ELISE action
Webinar Series

Workshop: SensorThings API brings Dynamic Data to INSPIRE

European Location Interoperability Solutions for e-Government

Enabling Digital Government through Geospatial and Location Intelligence

19/11/2020 at 14:00 CET (UTC+1)

ISA²

ISA² Programme & ELISE action

European Interoperability Programme

cross-border *and* ***cross-sector*** *Interoperability solutions*

for ***public administrations, businesses*** *and* ***citizens***

54 different actions tackling **interoperability** from different angles

ELISE action is the **only** action focusing on the **location dimension**

European Location Interoperability Solutions for e-Government

Enabling Digital Government through Geospatial and Location Intelligence

ISA²

Welcome to the ELISE webinar series

ELISE **Knowledge Transfer** activities

Purpose:

- Engage in **an agile way**
- with **topics** of relevance to the **Digital Transformation**
- **by harnessing the use of spatial data and technology.**
- **Validate** and **share** the results **of ELISE activities.**

https://europa.eu/!nP74ph

Our speakers

Kathi Schleidt

INSPIRE Expert

Hylke van der Schaaf

SensorThings Expert

The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

What we will cover today

- 14:00-14:45 SensorThings API & INSPIRE
- 14:45-14:50 Break
- 14:50-15:45 SensorThing API Deployment
- 15:45-16:00 Break
- 16:00-17:45 SensorThings Use
- 17:45-18:00 Wrap-up and Discussion

Overview

- **Background**
  - INSPIRE
  - APIs
  - API4INSPIRE
    - Project Goals
    - Evaluation Methodology
    - Endpoints
- Dynamic Data - SensorThings API (STA)
  - Observational Data
  - SensorThings Data Model
  - Alignment with INSPIRE EF
  - Request Patterns
- Discussion

To join our survey, please go to:
https://www.menti.com/
And enter the code: 68 81 18 7
Or scan the QR code below

What is INSPIRE?

- **Directive 2007/2/EC** establishing an Infrastructure for Spatial Information in the European Community
- Covers **34 Spatial Data Themes** grouped into 3 Annexes
- **OGC based UML** conceptual models created by TWGs, formalized in Implementing Rules (IR), XSD automatically generated
- Implementing Rules also govern **metadata, view & download services**
- Finalization date for data from Annex II & III fall 2020
- Current status: >100 000 datasets; ~7,000 institutions (and rising. Note: To date, most available datasets have not been harmonized)

What are OGC APIs?

- OGC is defining a new set of services to replace the currently used OWS, that date back 20 years and are hard to use.
- These new services are collectively identified as OGC APIs.
- They are Web APIs, sometimes referred to as **RESTful services**.
- Each service is described by an **OpenAPI document**.
- Mostly geared towards **JSON** based representations of resources
- Other encodings are supported, **e.g. HTML, XML**.
- Each service has a minimal core, and **numerous optional extensions to add functionality**.

OGC APIs

- Well suited for basic spatial features
- No support for underlying data models
- Query functionality still emerging
- Issues when dealing with dynamic data, temporal aspects

→For dynamic measurement data, we need something more!

→Thus, today's focus is on the OGC SensorThings API – also an API from OGC, but quite a bit more!

Why APIs in INSPIRE?

State-of-play

- Most services in INSPIRE geoportal are based on W*S/OWS services, OWS services are hard to use
  → APIs emerging within OGC
- SensorThings API first OGC API Standard (2016)
- Current issues:
  - different approaches (encodings, documentation, standards)
  - no technical guidance available, provider must show compliance
  - costs and benefits not yet very well known
- Candidate INSPIRE Good Practice Status for SensorThings API

Why APIs in INSPIRE?

European agenda

- European Strategy for Data
  - Sector-specific data spaces; Connecting different actors
- Open Data Directive
  - High-Value Datasets (harmonised, documented and available through APIs)
  - Requires APIs, includes temporal data
- Digital Europe Programme
  - Improve Europe's competitiveness in the global digital economy and achieve technological sovereignty
- INSPIRE MIWP 2020 - 2024
  - Standard-based APIs are a means for modernising INSPIRE’s technological stack
- NextGenerationEU
  - Rebuilding a post-COVID-19 Europe that will be a greener, more digital and more resilient.

Why APIs in INSPIRE?

APIs provide an excellent opportunity for INSPIRE

- Increase the use of the infrastructure
  - INSPIRE → mainstream ICT
  - Improve the discoverability through search
    - DWBP Best Practice 23: Make data available through an API
    - SDWBP Best Practice 12: Expose spatial data through 'convenience APIs'
- Leverage on grassroots standardisation
  - Novel approaches at the OGC (OGC API-Features and OGC SensorThings API)
    - Hackathons
    - Multiple early implementations
    - Co-creation of specifications

API4INSPIRE

- Implemented under the ISA^2 ELISE Action
  - European Location Interoperability Solutions for e-Government
- Based on demand
  - Requested by MS at the ISA^2 working group on geospatial solutions
- Novel approach
  - Providers on board
  - Learning from hands-on experiences
- Tasks
  - Evaluation Methodology
    - Benefits & Efforts
  - Deployment Strategies for
    - OGC API - Features
    - OGC SensorThings API
  - Deployment of API endpoints
  - Guidelines / technologies, lessons learned
  - Provide evidence for INSPIRE Good Practices with these APIs

Fraunhofer IOSB

DATA COVE

GeoSolutions
your one-stop-shop for geospatial open source software

API4INSPIRE - Project Partners

- Fraunhofer IOSB: developers of FROST server, experts on SensorThings API
- DataCove e.U.: INSPIRE expertise
- GeoSolutions: developers of GeoServer, experts on OGC API

API4INSPIRE - Data Providers

- Austrian Meteorological Agency (ZAMG) [AT]
- Austro Control (ACG) [AT]
- Austrian Environment Agency (UBA) [AT]
- European Environment Agency (EEA) [EU]
- City of Hamburg (CH) [DE]
- French Geological Survey (BRGM) [FR]
- Office for Biodiversity (OFB) + “INSIDE” - environmental information systems research center (BRGM+OFB) [FR]
- Environment Agency Baden-Württemberg (LUBW) [DE]

API4INSPIRE Tasks

- Evaluation Methodology
  - Benefits & Efforts
- Deployment Strategies for
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API4INSPIRE Tasks

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API4INSPIRE Evaluation Methodology

Goal - gain a better understanding of the impacts and benefits of:

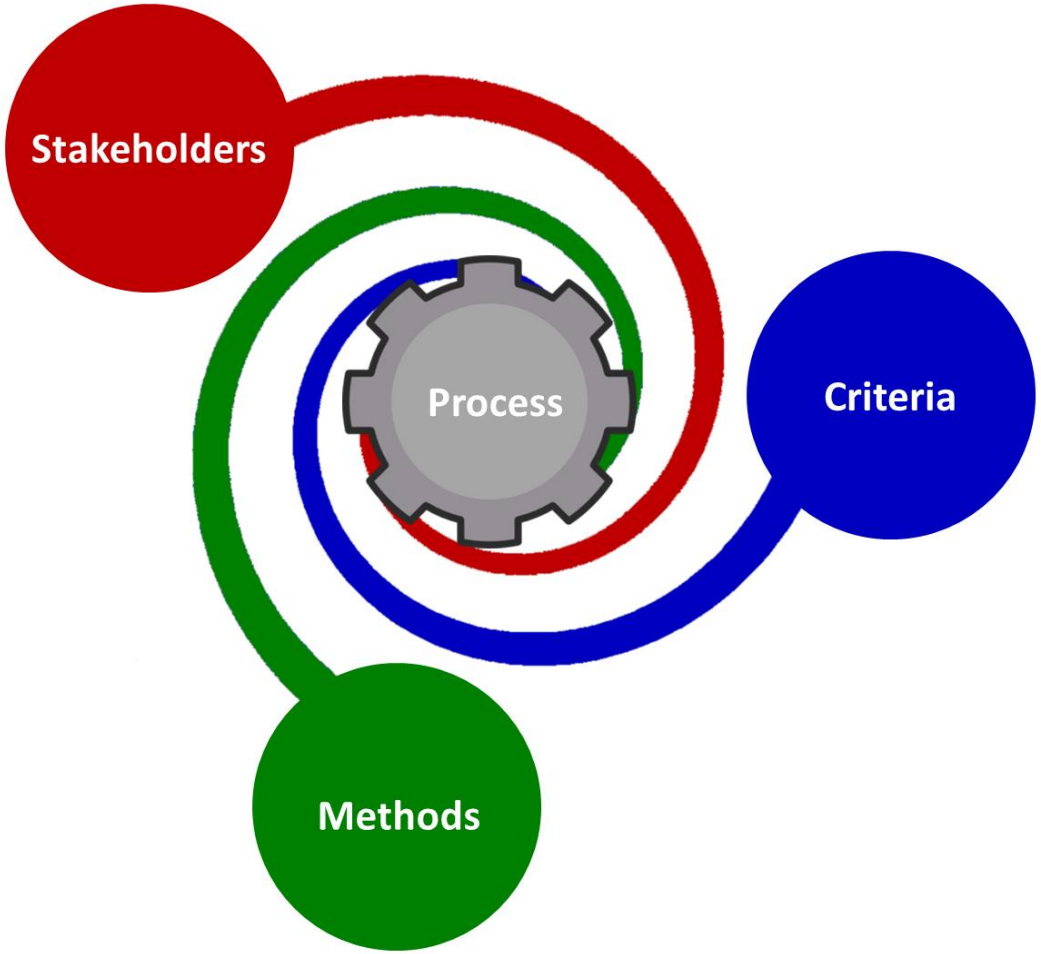
- APIs as valid INSPIRE download services;
- simplifications within the INSPIRE data models.

Evaluation Dimensions - Degrees of Freedom:

- API Specification
- Data Model
- Support Ecosystem

Evaluation Components:

- Stakeholder Perspectives
- Evaluation Criteria
- Evaluation Methods



API4INSPIRE Evaluation – Stakeholder Analysis

Requirements towards data provision and use analysed for following stakeholder types:

- Governmental Organizations providing data under INSPIRE
- Other Governmental Organizations (no INSPIRE requirements)
- Industry
- NGOs
- Scientific Organizations
- Citizen Science Initiatives
- Interested Public
- EC Institutions
- Standardization Bodies

API4INSPIRE Evaluation – Stakeholder Analysis

Provision Spectrum

- Configuration of an existing server for the provision of the desired API.
- Development of a dedicated system for provision of OGC API – Features
- API by proxy on existing WFS2

Usage Spectrum

- Direct access to data source (DB)
- File-based data sources
- Access to SOAP-Like OGC Web Services (OWS) with simple features
- Access to SOAP-Like OGC Web Services (OWS) with complex features
- Access to REST-Based APIs

API4INSPIRE Evaluation – Stakeholder Analysis

Stakeholder Perspectives

- **API Development** [Provision]: Concerning the role of a software engineer, responsible to develop an implementation of the API Standard.
- **API Deployment** [Provision]: Concerning the role of a data provider, responsible to publish through the API by utilizing and configuring existing implementations.
- **API Use** [Usage]: Concerning the role of API consumers.

API4INSPIRE Evaluation Criteria

- Based on the Five Level Open Data API evaluation model by Jarkko Moilanen;
- In turn derived from Sir Tim Berners-Lee's 5-star deployment scheme for Linked Open Data;
- Extensions from:
  - ISO 25010 Standard on Systems and software engineering - Systems and software Quality Requirements and Evaluation (SQuaRE)
  - Project Partners experience

API4INSPIRE Evaluation Criteria

Level 1: All find

- **Single Entry Point**: Is all information available from a single source (the portal), either directly or through links?
- **Documentation**: Is updated documentation available?
- **Example Requests**: Are there examples of API requests seen as part of the documentation?
- **Example Data**: Are there examples of the API request returned data?
- **Discoverability**: Is it possible to discover deployed instances of the API based on the resources provided?

API4INSPIRE Evaluation Criteria

Level 2: All use

- **JSON or XML**: Does it support the use of JSON and/or XML?
- **Data License**: Are data license details given through the API?
- **Terms of Use**: Are Terms of Use clear and easily accessible?
- **Embedded Metadata**: Does returning data include metadata?
- **Authentication**: Does the API support authentication/authorization?
- **API Standardization**: Is the API itself standardised, and is this specification openly available
- **Suitability**: Is the API suitable for the intended use?

API4INSPIRE Evaluation Criteria

Level 3: All trust

- **Query and Analytics API**: Does the API include Querying and Analytics?
- **Error Handling**: Is Error Handling in place and documented?
- **Performance and Cache**: Can the API offer sufficient performance and does it support caching?
- **Background Support**: Is the development and maintenance of the API supported by a big, stable entity or company?
- **Availability**: Is it easy to integrate into existing workflows and toolsets?
- **API Data Validation**: Can the data returned by the API be validated?

API4INSPIRE Evaluation Criteria

Level 4: All involved

- **SDK Availability**: Are API SDK's available for one or more environments?
- **Code Examples**: Are there examples of code in one or more commonly used programming languages?
- **Community**: Is there a growing community to consult if needed?
- **Playground**: Is there an API Playground for testing and getting familiar with the API?
- **Linked Documentation**: Is documentation linked to code examples and back again?
- **API Evolution**: Can a developer, data provider or user provide feedback on issues with the data model or API functionality and are custom extensions to the API foreseen?

API4INSPIRE Evaluation Criteria

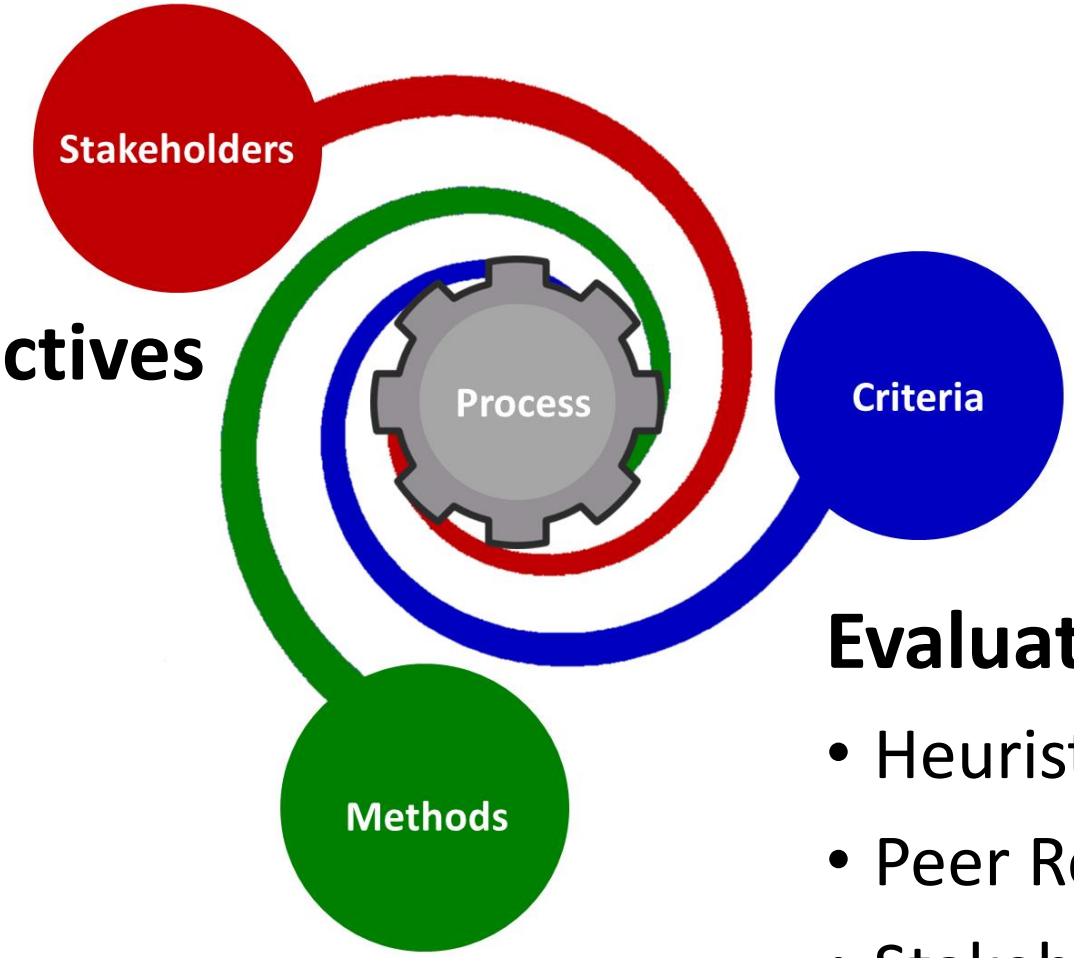
Level 5: All develop

- **Code Visible**: Is code visible/can be cloned?
- **Bug Tracker**: Can Bugs, issues and suggestions be reported in a public place and is dialogue public?
- **API License/reuse**: Is the API's license known, are parts of the API covered by patent claims, and does it allow further development and re-use?
- **Development Roadmap**: Is the API's development roadmap known and is it visible for all?
- **Linked Data Ready**: Is the data provided structured in a Linked Data ready manner, i.e. JSON-LD?
- **Test Framework available**: Can conformance to the API be formally tested?

