

INTEROPERABLE PROVISION OF RESEARCH VESSEL TRACKING DATA VIA OGC SENSORTHINGS API AND SENSOR OBSERVATION SERVICE

Christian Autermann

Geospatial Sensing | Virtual 2020

Münster, September 1st 2020

OVERVIEW

- EMODnet
- EuroFleets+
- Architecture
- Harmonizing Data Models
- Outlook

EMODNET

European Marine Observation and Data Network

EMODNET

- Collect data once and use it many times
- Develop standards across disciplines as well as within them
- Recognize that marine data is a public good
- Discourage cost-recovery pricing from public bodies
- Thematic Portals
 - Bathymetry
 - Geology
 - Seabed habitats
 - Chemistry
 - Biology
 - Physics
 - Human activities



EMODnet INGESTION

- Aims to reach out to all kind of organizations with marine data
- Motivate and support potential data providers to publish their data to EMODnet
- Transfer of the data to European datacenters, infrastructures and portals
- Help users to provide the data in the most appropriate format



WAKE UP YOUR DATA

*Set them free for
Blue Society*



© A. Nerro / RBINS

EMODNET-INGESTION.EU

WAKE UP YOUR DATA

*Set them free for
Blue Society*



© A. Nerro / RBINS

EMODNET-INGESTION.EU

WAKE UP YOUR DATA

*Set them free for
Blue Society*



© A. Nerro / RBINS

EMODNET-INGESTION.EU

WAKE UP YOUR DATA

*Set them free for
Blue Society*



© Vilda

EMODNET-INGESTION.EU

EMODnet, the European Marine Observation and Data Network, has over 160 organisations that work together to assemble and harmonise marine data, metadata and products, making them more accessible to Blue Society.

The **Data Ingestion Portal** facilitates submitting marine datasets for further processing, Open Data publishing and contributing to applications for society.





EUROFLEETS+

EUROFLEETS+

- Aims to integrate and advance the European Research Vessel infrastructure
- Fleet of 27 state-of-the-art research vessels
- Several ROVs and AUVs
- Multiple transnational access programs for researchers



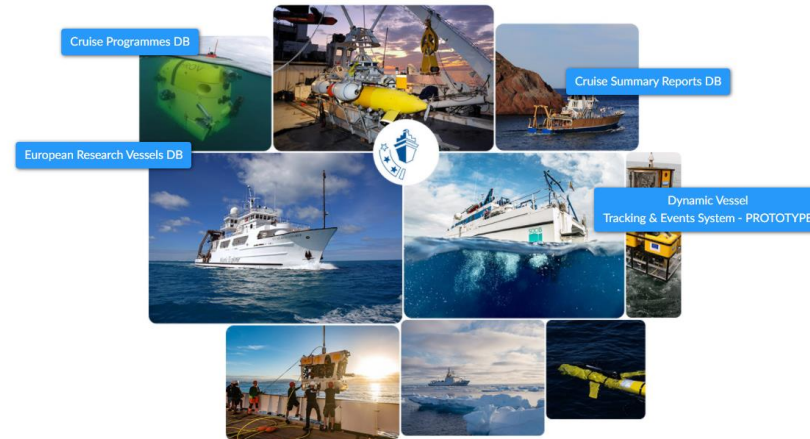
EVIOR

European Virtual Infrastructure in Ocean Research

EUROPEAN VIRTUAL INFRASTRUCTURE IN OCEAN RESEARCH (EVIOR)



European Virtual Infrastructure in Ocean Research (EVIOR)



Sharing information on planned, current and completed cruises and on details of European research vessels and specialized equipment. Giving e-access to underway events information, sailing tracks and current position of European research vessels

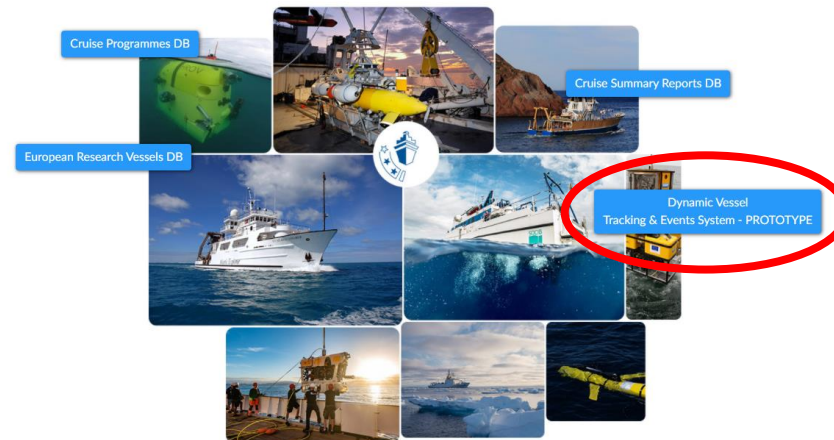


This project has received funding from the European Commission's Horizon 2020 Research and Innovation programme under grant agreement No 824077. Project coordinator: Marine Institute, Ireland. The information and views of this website lie entirely with the authors. The European Commission is not responsible for any use that may be made of the information it contains.

EUROPEAN VIRTUAL INFRASTRUCTURE IN OCEAN RESEARCH (EVIOR)



European Virtual Infrastructure in Ocean Research (EVIOR)



Sharing information on planned, current and completed cruises and on details of European research vessels and specialized equipment. Giving e-access to underway events information, sailing tracks and current position of European research vessels



This project has received funding from the European Commission's Horizon 2020 Research and Innovation programme under grant agreement No 824077. Project coordinator: Marine Institute, Ireland. The information and views of this website lie entirely with the authors. The European Commission is not responsible for any use that may be made of the information it contains.

EUROPEAN VIRTUAL INFRASTRUCTURE IN OCEAN RESEARCH (EVIOR)



Dynamic Vessel Tracking & Events System - PROTOTYPE [RETURN TO EVIOR HOME](#)

1. Select first which vessel to inspect

- ☒ Sarmiento de Gamboa
- ☐ Hesperides
- ☐ Thalassa
- ☐ Garcia Del Cid

2. Select Track

2018-09-23T00:01:04 (226718)

Track Info

Date	Speed	Bearing
2018-09-23T00:01:04	0.1	319.8
2018-09-23T00:03:06	0.1	319.8
2018-09-23T00:16:19	0.1	319.8
2018-09-23T00:23:26	0.1	319.9
2018-09-23T00:24:27	0.1	319.9
2018-09-23T00:26:29	0.1	319.7
2018-09-23T00:31:34	0.1	319.8
2018-09-23T00:41:44	0.1	319.7
2018-09-23T00:52:55	0.1	319.8
2018-09-23T00:54:57	0.1	319.8
2018-09-23T00:56:59	0.1	319.8
2018-09-23T00:58:00	0.1	319.8
2018-09-23T01:05:07	0.1	319.8
2018-09-23T01:21:23	0.1	319.9
2018-09-23T01:24:26	0.1	319.9

Sarmiento de Gamboa

Link to vessel details

Meteo data at latest position (2018-09-23T04:05:51)

Wind speed: 16.462 m/s
Wind direction: ↑

19.84°C

Air pressure: 1018 hPa

Summary of SSR

View track data

Play Fast Stop Reset Follow



This project has received funding from the European Commission's Horizon 2020 Research and Innovation programme under grant agreement No 824077. Project coordinator: Marine Institute, Ireland. The information and views of this website lie entirely with the authors. The European Commission is not responsible for any use that may be made of the information it contains.



