Striving towards INSPIRE compliance

Lena Hallin-Pihlatie [1], Kathi Schleidt [2], Raymond Cramer [3]

[1] Finnish Environment Institute (SYKE), [2] DataCave, [3] British Oceanographic Data Centre (BODC)

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sdn-userdesk@seadatanet.org – www.seadatanet.org

Introduction

- One goal of the SeaDataCloud project is to work towards better INSPIRE compliance

- One step towards the objective was made in WP 8.3 ‘Review of data formats, also considering INSPIRE data models (O&M)’
  - Introduce relevant INSPIRE data models to SeaDataCloud partners
  - Compare SeaDataNet data formats with INSPIRE data models
  - To do Proof of Concept mapping

- The goal of this presentation is to sum up the work done and bring forward some recommendations for future work

What is INSPIRE?

- A European Directive , which entered into force in May 2007
- The objective is to build a Spatial Data Infrastructure in Europe
- Re-use of standards (OGC, ISO) for (meta)data and services
- INSPIRE-specific standards (data models) and requirements
- Stepwise deadlines for the provision of metadata, 'as is' data, **harmonised data** and network services from 2007 to 2021
- The Directive evolves through the activities of the Work Programme led by the INSPIRE Maintenance and Implementation Group (MIG) and through interaction with communities
  - MIG = DG ENV + JRC + EEA + Member State representatives + experts

When to apply INSPIRE?

INSPIRE covers spatial data sets which fulfil the following conditions (Art. 4 §1):

a) they relate to an area where a Member State has and/or exercises jurisdictional rights;
b) they are in electronic format;
c) they are held by or on behalf of any of the following:
   i. a public authority, having been produced or received by a public authority, or being managed or updated by that authority and falling within the scope of its public tasks;
   ii. a third party to whom the network has been made available in accordance with Article 12;
d) they relate to one or more of the themes listed in Annex I, II or III.

INSPIRE Themes

ANNEX: 1

- Addresses
- Administrative units
- Cadastral parcels
- Coordinate reference systems
- Geographical grid systems
- Geographical names
- Hydrography
- Protected sites
- Transport networks

ANNEX: 2

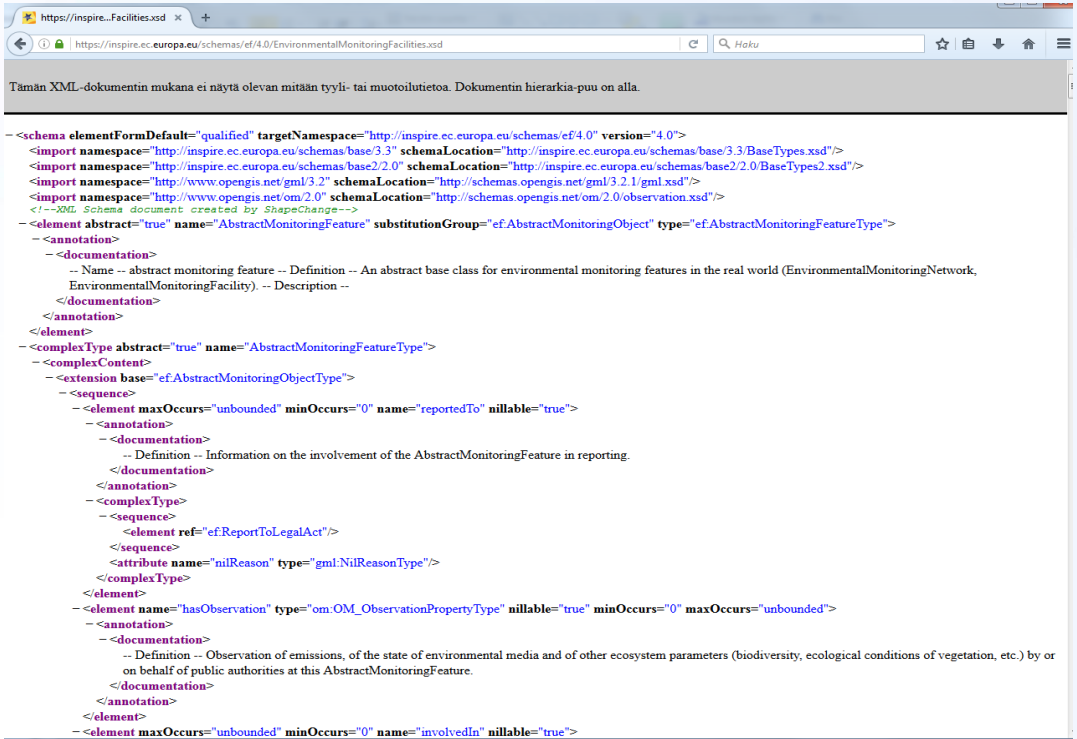
- Elevation
- Geology
- Land cover
- Orthoimagery

