



Global Water Information IG

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research data sharing without barriers
rd-alliance.org

RDA VP22 - 2024-05-17

Agenda

- Summary of recent activities on the OGC Hydro Domain Working Group and OGC side,
- OGC/WMO Water Quality Interoperability Experiment
- OneWater/Water4All FAIR Water Data projects
- Linking experimental research catchment datasets
- Additional discussions, summary, actions

Value proposition:

- facilitate dissemination of **water data standards** from OGC Hydro Domain Working Group (https://external.ogc.org/twiki_public/HydrologyDWG/WebHome);
- explore and **compare infrastructures for water data sharing**;
- address infrastructure issues out of the scope of OGC Hydro DWG;
- facilitate **application of RDA recommendations in the water domain**;
- explore **policies for water data sharing**
- **coordinate with other RDA groups** on addressing common issues
- organize water data-related **use cases**;
- **attract academic researchers**, and participants from outside OGC Hydro DWG;

Recent OGC and OGC Hydro activities of interest for GWIIG - OMS (ISO 19156:2023)

- OGC/ISO Observations & Measurements (ISO 19156:2011, O&M) update process finalised => now Observations, measurements & samples (ISO 19156:2023) a.k.a OMS

- More details here :

https://external.ogc.org/twiki_public/pub/HydrologyDWG/HdwgSpring2023/OM%20V3%20to%20STA.pptx

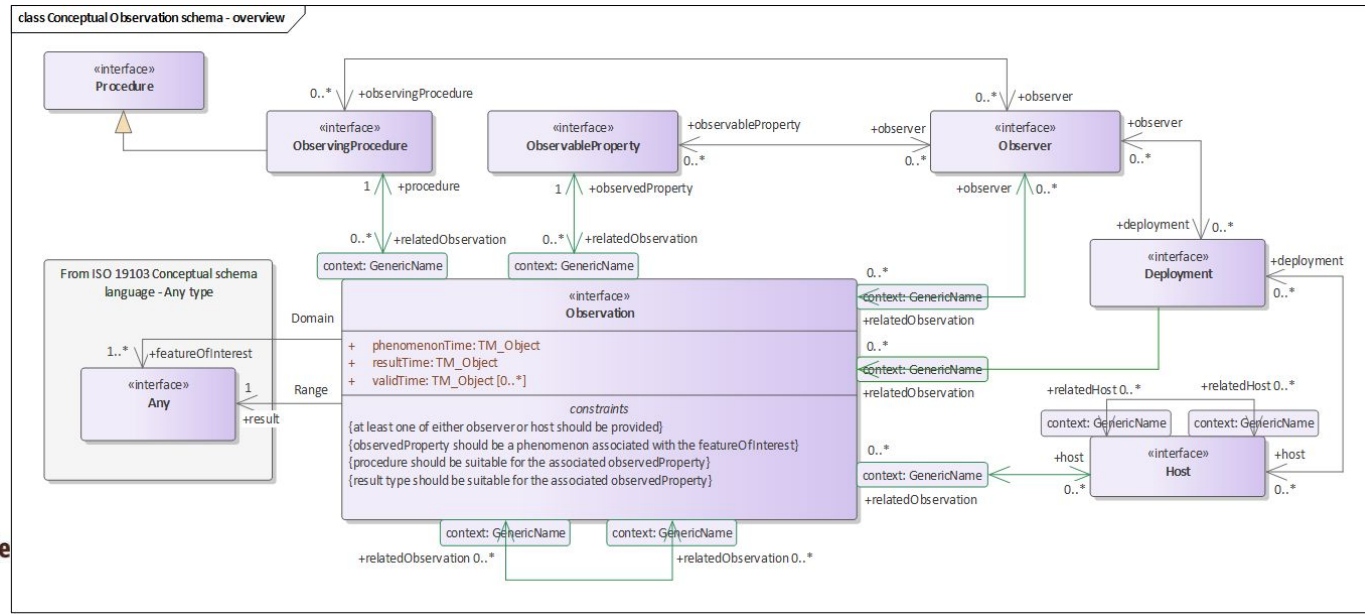
Recent OGC and OGC Hydro activities of interest for GWIIG - OMS (ISO 19156:2023)

