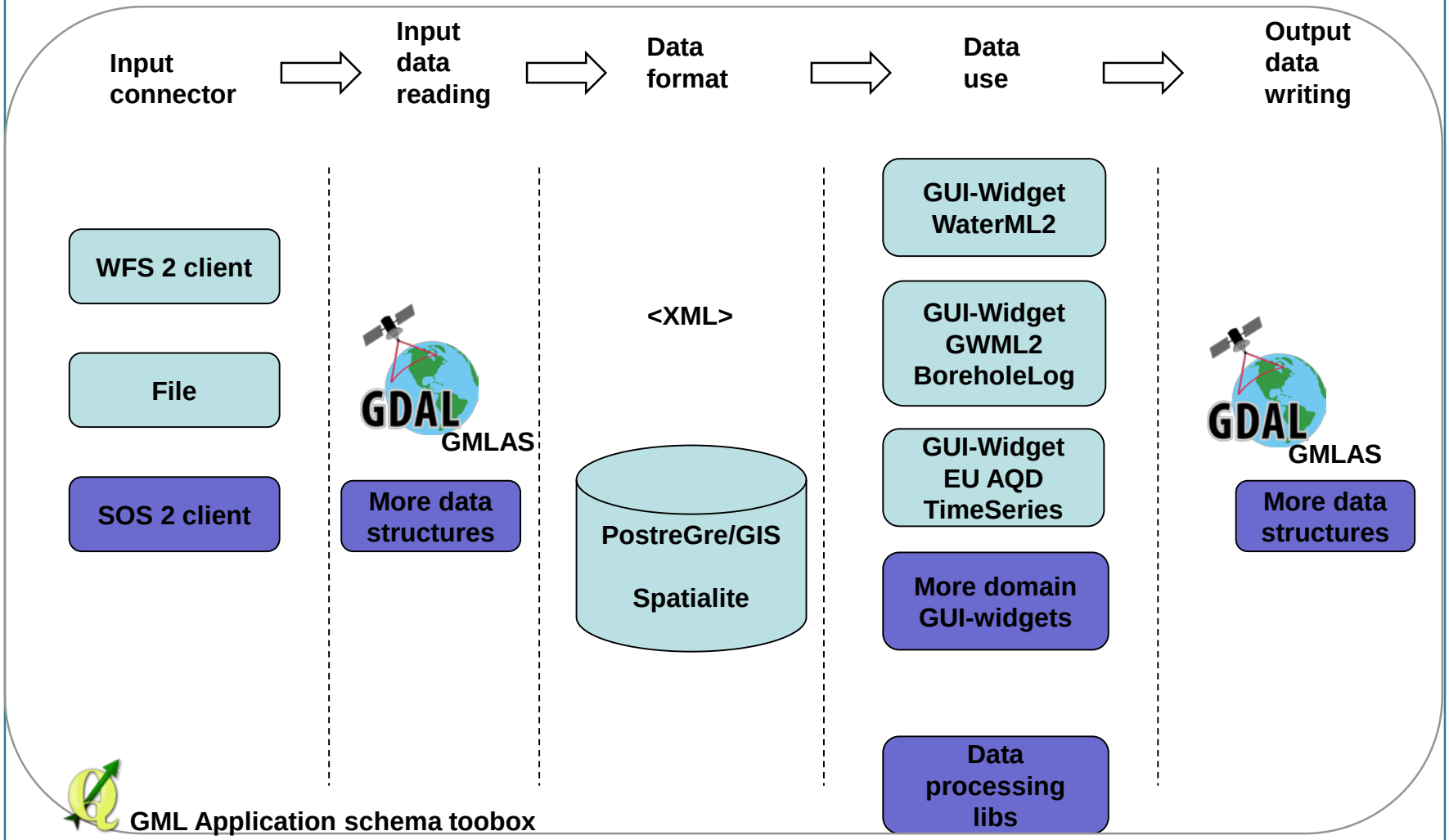
- OGC : GroundWaterML2, GeoSciML4, WaterML2
- INSPIRE : EnvironmentalMonitoringFacilities, BioGeographicalRegions, LandCover, ProtectedSites, MineralResources, PointTimeSeriesObservation

> 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


s.grellet@brgm.fr
m.beaufils@brgm.fr
Géosciences pour une Terre durable
brgm