ANNEX: 3

- Agricultural and aquaculture facilities
- Area management / restriction / regulation zones & reporting units
- Atmospheric conditions
- Bio-geographical regions
- Buildings
- Energy Resources
- Environmental monitoring Facilities
- Habitats and biotopes
- Human health and safety
- Land use
- Meteorological geographical features
- Mineral Resources
- Natural risk zones
- Oceanographic geographical features
- Population distribution and demography
- Production and industrial facilities
- Sea regions
- Soil
- Species distribution
- Statistical units
- Utility and governmental services

INSPIRE Data Models

- The endorsed INSPIRE data model can be found in this repository: https://inspire.ec.europa.eu/schemas/
- Encoding in GML 3.2.1

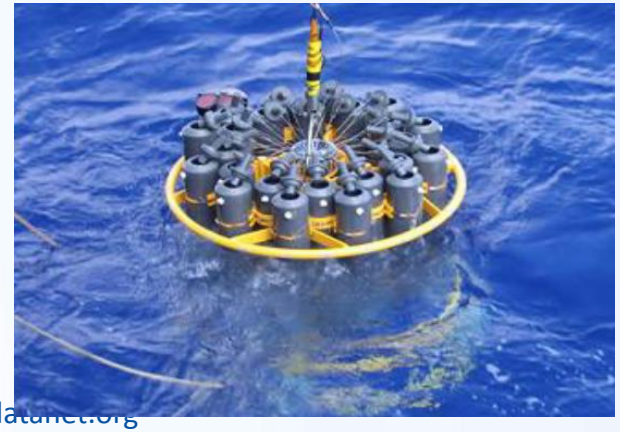


Interlinkage EF – OF – O&M - SR

Environmental Monitoring Facilities (EF): Describes the platform, activity and network collecting measurements

Oceanographic Geographical Feautures (OF): O&M Specialised Observation types to use for provision of marine measurements in INSPIRE

