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Observation trends: Expectations from European Comission regarding data exchange and interoperability

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COMMON SENSE FINAL MEETING
Barcelona, Spain, 27th January 2017

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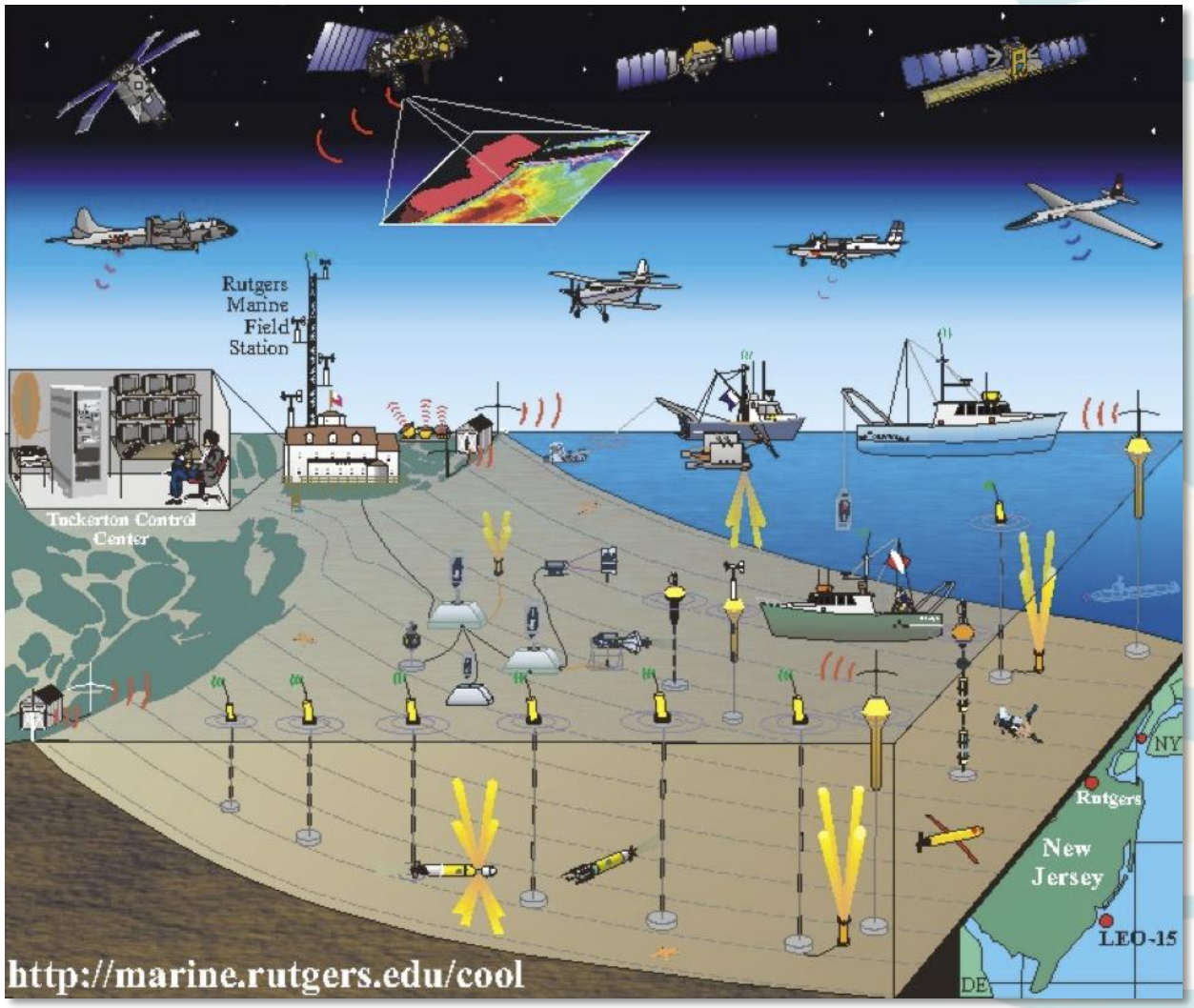
Context: An ocean of data