Dynamic Vessel Tracking & Events System - PROTOTYPE [RETURN TO EVIOR HOME](#)

1. Select first which vessel to inspect

- ☒ Sarmiento de Gamboa
- ☐ Hesperides
- ☐ Thalassa
- ☐ Garcia Del Cid

2. Select Track

2018-09-02T00:00:23 (226715)

Track Info

Date	Speed	Bearing
2018-09-02T00:00:23	4.57	161.3
2018-09-02T00:01:26	4.54	161.5
2018-09-02T00:02:28	4.52	161.7

Sarmiento de Gamboa

Link to vessel details

Meteo data at latest position (2018-09-23T04:05:51)

Wind speed: 16.462 m/s
Wind direction: ↑

19.84°C

Air pressure: 1018 hPa

SELECTED TRACK: 2018-09-02T00:00:23 (226715); VIEW TRACK WEATHER

Click and drag a box to zoom in on the graph.

Table View

Wind speed m/s

Wind gust m/s

2. Sep 12:00 3. Sep 12:00 4. Sep 12:00 5. Sep 12:00

Play Fast



This project has received funding from the European Commission's Horizon 2020 Research and Innovation programme under grant agreement No 824077. Project coordinator: Marine Institute, Ireland. The information and views of this website lie entirely with the authors. The European Commission is not responsible for any use that may be made of the information it contains.

Director: Marine Institute

EUROPEAN VIRTUAL INFRASTRUCTURE IN OCEAN RESEARCH (EVIOR)

Navigational

- Longitude/Latitude
- Heading
- Speed
- Depth
- Course Over Ground
- Speed Over Ground

Meteorological

- Wind Speed
- Wind Direction
- Air Temperature
- Humidity
- Solar Radiation
- Atmospheric Pressure

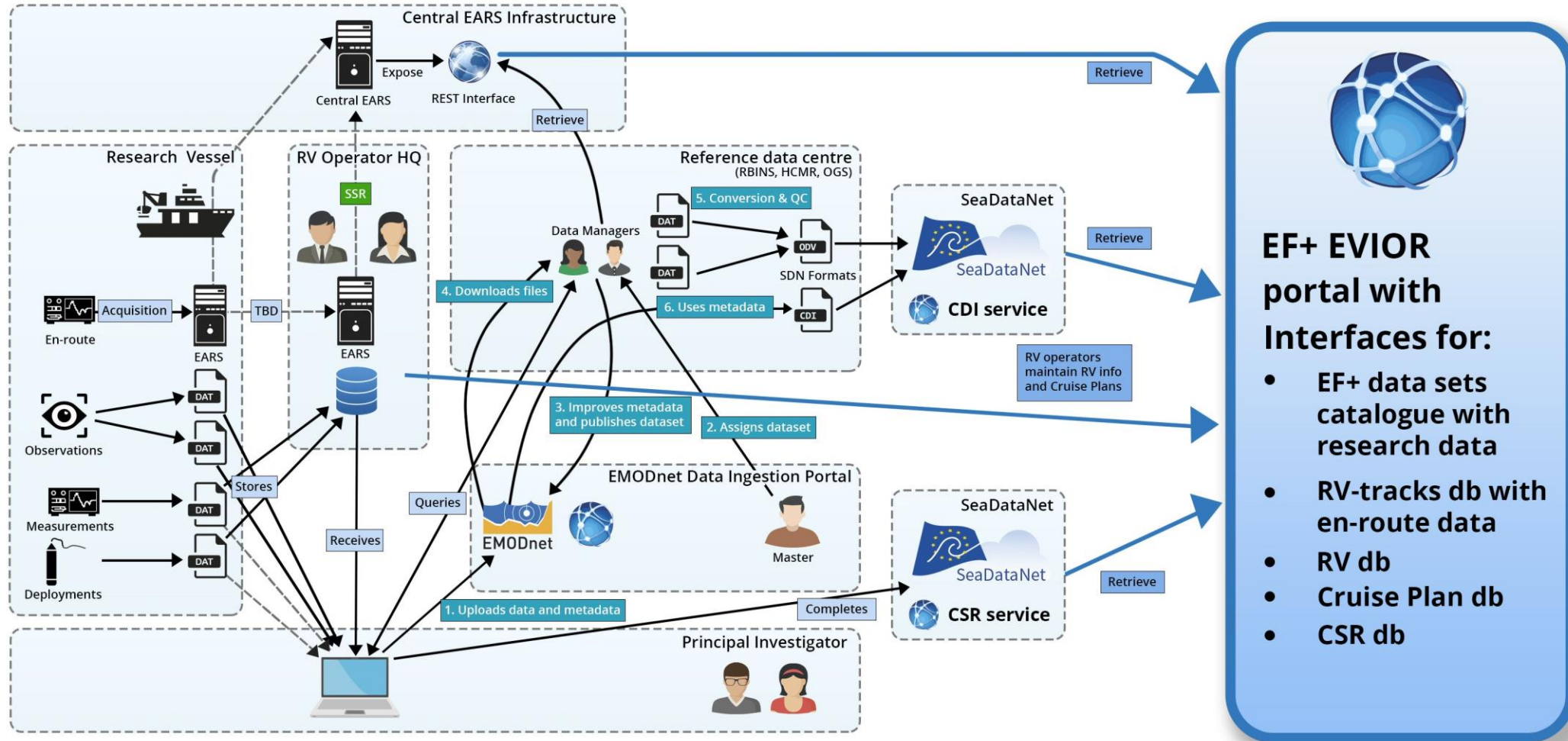
Thermosalinity

- Salinity
- Water Temperature
- Raw Fluorometry
- Density (σ_T)

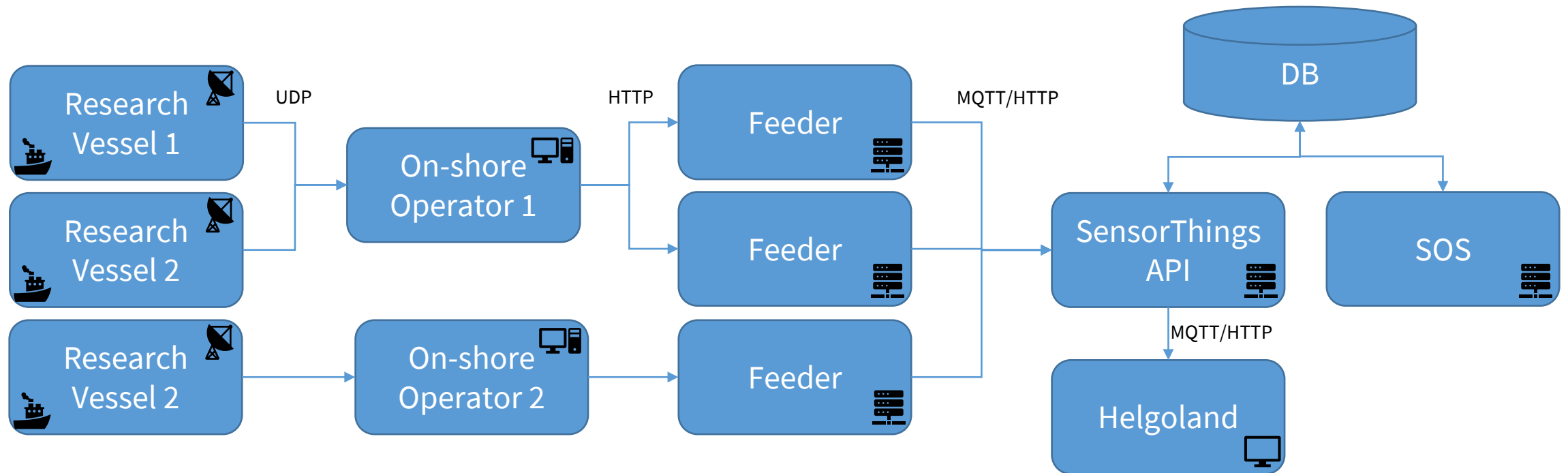
All mapped to definitions in the NERC Vocabulary Server