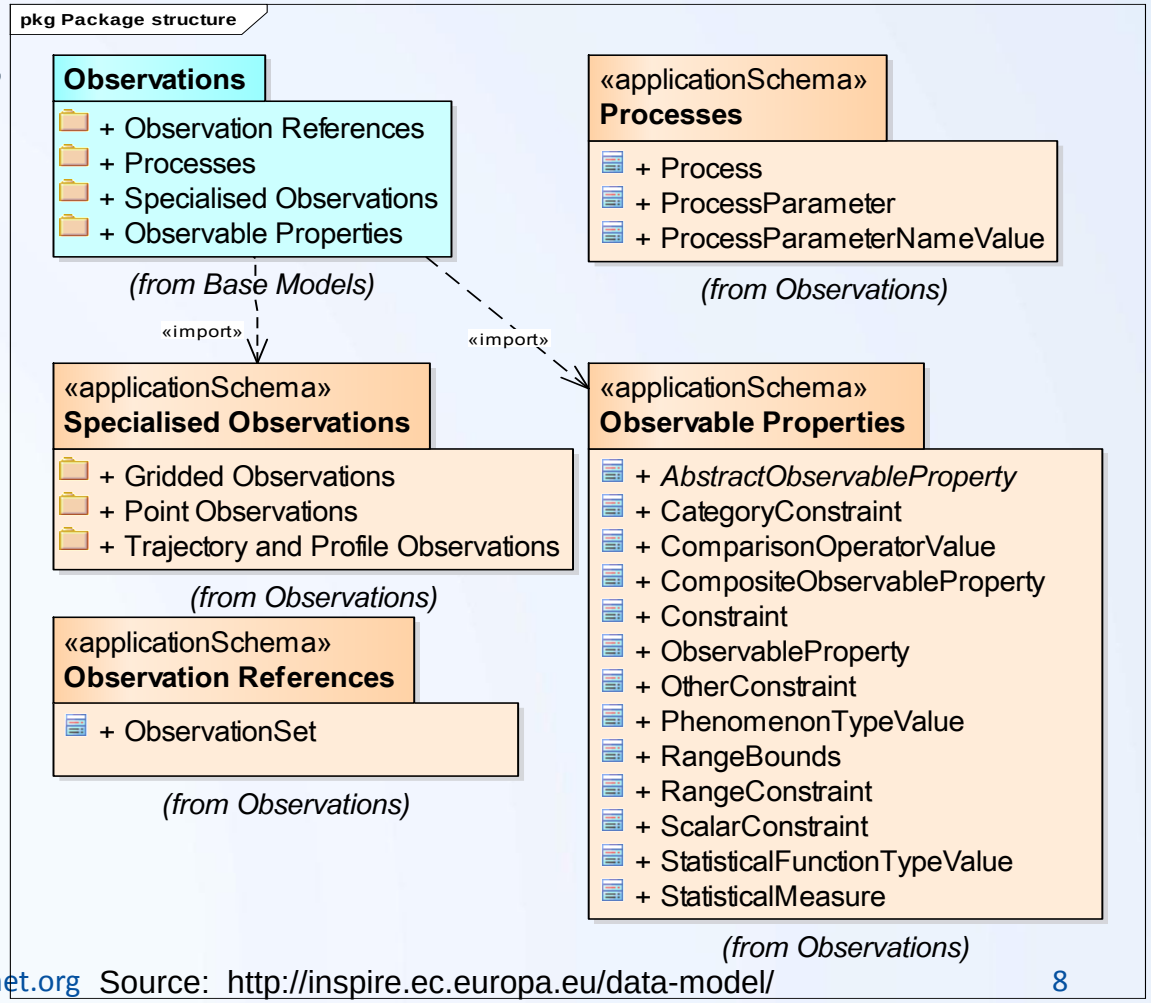
Observations and Measurements (O&M): Technical Guidance on the provision of measurement data in INSPIRE



Sea Region (SR): The administrative sea region, which the measurements represent

OF: The Observation package of GCM is used

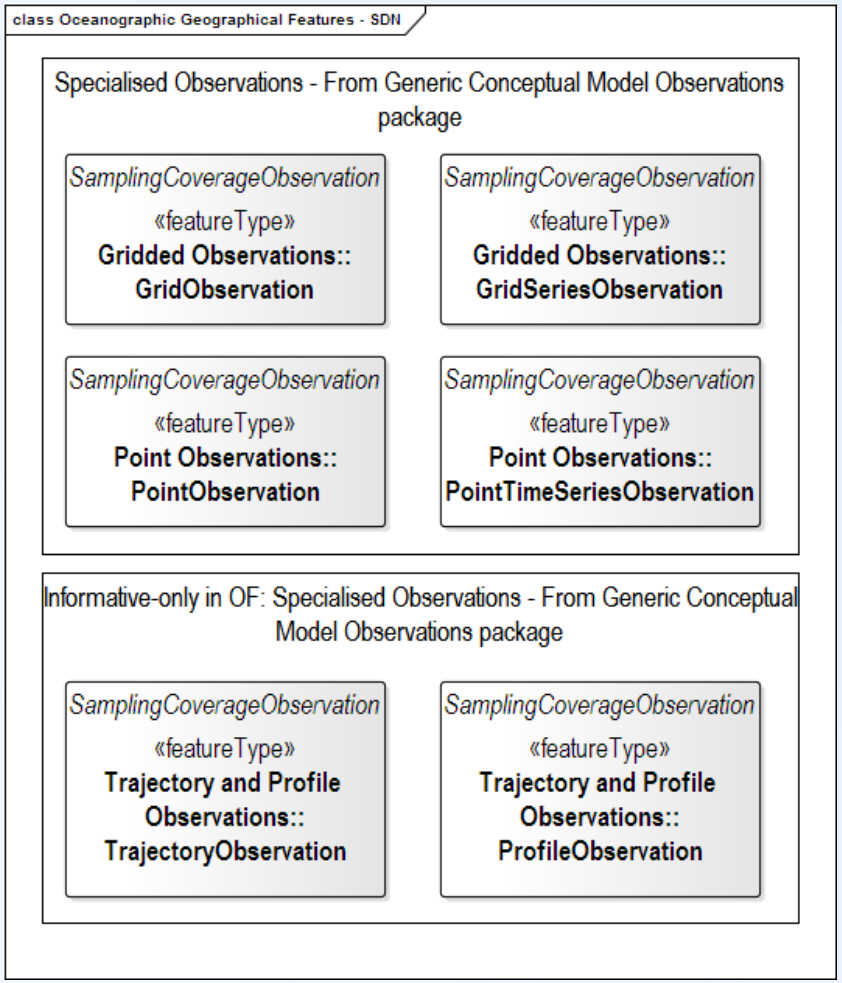
- Observable Properties
  - Use of BODC P01 parameter code suffice
- Observation References
  - Linkage between INSPIRE features and OM_Observation
- Specialised Observations
- Processes