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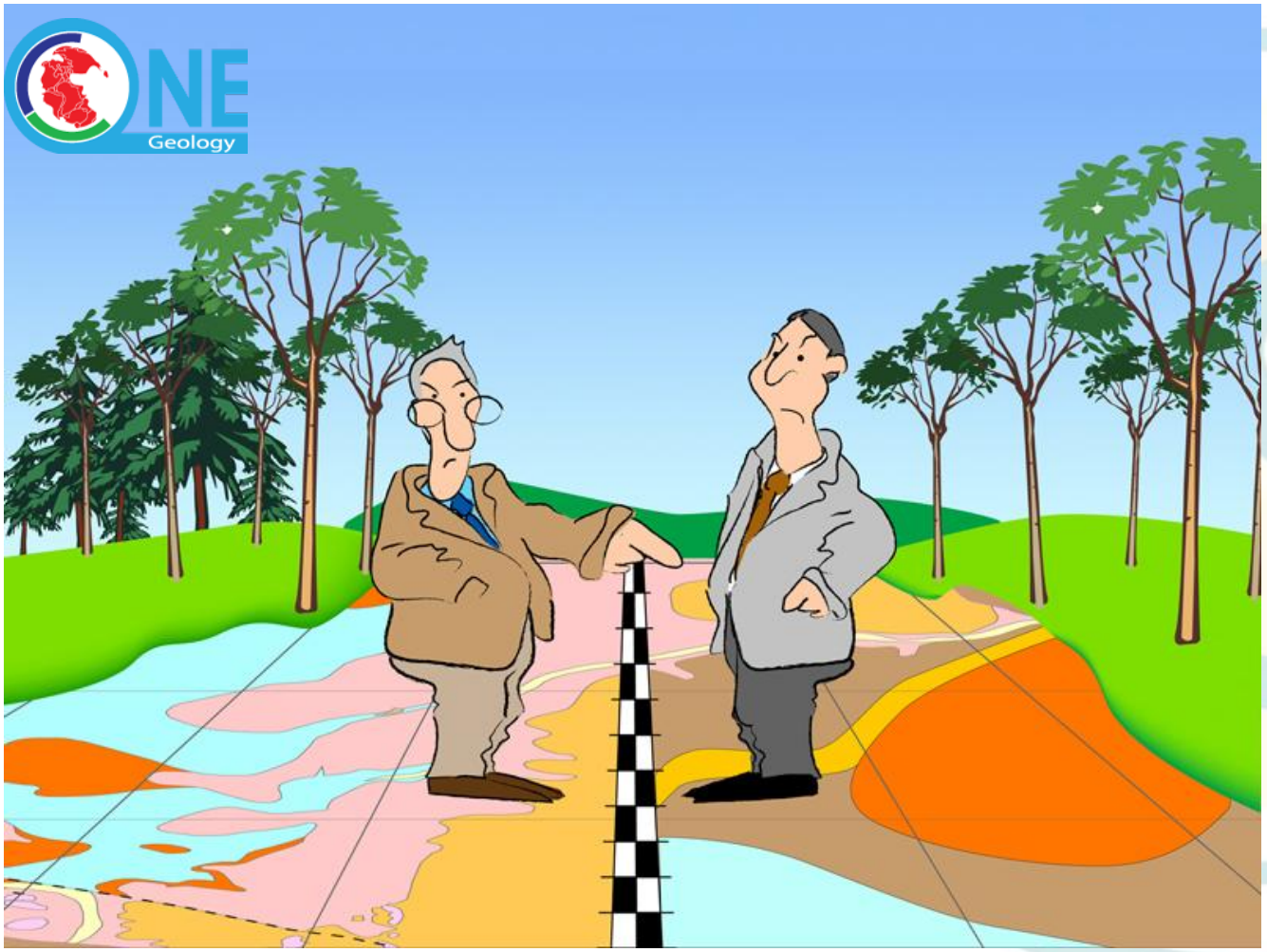
Interoperability?



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Interoperability?