API4INSPIRE Evaluation Methods

- **Heuristic Expert Evaluation**: domain experts from project team & data provider staff;
- **Peer Review**: similar to code review, a specific aspect of the API is reviewed in a structured manner;
- **Stakeholder Interview**: in-depth interviews with engaged stakeholders
- **Stakeholder Questionnaire**: online poll in the framework of events (such as this one)

API4INSPIRE Evaluation Process



Stakeholder Perspectives

- API Development
- API Deployment
- API Use

Evaluation Criteria

- Level 1: All find
- Level 2: All use
- Level 3: All trust
- Level 4: All involved
- Level 5: All develop

Evaluation Methods

- Heuristic Expert Evaluation
- Peer Review
- Stakeholder Interview
- Stakeholder Questionnaire

Details at: https://datacoveeu.github.io/API4INSPIRE/files/D1-EvaluationMethodology_1.1.pdf

API4INSPIRE Tasks

- Evaluation Methodology
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- **Deployment Strategies for**
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Details at: https://datacoveeu.github.io/API4INSPIRE/files/D2-DeploymentStrategy_1.1.pdf

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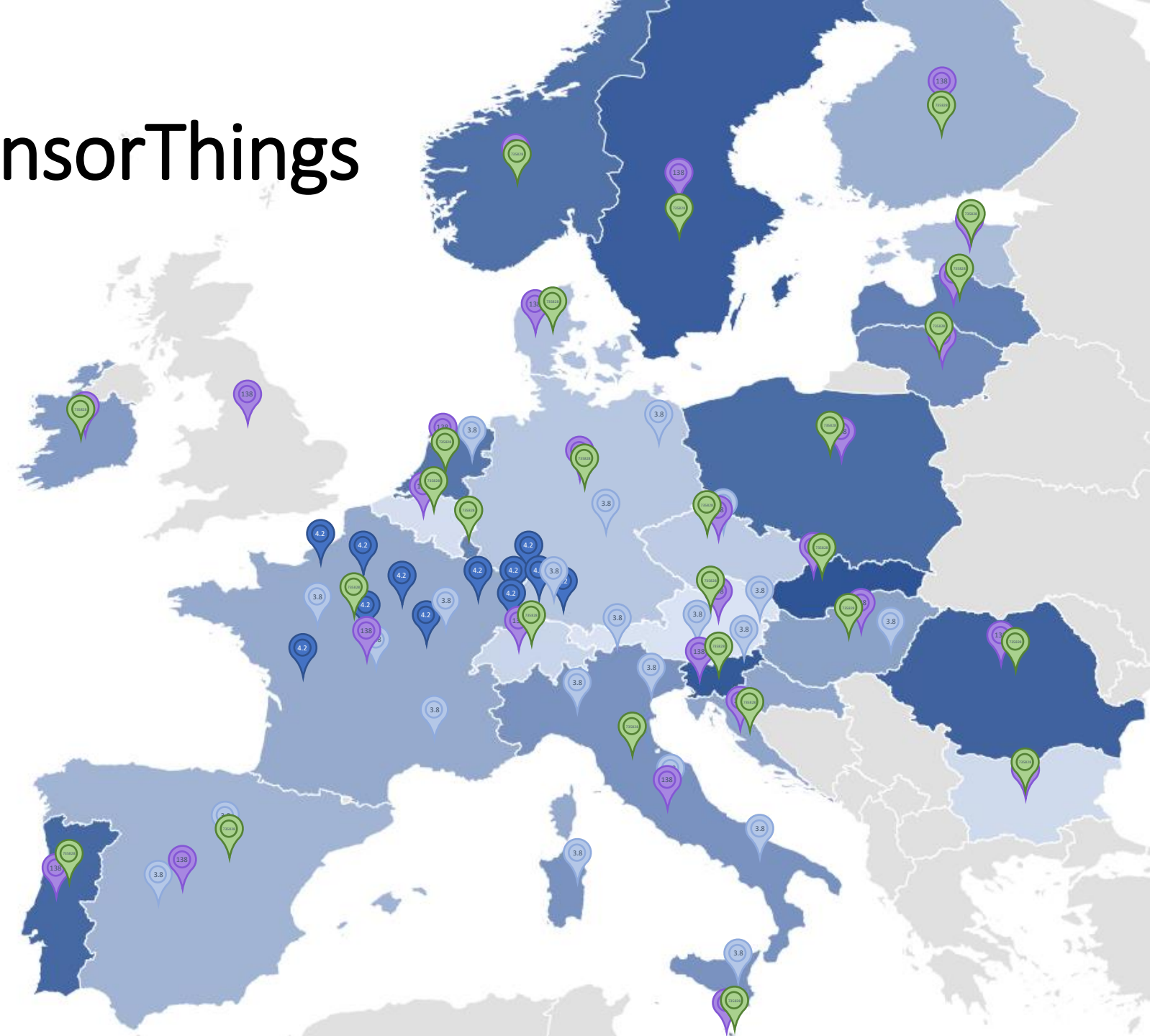
Data Nests

Sets of colocated and complementary data sources exposed by the APIs under evaluation:

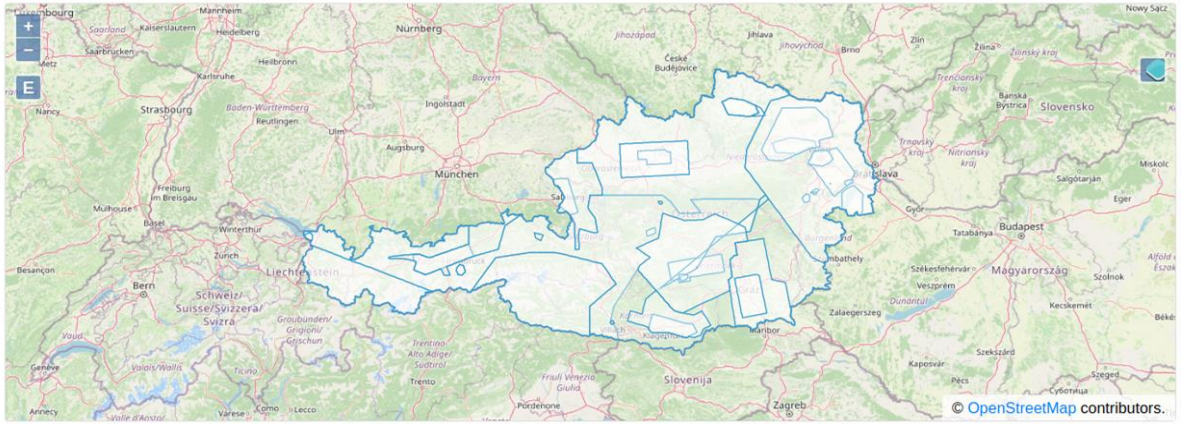
- **Airy Austria:**
  Air Transport information complemented by meteorological data
- **Urban Data Platform Hamburg:**
  Smart City Sensors together with road transport networks
- **Franco-Germanic Flow:**
  Cross-border water: surface & ground, quality & quantity, flood zones
- **Covid ad-hoc:**
  Realtime air quality, Covid-19 case data complemented by a background demography layer

API4INSPIRE - SensorThings

- HydroThings
- AirThings
- CovidThings
- DemographyThings



Airy Austria



Air Transport information
& meteorological data.

This nest consists of the following data providers and end points:

- **Austro Control** is the air navigation services provider that controls Austrian airspace
  WFS2: https://sdigeo-free.austrocontrol.at/geoserver/tn-a/wfs?service=WFS&version=2.0.0&request=GetCapabilities
  OGC API: https://inspire.austrocontrol.at/ogcapi/ogc/features
- **Austrian Meteorological Agency (ZAMG)** has a wide range of expertise at its disposal pertaining to all aspects of meteorological data management and provision

Urban Data Platform Hamburg

The **City of Hamburg** has long seen the potential of Smart City technology, and been involved in diverse Smart City initiatives, successively extending their smart sensor infrastructure to an ever widening usage area.

Endpoint: https://iot.hamburg.de/v1.0

- Charging stations for electric cars
- Bike sharing stations from StadtRad
- Data from the Energy Campus of the Hamburg University of Applied Sciences

Future plans: A Lot!

- Traffic lights, traffic density, etc...

Franco-Germanic Flow

- The French Geological Survey (BRGM) has long been involved in pushing the envelope pertaining to the possibilities of environmental data provision.
- Along with the French Office for Biodiversity (OFB) and their joint research center on information system (INSIDE), they provide access to (linked) datasets from various French Information Systems on Water, Underground Risk using

Geoscience for a sustainable Earth
brgm

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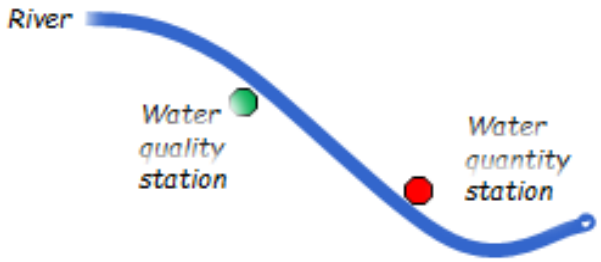
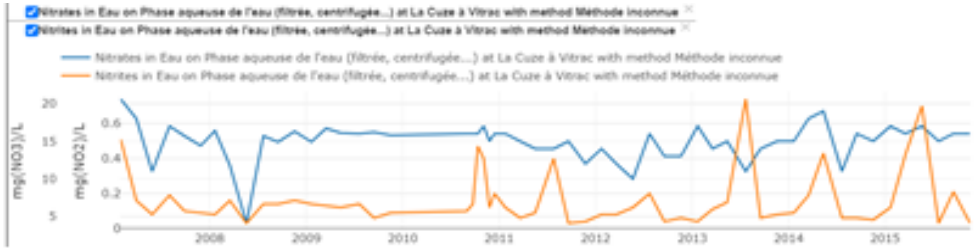
OFFICE FRANÇAIS DE LA BIODIVERSITÉ

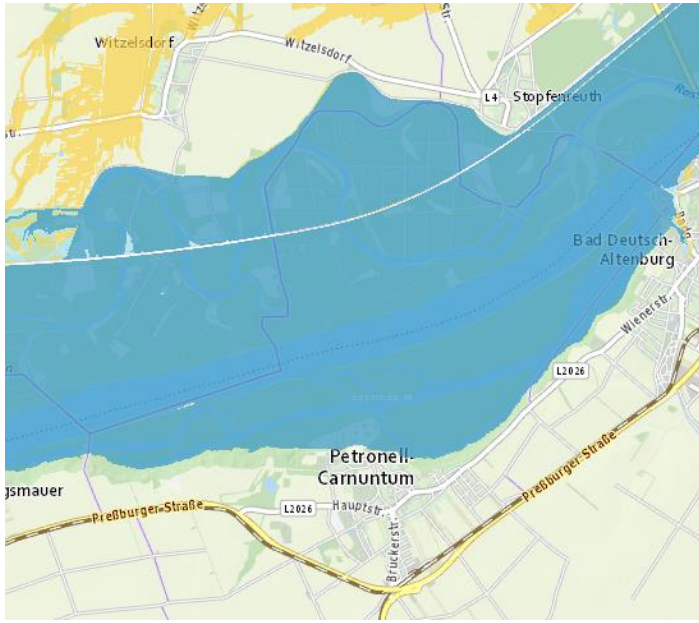
- The Environment Agency Baden-Württemberg – **LUBW** provides diverse water resources within Germany.
  STA: https://lubw.k8s.ilt-dmz.iosb.fraunhofer.de/v1.1
  Viewer: https://api4inspire.k8s.ilt-dmz.iosb.fraunhofer.de/servlet/is/107/

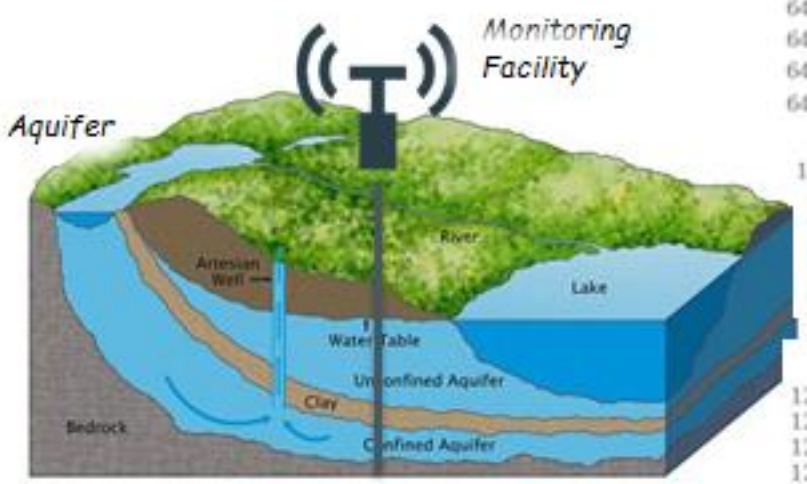
LUBW

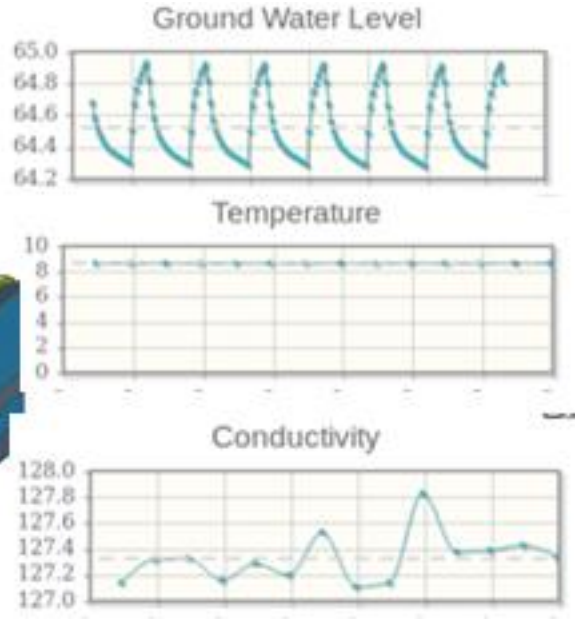
Franco-Germanic Flow











Geoscience for a sustainable Earth
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LUBW

Ad-Hoc Nest

AirThings

Data from Umweltbundesamt (AT) and EEA (EU)

- https://airquality-frost.k8s.ilt-dmz.iosb.fraunhofer.de/v1.1
- https://api4inspire.k8s.ilt-dmz.iosb.fraunhofer.de/servlet/is/127/

CovidThings

Data from Johns Hopkins and Robert Koch Institute (RKI)

- http://covidsta.hft-stuttgart.de/server/

DemographyThings

Data from Eurostat DB and Statistics Poland

- European NUTS Regions: https://demography.k8s.ilt-dmz.iosb.fraunhofer.de/v1.1
- European 1km Grid for Poland: http://service.datacove.eu/DemographyThings/v1.1

API4INSPIRE Tasks

- Evaluation Methodology
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API4INSPIRE

Documentation of APIs for INSPIRE

View On GitHub

Project maintained by DataCoveEU

API4INSPIRE

The EC has a long history of promoting open access to public data across Europe, breaking down electronic barriers at national borders through the creation of common data and service models, as well as through the provision of accompanying legislation facilitating such endeavours. The INSPIRE Directive has been a core buil block in this work, which has been further elaborated within the "European Union Location Framework (EULF)" "A Reusable INSPIRE Reference Platform (ARe3NA)"

API4INSPIRE serves to investigate new developments in geospatial standards and technologies, foremost the r OGC API – Features and SensorThings API standards, together with the outcomes of the INSPIRE MIG Action 2(on alternative encodings for INSPIRE data. For this purpose, an evaluation strategy has been developed suited determine how these new and emerging standards can best be utilized to leverage existing investments by EU Member States in the INSPIRE implementation.