ARCHITECTURE

ARCHITECTURE



ARCHITECTURE



INITIAL DEPLOYMENT

- Single deployment at CSIC, Spain
- Inclusion of 4 test vessels for development and testing
- Testing on two cruises from EuroFleets+

TEST VESSELS

R/V Sarmiento de Gamboa, Vigo (Spain)



R/V García del Cid, Vigo (Spain)



TEST VESSELS

R/V Belgica, Zeebrugge (Belgium)



R/V Thalassa, Brest (France)



PILOT VESSELS

R/V Árne Friðriksson, Reykjavík (Iceland)



R/V Dana, Hirtshals (Denmark)



PILOT VESSELS

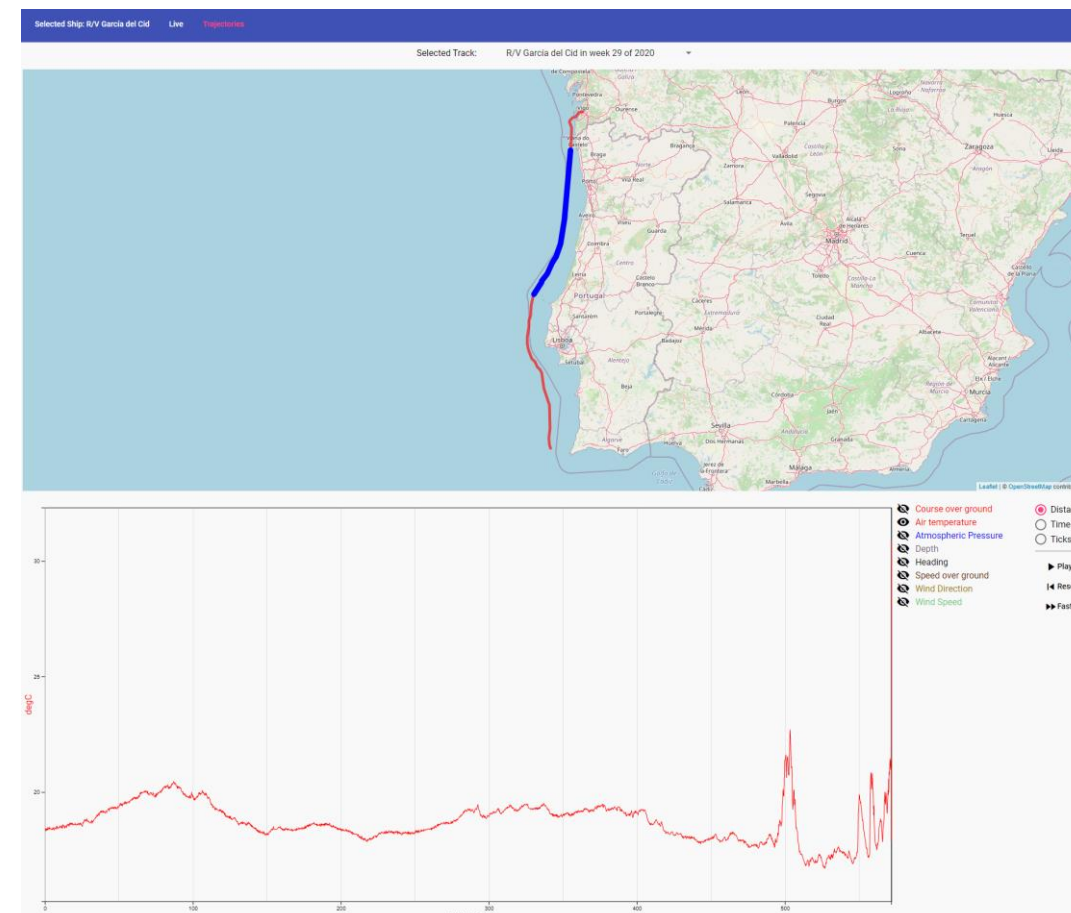
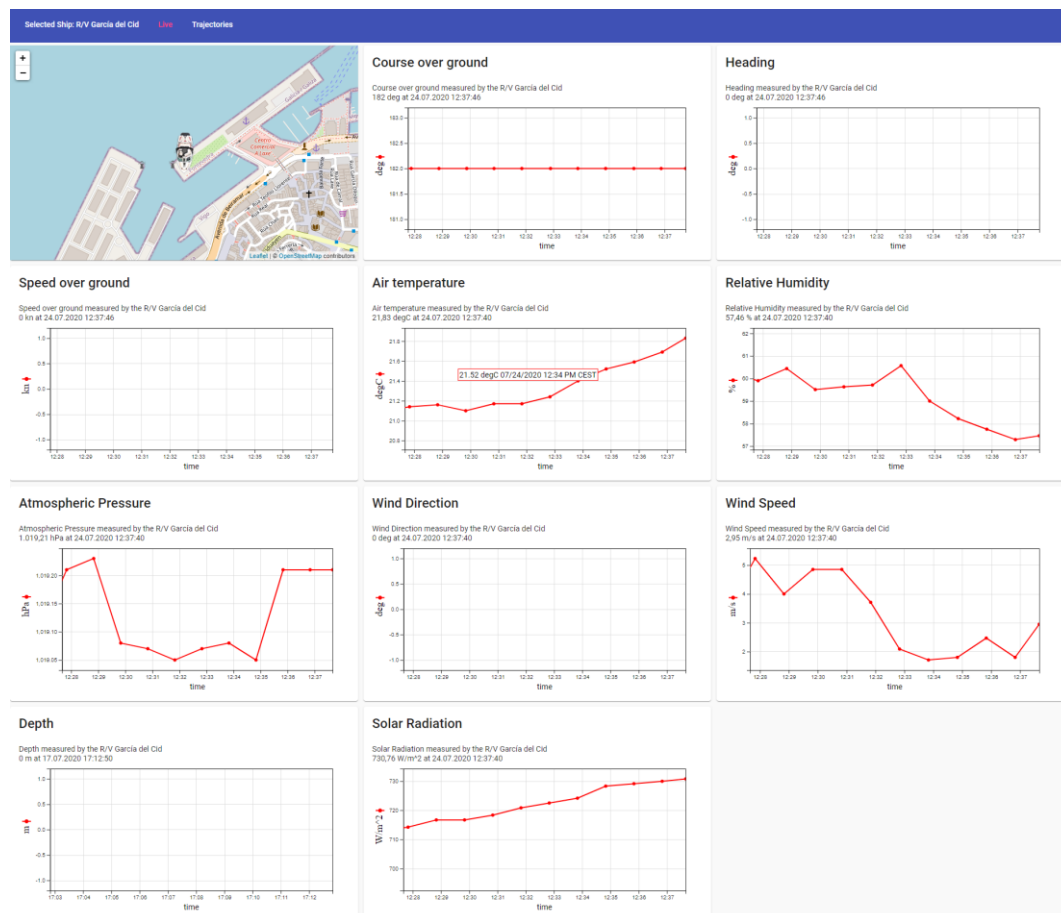
R/V Árne Friðriksson, Reykjavík (Iceland)