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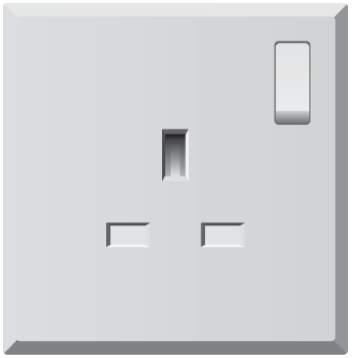
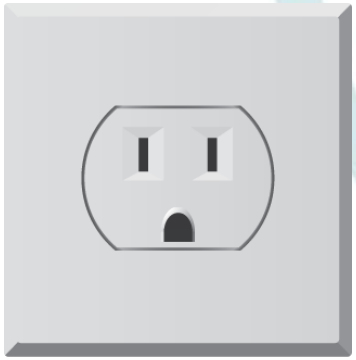
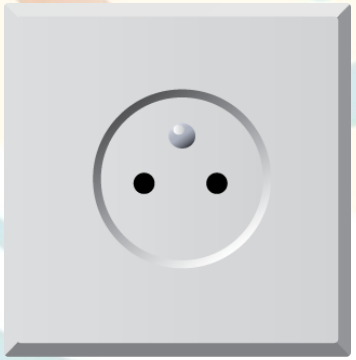
Data Integration and Interoperability problem







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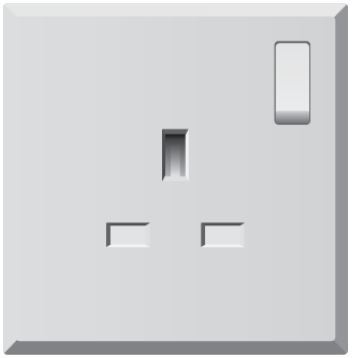
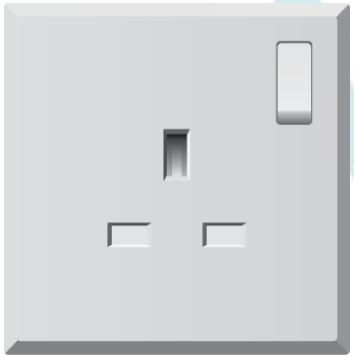
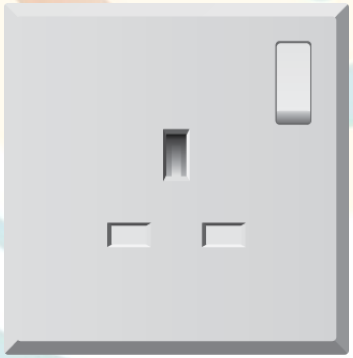
Approach 1: Standardisation







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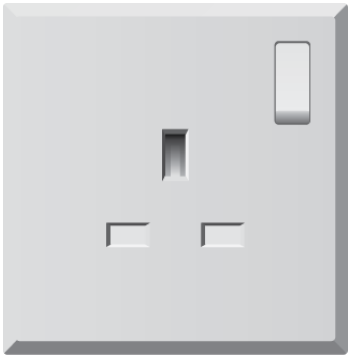
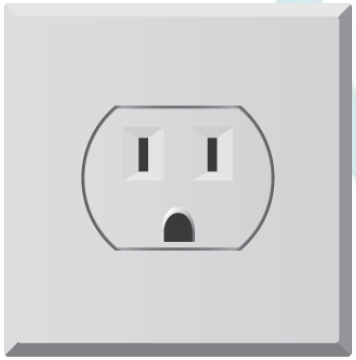
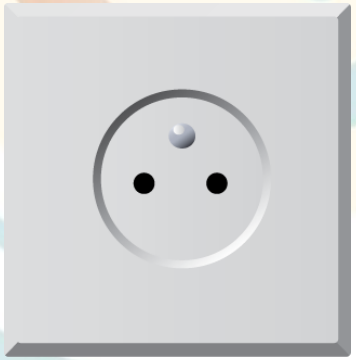
Approach 2: Mediation (Adaptor)







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Interoperability

Interoperability: What, Why, How?

What?

Ability of two or more systems to communicate and interact or be used together despite their differences

Why?

- Facilitates exchange and sharing of information
- Increases the availability, access, integration of data
- Facilitates the understanding and usage of data
- Solves heterogeneity (differences)

How

- **Standards** enable interoperability: standards for data, metadata, services
- Semantic interoperability: **ontology**, **controlled vocabulary**