Observer – abstracted from SOSA Sensor

Host – abstracted from SOSA Platform

Deployment – link between Observer and Host

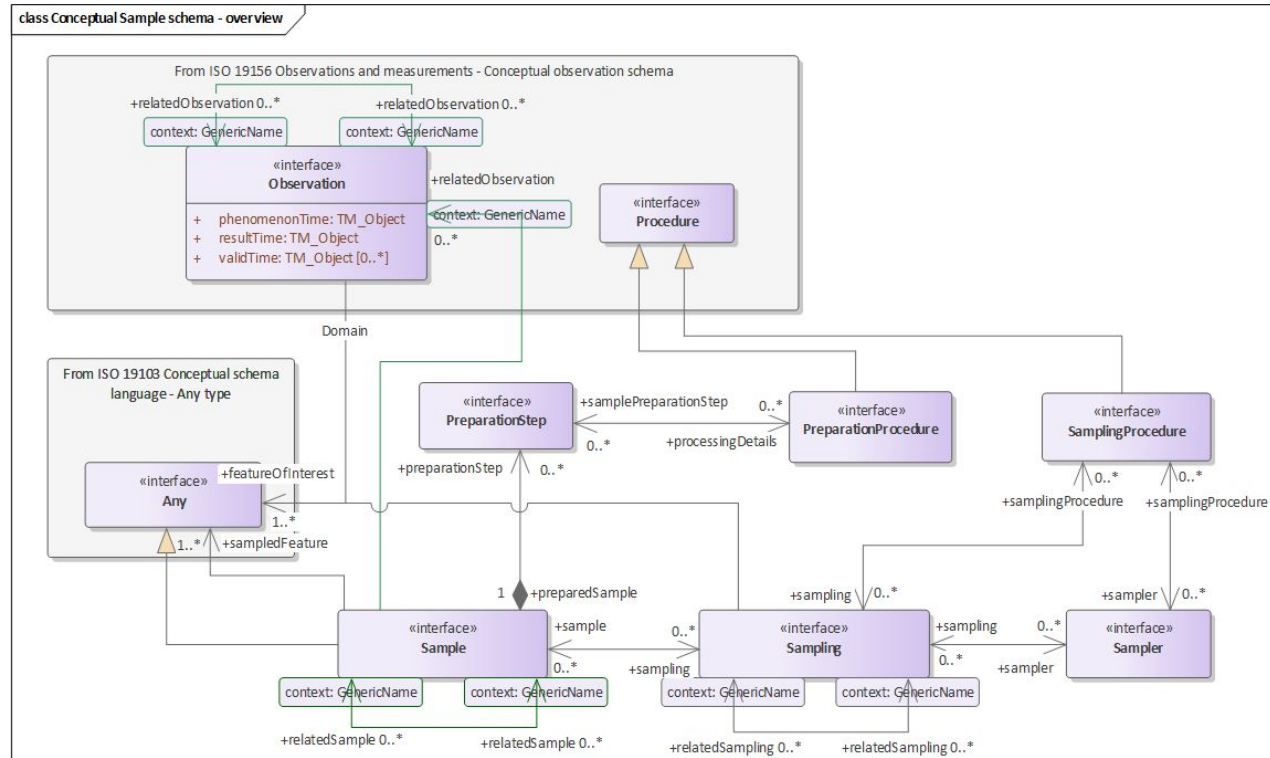
relatedObservation
association
ubiquitous
across mode



Recent OGC and OGC Hydro activities of interest for GWIIG - OMS (ISO 19156:2023)

Sampling: from SOSA,
act of taking a **Sample**

Sampler: from SOSA,
person or device that
performs the **Sampling**



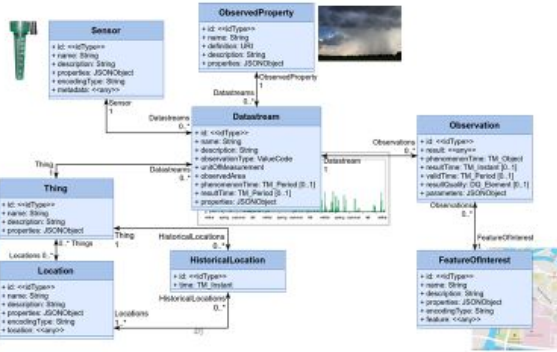
Recent OGC and OGC Hydro activities of interest for GWIIG - Big uptake of OGC SensorThings API

- Currently being deployed in many water information systems and research organisations to share observations and samples acquired
 - In many environmental domains (including freshwater)
- Reference links
 - Standard reference page : <https://www.ogc.org/standard/sensorthings/>
 - One reference server implementation <https://www.iosb.fraunhofer.de/en/projects-and-products/frost-server.html>
 - Native support in QGIS being now available : <https://hal.science/hal-04530934v1>
 - EU INSPIRE directive compliant : “Extending INSPIRE to the Internet of Things through SensorThings API” (<https://doi.org/10.3390/geosciences8060221>)
- Example presentations
 - SensorThings API in the hydro Community –EU insights <https://hal.science/hal-04178295v1>
 - OZCAR Research Infrastructure/TERENO conference : water use case <https://hal.science/hal-03498874v1>