R/V Dana, Hirtsholm (Denmark)



EUROFLEETS+ DASHBOARD

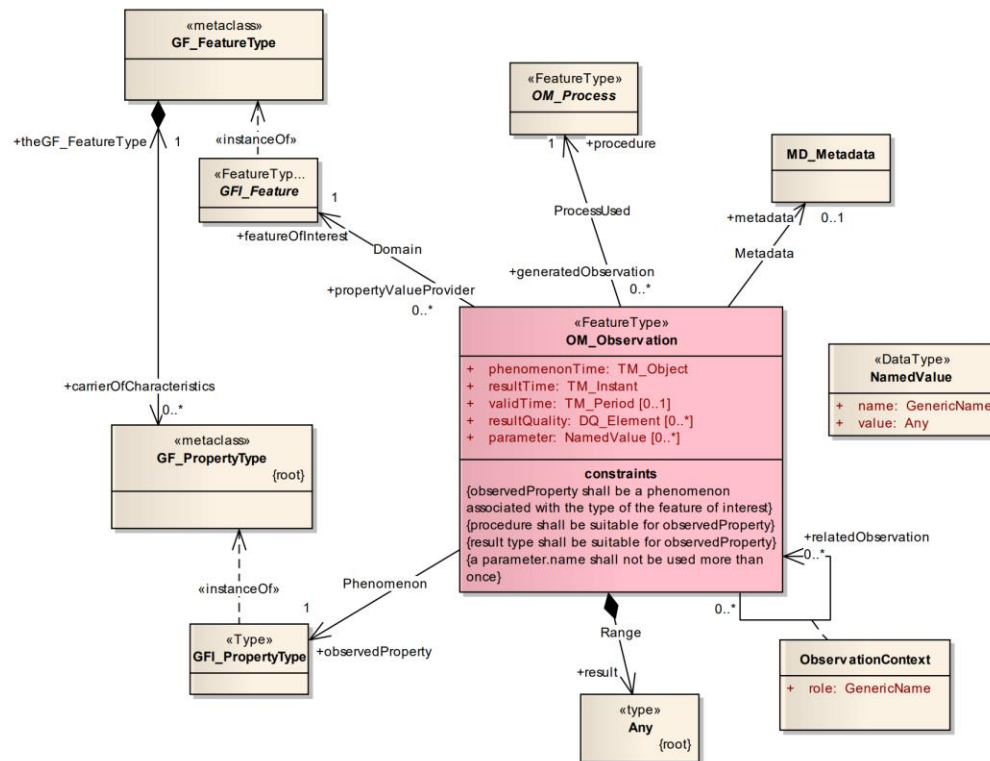


HARMONIZING DATA MODELS

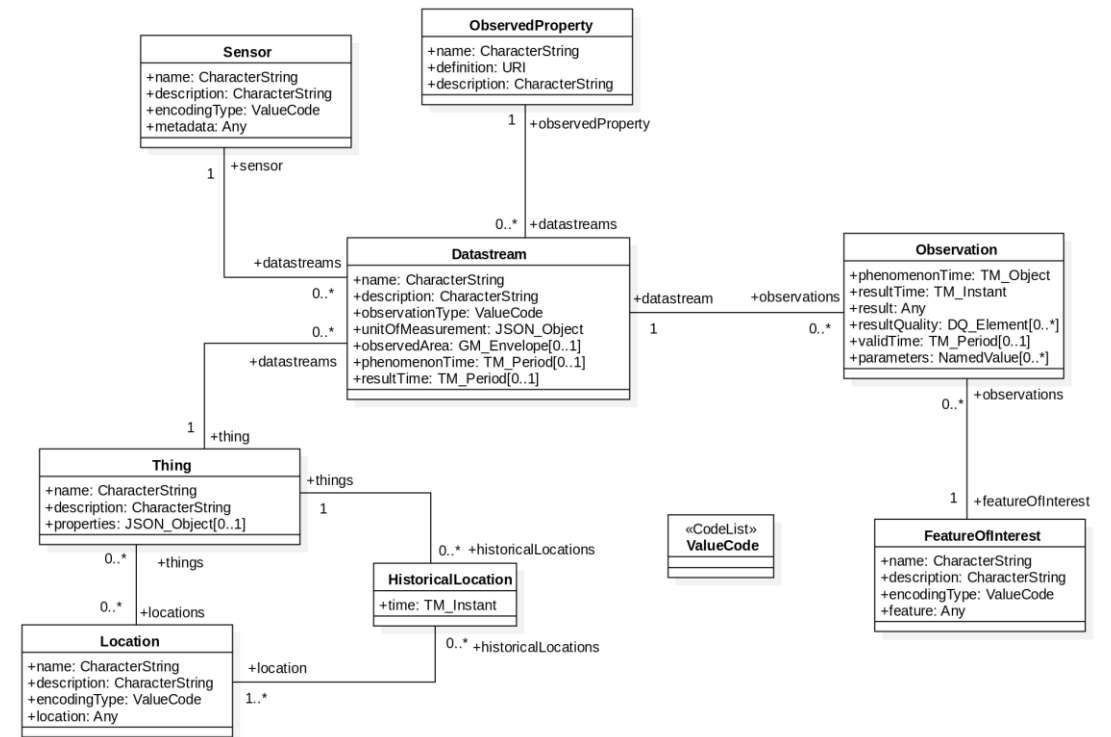
Sensor Observation Service vs. SensorThings API