Source: http://inspire.ec.europa.eu/data-model/

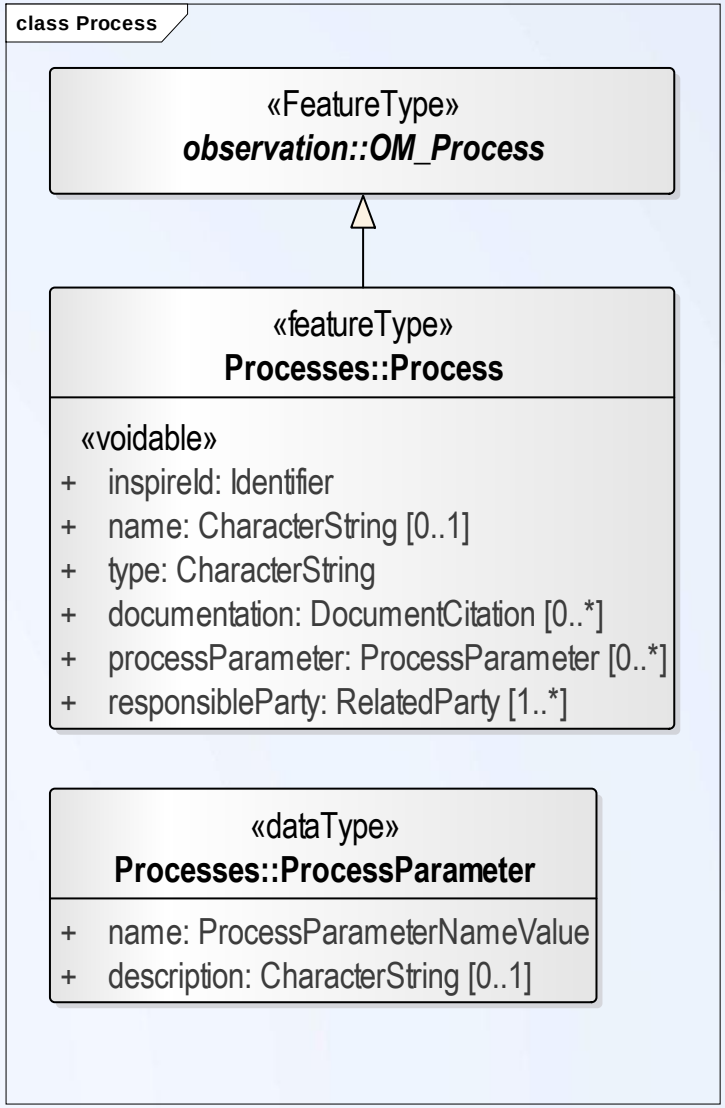
OF: Specialised Observations

- O&M Measurements expected in SeaDataCloud
  - GridObservation
  - GridSeriesObsevation
  - PointObservation
  - PointTimeSeriesObservation
  - TrajectoryObservation
  - ProfileObservation