=> The OGC / WMO Water Quality IE builds on this dynamic

Recent OGC and OGC Hydro activities of interest for GWIIG - Big uptake of OGC SensorThings API

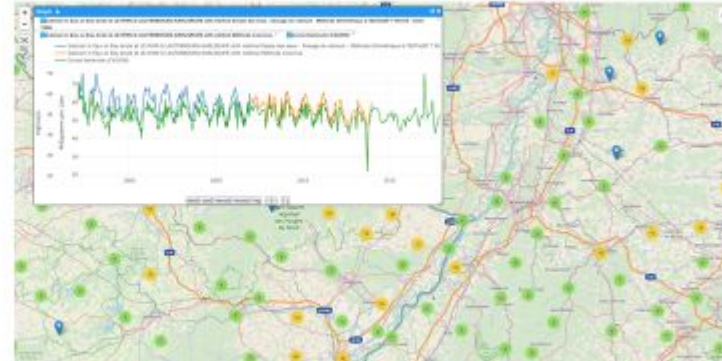
SensorThings API 1.1 – Data Model



Implementation



- French & German Data
- 1 Map



Fancy Queries

```

All data for a map:
v1.1/Things?
$select=id,name,description,properties&
$top=10&
$filter=properties/countryCode eq 'HR'&
$expand=
  Locations ($select=location),
  Datastreams (
    $select=id,name,unitOfMeasurement;
    $expand=
      ObservedProperty ($select=name),
      Observations (
        $select=result,phenomenonTime;
        $orderby=phenomenonTime desc;
        $top=1)
  )
  
```

[Link](#)

From ESIP IT&I presentation : *Achieving FAIR water quality data exchange thanks to international OGC water standards :*
<https://youtu.be/AIYnSNWJYy0>

Recent OGC and OGC Hydro activities of interest for GWIIG - W3C SSN/SOSA Update

- Mainly triggered by OMS being available
 - => Integration of new concepts from OMS
 - Update in the alignment modules
 - Handling of the various Change Request from the previous version
- <https://github.com/w3c/sdw-sosa-ssn>
- Weekly meetings
- Target : updating SSN/SOSA in 2024

Recent OGC and OGC Hydro activities of interest for ¹⁰ GWIIG - RDA I-ADOPT & OMS - SSN/SOSA

- Planned presentation @VP22 next Wednesday May 22nd
- Several actions on-going to better have I-ADOPT on standard side
 - I-ADOPT & OMS logical model
 - I-ADOPT Extension to ST API
 - I-ADOPT in/next to SSN/SOSA revision

Recent OGC and OGC Hydro activities of interest for ¹¹ GWIIG - GroundWater + WaterQuality workshops

- GroundWaterML2.0 workshop
https://external.ogc.org/twiki_public/HydrologyDWG/GWML2WorkshopMarch2022
- WMO-UNEP-UNESCO-WHO-OGC Water quality workshop
https://external.ogc.org/twiki_public/HydrologyDWG/WaterQualityWorkshopSprint2022

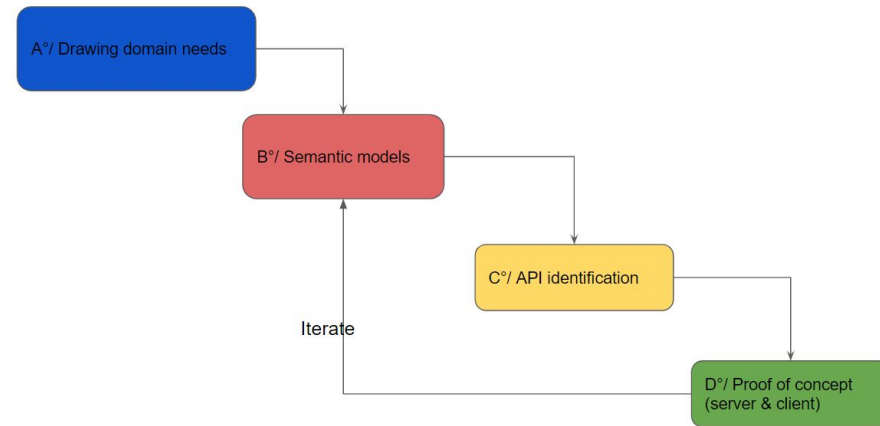
- Started September 2022 after the Water quality workshop
- Reference point :
<https://github.com/opengeospatial/WaterQualityIE>
- Complete presentation from the week before at ESIP IT&I presentation : “*Achieving FAIR water quality data exchange thanks to international OGC water standards*” :
<https://youtu.be/AIYnSNWJYy0>