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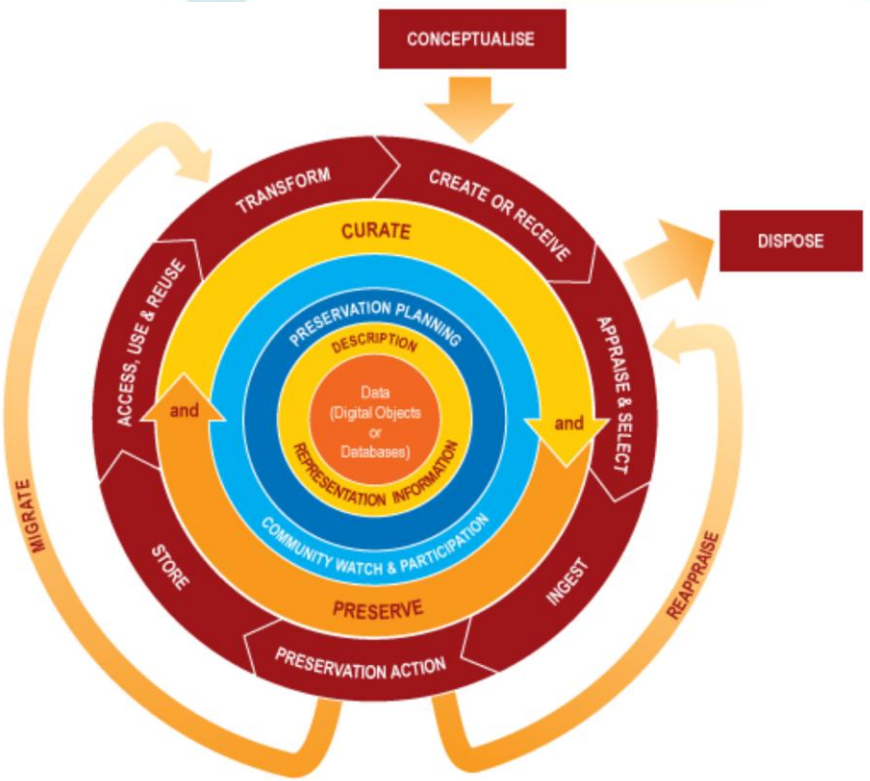
H2020 - Data Integration and Interoperability

Guidelines on Open Access to Scientific Publications and Research Data in Horizon 2020 define Open access as the practice of providing on-line access to scientific information that is free of charge to the end-user and that is re-usable.

In the context of research and innovation, 'scientific information' can refer to peer-reviewed scientific research articles (published in scholarly journals) or research data (data underlying publications, curated data and/or raw data).