For the provision of data via OGC API – Features, our most common deployment option is GeoServer with the OGC API extension. For cases where GeoServer is not used or where we do not have access to provider infrastructure, LD-Proxy is utilized to transform data available via WFS2. In addition, the OGC API – Simple ser has been developed within the API4INSPIRE project; this simple implementation allows for provision of simple features in accordance with SF-0. For the provision of SensorThings API, we utilize the Fraunhofer Open Sourc SensorThings (FROST) Server.

Data Providers

Six data providers from Germany, France and Austria are contributing data, staff and infrastructure, and are we

Demography data for NUTS Regions

Project maintained by DataCoveEU

hub.io/API4INSPIRE/maps/Demography.html

Italia

- Population Count age <15, gender total
- Population Count age >65, gender total
- Population Count age 15-64, gender total
- Population Count age unknown, gender total
- Population Count age total, gender total
- Population Count age <15, gender male
- Population Count age >65, gender male
- Population Count age 15-64, gender male
- Population Count age unknown, gender male
- Population Count age total, gender male
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- Population Count age >65, gender female
- Population Count age 15-64, gender female
- Population Count age unknown, gender female
- Population Count age total, gender female
- Population Density

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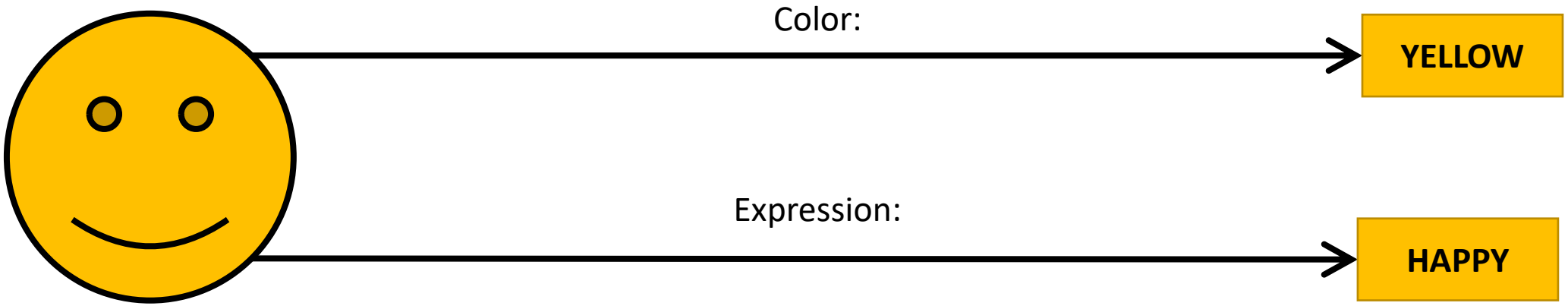
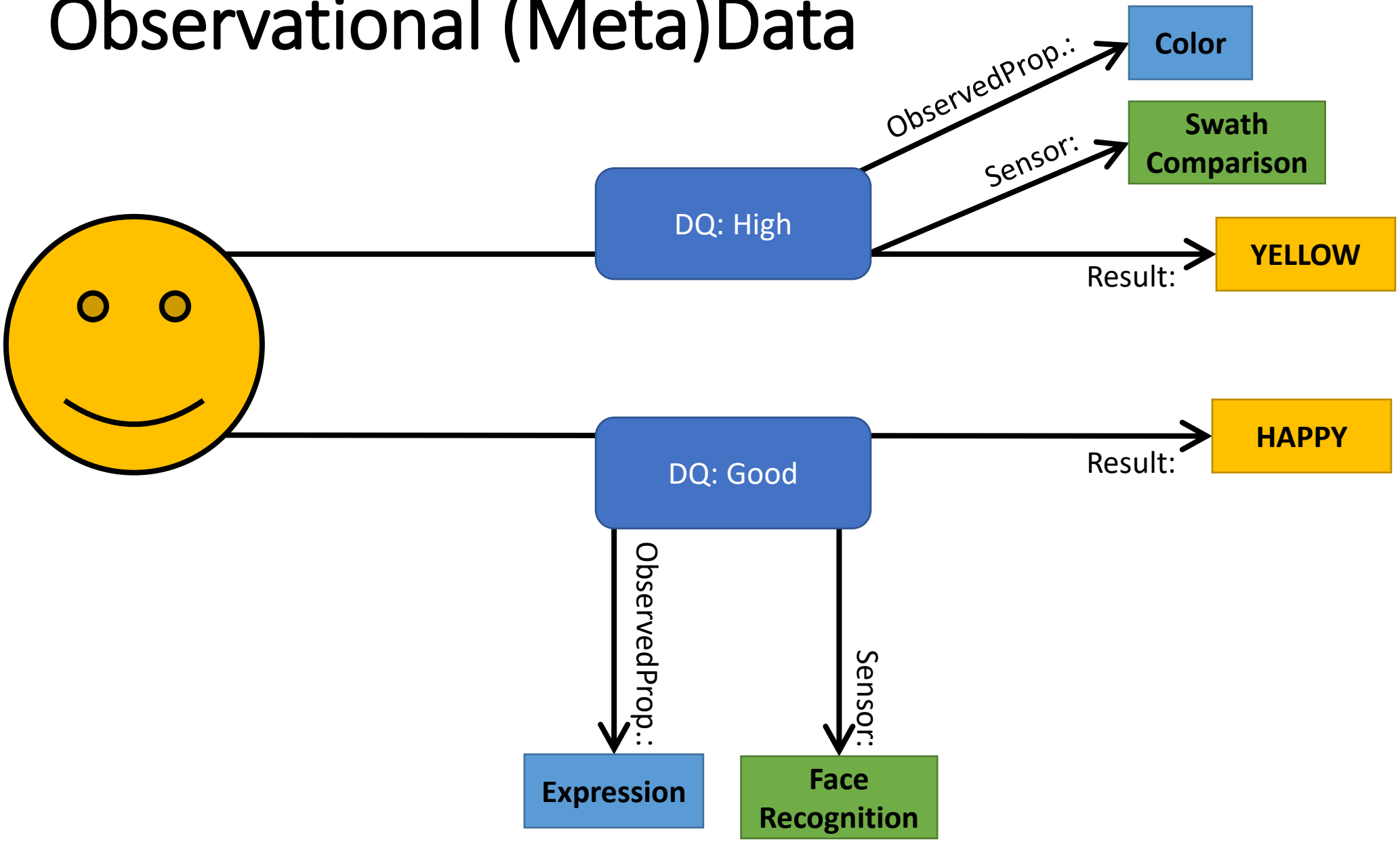
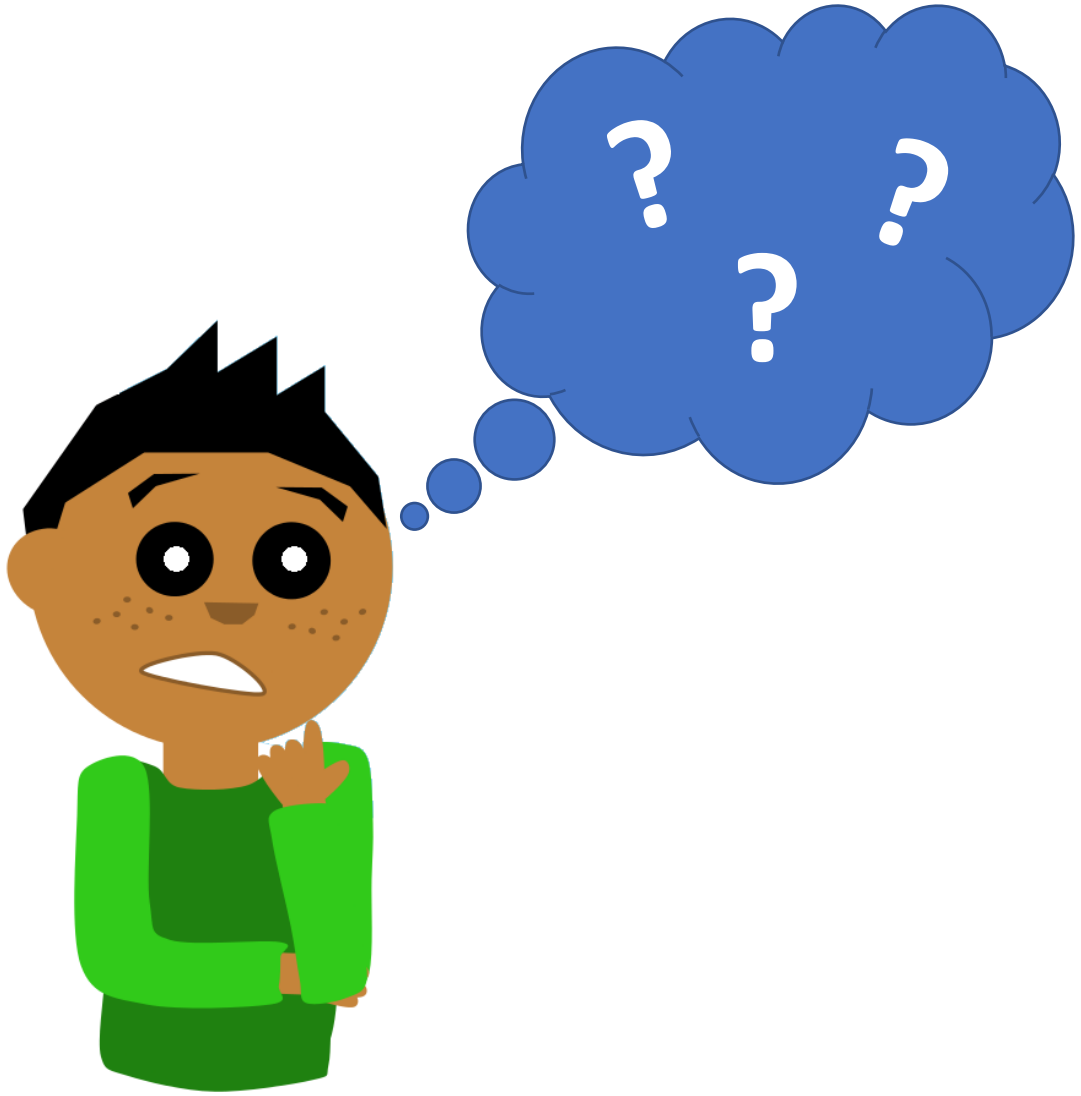
Observational (Meta)Data