	Org	Fol Type: Water (Surface and Ground together at this stage)			
Method	<i>Observed Property group</i>	Quantity	Physical properties	Chemistry	Biology
	Samples	Here as a support to WQ	1	2	3
	Sensors				
	Hydro Models				
	Remote Sensing				

*Fol = Feature Of Interest
= the real world feature on which observation is made*

- Water Quality Use Case prioritisation
 - Physical Properties (ex : Temperature, Conductivity), Chemistry
 - + Water Quantity as a support to Water Quality
 - *Out of scope this IE : Biology (taxa observation), Hydro Models, Remote Sensing*

Rationale (per Use Case)



- UML models based on OGC and ISO standards for both GroundWater (GW) and SurfaceWater (SW) quality
- 2 modelling patterns

GW_InSitu_QuantityObservation < > SW_InSitu_QuantityObservation

GW_InSitu_QualityObservation < > SW_InSitu_QualityObservation

In situ sensor

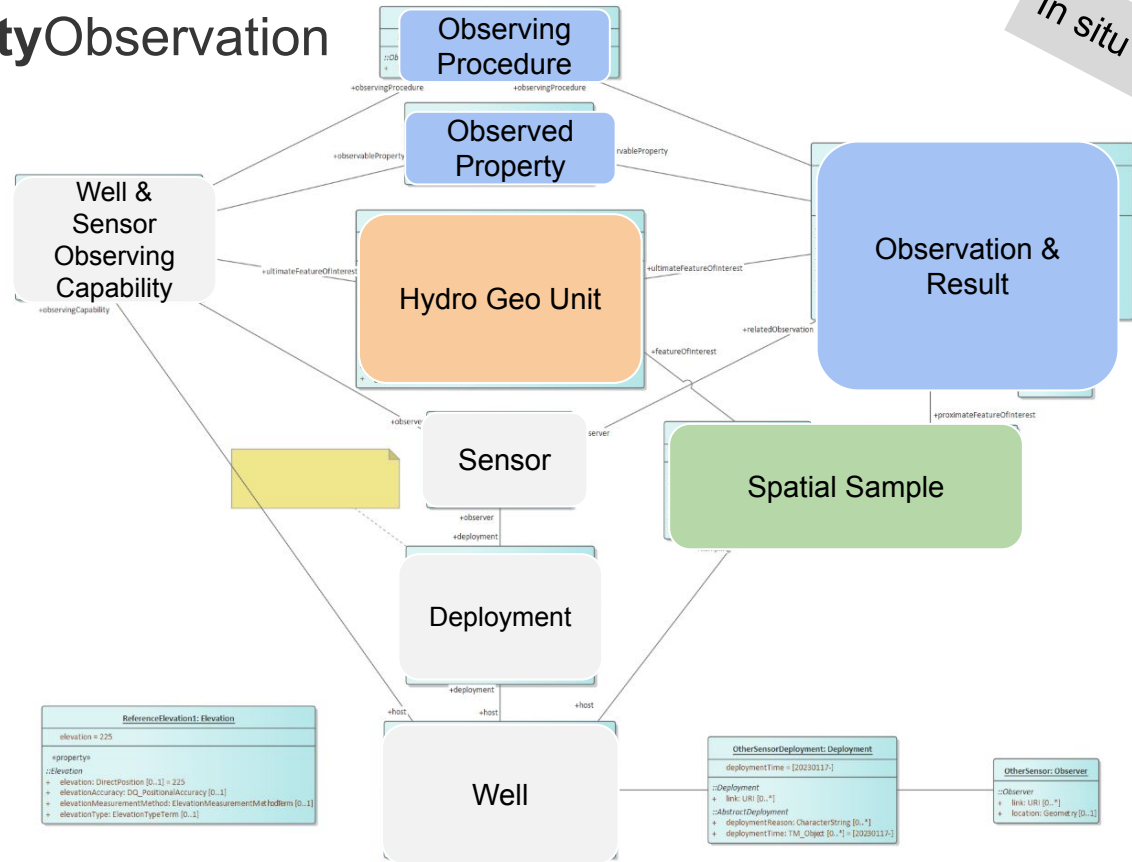
GW_ExSitu_QualityObservation <> SW_ExSitu_QualityObservation

