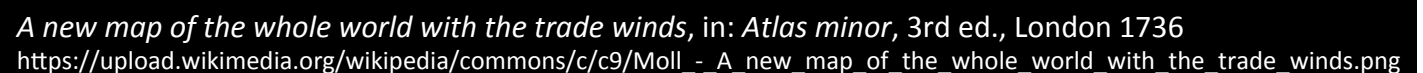


Data management within Spatial Data Infrastructures

tagliolato.p@irea.cnr.it

Scuola di Architettura Urbanistica Ingegneria delle Costruzioni
Landscape Architecture. Land Landscape Heritage
ENVIRONMENTAL ANALYSIS AND LANDSCAPE MAPPING
Politecnico di Milano – 19/11/2018



Sharing geospatial data

The “enlightened” phase
(late XIX–XX century)

Producers:

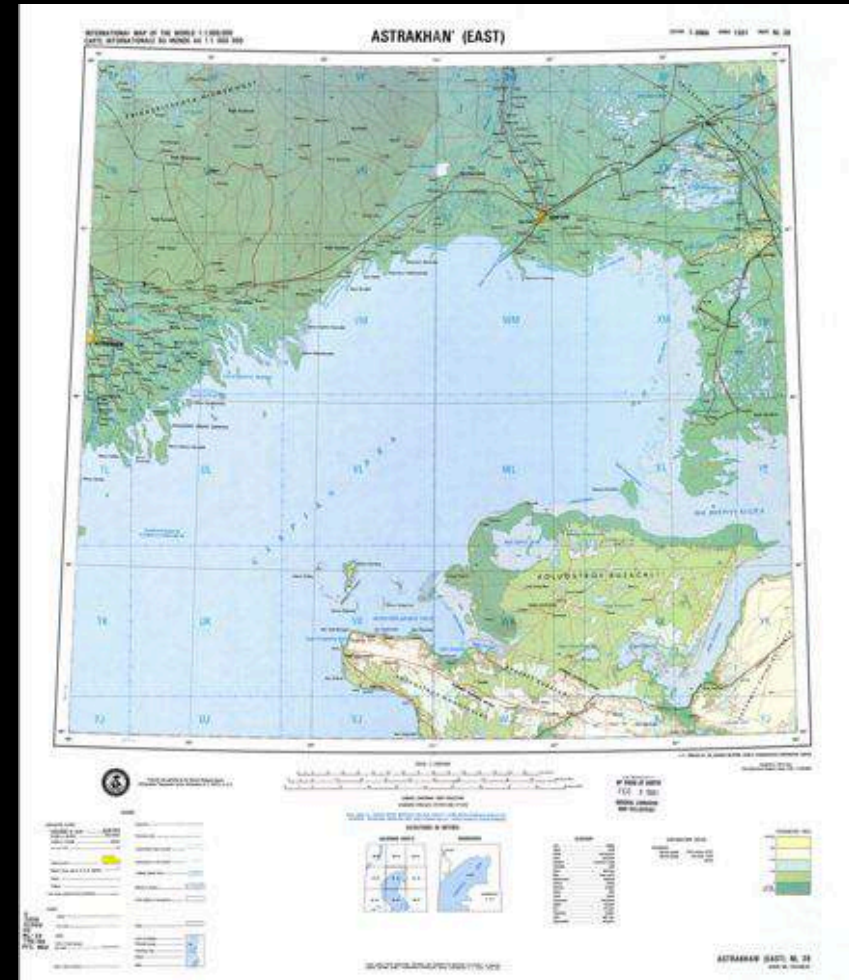
National mapping agencies (often military branches)

Aims:

Establish and maintain dominion; exhaustive representation of the world (with accuracy and scale). Mapping stable phenomena

Data sharing model:

Simple radial model. Geoinformation is produced and distributed by NMPs



U. S. National Geospatial-Intelligence Agency - International Map of the World 1:1,000,000 – North-East part of Caspian Sea (1975)

[https://commons.wikimedia.org/wiki/File:North-East_part_of_Caspian_Sea_\(IMW_NL39\).jpg](https://commons.wikimedia.org/wiki/File:North-East_part_of_Caspian_Sea_(IMW_NL39).jpg)

Sharing geospatial data

The contemporary phase
(late XX century - today)

The digital Earth (Al Gore, 1998)

Producers:

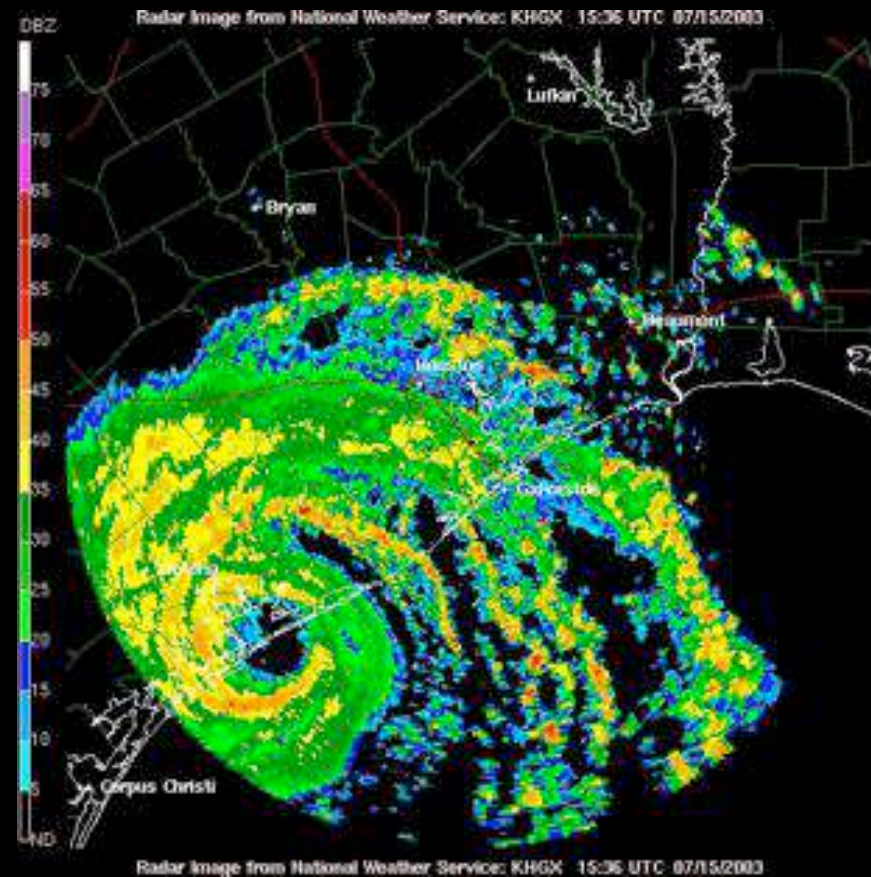
Geographic information become a distributed enterprise (lower cost due to ICT evolution: more providers). Central government, but also local, and private business is new actor

Aims:

Value added products for the market.
Mapping transitory phenomena becomes possible (e.g. weather, traffic reports, ...).