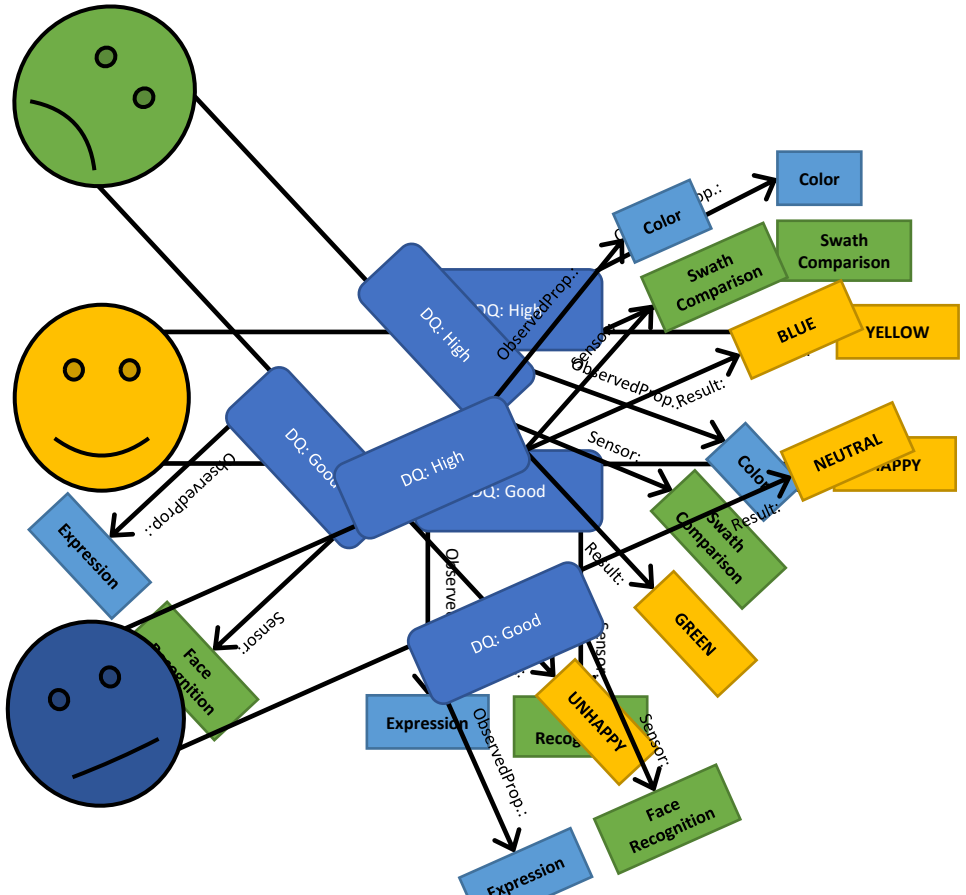


Observational (Meta)Data

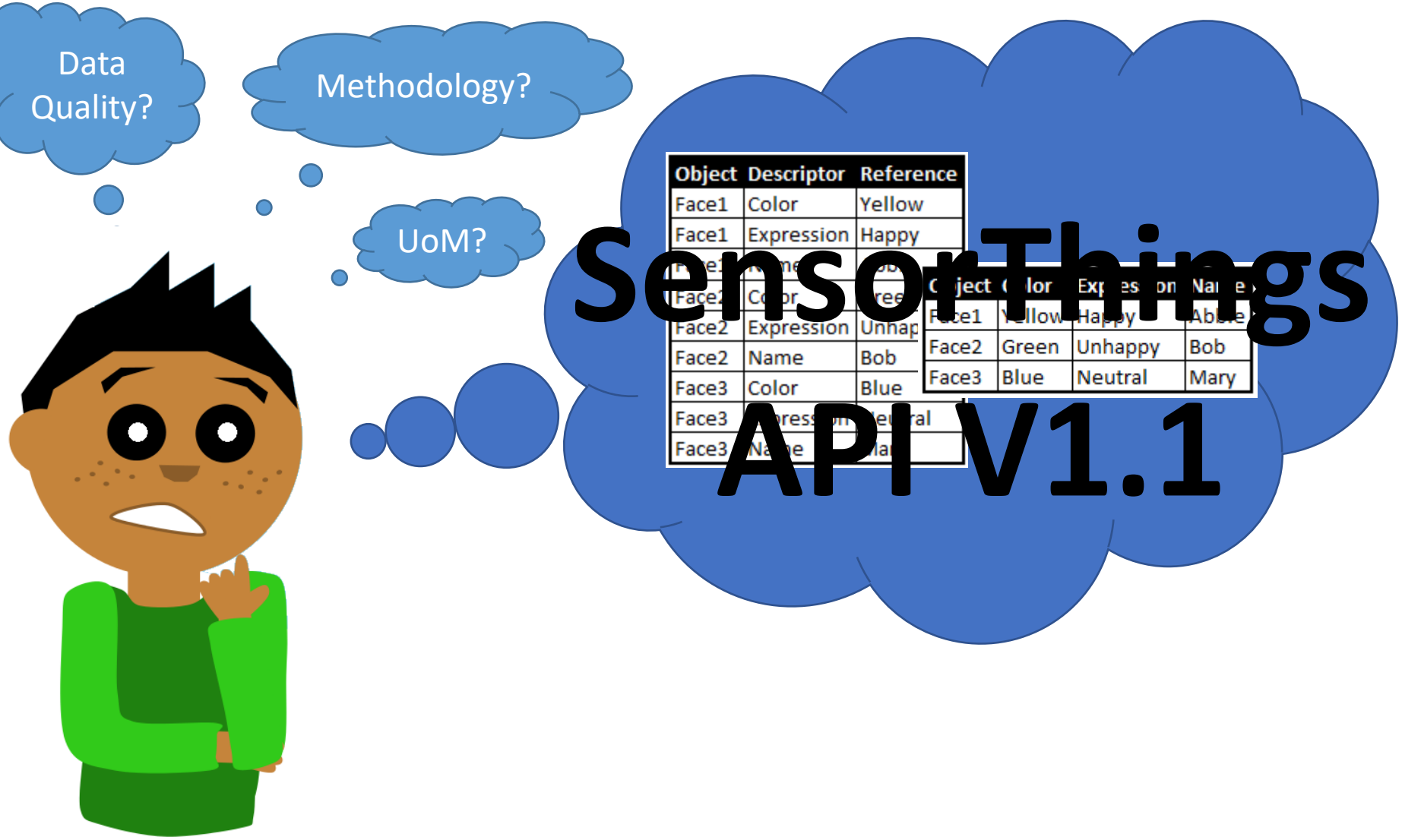


Using Observational (Meta)Data





Using Observational (Meta)Data



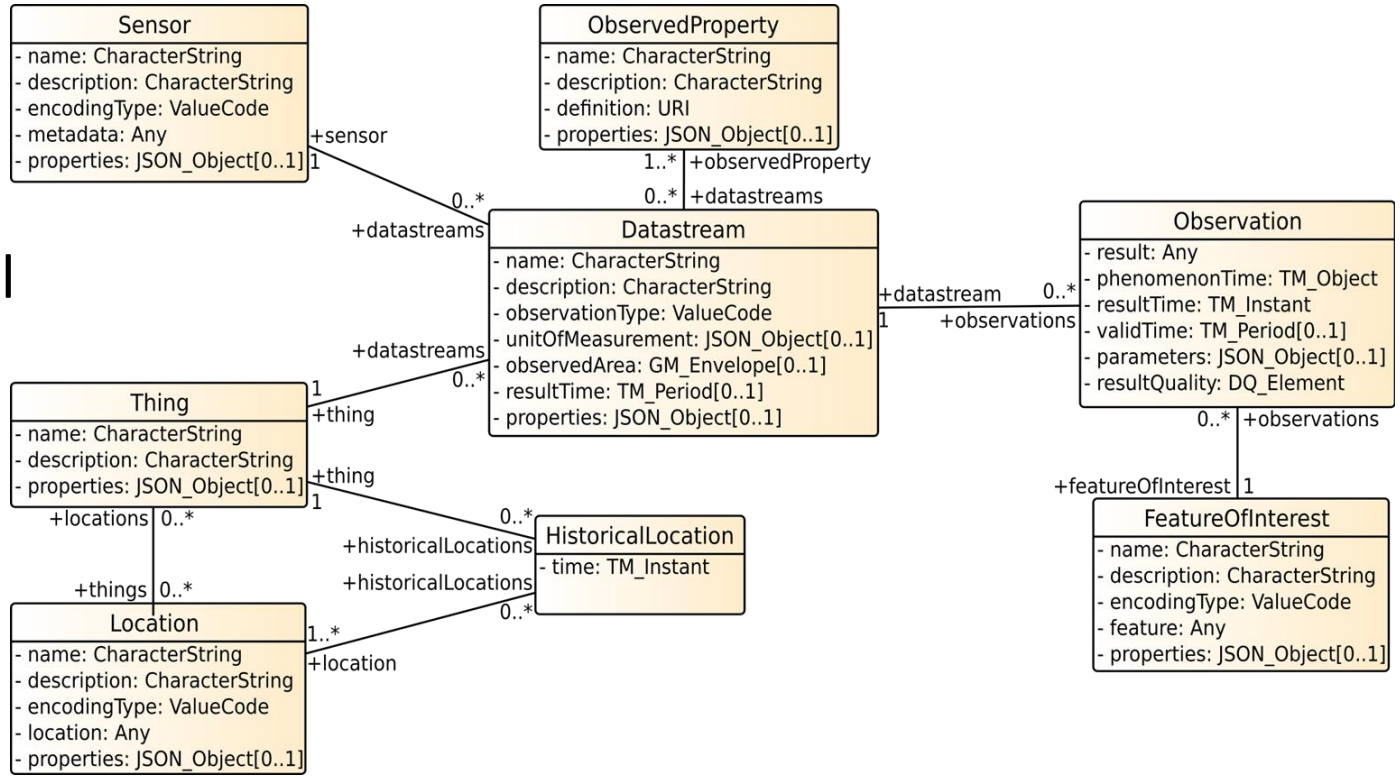
OGC SensorThings API

FROST Server

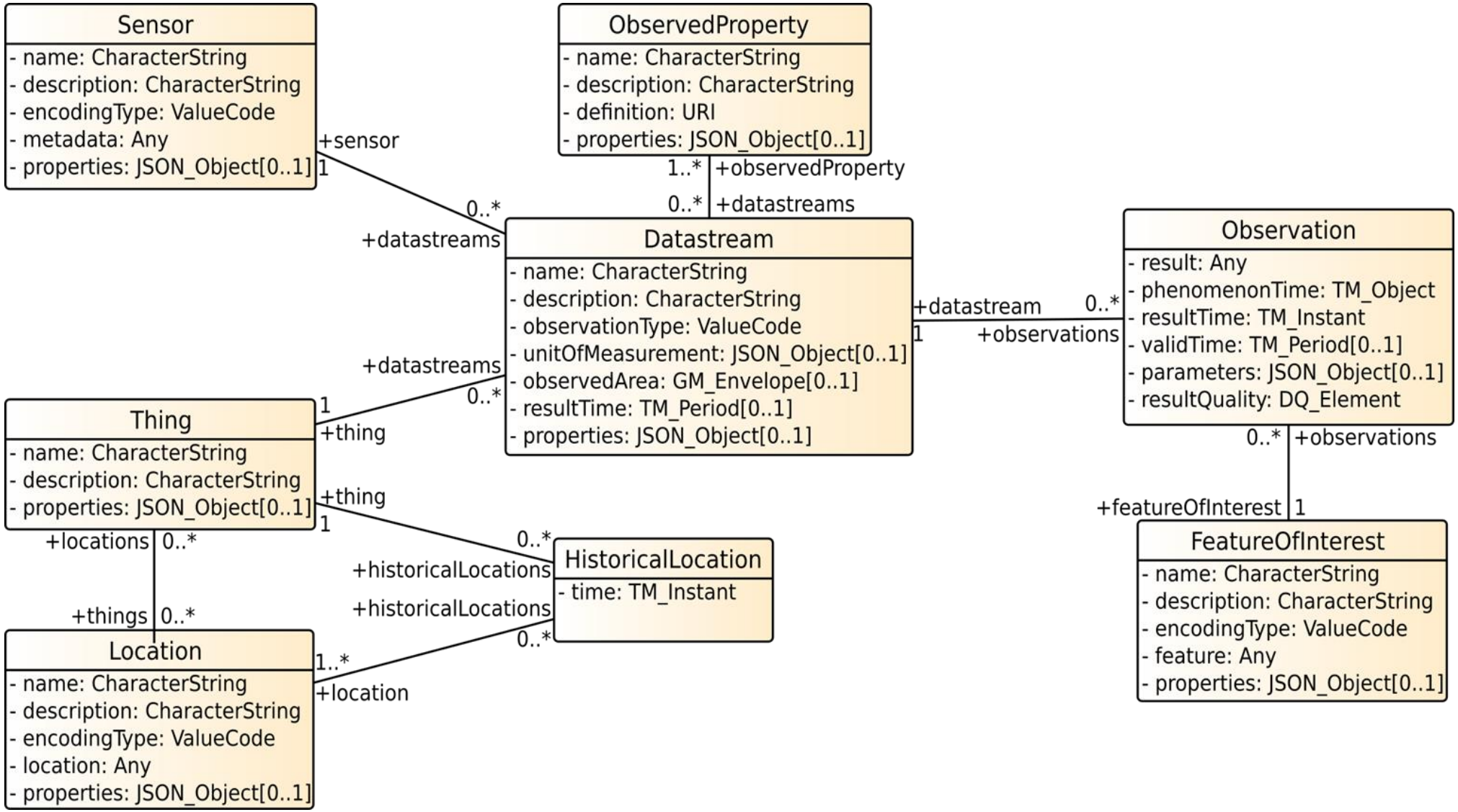
The successor to SOS

- REST + JSON + Full Editing
- O&M Based Data Model
  - Extendible properties
- Powerful OData Queries
  - Across the entire data model
  - Composable response data
- Scalable
  - Thousands of stations
  - Millions of observations
- Understandable
  - Follow the links to *all* data

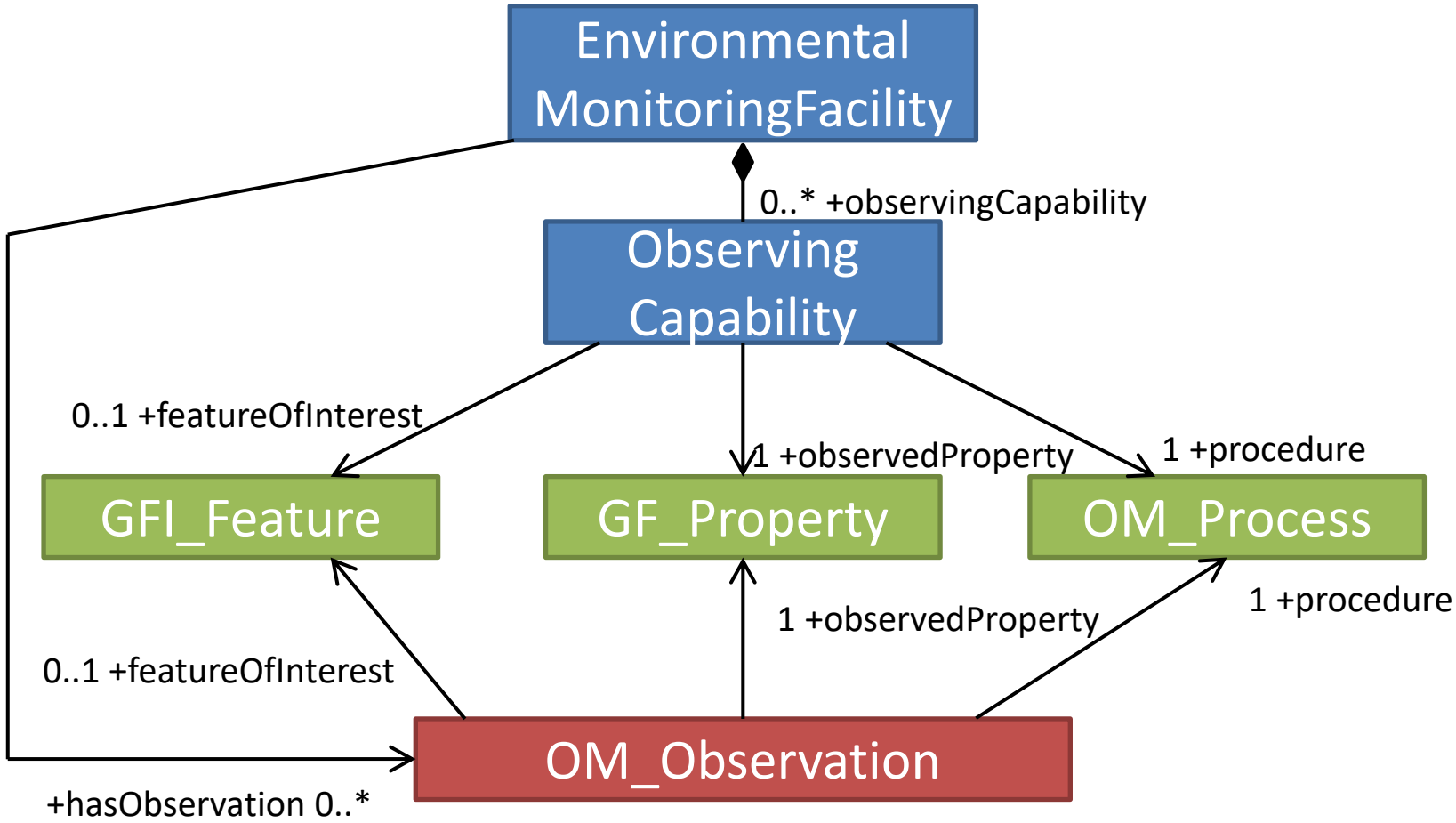
Caveat: In contrast to OGC APIs, OGC SensorThings API is based on the **Odata API Model**