HARMONIZING DATA MODELS

Observations & Measurements

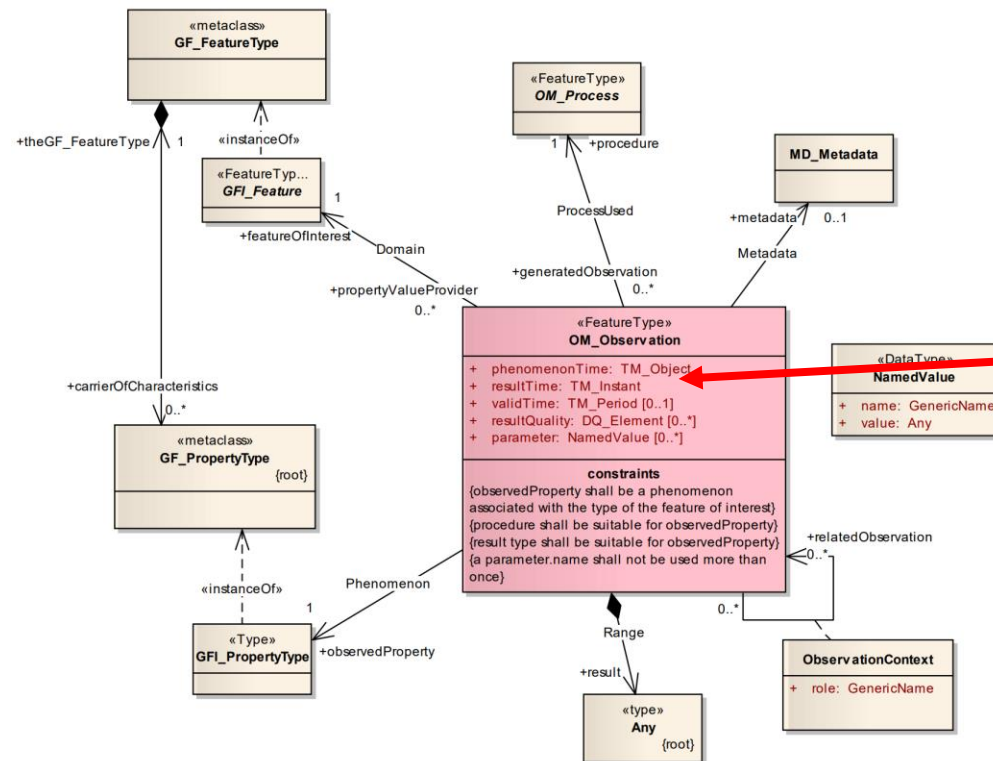


SensorThings API

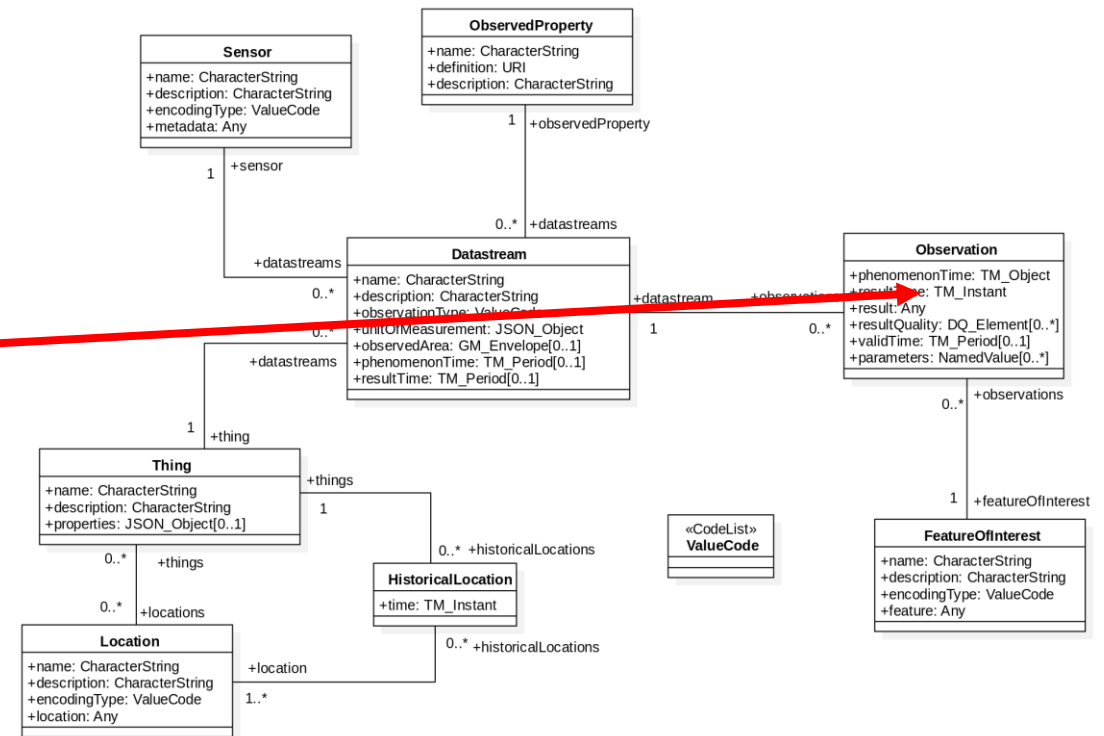


HARMONIZING DATA MODELS

Observations & Measurements

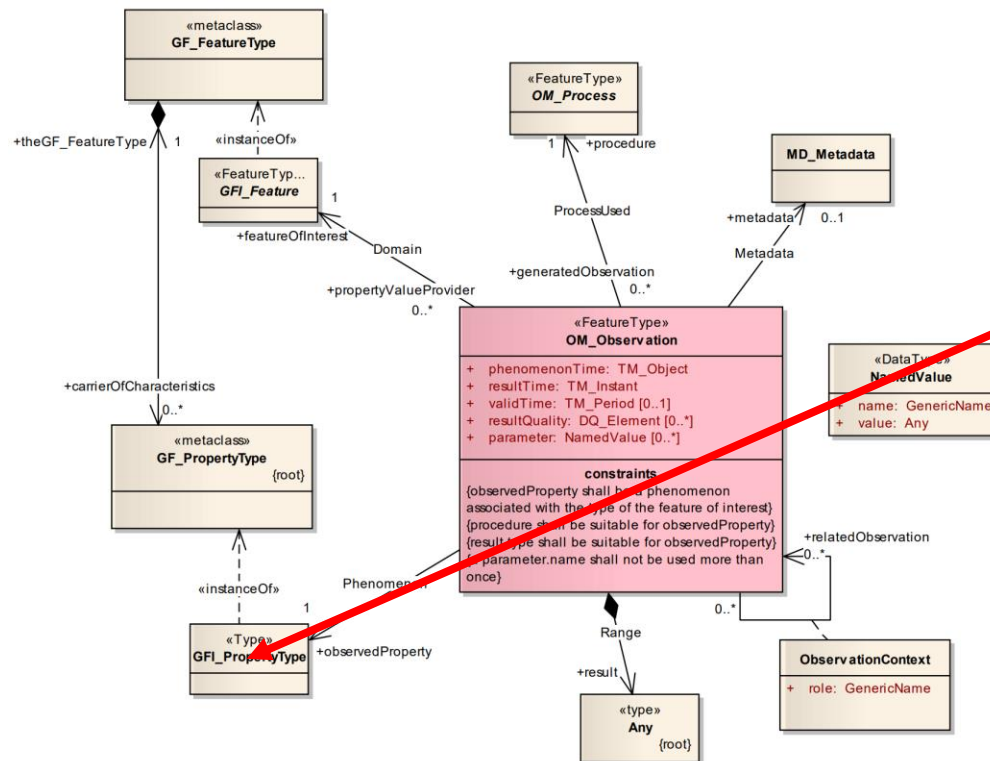


SensorThings API

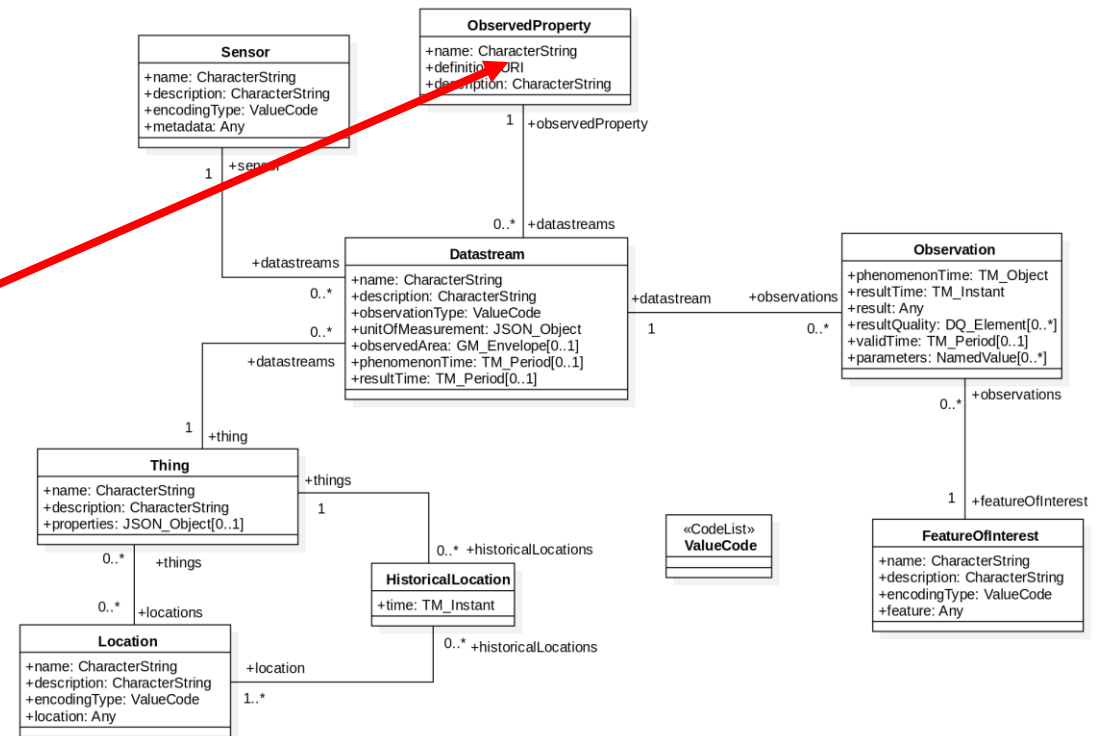


HARMONIZING DATA MODELS

Observations & Measurements



SensorThings API



HARMONIZING DATA MODELS

- Feeder only communicates with SensorThings API
 - Initially via HTTP
 - During the feeding only via MQTT
- But SOS requirements are clear:
 - One Procedure and Offering per vessel
 - Observation should comply with the Spatial Filtering Profile