Data sharing model:

Federated, multitenanted. Each actor contribute to part of a larger “patchwork”



Radar image from National Weather service - 2011

Sharing geospatial data

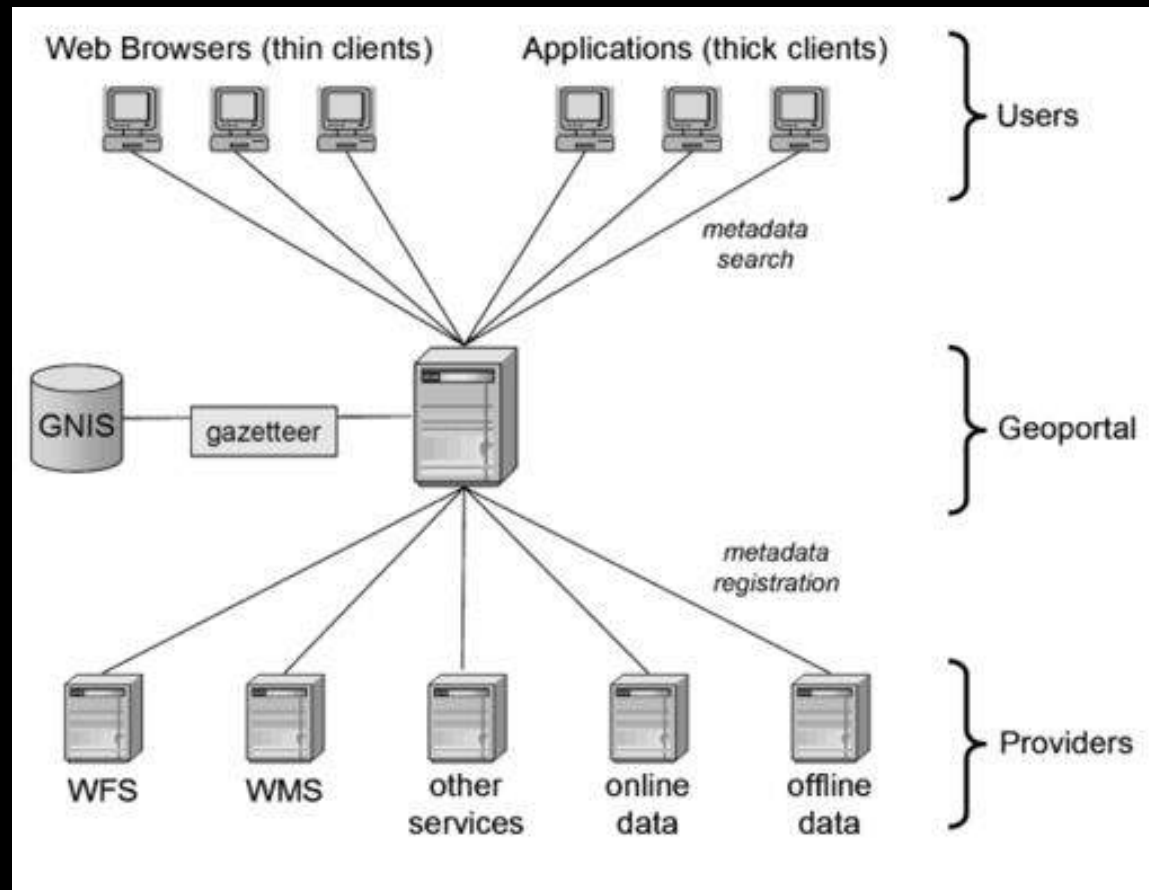
1994 First Spatial Data Infrastructure : NSDI (USA)