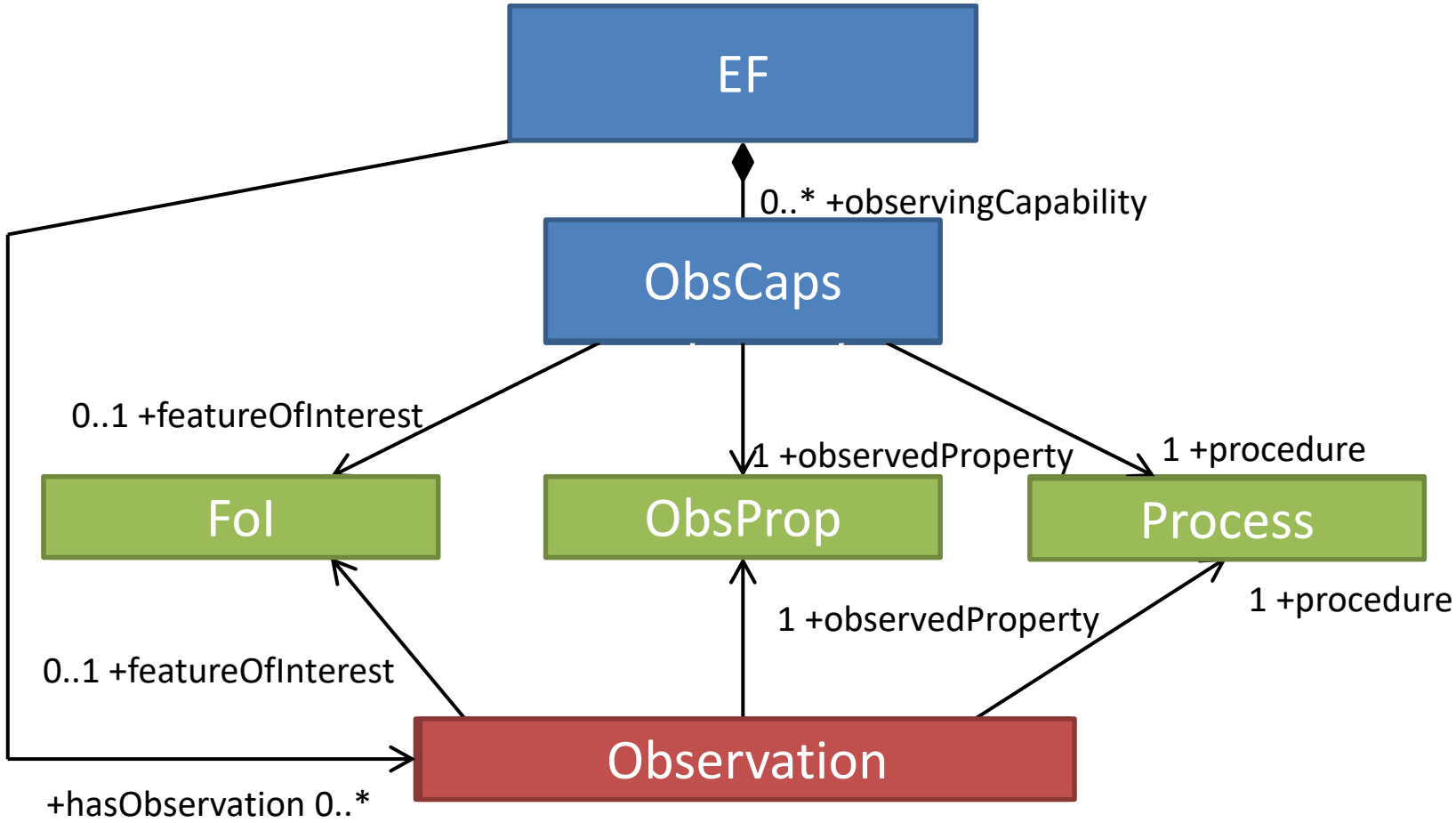
OGC SensorThings API



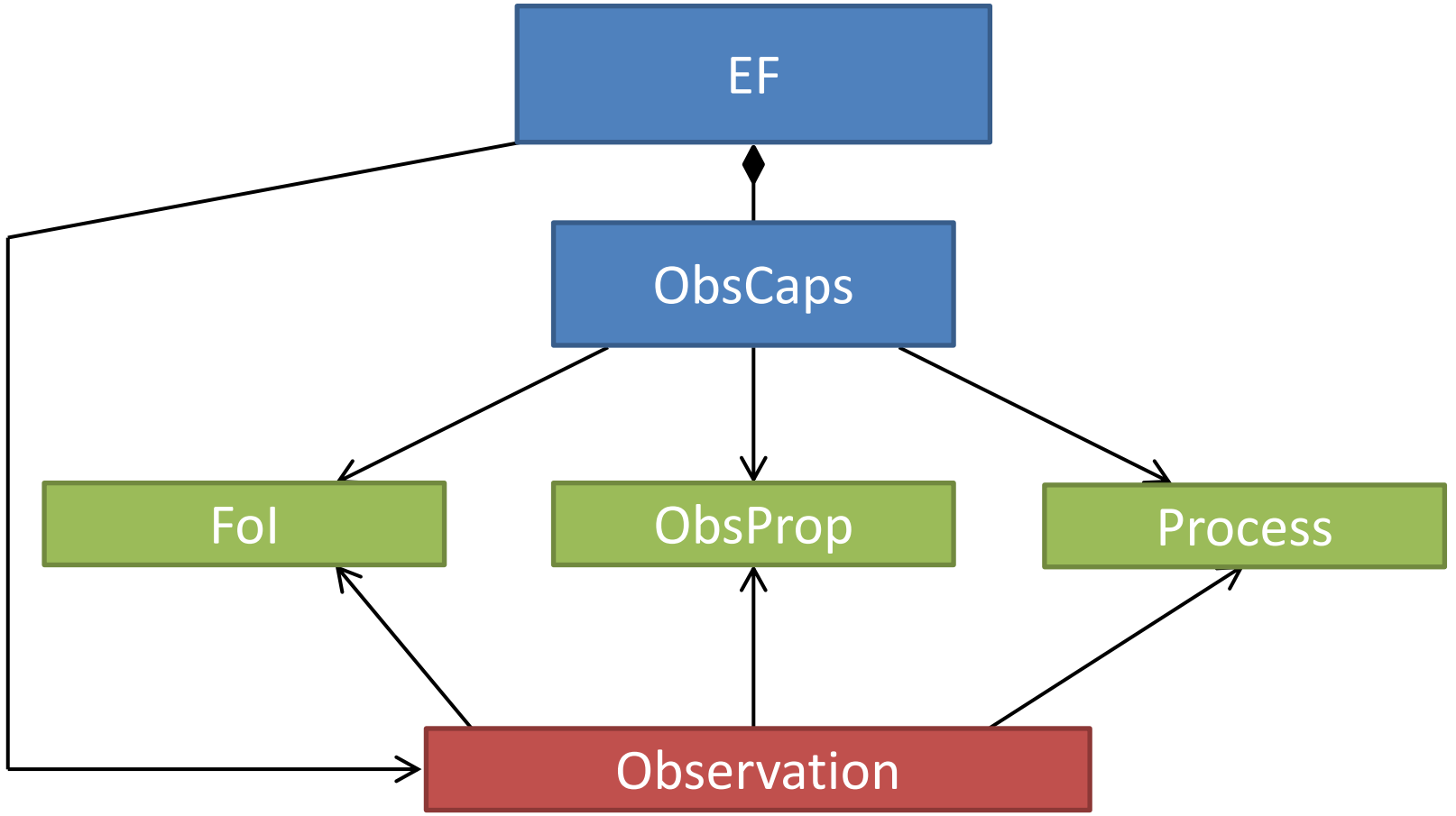
INSPIRE EF


Environmental MonitoringFacility
0..* +observingCapability
Observing Capability
0..1 +featureOfInterest
1 +observedProperty
1 +procedure
GFI_Feature
GF_Property
OM_Process
1 +observedProperty
1 +procedure
0..1 +featureOfInterest
OM_Observation
+hasObservation 0..*

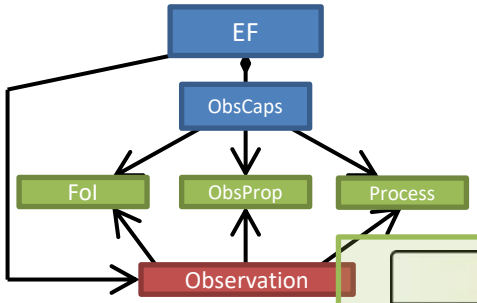
INSPIRE EF


EF
0..* +observingCapability
ObsCaps
0..1 +featureOfInterest
1 +observedProperty
1 +procedure
FoI
ObsProp
Process
1 +observedProperty
1 +procedure
0..1 +featureOfInterest
Observation
+hasObservation 0..*

INSPIRE EF



INSPIRE EF



Process

ObsProp

ObsCaps

Observation

EF

FoI

Sensor
- name: CharacterString
- description: CharacterString
- encodingType: ValueCode
- metadata: Any
- properties: JSON_Object[0..1]

+sensor
1

ObservedProperty
- name: CharacterString
- description: CharacterString
- definition: URI
- properties: JSON_Object[0..1]

1..* +observedProperty
0..* +datastreams

0..* +datastreams

Thing
- name: CharacterString
- description: CharacterString
- properties: JSON_Object[0..1]

1 +thing
+thing 1
+locations 0..*

0..* +historicalLocations
+historicalLocations 0..*

HistoricalLocation
- time: TM_Instant

+thing 0..*

Location
- name: CharacterString
- description: CharacterString
- encodingType: ValueCode
- location: Any
- properties: JSON_Object[0..1]

1..* +location

0..* +datastreams
0..* +datastreams

- name: CharacterString
- description: CharacterString
- observationType: ValueCode
- unitOfMeasurement: JSON_Object[0..1]
- observedArea: GM_Envelope[0..1]
- resultTime: TM_Period[0..1]
- properties: JSON_Object[0..1]

+datastream 0..*
1 +observations

Observation
- result: Any
- phenomenonTime: TM_Object
- resultTime: TM_Instant
- validTime: TM_Period[0..1]
- parameters: JSON_Object[0..1]
- resultQuality: DQ_Element

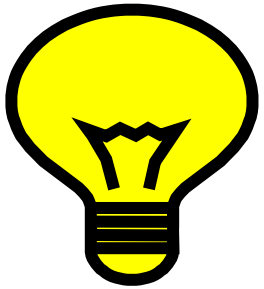
0..* +observations

+featureOfInterest 1

FeatureOfInterest
- name: CharacterString
- description: CharacterString
- encodingType: ValueCode
- feature: Any
- properties: JSON_Object[0..1]

INSPIRE EF Details

- Class level mapping clear, but what to do with the mandatory attributes?
- EF Requirements on Thing:
  - measurement Regime
  - mobile
  - operational Activity Period



- Provide in object properties!

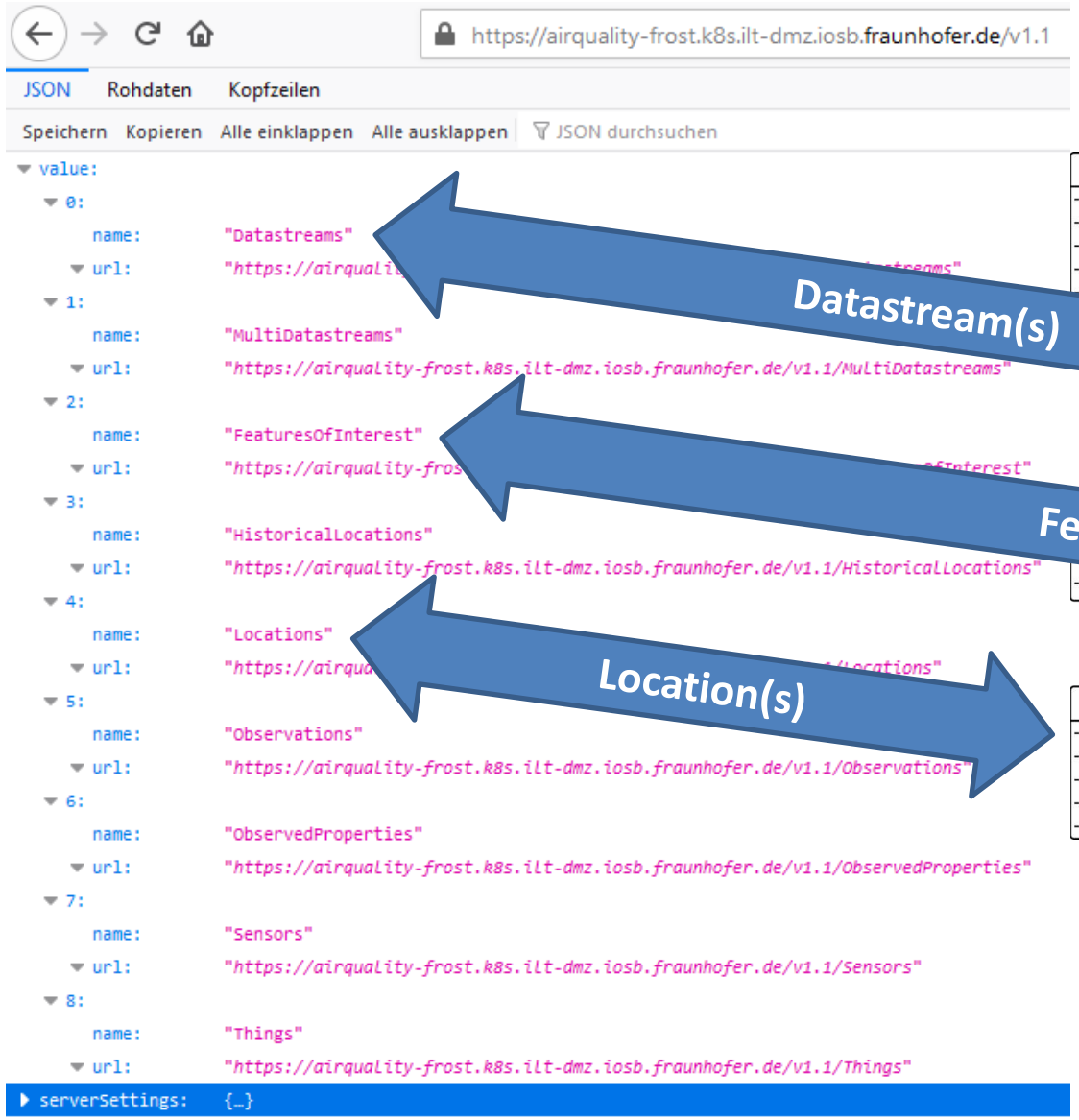
INSPIRE EF Details - Thing

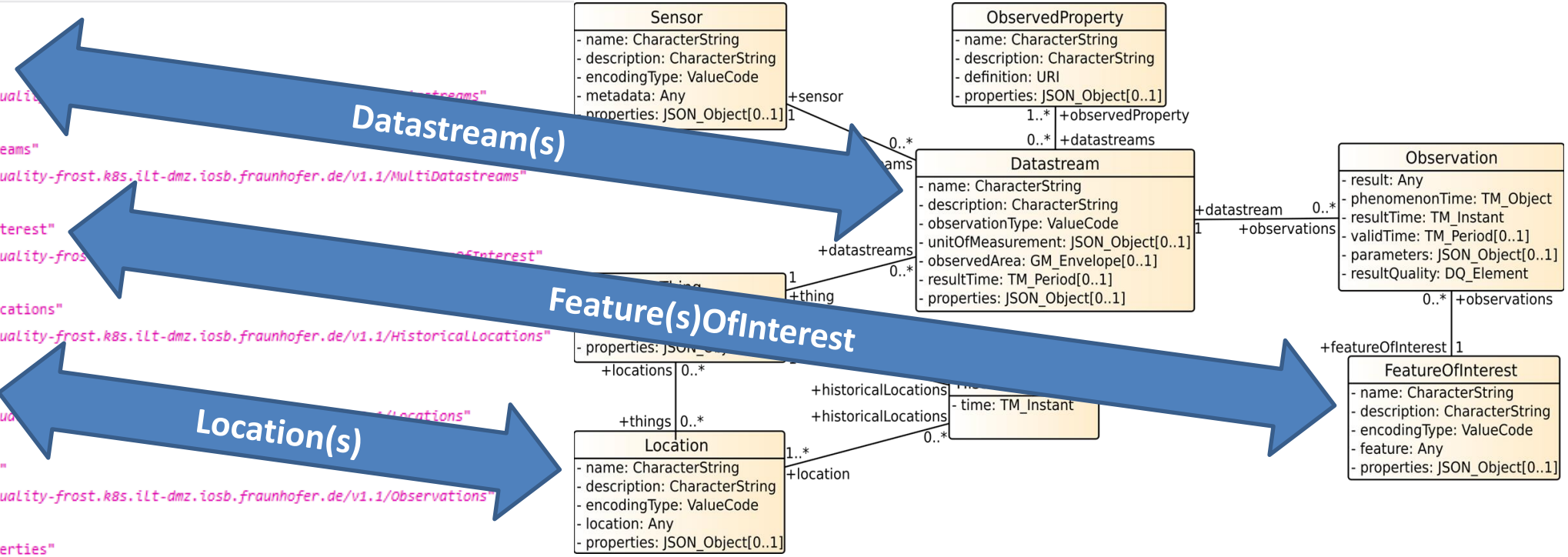
INSPIRE	STA
inspireId	
localId	ID
namespace	PROPERTIES/namespace
name	NAME
mediaMonitored	PROPERTIES/mediaMonitored
measurementRegime	PROPERTIES/measurementRegime
mobile	PROPERTIES/mobile
operationalActivityPeriod	PROPERTIES
beginPosition	PROPERTIES/beginTime
endPosition	PROPERTIES/endTime