 - One Feature Of Interest (FOI) per cruise
 - Position updates should be appended to the LineString so that the FOI contains the complete track

HARMONIZING DATA MODELS

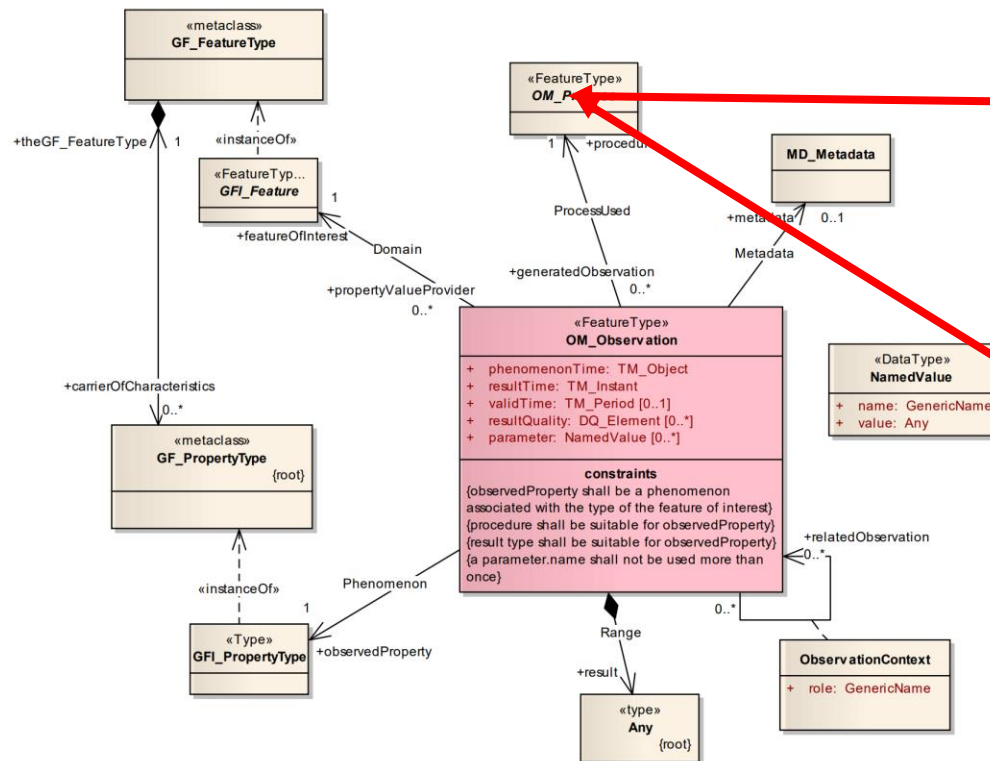
- Feeder only communicates with SensorThings API
 - Initially via HTTP ✓
 - During the feeding only via MQTT
 - Allow publishing on more topics then the standard allows (/Locations) ✓
- But SOS requirements are clear:
 - One Procedure and Offering per vessel
 - Observation should comply with the Spatial Filtering Profile
 - One Feature Of Interest (FOI) per cruise
 - Position updates should be appended to the LineString so that the FOI contains the complete track