Source: Data Curation Centre

http://www.dcc.ac.uk/sites/default/files/lifecycle_web.png

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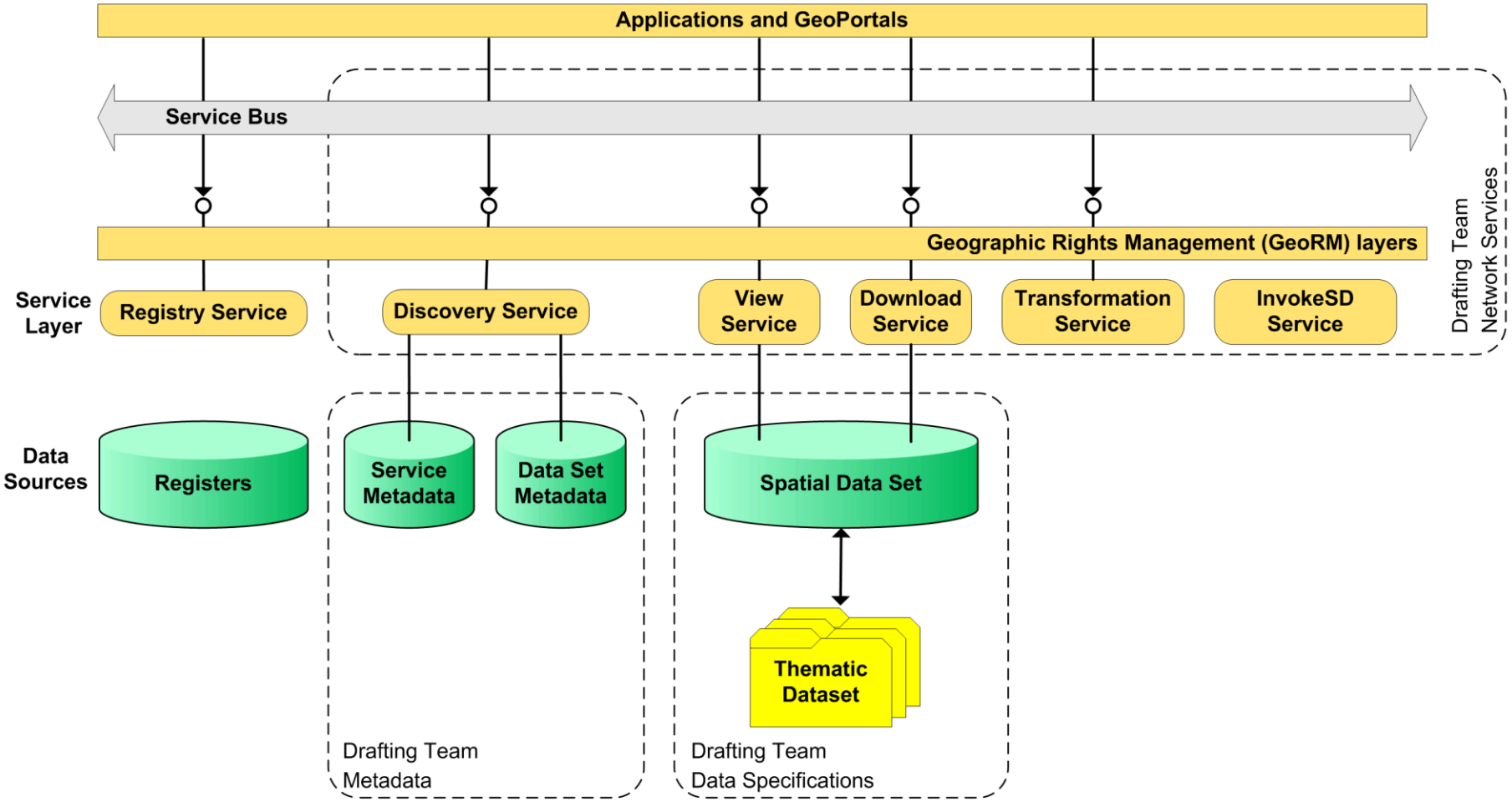
INSPIRE
Directive Architecture



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European Commission legal framework	D5: Eutrophication	D8: Contaminants	D10: Marine litter	D11: Underwater noise
Marine Strategy Framework Directive	x	x	x	x
Water Framework Directive	x	x	x	
Bathing Directive	x	x	x	
RoHS restricting the use of hazardous substances in electrical and electronic equipment		x	x	

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	D5: Eutrophication	D8: Contaminants	D10: Marine litter	D11: Underwater noise
HELCOM	x	x	x	x
OSPAR	x	x	x	
Barcelona Convention	x	x	x	x
Aberdeen Declaration	x	x		
HELCOM	x	x	x	x
Spain	x	x	x	x
Poland	x	x	x	x
Ireland	x	x	x	x
SHOAL	x	x		
Eurofleets 2		x	x	x
SeaDataNet 2		x		x
ODIP	x	x	x	x

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Heterogeneity

Interoperability & Heterogeneity

Heterogeneity is a major barrier to interoperability

Heterogeneity at different levels

- **System** (i.e. *interaction between computers* of different OS and databases of different DBMS)
- **Syntactic** (i.e. *differences between formats* such as a GML document and a Shapefile)
- **Schematic** (i.e. *differences in conceptual schemas* such as *street* may be defined as a class or as a value of an attribute of a *road* class)
- **Semantic** (i.e. *difference of meaning*, e.g. *temperature, is it sea temperature or air temperature; coastline vs shoreline*)