INSPIRE Good Practice

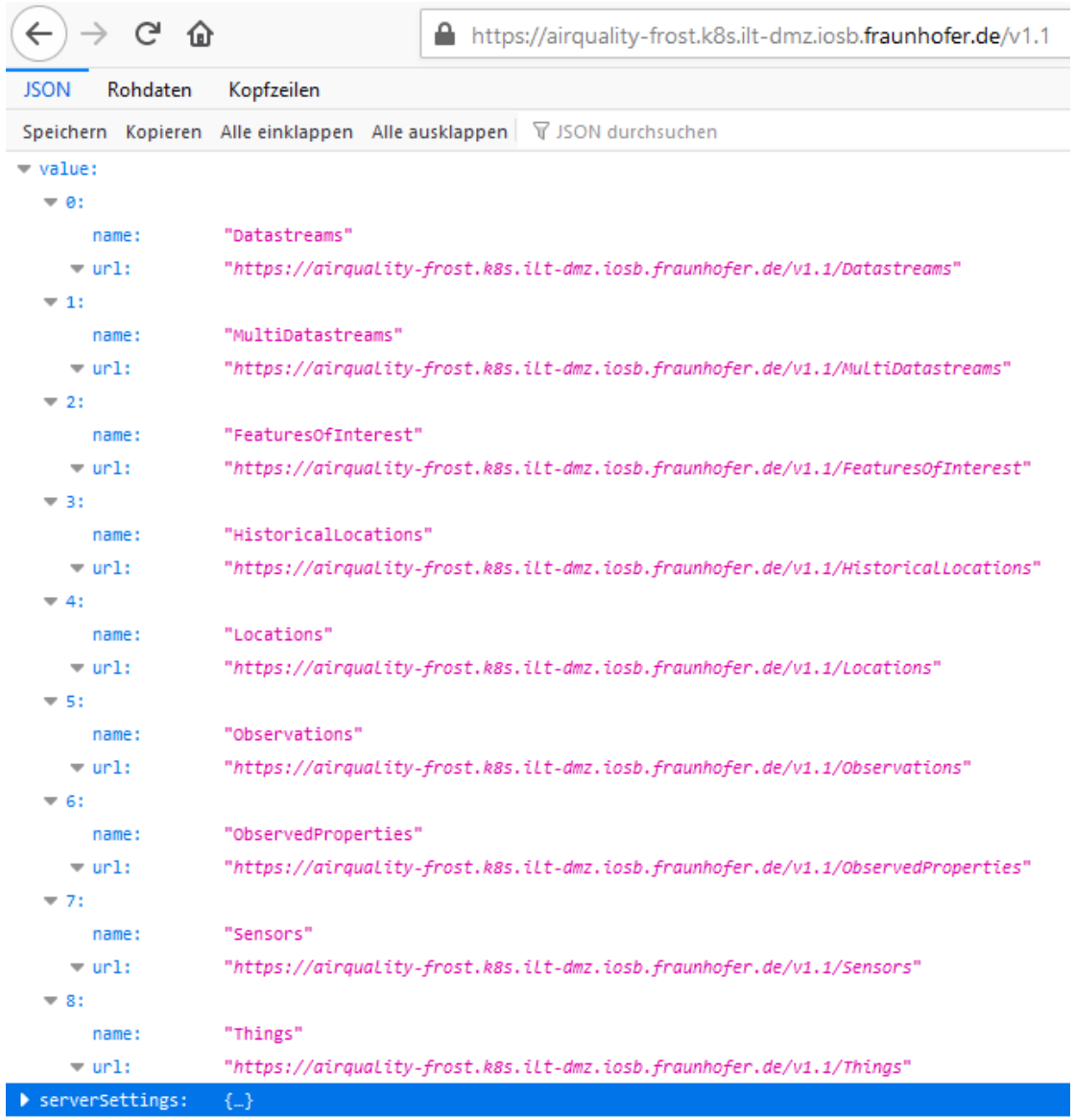
- Mapping for all attributes provided at: www.mdpi.com/2076-3263/8/6/221
- Candidate Good Practice Status achieved at MIG-T Meeting October 13th 2020
- Information at: https://github.com/INSPIRE-MIF/gp-ogc-sensorthings-api
- Looking for final endorsement at upcoming MIG Meeting November 26-27

OGC SensorThings API (STA)





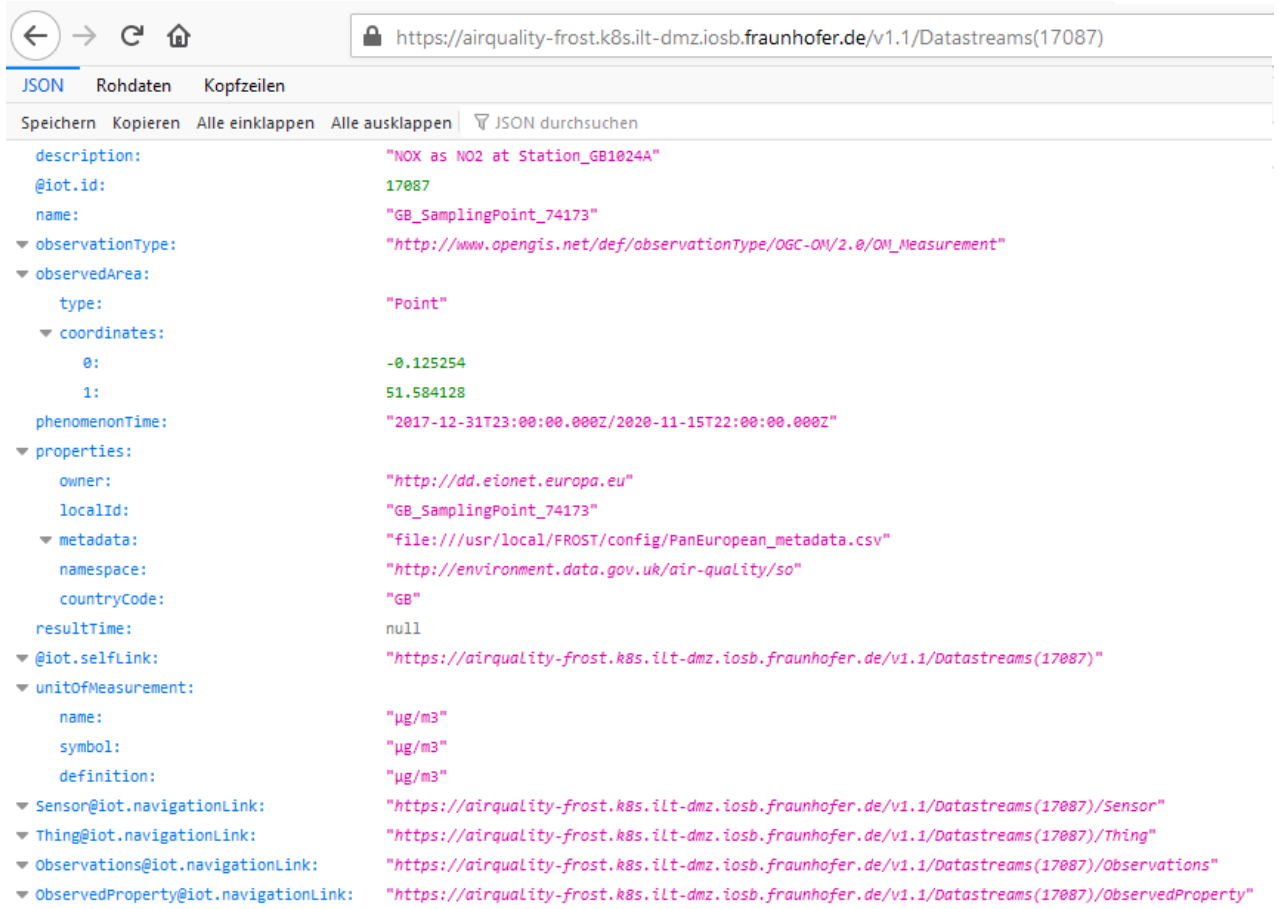
STA Requests



Read: GET

- v1.1
  → Get collection index
- v1.1/Collection
  → Get all entities in a collection
- v1.1/Collection(id)
  → Get one entity from a collection

STA Requests



Read: GET

- v1.1
  → Get collection index
- v1.1/Datastreams
  → Get all entities in a collection
- v1.1/ Datastreams(17087)
  → Get one entity from a collection

STA Requests

Create: POST

- v1.1/Collection → Create a new entity

Update: PATCH

- v1.1/Collection(id) → Update an entity

Update: PUT

- v1.1/Collection(id) → Replace an entity

Delete: DELETE

- v1.1/Collection(id) → Remove an entity

STA Requests

Create: POST

- v1.1/Things

Update: PATCH

- v1.1/ Things(1)

Update: PUT

- v1.1/ Things(1)

Delete: DELETE

- v1.1/ Things(1)

```
{
  "name" : "My Updated Kitchen",
  "description" : "The kitchen in my renovated house",
  "properties" : {
    "oven" : true,
    "heatingPlates" : 6,
    "dishwasher": true
  }
}
```

```
"oven" : true,
```

```
{
  "name" : "My Updated Kitchen"
}
```

→ Remove an entity

Tailoring STA Responses

- **$top**: specify the maximum number of objects to be returned. The usual default setting for $top is 100.
- **$skip**: used for paging, skip over the first n records and provide records from the n + 1 on.
- **$count**: return the total number of objects in the response. The usual default setting for $count is false.
- **$orderBy**: used to specify that the returned objects should be ordered by a specific attribute, either ascending or descending.

Tailoring STA Responses

- **$filter**: specify filters that control which entities are returned.
- **$select**: specify exactly which attributes are to be provided in the response.
- **$expand**: create a response returning multiple object types nested within each other.

Tailoring STA Responses - $filter

v1.1/Observations?$filter=result gt 5


```
{
  "@iot.count" : 8,
  "@iot.nextLink" : "/v1.1/Observations?$filter=result gt 5&$top=4&$skip=4",
  "value" : [
    {
      "phenomenonTime" : "2016-06-22T13:21:31.144Z",
      "resultTime" : null,
      "result" : 10,
      "@iot.id" : 34,
      "@iot.selfLink" : "/FROST-Server/v1.1/Observations(34)"
    }, {
      ...
    }, {
      ...
    }, {
      ...
    }
  ]
}
```

Tailoring STA Responses - $select

v1.1/Things?$select=@iot.id,description


```
{
  "value" : [
    {
      "description" : "camping lantern",
      "@iot.id" : 1
    },
    {
      "description" : "camping stove",
      "@iot.id" : 2
    }
  ]
}
```

Tailoring STA Responses - $expand

v1.1/Things(1)?$select=@iot.id,description&$expand=Datastreams


```
{
  "description" : "camping lantern",
  "@iot.id" : 1,
  "Datastreams" : [
    {
      "description" : "Temperature measurement",
      "observationType" : "http://www.opengis.net/.../OGC-OM/2.0/OM_Measurement",
      "unitOfMeasurement" : {
        "name" : "Celsius",
        "symbol" : "°C",
        "definition" : "http://www.qudt.org/.../Instances.html#Celsius"
      },
      "phenomenonTime" : "2016-06-22T15:21:31+02:00/2016-06-22T15:21:31+02:00",
      "resultTime" : "2016-06-22T15:21:31+02:00/2016-06-22T15:21:31+02:00",
      "@iot.id" : 19,
      "@iot.selfLink" : "http://.../Datastreams(19)"
    }, {…}, {…}
  ]
}
```

Summary

- SensorThings API is well suited for provision of dynamic data within INSPIRE and beyond.
- While the evaluation process is still underway, initial heuristic analysis shows a reduction of resources required for both data provision and use.
- API4INSPIRE has helped to demonstrate the flexibility of SensorThings technology, as well as enabling its uptake at diverse data providers across Europe.
- We would very much welcome final certification for SensorThings API as an INSPIRE Good Practice at the upcoming INSPIRE MIG Meeting.