A network of producers -> a maintained patchwork coverage

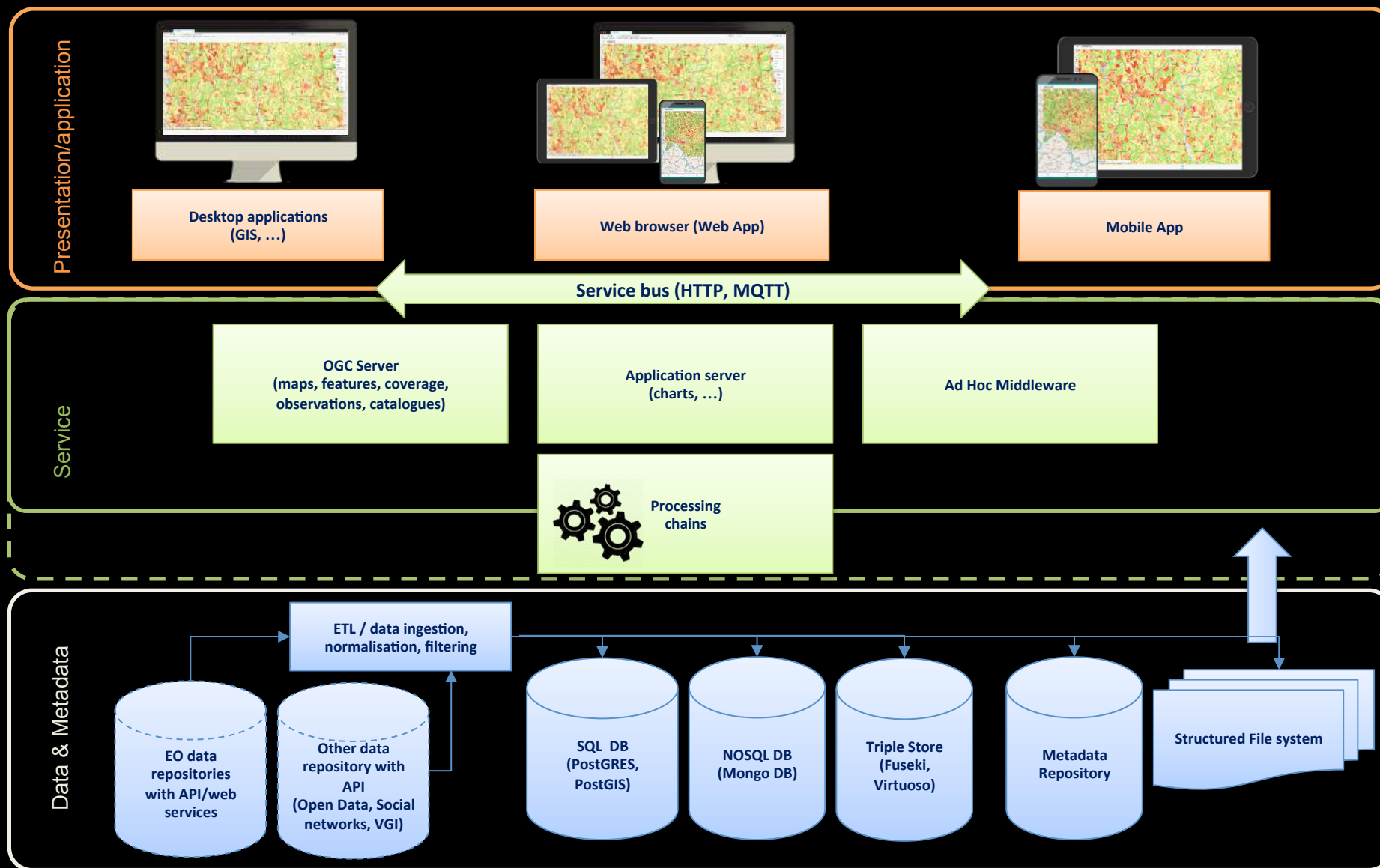
Standards are in place: for interoperation of the various parts

Spatial data infrastructure (SDI)

Typical Architecture of a SDI



Sharing Geographic Information: An Assessment of the Geospatial One-Stop
Michael F. Goodchild, Pinde Fu and Paul Richz, 2007



Standards involved in current SDI

- Standardization bodies: Main International Standardization bodies:
 - W3C: http, semantic web (RDF, SPARQL, SKOS, ...)
 - ISO: 19115/19139 Metadata for geospatial objects
 - Technology: XML <- validation - gatekeeping
 - OGC: geospatial services

Standards involved in current SDI

OGC services - Visualization

- Map service for the web (WMS): images of data
 - Operations of WMS

Operation	Description
GetCapabilities	Retrieves metadata about the service, including supported operations and parameters.
GetMap	Retrieves a map image for a specified area and content.
GetFeatureInfo (optional)	Retrieves the underlying data, including geometry and attribute values, for a specific location on the map.
DescribeLayer (optional)	Indicates the WFS or WCS to retrieve additional information about the layer.
GetLegendGraphic (optional)	Retrieves a legend for a map.

Standards involved in current SDI

- OGC services – data access
 - Web Feature Service (WFS) – vector data
 - Operations of WFS



GetCapabilities Returns a document that describes the functionality and resources offered by the WFS service that is provided by the server.

DescribeFeatureType Returns a description of the structure of feature types and feature properties offered or accepted by an instance of a WFS.

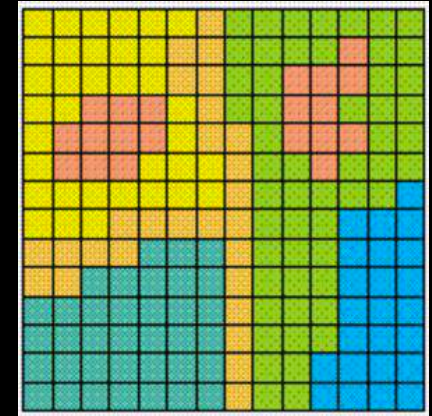
ListStoredQueries Returns a list of the queries that have been stored inside the WFS instance.

DescribeStoredQueries Returns a description of the queries that have been stored inside the WFS instance.

GetFeature Returns a selection of feature instances from a data store published through the WFS.

Standards involved in current SDI

- OGC services – data access
 - Web Coverage Service (WCS) – raster data
 - Operations of WCS



GetCapabilities Retrieves a list of the server's data, as well as valid WCS operations and parameters

DescribeCoverage Retrieves an XML document that fully describes the request coverages.

GetCoverage Returns a coverage in a well known format. Like a WMS GetMap request, but with several extensions to support the retrieval of coverages.

Standards involved in current SDI

OGC services – data access

– Sensor Observation Service (SOS) – (sensor) observation data

- Operations of SOS

GetCapabilities Returns a document that describes the functionality and resources offered by the SOS service that is provided by the server.

DescribeSensor Returns a description of the procedures or sensors associated with an SOS.

GetObservation Returns observation data that has been collected by the procedure or sensor.