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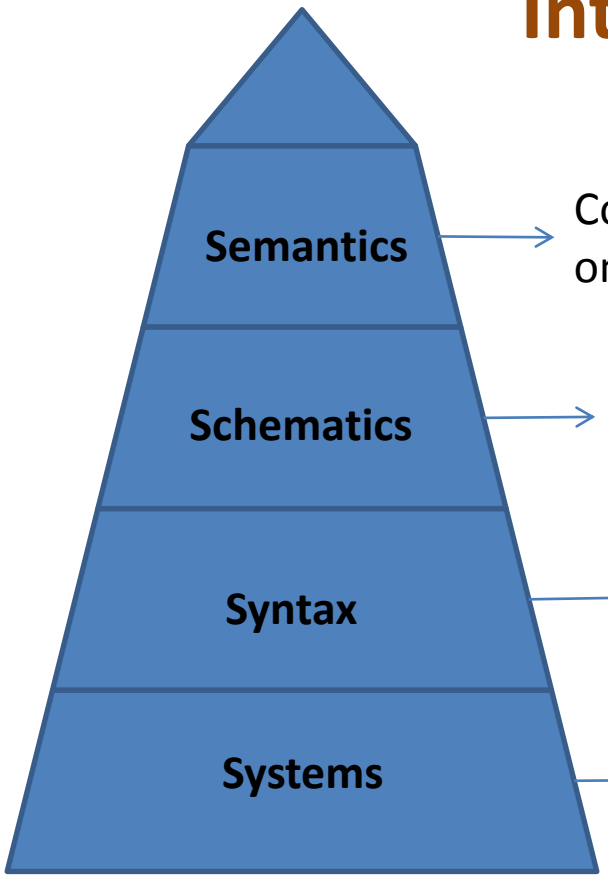
Interoperability Stack - solutions



Community specific vocabularies and concepts, ontology (share concepts)

Domain specific markup languages, data schema, community profiles

File format (shp, dxf), languages (sql, xml, gml, sensorML, O&M, rdf, owl, json, NetCDF)

Transfer protocol (FTP, HTTP) and services (WMS, WFS, WCS, CS-W, SOS, WSDL, etc.)

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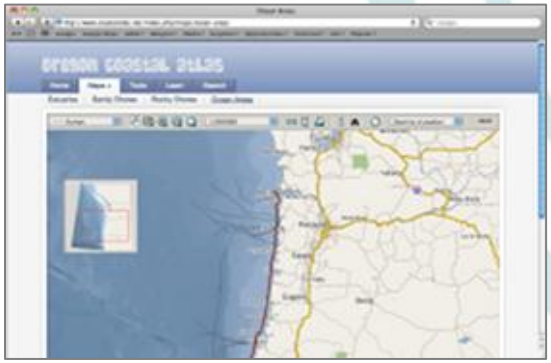
Ontologies and controlled vocabularies

Use a controlled vocabulary web service to define concepts (e.g. NERC)

"Coastline"

"Shoreline"



"Ligne de côte"

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Open Geospatial Consortium Sensor Web Enablement

The OGC's Sensor Web Enablement (SWE) standards enable developers to make all types of sensors, transducers and sensor data repositories discoverable, accessible and useable via the Web

- Open interfaces for sensor web applications
- "Hooks" for IEEE 1451, TML (TransducerML), CAP (Common Alerting Protocol), WS-N (Web Services Notification) , ASAP (Asynchronous Service Access Protocol)
- Imaging device interface support
- Opportunity to participate in an open process to shape standards
- Sensor location tied to geospatial standards
- Fusion of sensor data with other spatial data
- Ties to IEEE and other standards organizations

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OGC's Sensor Web Enablement

- **SWE Common Data Model** – Defines low-level data models for exchanging sensor related data between nodes of the OGC® Sensor Web Enablement (SWE) framework.
- **Observations & Measurements (O&M)** –The general models and XML encodings for observations and measurements.
- **Sensor Model Language (SensorML)** – Standard models and XML Schema for describing the processes within sensor and observation processing systems.
- **Sensor Observation Service (SOS)** – Open interface for a web service to obtain observations and sensor and platform descriptions from one or more sensors.
- **PUCK Protocol Standard** – Defines a protocol to retrieve a SensorML description, sensor "driver" code, and other information from the device itself, thus enabling automatic sensor installation, configuration and operation
- **Sensor Planning Service (SPS)** – An open interface for a web service by which client can determine the feasibility of collecting data from one or more sensors or models, and submit collection requests.
- **SWE Service Model** -– Defines data types for common use across OGC Sensor Web Enablement (SWE) services. Five of these packages define operation request and response types.