Discussion

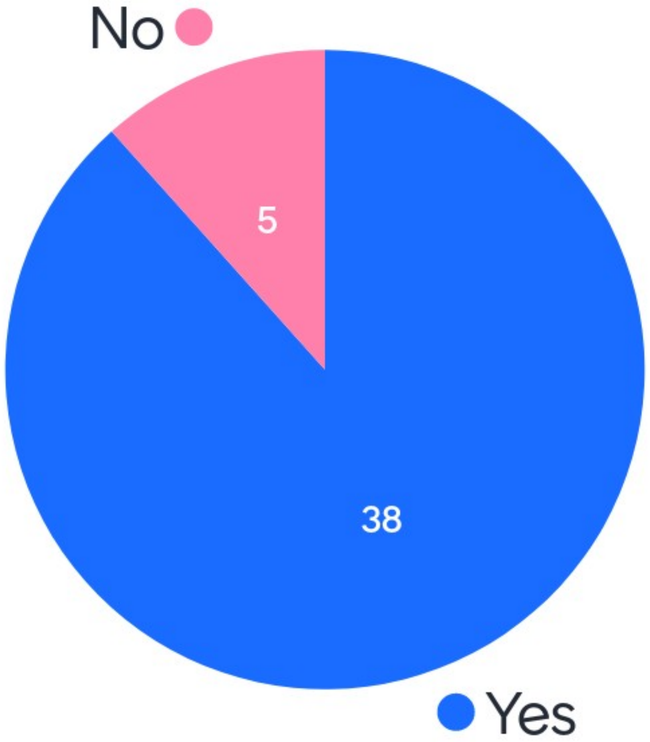
Mentimeter

Welcome

3

Have you ever used an API

Mentimeter



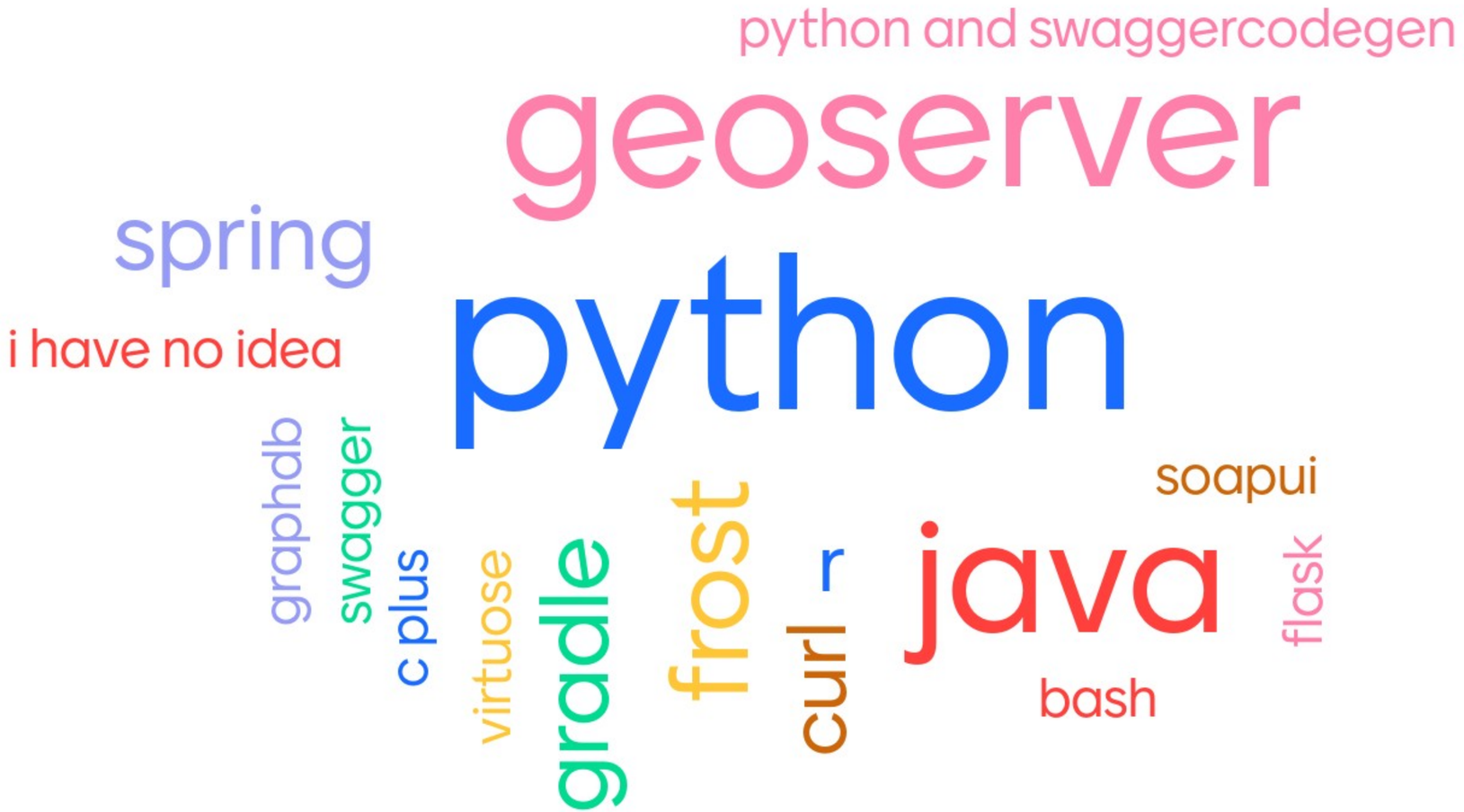
43

Which APIs are you familiar with?

Mentimeter

34

Which software solution was utilized for APIs

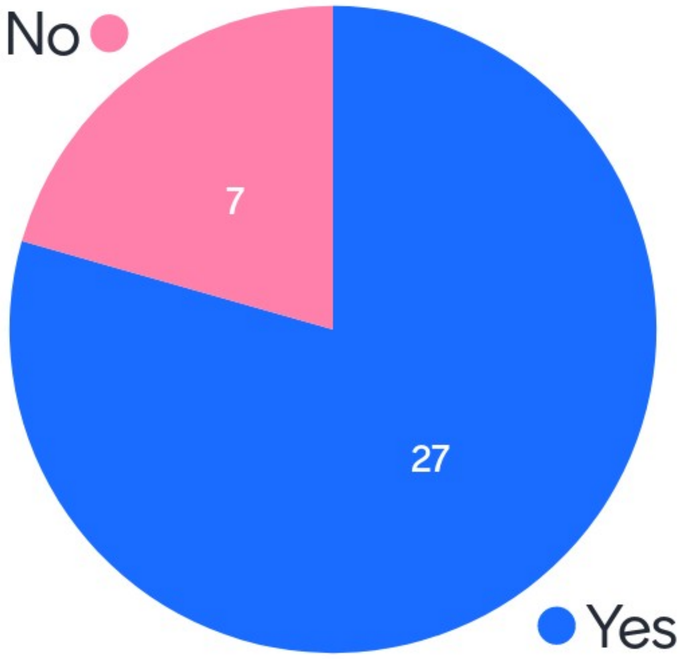


APIs in INSPIRE

Level 1 - All Find

Does your organization currently use APIs?

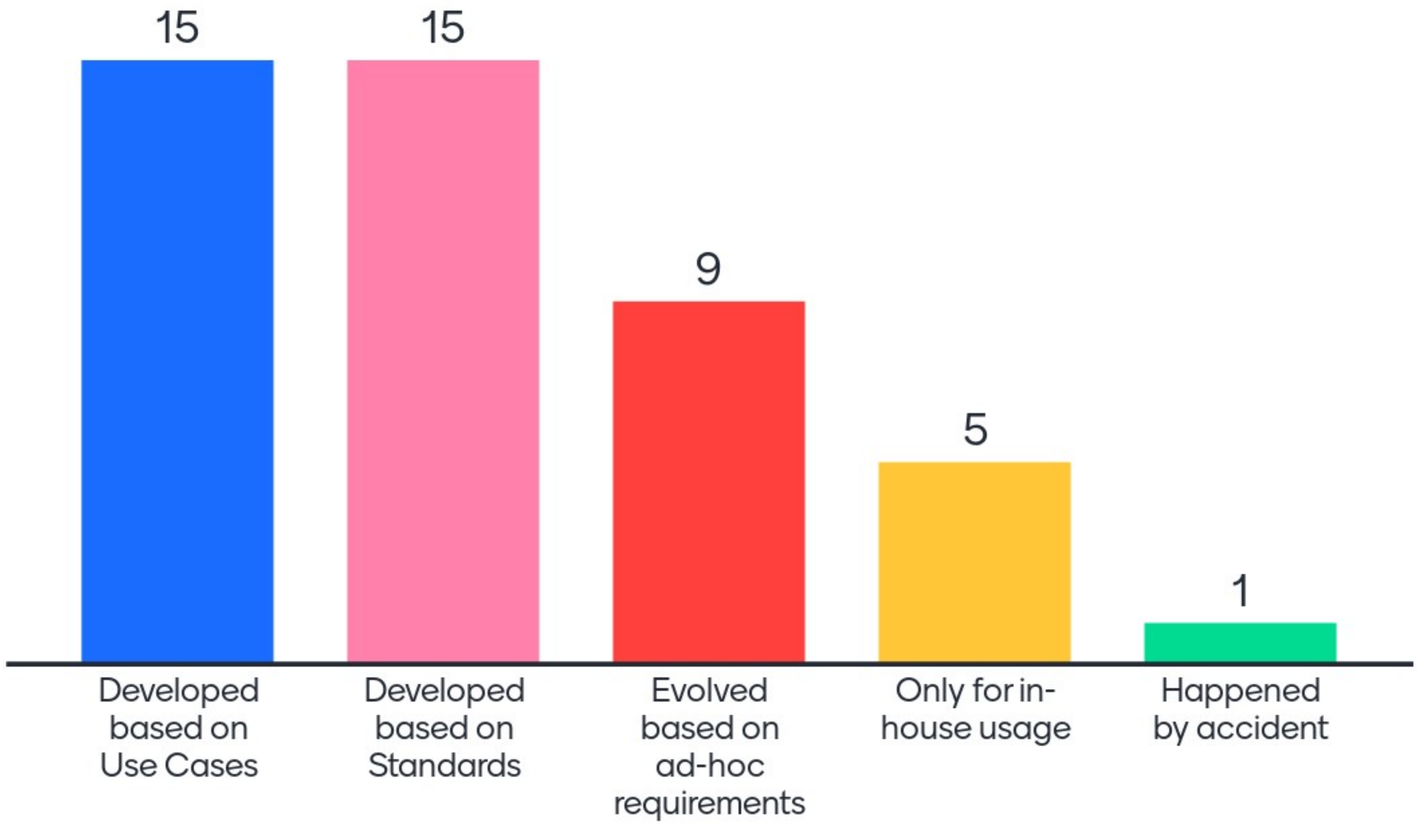
Mentimeter



34

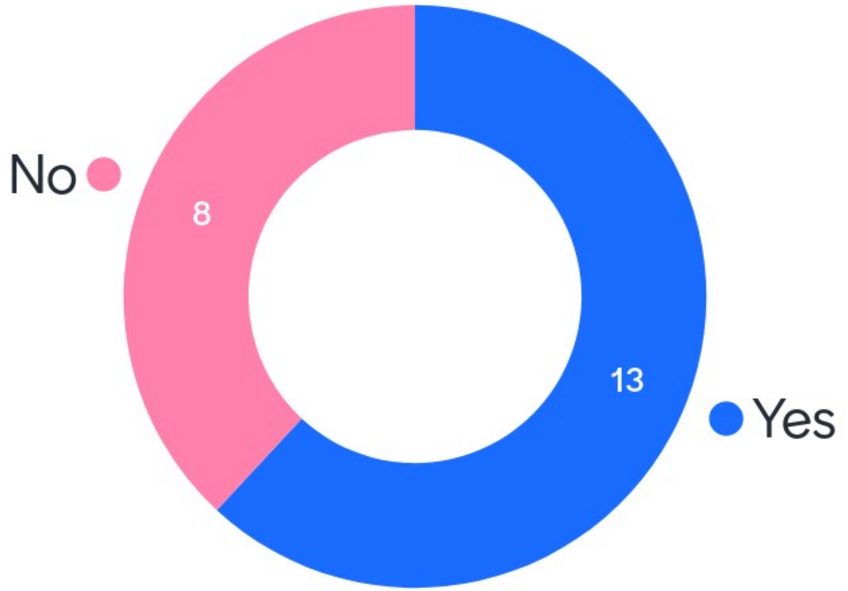
Which of the following pertain to operational APIs used by your organization:

Mentimeter

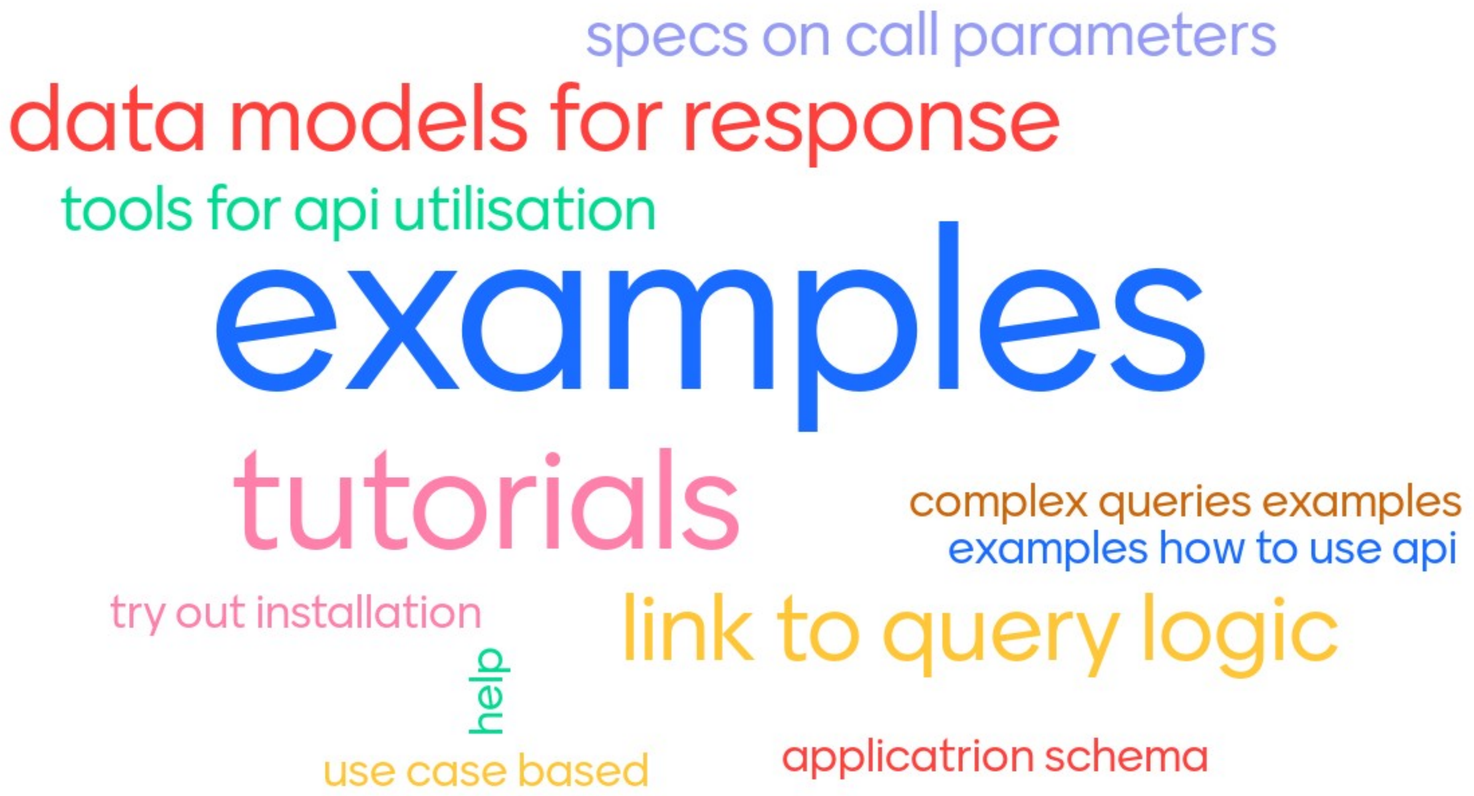


30

Does the API documentation provide all information required to utilize the API?

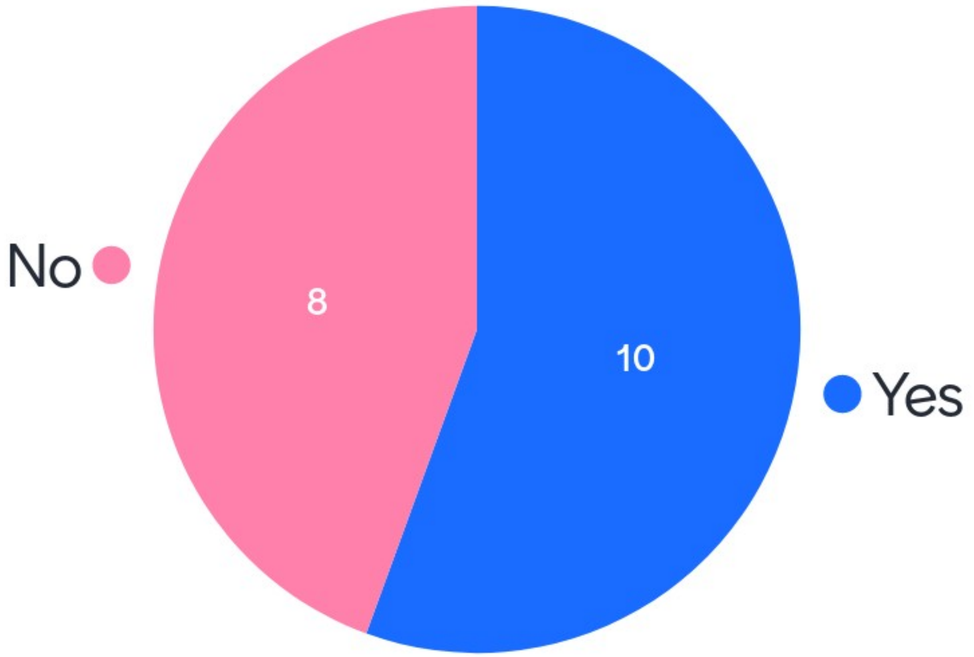


What further documentation would you require?