HARMONIZING DATA MODELS

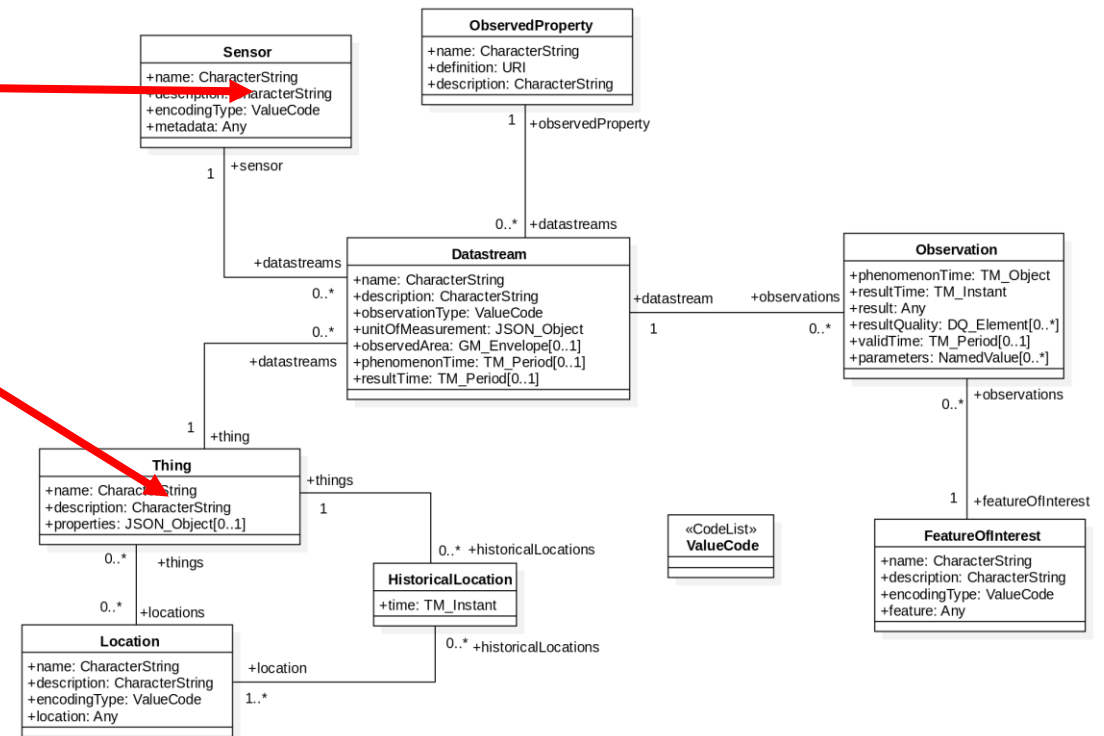
- Feeder only communicates with SensorThings API
 - Initially via HTTP ✓
 - During the feeding only via MQTT
 - Allow publishing on more topics then the standard allows (/Locations) ✓
- But SOS requirements are clear:
 - One Procedure and Offering per vessel
 - Vessel = Sensor = Thing = Procedure ✓
 - Observation should comply with the Spatial Filtering Profile
 - One Feature Of Interest (FOI) per cruise
 - Position updates should be appended to the LineString so that the FOI contains the complete track

HARMONIZING DATA MODELS

Observations & Measurements



SensorThings API

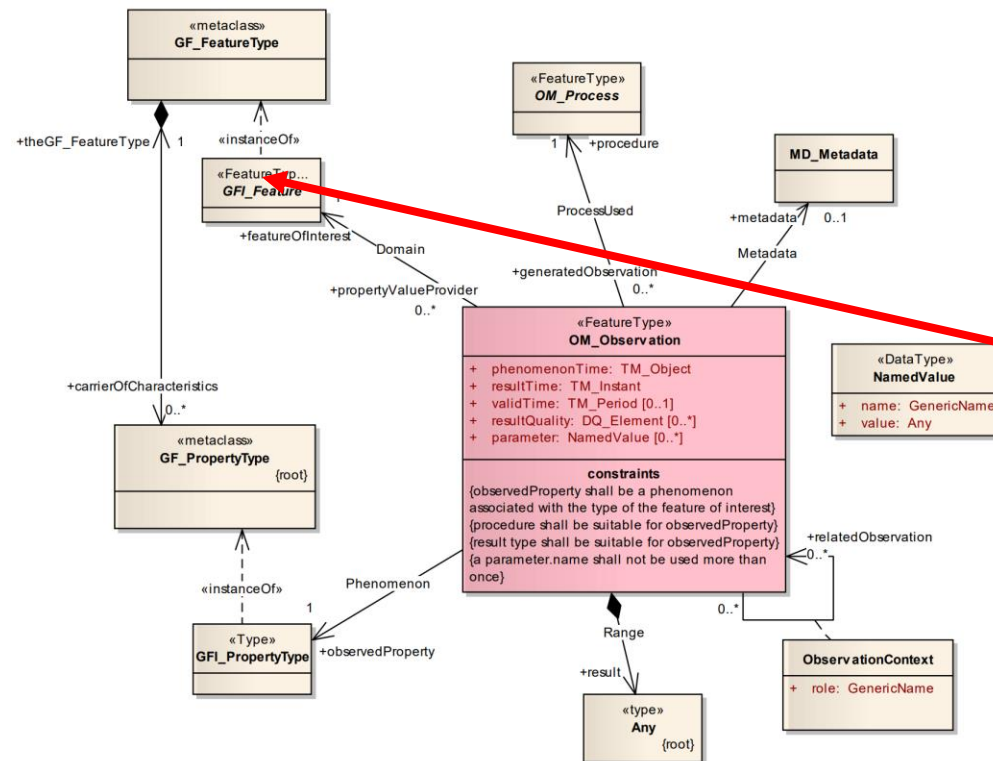


HARMONIZING DATA MODELS

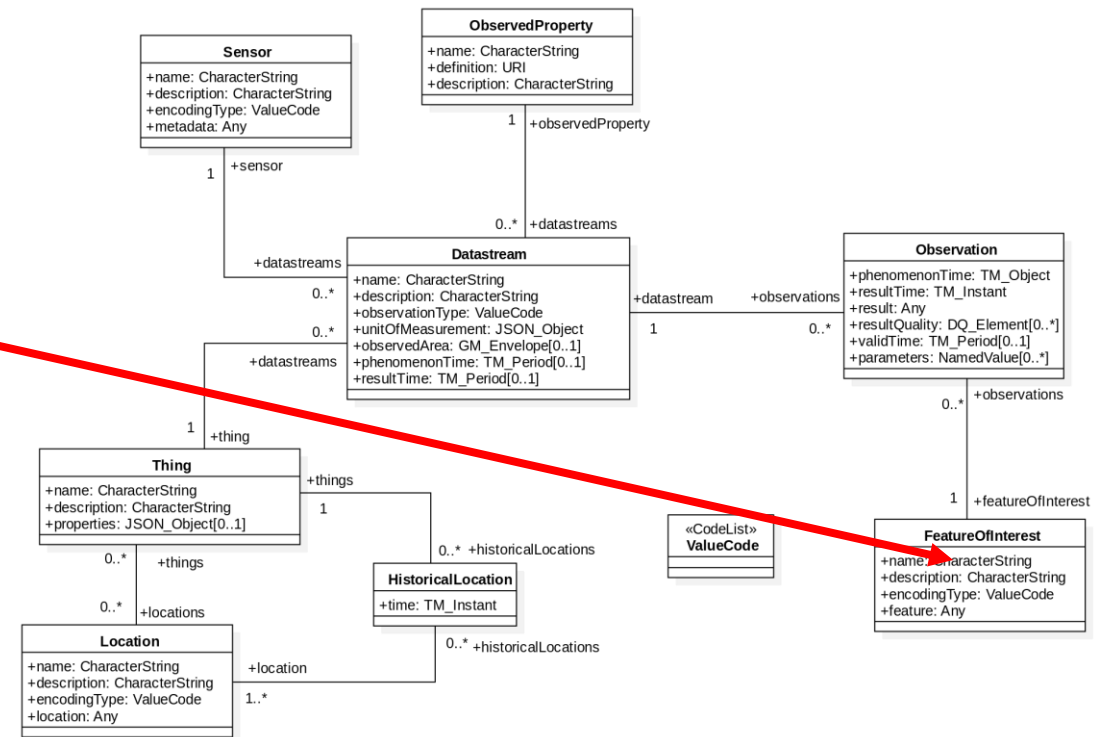
- Feeder only communicates with SensorThings API
 - Initially via HTTP ✓
 - During the feeding only via MQTT
 - Allow publishing on more topics then the standard allows (/Locations) ✓
- But SOS requirements are clear:
 - One Procedure and Offering per vessel
 - Vessel = Sensor = Thing = Procedure ✓
 - Observation should comply with the Spatial Filtering Profile
 - One Feature Of Interest (FOI) per cruise
 - Position updates should be appended to the LineString so that the FOI contains the complete track