Ex situ = Laboratory

WaterQuality IE - conceptual model examples

■ GW_InSitu_QuantityObservation

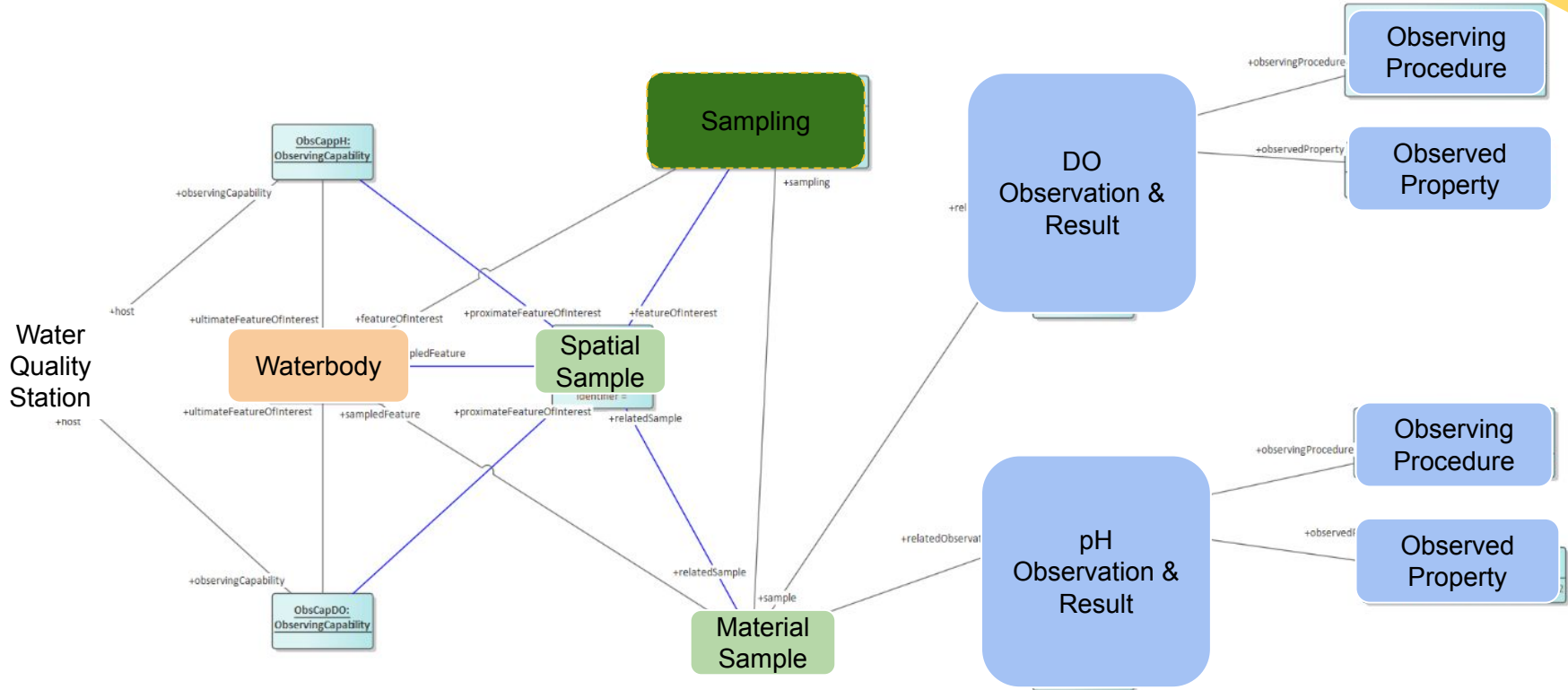
In situ sensor



WaterQuality IE - conceptual model examples

Ex situ = Laboratory

SW_ExSitu_QualityObservation



WaterQuality IE - SensorThings API extension

implemented in FROST

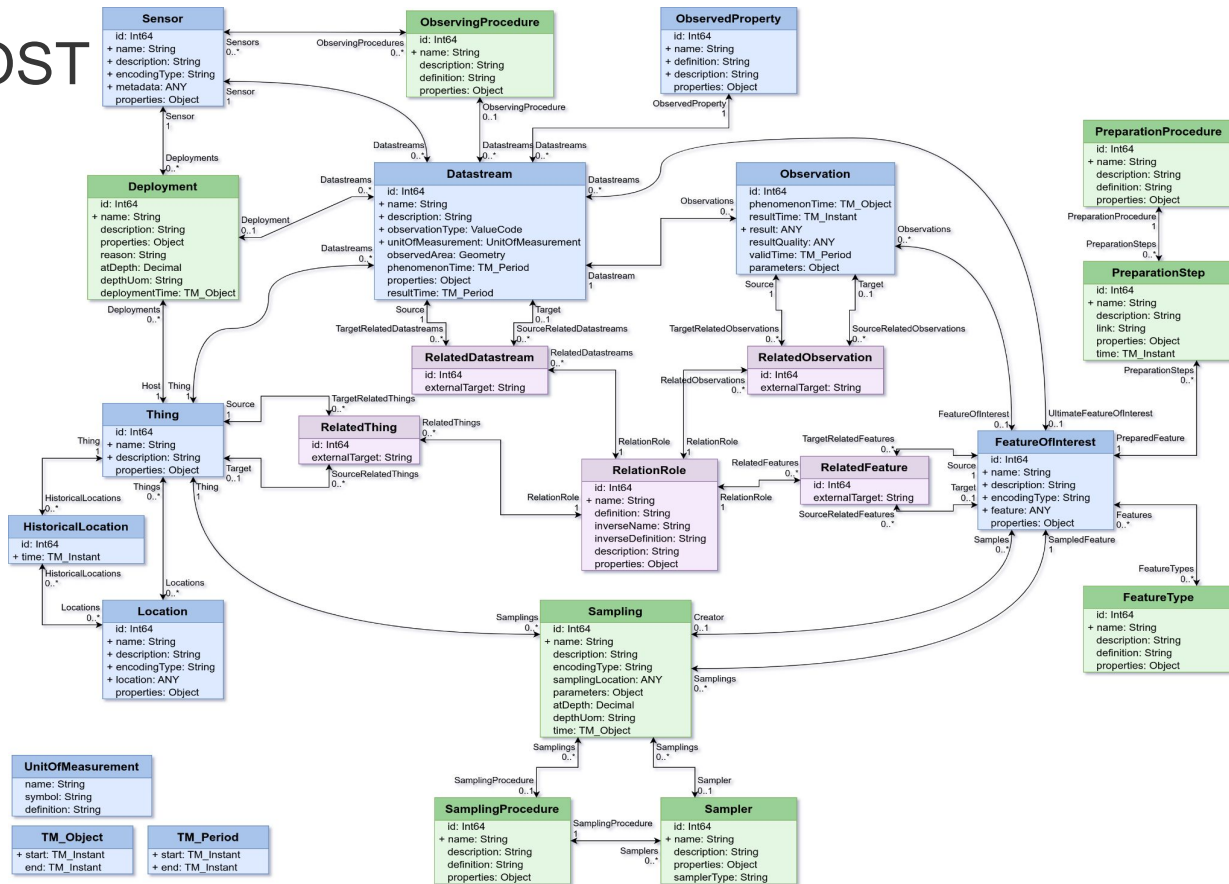
Full data model

- Still v1.1 compatible