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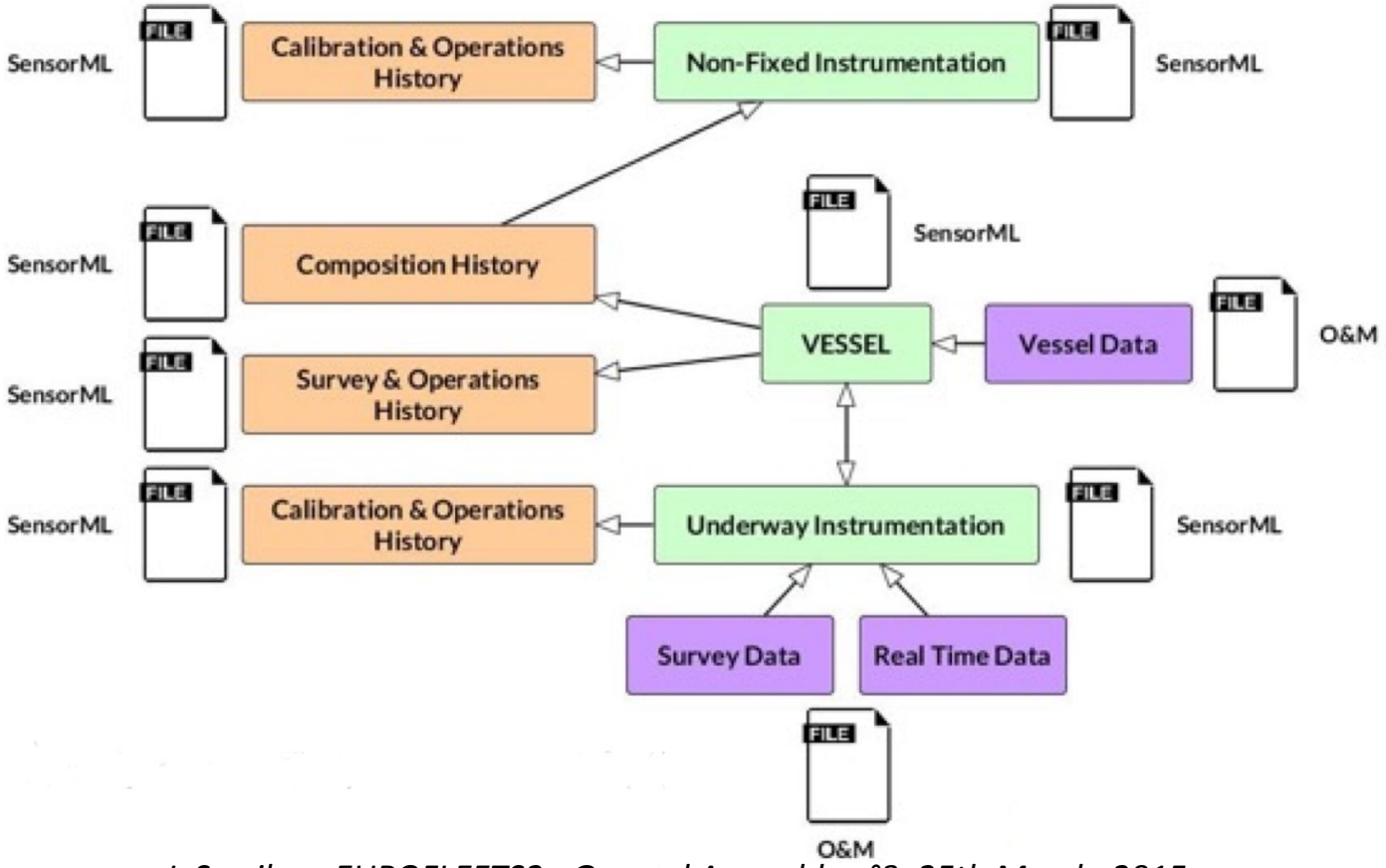
Sensor Model Language <-> Harmonization of data at EUROFLEETS