Standards involved in current SDI

OGC services – metadata

– Catalog service for the web (CSW) –
metadata documents

- Operations of CSW

GetCapabilities allows CSW clients to retrieve service metadata from a server

DescribeRecord: "allows a client to discover elements of the information model supported by the target catalogue service. The operation allows some or all of the information model to be described"

GetRecords: search for records, returning record Ids

GetRecordById: "retrieves the default representation of catalogue records using their identifier"

INSPIRE and SOS

- Presentation of INSPIRE



<http://inspire.ec.europa.eu/about-inspire/563>

Technological solutions: GET-IT

- Presentation of get-it: enabling nodes of SDI

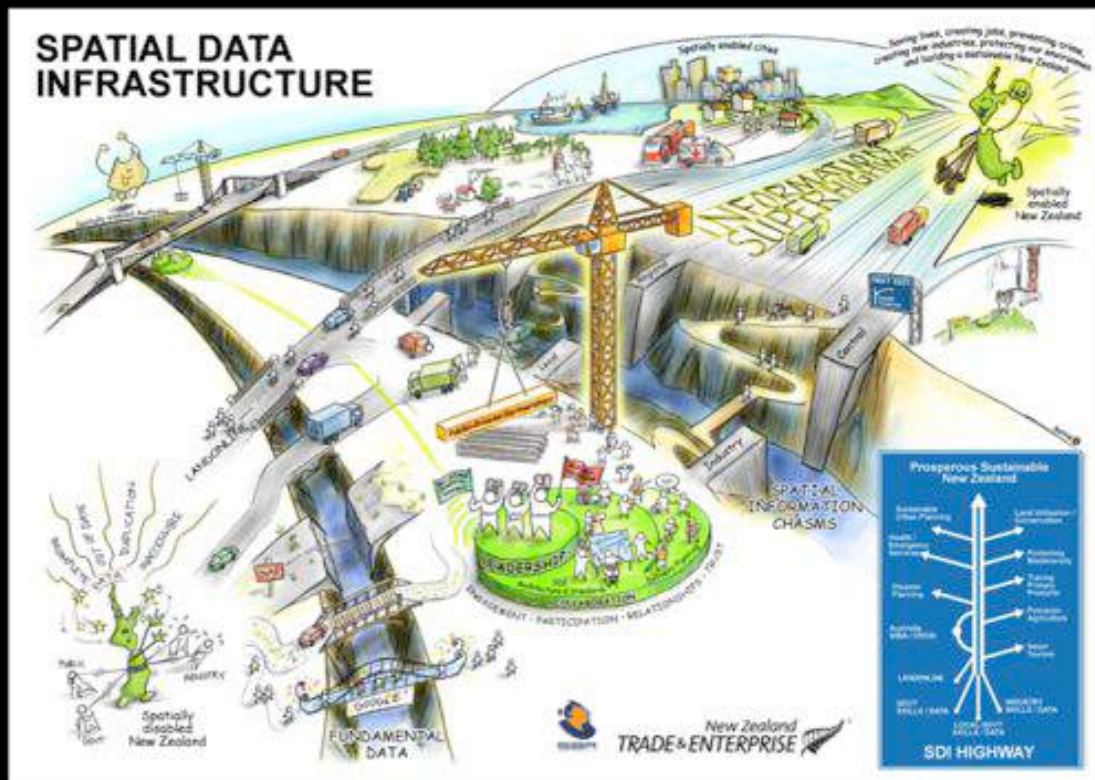


What is GET-IT?

- Aims to enable research groups/institutes to become leaders in the creation of an interoperable Spatial Data Infrastructures (SDI).



www.get-it.it

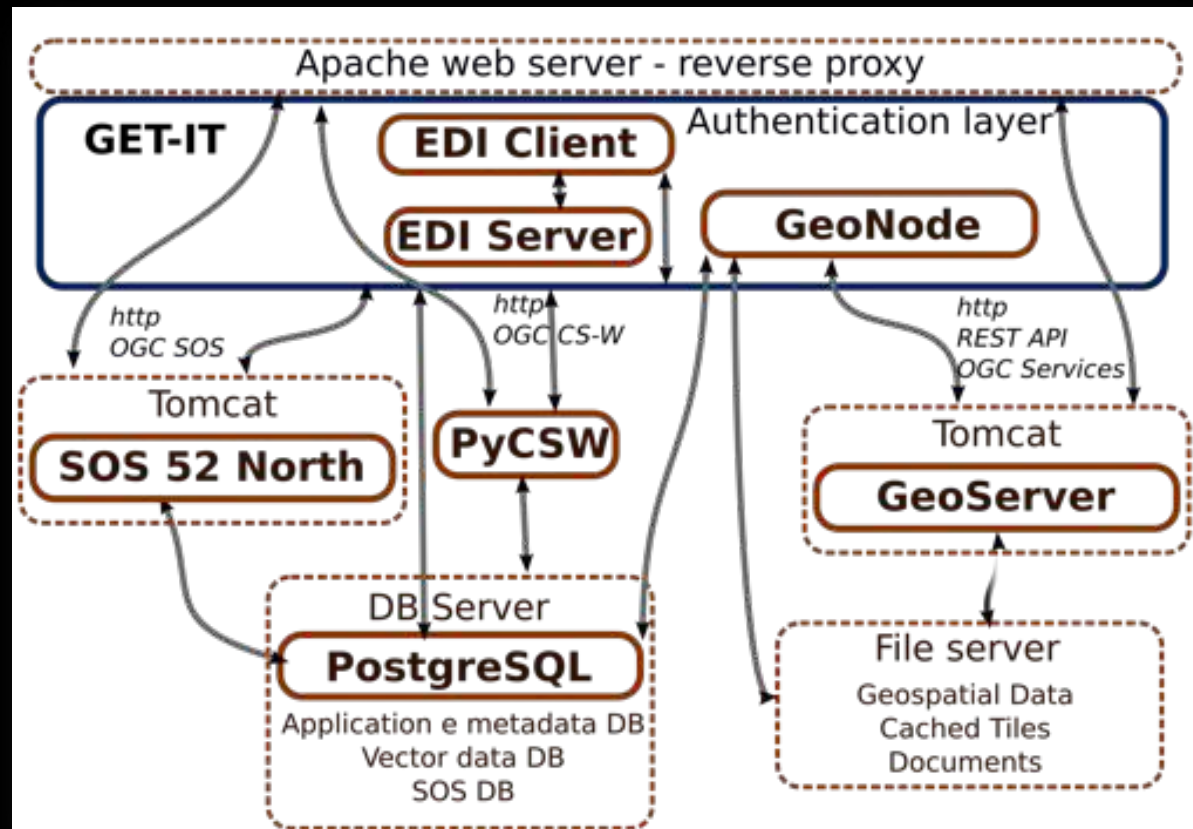


What is GET-IT?

- Developed by a joint research group of CNR IREA – ISMAR is based on GeoNode open source software.