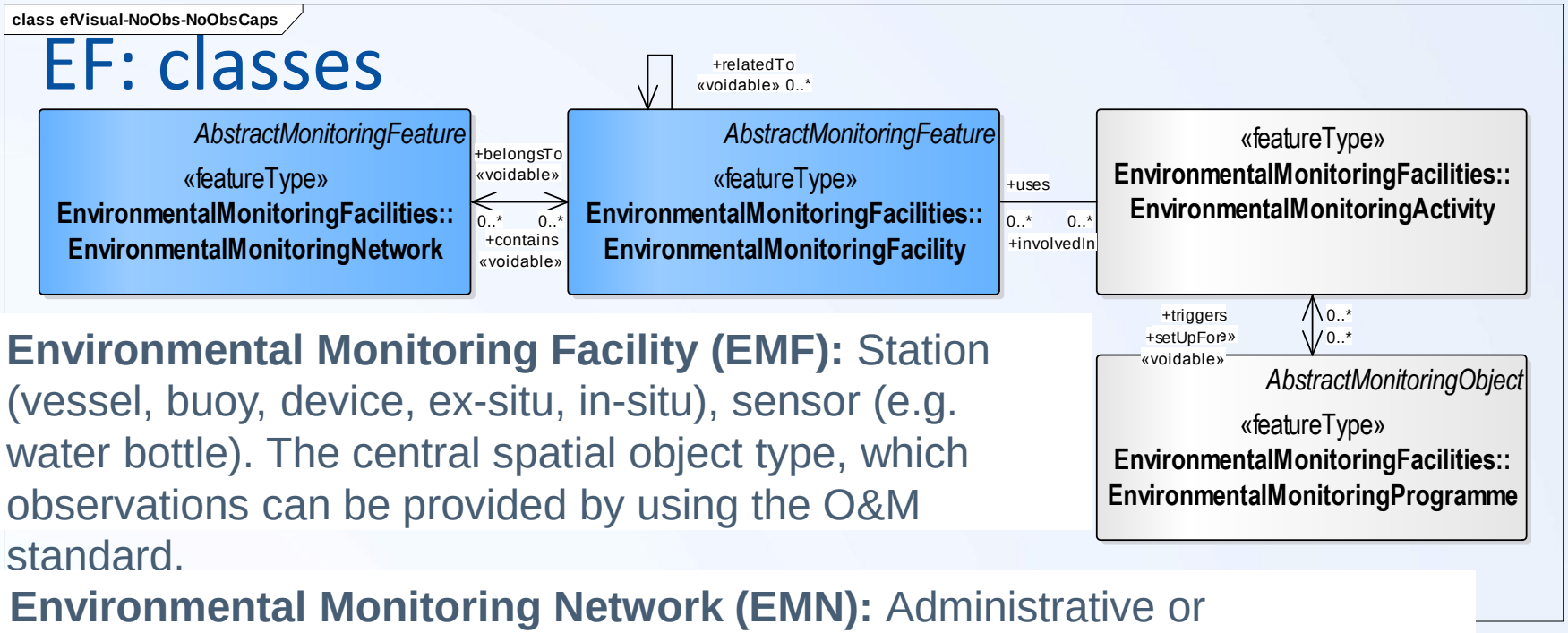


OF: Process

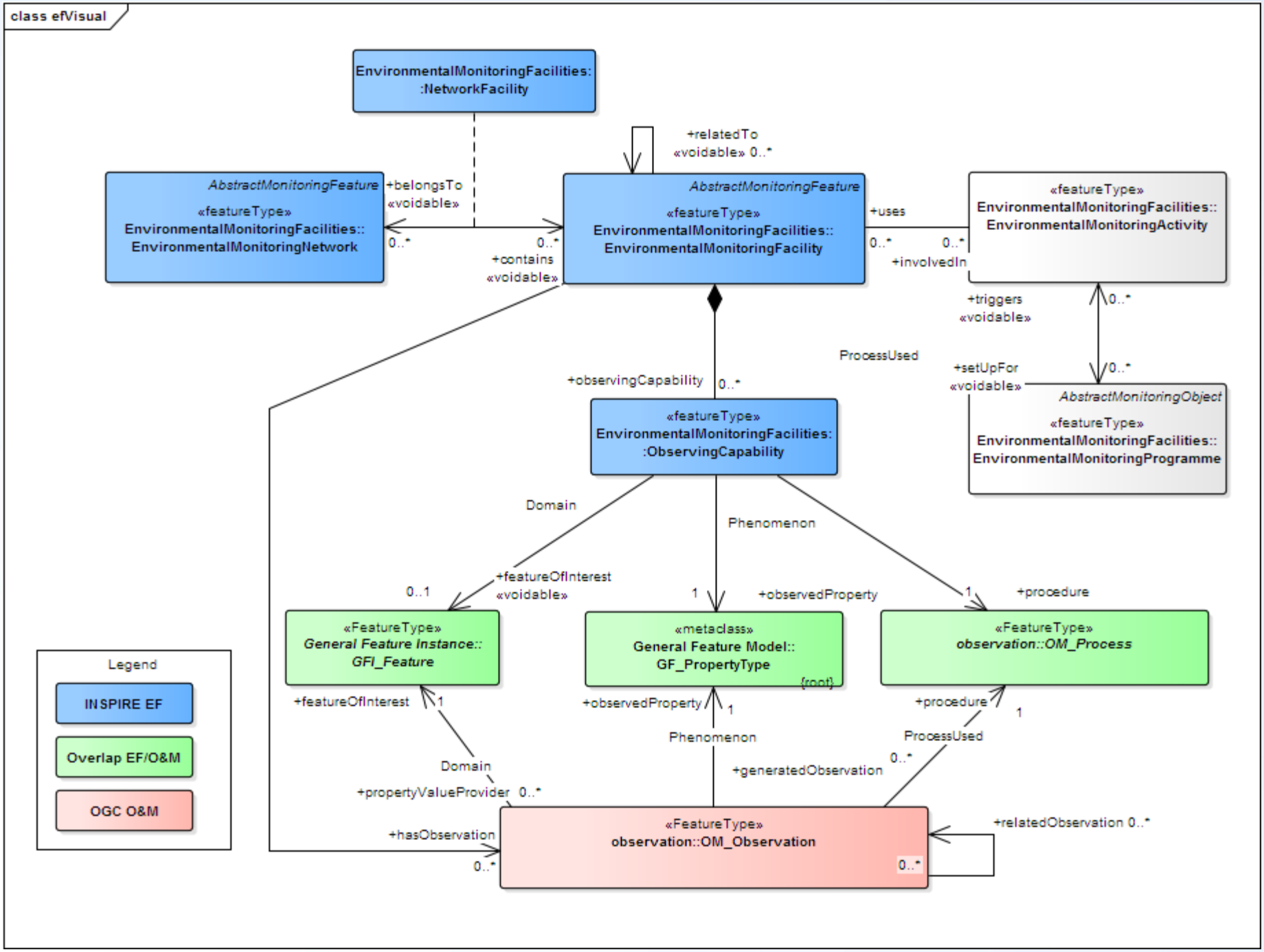
- Simplified Process Description, which can be used instead of SensorML



EF: classes



- **Environmental Monitoring Facility (EMF):** Station (vessel, buoy, device, ex-situ, in-situ), sensor (e.g. water bottle). The central spatial object type, which observations can be provided by using the O&M standard.
- **Environmental Monitoring Network (EMN):** Administrative or organisational grouping of EnvironmentalMonitoringFacilities managed the same way for a specific purpose, targeting a specific area.
- **Environmental Monitoring Programme (EMP):** Framework based on policy relevant documents defining the target of a collection of observations and/or the deployment of AbstractMonitoringFeatures on the field.
- **Environmental Monitoring Activity (EMA):** Monitoring activities are triggered by Monitoring Programmes, use specific Environmental Monitoring Facilities to capture required data.


class efVisual
EnvironmentalMonitoringFacilities::NetworkFacility
AbstractMonitoringFeature
«featureType»