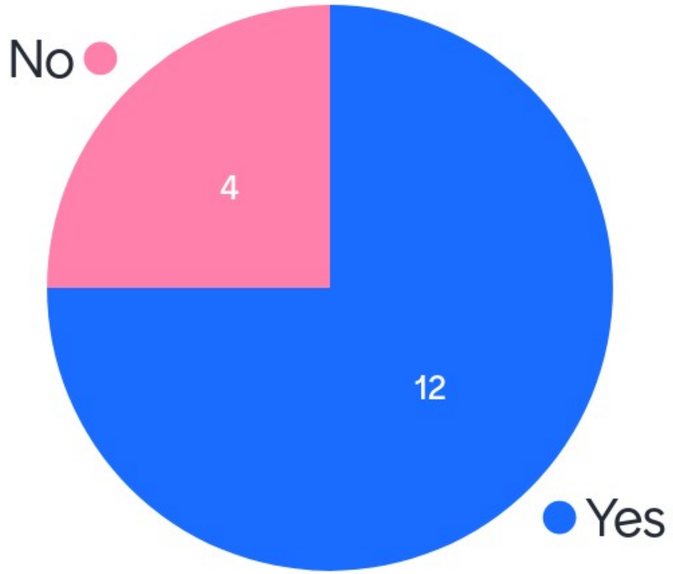
Could you find relevant example requests?

Mentimeter



18

Could you find relevant data encoding examples?

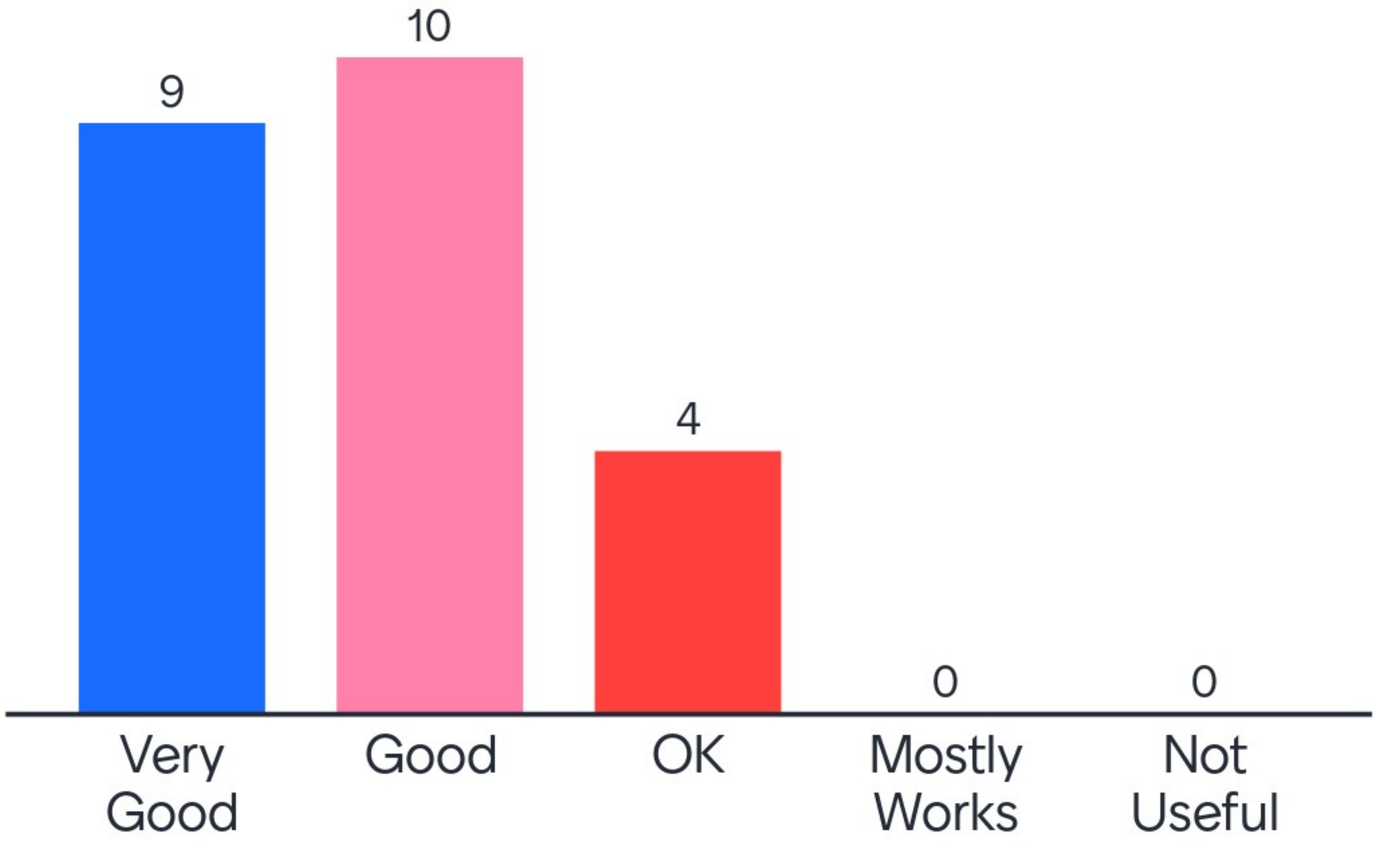


APIs in INSPIRE

Level 2 - All Use

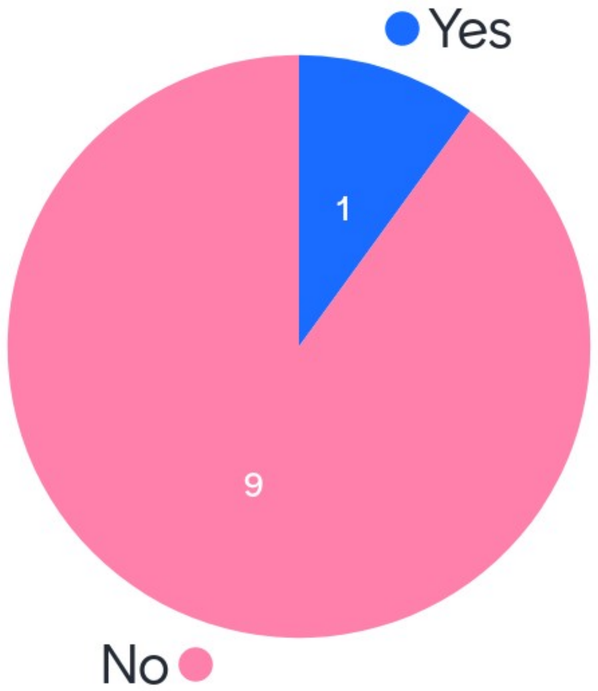
How intuitively usable do you see the provided APIs?

Mentimeter



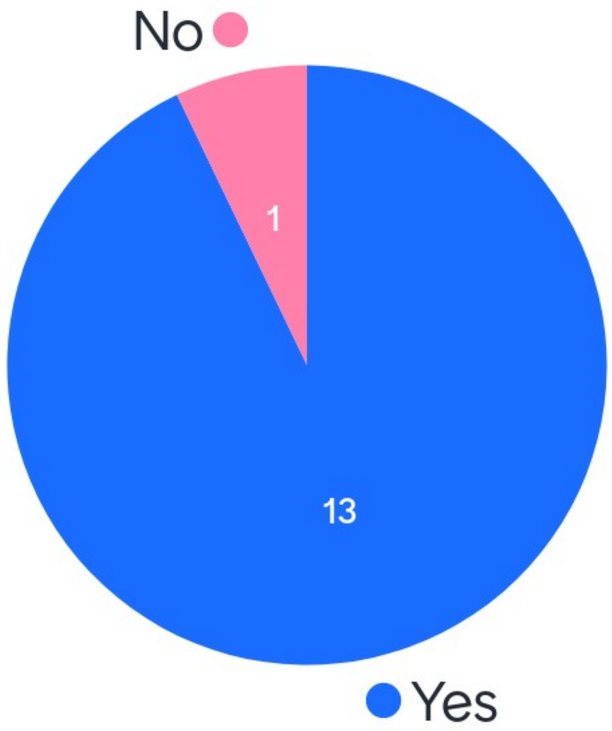
23

Is the relevant metadata available or is some information missing?



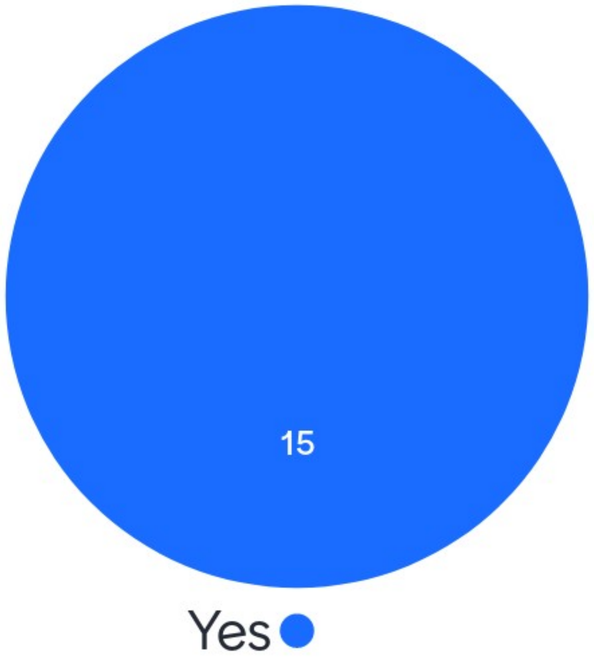
Having a given use-case is it possible to realise all involved aspects with SensorThings API?

Mentimeter



14

Is the overhead involved with the use of the API acceptable?

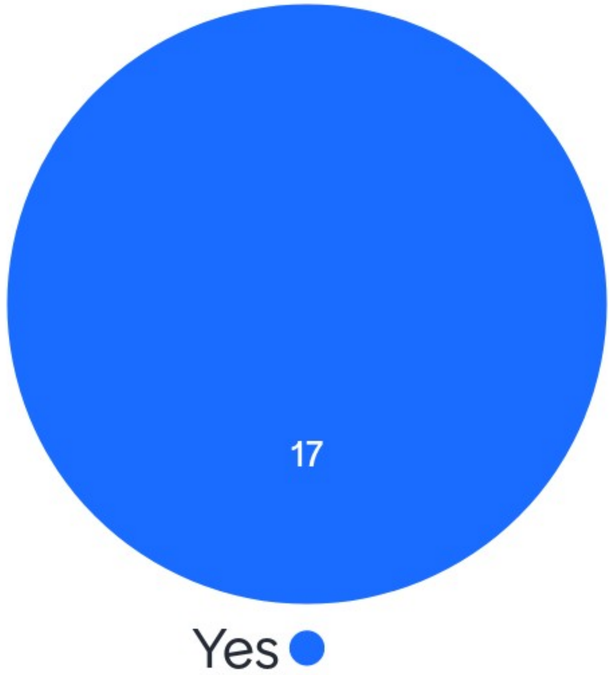


APIs in INSPIRE

Level 3 - All trust

Does the SensorThings API support all requirements towards your desired application?

Mentimeter



17

Is it possible to map the use-case specific request to the supported filter mechanism?

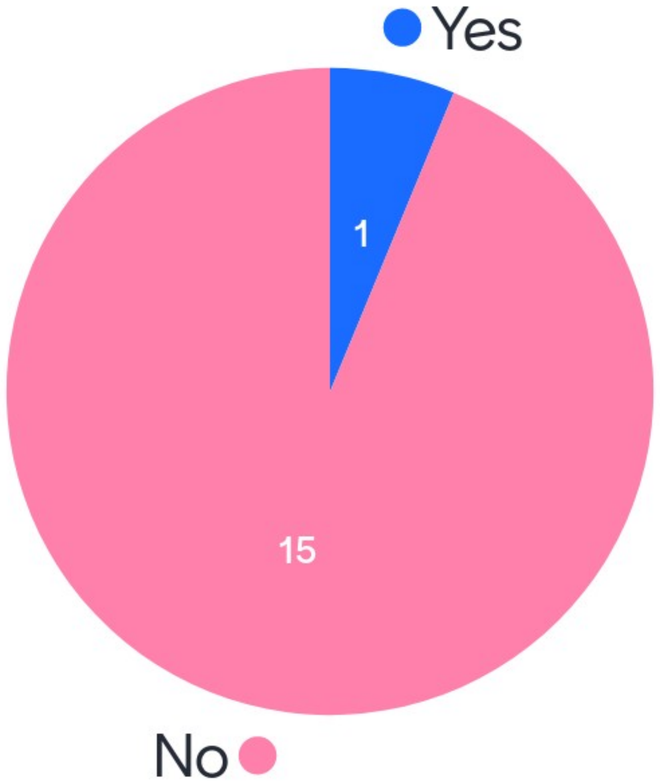
Mentimeter

0
No

11

Is it clear how to handle specific errors?

Mentimeter



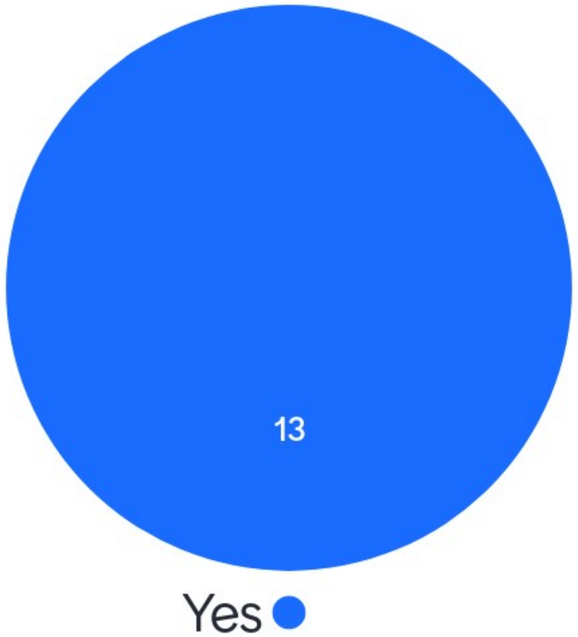
16

APIs in INSPIRE

Level 4 - All involved

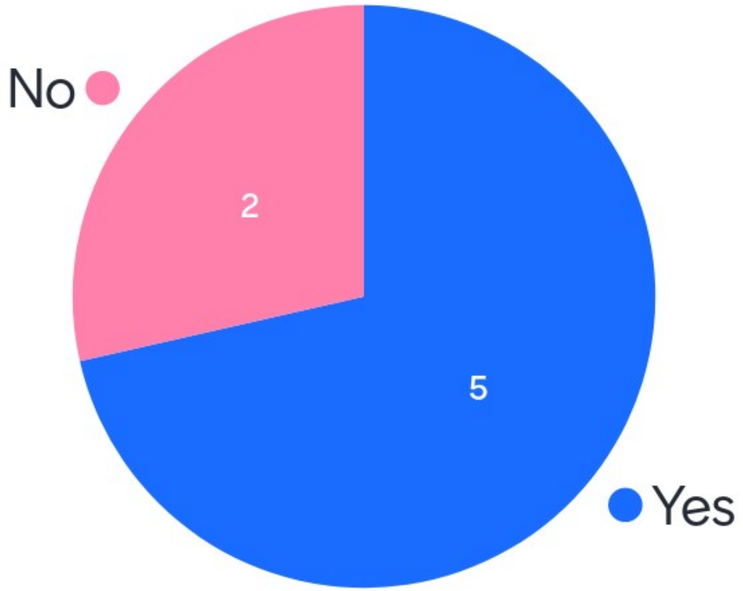
Could you access a playground to experiment with the API

Mentimeter



13

Could you access necessary documentation based on the API endpoint



APIs in INSPIRE

Level 5 - All develop