New contribute:

- *Metadata Editor (EDI)*
- *Import observation tool*
- *Web client for visualization of map, layers and observations*



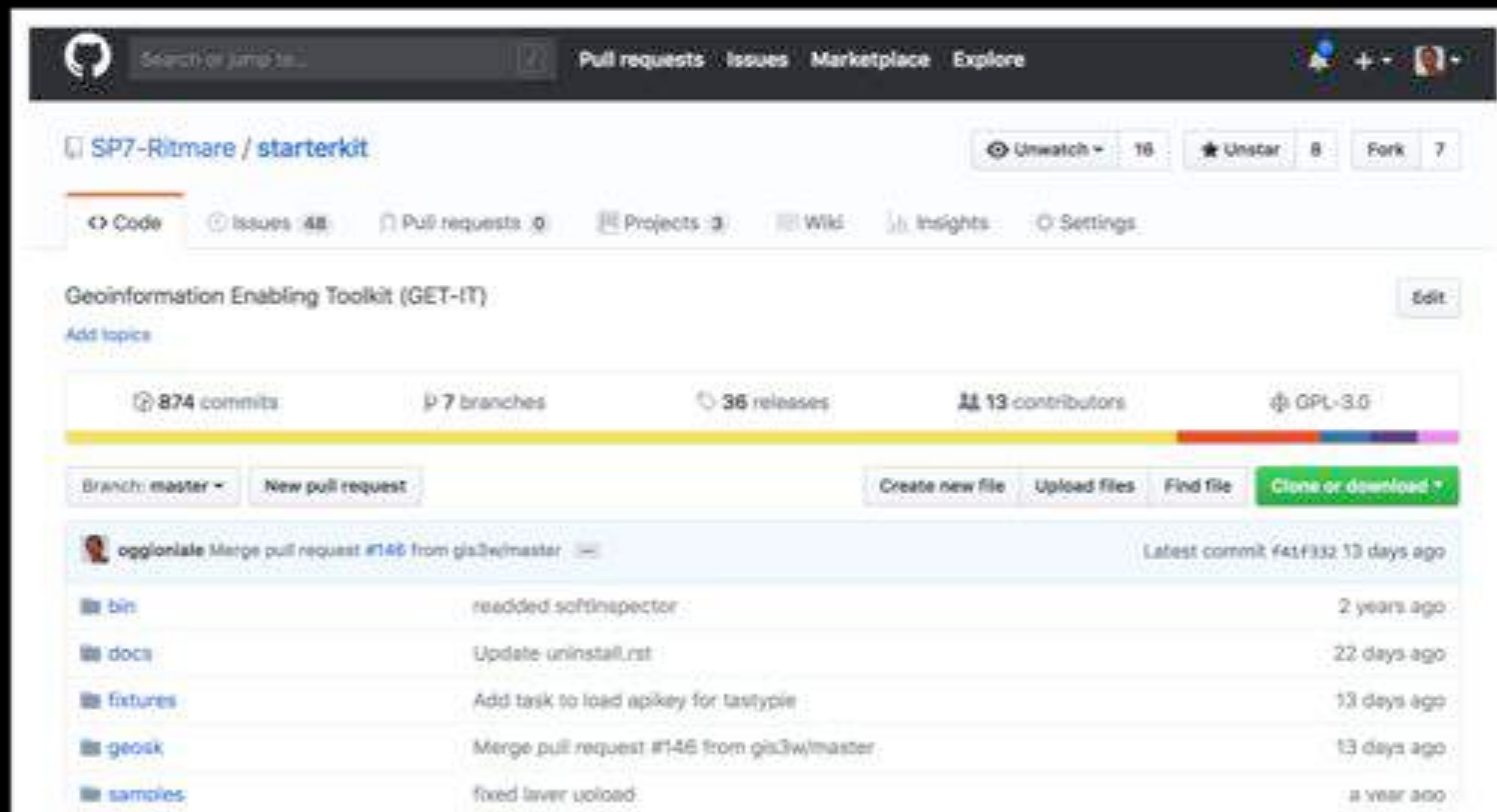
What is GET-IT?

- By exploiting standards from the OGC it enables the interoperable distribution of geospatial data, sensors, measurements and metatada.

Service	Version	Software
OCG Web Map Service	1.1.1, 1.3.0	GeoNode (GeoServer)
OGC Web Feature Service	1.0.0, 1.1.0, 2.0	GeoNode (GeoServer)
OGC Web Coverage Service	1.0, 1.1	GeoNode (GeoServer)
OSGeo WMS Tile Caching		GeoNode (GeoServer/GWC)
OGC Web Map Tile Service		GeoNode (GeoServer/GWC)
OSGeo Tile Map Service		GeoNode (GeoServer/GWC)
OGC Catalogue Services for the Web	2.0.2	GeoNode (pycsw)
INSPIRE Discovery Services	3.0	GeoNode (pycsw)
OGC SOS	1.0.0, 2.0	52°North SOS
OGC Sensor Model Language (SensorML)	2.0.0	52°North SOS
OGC Observation and Measurement (O&M)	2.0.0	52°North SOS
OGC Geography Markup Language (GML)	3.1.1	52°North SOS
Service	Version	Software
OCG Web Map Service	1.1.1, 1.3.0	GeoNode (GeoServer)

What is GET-IT?

- Completely free and open-source.



GET-IT functions

**Upload layers/maps
(OGC WMS, WFS & WCS)**

The screenshot shows the 'Upload Layers' page of the LTER Europe portal. The page has a light blue header with the LTER Europe logo, a search bar, and user information (root, login, info, demo). Below the header is a navigation bar with links: HOME, LAYERS, SENSORS, DOCUMENTS, VIEWS, PEOPLE, SEARCH, and SERVICES. The main content area has two tabs: 'EXPLORE LAYERS' and 'UPLOAD LAYERS'. The 'UPLOAD LAYERS' tab is active, showing a large dashed box with an upload icon and the text 'Drop files here'. Below this, it says 'or select them one by one:' and provides a 'Choose Files' button next to the text 'no files selected'. A dark grey bar labeled 'FILES TO BE UPLOADED' is empty. Below this, there is a label 'Select the charset or leave default' and a dropdown menu currently set to 'UTF-8/Unicode'. At the bottom right of the form are 'Clear' and 'Upload files' buttons. The footer contains a link to 'GeoInformation Enabling Toolkit', a note that the toolkit is developed by SP7-@ITMARE, and links for 'Contacts', 'Legal Notes', and 'Credits'. It also mentions 'Based on GeoNode' and has a language selector set to 'English'.