EnvironmentalMonitoringFacilities::
EnvironmentalMonitoringNetwork
+belongsTo
«voidable»
0..*
0..*
+contains
«voidable»
+relatedTo
«voidable» 0..*
AbstractMonitoringFeature
«featureType»
EnvironmentalMonitoringFacilities::
EnvironmentalMonitoringFacility
+uses
0..*
0..*
+involvedIn
«featureType»
EnvironmentalMonitoringFacilities::
EnvironmentalMonitoringActivity
+triggers
«voidable»
0..*
ProcessUsed
+setUpFor
«voidable»
0..*
AbstractMonitoringObject
«featureType»
EnvironmentalMonitoringFacilities::
EnvironmentalMonitoringProgramme
+observingCapability
0..*
«featureType»
EnvironmentalMonitoringFacilities::
ObservingCapability
Domain
Phenomenon
0..1
+featureOfInterest
«voidable»
1
+observedProperty
1
+procedure
«FeatureType»
General Feature Instance::
GFI_Feature
«metaclass»
General Feature Model::
GF_PropertyType
{root}
«FeatureType»
observation::OM_Process
+featureOfInterest
1
+observedProperty
1
Phenomenon
+procedure
1
ProcessUsed
Domain
+propertyValueProvider
0..*
0..*
+generatedObservation
+hasObservation
0..*
«FeatureType»
observation::OM_Observation
0..*
+relatedObservation 0..*
Legend
INSPIRE EF
Overlap EF/O&M
OGC O&M