- Paving the way to STA 2.0

STA 1.1

OMS addition

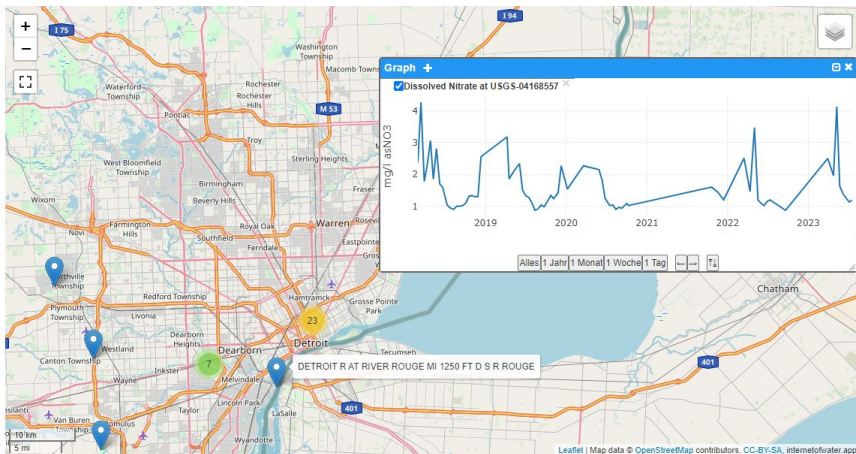
Relation extension



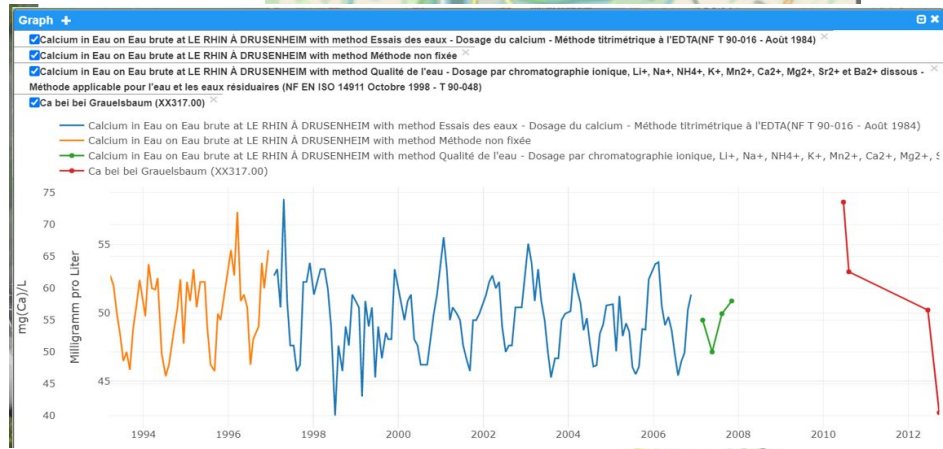
- On-Going at the IE Partners level
 - Water Quality IE members USGS, USEPA, DataStream (Canada), BRGM, BaFG (Unesco Gems water), Fraunhofer
- EU Water4All project partners: Danish DEP, ISPRA, Fraunhofer, VITO etc...
- EU GSEU project partners : Many EU geological surveys