LTER Europe

Search...

root | | Demo

HOME LAYERS SENSORS DOCUMENTS VIEWS PEOPLE SEARCH SERVICES

EXPLORE LAYERS **UPLOAD LAYERS**

UPLOAD LAYERS

Drop files here

or select them one by one:

Choose Files no files selected

FILES TO BE UPLOADED

Select the charset or leave default

UTF-8/Unicode

Clear Upload files

→ GeoInformation Enabling Toolkit: masterkit@ is developed by SP7-@ITMARE | Contacts | Legal Notes | Credits | → Based on GeoNode

Language: English

GET-IT functions

Register INSPIRE
MetaData
(ISO 19115)

EDI



Edit metadata pusiano_lago

Information on metadata

Identification

Classification

Constraints related to access and use

Description

Geographic location

Temporal reference

Quality and validity

Information on metadata

Metadata language ⓘ
English

Metadata point of contact ⓘ
Email
mailto:roggioni.a@ira.cnr.it
Institute
Istituto per il Rilevamento Elettromagnetico dell'Ambiente
+ Metadata point of contact

Metadata date ⓘ

Cancel Save metadata

doi:

GET-IT functions

Register sensor
information
(OGC SensorML v2.0.0)

EDI



Register Sensor

Description of system

Keywords

Identification of the system

System Classifiers

Temporal validity of metadata

Characteristic

Capabilities

Relevant Contacts

System Documentation

History

Feature Of Interest

Output signals

Position Properties

Description of system

Physical system name ⓘ

Description of the physical system ⓘ

Description of the physical system

Keywords

Free keyword ⓘ

+ Free keyword

Identification of the system

Manufacturer name ⓘ

Cancel Register

doi:

GET-IT functions

Describe sensor (OGC SensorML v2.0.0)

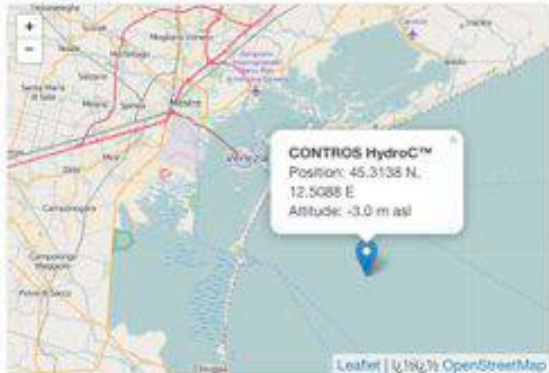
CONTROS HydroC™ (Piattaforma Acqua Alta - CONTROS HydroC)

The CONTROS HydroC™ CO2 sensor is a unique underwater dioxide sensor for in-situ and online measurements of dissolved CO2. The versatile HydroC™ CO2 is suitable for platform installations (e.g. ROV's or AUV's), long-term deployments (e.g. buoys and moorings) as well as for profiling applications (e.g. water sampling rosettes). Fields of application include: ocean acidification research, climate studies, air-sea gas exchange, limnology, fresh water control, aquaculture/fish farming, carbon capture and storage – monitoring, measurement and verification (CCS-MMV).

Manufacturer Name
CONTROS
tel: +49-431-2609-5900
Wischhofstrasse 1-3 Geb.
Kiel - Seefischmarkt
D-24148
DE
<mailto:contact@contros.eu>
<http://www.contros.eu>

Model Number
HydroC

Parameters
[Partial pressure of carbon dioxide {pCO2} in the atmosphere by infra-red gas analysis](#)
Unit of measure: uatm
Partial pressure of carbon dioxide (pCO2) in the atmosphere by infra-red gas analysis

Position



CONTROS HydroC™
Position: 45.3138 N,
12.5088 E
Altitude: -3.0 m asl

Contact

Owner
Istituzione Centro Previsioni
Segnalazioni Maree
+39 041 27 48 787
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maree@comune.venezia.it
<http://www.comune.venezia.it/maree/>

Operator
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S. Marco 4090
Venezia
30124
Italia
maree@comune.venezia.it
<http://www.comune.venezia.it/maree/>

Documentation
Documentazione Stazione dal sito ufficiale
[application/pdf](#)