PoC: SeaDataNet data formats reviewed

- Source data: SeaDataNet (meta)data formats
  - SeaDataNet **ODV data** files
  - SeaDataNet **Common Data Index (CDI) and Cruise Summary Report (CSR) metadata** files corresponding to the data files
  - BODC code list register

- Target schemas: EF/OF/O&M INSPIRE data application schemas (xsd)

Approach for more in-depth analyis

- Provide mapping between SDN (meta)data sources and INSPIRE models in **Matching Tables** (Excel)
  - Can a matching be done? Where are the gaps/issues?

- Provide corresponding **example XML/GML files**
  - How does the encoding look like?

Matching tables and GML files created

- Environmental Monitoring Facilities (EF):
  - EMF: Platform and EMA: Activity
  - EMF: Sampling Point
- EF/OF
  - Feature of Interest
  - Process
- Oceanographic Geogrpahic Features (OF):
  - OF/Specialised Observations: Time Series
  - OF/Specialised Observations: Profile
  - OF/Specialised Observations: Trajectory

Example: Matching table for Observations

Type : OM_Observation - TimeSeriesObservation

Attribute Association role Constraint	Values/Enumerations	Multiplicity	Voidable/ Non-voidable	Example	Source	Path
				Application Schema <provide the name of the application schema>		
gml:id	NCName	1		OFTS_D278_TEMPPR01		OFTS + [CruiseID] + + [ObservedProperty]
gml:description	gml:StringOrRefType	0..1		A single series of Currents - subsurface Eulerian data collected between 25 March 2004 00:00 and 11 May 2005 00:00.	CDI	/gmd:MD_Metadata/gmd:identificationInfo/sdn:SDN_DataIdentification/gmd:abstract/gco:CharacterString
gml:name	gml:CodeType	0..*		36113/1156	CDI	/gmd:MD_Metadata/gmd:identificationInfo/sdn:SDN_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:title/gco:CharacterString
om:type	gml:ReferenceType	0..1		http://inspire.ec.europa.eu/featureconcept/PointTimeSeriesObservation		
parameter	NamedValue	0..*				
om:name@xlink:href	gml:ReferenceType	1		relatedMonitoringFeature		"relatedMonitoringFeature"
om:value	xsi:Any	1		EFSP_D278_TEMPPR01	ODV	EFSP + [CruiseID] + + [ObservedProperty]
phenomenonTime	TM_Object	1				
gml:id	NCName	1		OFTS_PT_D278_TEMPPR01		OFTS_PT_ + [CruiseID] + _ + [ObservedProperty]
beginPosition	gml:TimePositionType	1		2004-03-25T00:00:00	CDI	/gmd:MD_Metadata/gmd:identificationInfo/sdn:SDN_DataIdentification/gmd:extent/gmd:EX_Extent/gmd:temporalElement/gmd:EX_TemporalExtent/gmd:extent/gml:TimePeriod/gml:beginPosition
endPosition	gml:TimePositionType	1		2005-05-11T00:00:00	CDI	/gmd:MD_Metadata/gmd:identificationInfo/sdn:SDN_DataIdentification/gmd:extent/gmd:EX_Extent/gmd:temporalElement/gmd:EX_TemporalExtent/gmd:extent/gml:TimePeriod/gml:endPosition
resultQuality	DQ_Element	0..*				
resultTime	TM_Instant	1				
gml:id	NCName	1		OFTS_RT_D278_TEMPPR01		OFTS_RT + [CruiseID] + + [ObservedProperty]
beginPosition	gml:TimePositionType	1		2005-05-11T00:00:00	CDI	/gmd:MD_Metadata/gmd:identificationInfo/sdn:SDN_DataIdentification/gmd:extent/gmd:EX_Extent/gmd:temporalElement/gmd:EX_TemporalExtent/gmd:extent/gml:TimePeriod/gml:endPosition
validTime	TM_Period	0..1				
metadata	MD_Metadata	0..1		http://seadatanet.maris2.nl/v_cdi_v3/print_xml.asp?n_code=2075842	ODV	//sdn_reference@xlink:href