WaterQuality IE - Implementation

■ It works !



Surface water quality
USGS – Internet of Water US



Surface water quality
France - Germany

- Landing the test
 - Demo at OGC Member Meeting June 2024
 - Then, Engineering report and WaterML2.0 Part 5 Water Quality best practice update
- Next steps
 - More implementations
 - Add the other UseCases out of scope this IE : Biology (taxa observation), Hydro Models, Remote Sensing
 - Work on shared 'controlled' vocabularies : e.g Observed Property (? using I-ADOPT ?), Observing Procedure, ...

OneWater/Water4All FAIR Water Data projects



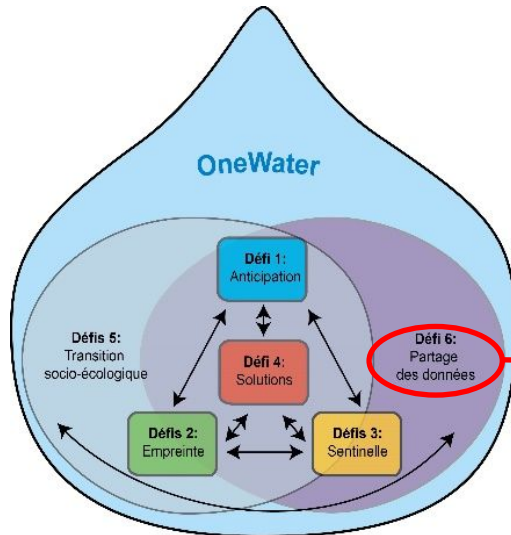
PROGRAMME NATIONAL
DE RECHERCHE SUR L'EAU



<https://www.onewater.fr/>

53 millions €, 10 years French research programme
ANR project : ANR-22-PEXO-0009 - France 2030

To contribute to accelerate transitions a measure impacts of global changes on socio-ecological systems through 6 scientific challenges, one being :



FAIR Water Data Sharing and Platform



<https://www.water4all-partnership.eu/>

31 countries, 7 years

86 m€, 81 partners for the 1st two years

To tackle water challenges as means to face climate change, help to achieve the United Nations' Sustainable Development Goals and boost the EU's competitiveness and growth (EU Green Deal).

Water4All activities are organised around five operational Pillars:

Pillar A Water4All's Joint Vision and Strategic Research and Innovation Agenda (SRIA)

Pillar B Developing new knowledge and innovative solutions for a systemic and inclusive approach of water challenges at an operational scale

Pillar C Science Policy – Policy – End-Users interface

Pillar D Demonstration activities

Pillar E Internationalisation

Task C.4: Developing open science & open access to projects outputs and connected observatories and research infrastructures

FAIR Water Data Sharing and Platform

OneWater/Water4All FAIR Water Data projects

- shared elements

- Long term projects just starting
 - Both with a mixture of public organization and research data
 - Will apply OGC, W3C, INSPIRE, RDA standards and best practices
 - Will work at sharing
 - Classic reference features: river networks, aquifer systems
 - Observation and monitoring systems
 - Could also share other water data (waste water, industry, bathing, ...)
- ⇒ opportunity to define shared standards/Best Practices, associated tools & training to share water data in FAIR way
- ⇒ opportunity to deploy, test, enhance, communicate on OGC standards (HydroDWG, OMS, API – Features, SensorThings API etc...) in a coordinated approach
- ⇒ more here <https://hal.science/hal-04133232v1>
- ⇒ contact us if interested