History


GET-IT functions

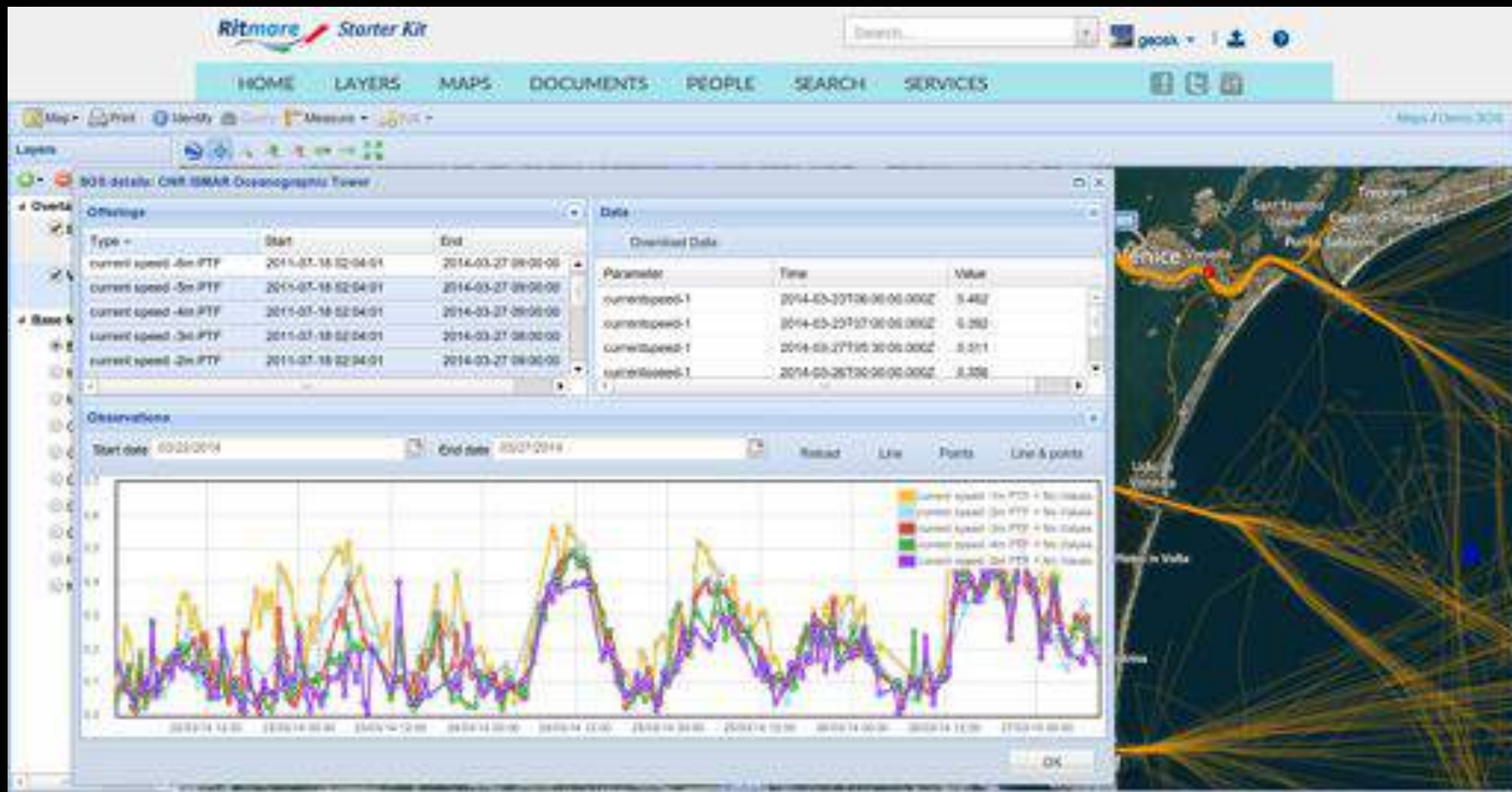
Insert observations from monitoring and experimentation activities (OGC SOS v2.0)

The screenshot shows the 'UPLOAD OBSERVATIONS' tab in the GET-IT web interface. The top navigation bar includes links for HOME, LAYERS, SENSORS, DOCUMENTS, VIEWS, PEOPLE, SEARCH, and SERVICES. Below the navigation bar, there are tabs for 'EXPLORE SOS' and 'UPLOAD OBSERVATIONS'. Under 'UPLOAD OBSERVATIONS', there are sub-tabs for 'Select Procedure', 'Select Location', and 'Insert observations'. The 'Select Location' sub-tab is active, showing a map of Europe. Below the map, there is a form with fields for 'Name', 'Sampling point', 'Lat.', 'Lon.', 'SRS', and 'Sampled Feature (URI)'. The 'SRS' field is set to 'wgs84'. A 'Use' button is visible next to the 'Sampled Feature (URI)' field.

The screenshot shows the 'INSERT OBSERVATIONS' tab in the GET-IT web interface. The top navigation bar is the same as the previous screenshot. Below the navigation bar, there are tabs for 'EXPLORE SOS' and 'UPLOAD OBSERVATIONS'. Under 'UPLOAD OBSERVATIONS', there are sub-tabs for 'Select Procedure', 'Select Location', and 'Insert observations'. The 'Insert observations' sub-tab is active, showing a form for inserting data. The form has a section titled 'Insert data' with instructions: 'Fill in the data manually or paste them from a spreadsheet, without headings. Please check the order of columns here proposed.' Below this, there is a 'Show accepted date-time formats.' button. A 'save data' button is visible. Below the 'save data' button, there is a 'ResultTime' section with instructions: 'Please check the result time (i.e. the time when the result became available). Change it if different from the last phenomenonTime (default).' Below this, there is a text input field. Below the text input field, there is a table with two columns: 'phenomenonTime' and 'albedo'. Below the table, there are 'save data' and 'reset table' buttons. At the bottom, there is a 'Legend - Fields definition' section.


GET-IT functions

Explore layers/maps (OGC WMS, WFS & WCS) and observations (OGC SOS)



GET-IT LADeC

<http://ladec.get-it.it>

**GET-IT**

Search...