source: J. Sorribas, EUROFLEETS2 - General Assembly n°3, 25th March, 2015

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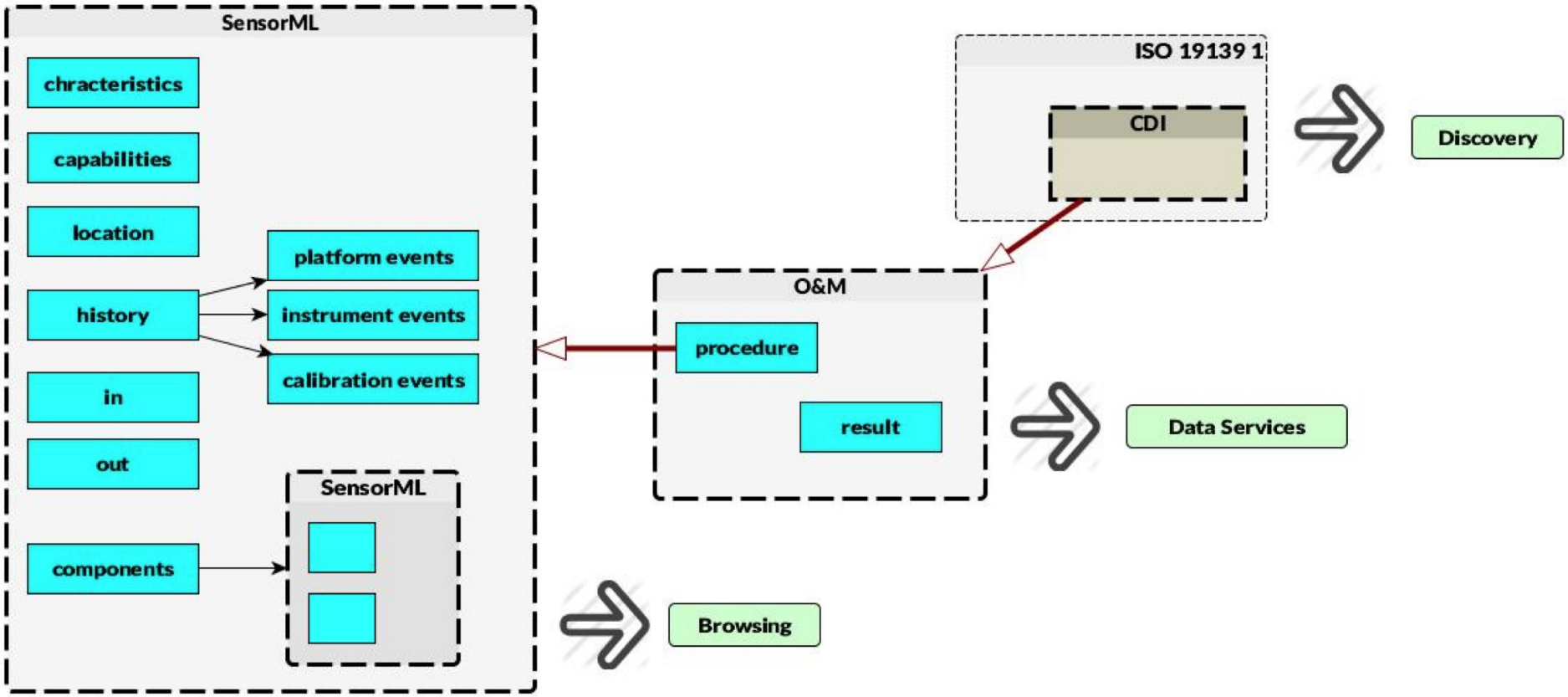
Sensor Observation Service <-> SeaDataNet CDI service



source: R. Casas, SeaDataNet II – Final Plenary Meeting 16-17 September 2015, Brest

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Country	Programme	T,P, nH/nCO2	Heavy Metals	N	µPlastic	uNoise
Denmark	Nation-wide aquatic monitoring programme - monitoring of coastal and open marine waters					
Finland	Monitoring programmes					
France	National sea water quality monitoring network - RNO					
France	French seashore phytoplankton monitoring - REPHY					
Germany	Bund/Länder Messprogramm für die Nordsee					
Greece	MED POL in the Aegean and Ionian Sea and the Saronic Gulf					
Ireland	General Quality of Estuarine and Coastal Receiving Waters					
Ireland	Bathing waters					
The Netherlands	National surface water monitoring programme Monitoring of marine waters					
Norway	Trend monitoring of the Norwegian coastal areas					
Norway	Arctic Monitoring and Assessment (AMAP)the Barents Sea & northern fjords					
Sweden	Nation-wide pelagic frequent monitoring					
UK	UK National Marine Monitoring Plan					

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Conclusions

Common Sense Interoperability with other projects in marine domain

- System interoperability (YES)
  - ✓ use of SOS
- Syntax interoperability (YES)
  - ✓ use of SensorML and O&M data formats
- Schematic interoperability (partialy)
  - ✓ different SensorML and O&M profiles (differences in structure)
- Semantic interoperability (no)
  - ✓ lack of common controlled vocabulary (differences in areas)

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Thank you for your Attention

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