Linking Experimental Research Catchment datasets²⁴

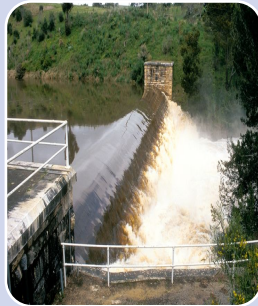
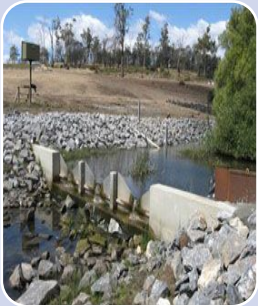
- Numerous catchment research / experimental catchment monitoring activities globally
 - TERENO, OZCAR, CZO, etc.
 - UK is building new research infrastructure for hydrology (<https://www.ceh.ac.uk/our-science/projects/floods-and-droughts-research-infrastructure-fdri>)
- Some initiatives to continue “networks” of experimental catchments:
 - Euro-Mediterranean Network of Experimental and Representative Basins (<https://erb-network.simdif.com/>)
 - 8th Galileo conference (2023) - A European vision for hydrological observations and experimentation (<https://egu-galileo.eu/gc8-hydro/home.html>)
- - Increasing need for monitoring data as evidence-base
 - But limited efforts towards cataloguing or data sharing

Linking Experimental Research Catchment datasets²⁵

- Is there interest in / potential for integration of research monitoring datasets
- Aims:
 - Improve understanding and visibility of experimental catchment data
 - Support access to data availability information, and data itself
 - Understand current status and enhance usage of standards within research catchment monitoring
 - Enhance research opportunities across catchment gradients
- Potential issues:
 - Cataloguing and metadata to describe experiments / catchment types
 - Accessibility of research monitoring data
 - Engagement with / capacity of researchers / data managers
- Please contact Matt Fry if you would like to discuss this further (mfry@ceh.ac.uk)

HDWG WaterML2 suite

- WaterML2.0
 - Open and documented
 - implemented in WMO Information System and in many organizations : UNESCO, USGS, US EPA, NrCan, NIWA, BRGM, etc...
 - And in opensource tools : CUASHI Hydro-Server, Kisters, 52°N etc...
 - Updated with a regular contribution from projects involving Hydro DWG partners



Part 1 -
Timeseries

Part 2 –
Ratings,
Gaugings and
Sections

Part 3 –
Surface water
features

Part 4 –
Groundwater

Part 5 –
Water quality
(best practice)

Soon to be updated
by the Water
Quality IE

Websites

■ HDWG

- Complements the mailing list
- The place where all HDWG activity is announced / coordinated / reported
 - Meeting summaries; Interoperability experiments; Tools, ...
- A section dedicated to RDA GWIIG
- http://external.opengis.org/twiki_public/HydrologyDWG/WebHome

■ GWIIG section of RDA website

- Summary of GWIIG actions/organisation + link to its specific section under HDWG website
- **Purpose** : To better intertwine both groups/communities and avoid people being lost between too many websites.

Meetings 2014 and later:

- OGC TC Meeting - Arlington - 24-28 March 2014
- OGC TC Meeting - Geneva - 10-14 June 2014
- 5th Hydrology DWG Workshop 2014 - New York - 11-15 August 2014
- Training workshop at 11th International Hydroinformatics Conference - Standardization of Water Data Exchange: [WaterML 2.0](#) and Beyond - 16 August 2014
- OGC TC Meeting - Boulder - 3 June 2015
- OGC Water Data Summit - Boulder TC - 3 June 2015
- OGC TC Meeting - Nottingham - 17 September 2015
- 6th Hydrology DWG Workshop 2015 - Orleans - 21-25 September 2015
- OGC TC Meeting - Sydney - 2 December 2015
- OGC TC Meeting - Washington - March 2016
- 7th Hydrology DWG Workshop 2016 - Koblenz - 13-17 June 2016
- OGC TC Meeting - Dublin - June 2016
- OGC TC Meeting - Delft - March 2017
- 8th Hydrology DWG Workshop 2017 - Tuscaloosa - 20-23 June 2017
- OGC TC Meeting - St John's - June 2017
- OGC TC Meeting - Palmerston North - December 2017
- OGC TC Meeting - Orleans - March 2018
- OGC TC Meeting - Stuttgart - September 2018
- 9th Hydrology DWG Workshop 2018 - Geneva - 17-20 September 2018
- OGC TC Meeting - Charlotte - December 2018
- OGC TC Meeting - Leuven - June 2019
- Session on HDWG during the ISDE11 - Florence - September 2019 - [conference paper](#)
- HydroDWG Seminar January 2021
- HydroDWG Seminar March 2021 - WQ Data
- HydroDWG Seminar August 2021 - Mainstems
- HydroDWG OGC Member Meeting - December 2021
- HydroDWG OGC Member Meeting - March 2022
- GWML2 Workshop March 2022
- Water Quality Workshop March 2022
- HydroDWG OGC Member Meeting - June 2022
- HydroDWG OGC Member Meeting - October 2022
- HydroDWG OGC Member Meeting - February 2023
- HydroDWG Spring 2023 - May 2023