starterkit

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Follow us



SP7-Ritmare/starterkit



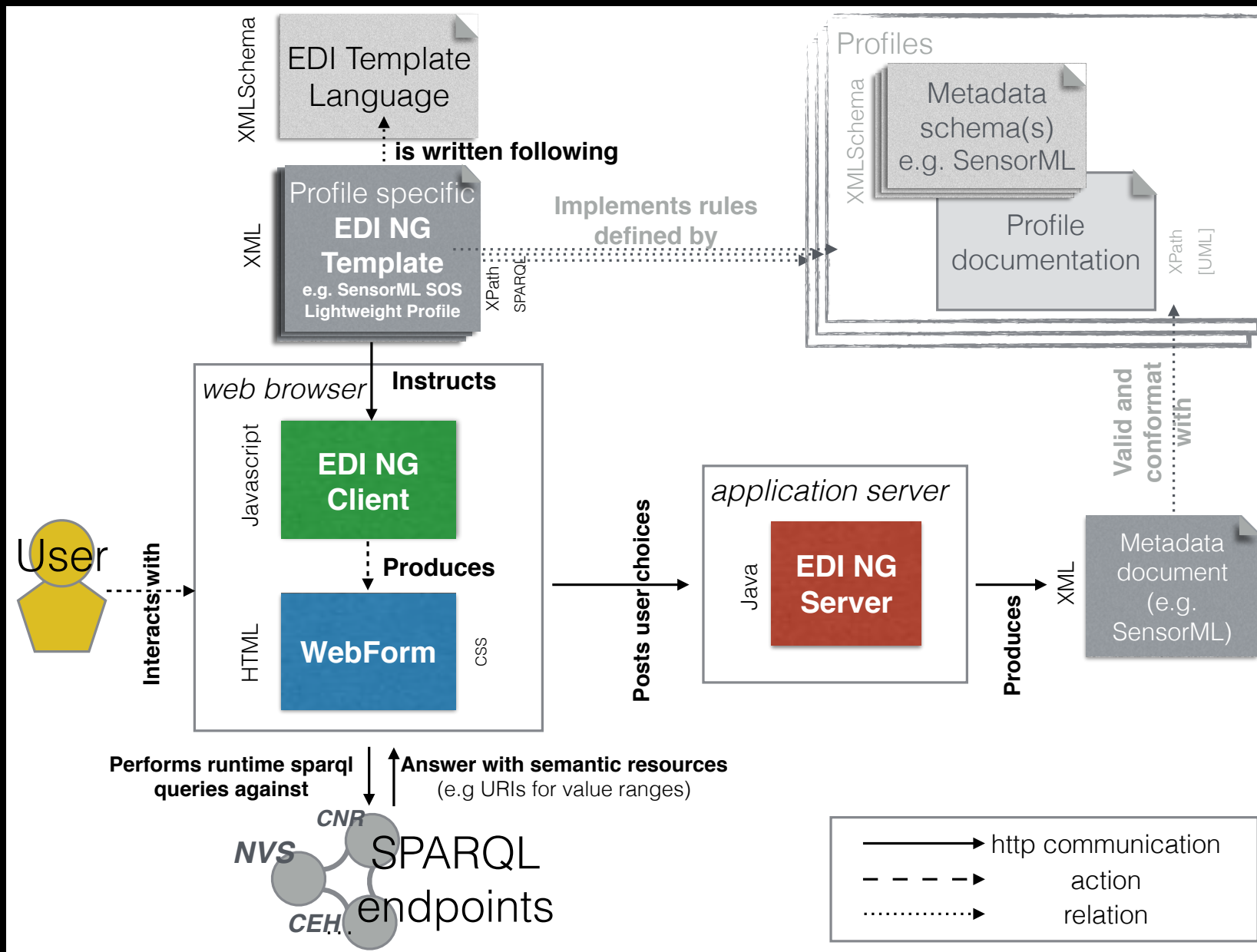
@GETITSK

Standards involved in current SDI

- Data and Metadata Standards do not suffice
 - Several communities
 - Only syntactic interoperability is granted
- “profiles” are needed
 - Each community can define its own profile
 - Profiles specify:
 - Additional Constraints (e.g. mandatory fields)
 - Value ranges
 - Semantic technologies can be of help

Semantics

- Examples:
- Thesauri: eurovoc, agrovoc, NERC vocabulary service
- For:
 - Keywords (cfr. INSPIRE metadata)
 - O&M observed properties
 - Place names



Data life cycle - recap

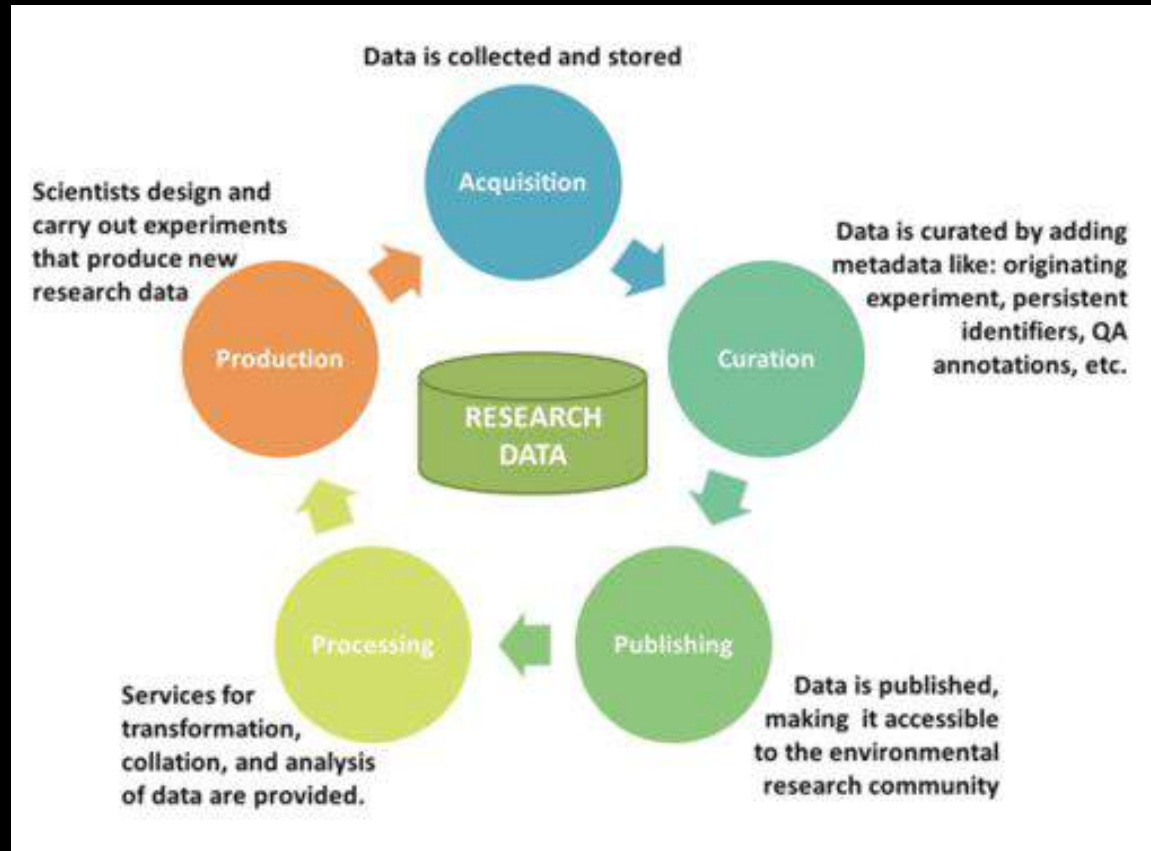


Figure from: Hardisty, Nieva de la Hidalga *How the ENVRI Reference Model helps to design research infrastructures*, ENVRIplus Newsletter, 2016

Hands on (proposal)

- demo2.get-it.it
- LADEC server
- Upload layer
- Open QGIS
- Install metasearch
- Use metasearch to add CSW of LADEC
- Alternatively add WMS/WFS layer

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