Example: GML file for Observations

```
<?xml version="1.0" encoding="UTF-8"?>
<omso:PointTimeSeriesObservation gml:id="OFTS_D278_TEMPPR01" xmlns:om="http://www.opengis.net/om/2.0"
 xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:tsml="http://www.opengis.net/tsml/1.0"
 xmlns:wml2="http://www.opengis.net/waterml/2.0"
 xmlns:sams="http://www.opengis.net/samplingSpatial/2.0"
 xmlns:omso="http://inspire.ec.europa.eu/schemas/omso/3.0"
 xsi:schemaLocation="
       http://inspire.ec.europa.eu/schemas/omso/3.0
       http://inspire.ec.europa.eu/schemas/omso/3.0/SpecialisedObservations.xsd
       http://www.opengis.net/tsml/1.0
       http://schemas.opengis.net/tsml/1.0/timeseriesML.xsd">
 <gml:description>
  <!-- Description -->
   A single series of Currents -subsurface Eulerian data collected between 25 March 2004 00:00 and 11 May 2005 00:00.
 </gml:description>
 <gml:name>36113/1156</gml:name>
 <!-- Name -->
 <om:type xlink:href="http://inspire.ec.europa.eu/featureconcept/ProfileObservation"/>
 <om:metadata xlink:href="http://seadatanet.maris2.nl/v_cdi_v3/print_xml.asp?n_code=2075842"/>
 <!-- Type -->
 <om:phenomenonTime>
  <!-- Phenomenon Time -->
  <gml:TimePeriod gml:id="OFTS_PT_D278_TEMPPR01">
   <gml:beginPosition>2004-03-25T00:00:00</gml:beginPosition>
   <gml:endPosition>2005-05-11T00:00:00</gml:endPosition>
  </gml:TimePeriod>
 </om:phenomenonTime>
```

Some findings

- Several errors and deficits in the INSPIRE data models have been encountered and reported further
  - For example issues were found with TrajectoryObservation, ProfileObservation and GridObservation
- INSPIRE Coordinate Reference System (CRS) requirements
  - WGS84 is not a default CRS in INSPIRE
- The measurement procedure is not well documented in SDN
  - Needed in the INSPIRE Process is at least:
    - type: type of measurement process, i.e. rain-gauge, numerical model
    - responsibleParty: individual or organisation related to the process.

Recommendations

- Set up a Proof-of-Concept Transformation Service including
  - Coordinate Reference System (CRS) change: 4326 (WGS84/SDN) **->** 4258 (INSPIRE)
  - Transformation rules CDI, CSR + ODV **->** EF/OF XML/GML files
  - Focus first on the provision of TimeSeriesObservation

- Explore Out-of-band data provision of measurements
  - The OGC O&M standards gives alternatives, but it is not clear how to do out--of-band encoding in INSPIRE
    - Observe: also with Out-of band encoding there is a need for change of CRS and for tranformation to EF/OF application schemas

Other issues to decide and to work on?

- Does SeaDataCloud want to use Process or SensorML?
- There is a need to set up a namespace strategy
  - Which namepaces to use in the identifiers (URIs)?
- Does SeaDataCloud want to get involved and contribute to the following MIG developement/discussions? How?
  - Coverage encoding options – discussion on alternatives is going on in the INSPIRE community. Explore options?
  - Call for encoding alternatives - on the INSPIRE agenda 2018. Proposals by SeaDataCloud?
  - Coordinate Reference System – need for support of WGS84?

Summary

- Data from SeaDataNet ODV, as well as CDI and CSR files will be necessary to implement EF & OF/O&M according to relevant INSPIRE application schemas
- The mapping tables and the example GMLs can be used to set a PoC tranformation service in the cloud, but there are still some open issues
- Overall time table and the agenda of INSPIRE fits the time table of SeaDataCloud