HARMONIZING DATA MODELS

Observations & Measurements

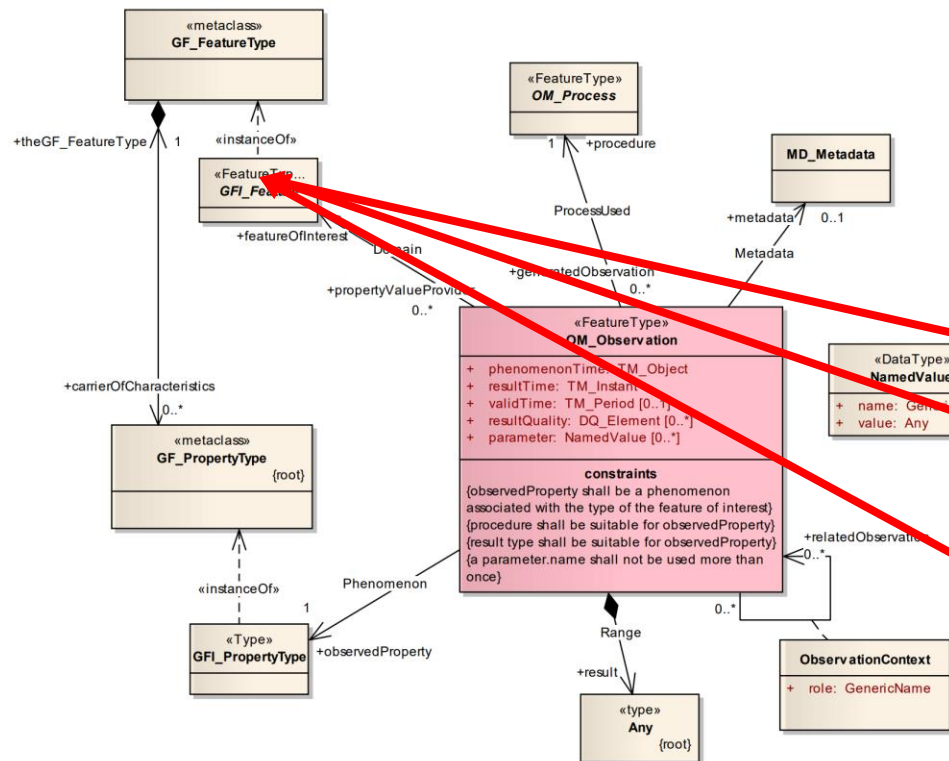


SensorThings API

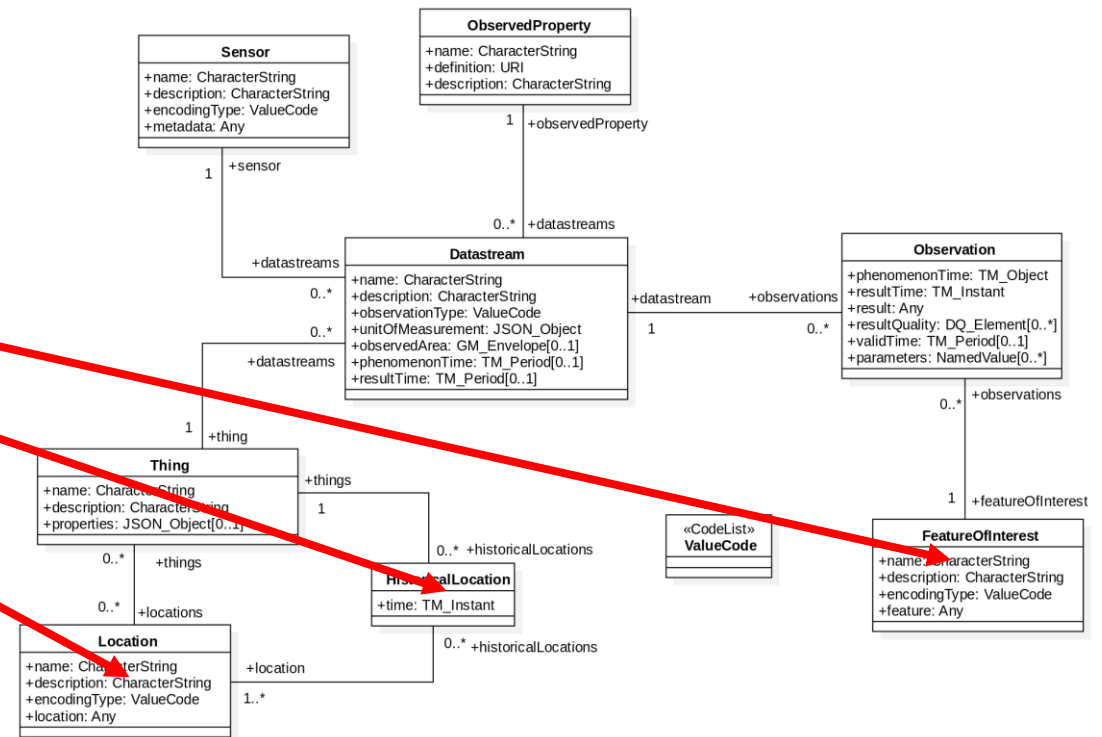


HARMONIZING DATA MODELS

Observations & Measurements



SensorThings API



HARMONIZING DATA MODELS

- Feeder only communicates with SensorThings API
 - Initially via HTTP ✓
 - During the feeding only via MQTT
 - Allow publishing on more topics then the standard allows (/Locations) ✓
- But SOS requirements are clear:
 - One Procedure and Offering per vessel
 - Vessel = Sensor = Thing = Procedure ✓
 - Observation should comply with the Spatial Filtering Profile
 - STA-Implementation was extended to recognize this special observation parameter ✓
 - One Feature Of Interest (FOI) per cruise
 - Not really possible, interim solution: one FOI per week ✗
 - Position updates should be appended to the LineString so that the FOI contains the complete track
 - New configurable feature of our STA implementation: a configured FOI is automatically updated (via Locations and Observations) ✓

OUTLOOK

- Deployment to more RV operators
- Federation into the EVIOR portal
- Push-based data flow
- Richer Metadata (SensorML) descriptions
- Transmission of events and inclusion in SensorML
 - E.g. sensor calibration and deployments

THANKS!

Christian Autermann

c.autermann@52north.org