Water-ForCE
Workshop 20/5/2021

e-shape in-situ first findings

In situ calibration and validation of satellite products of water quality and hydrology workshop

Marie-Francoise Voidrot, OGCE, Europe Director Innovation Program
e-shape Implementation WP Lead

The e-shape project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 820852

Fast facts

e-shape

60
partners

A SUPER panel

7
showcases
32
pilots

A lot of return on experience

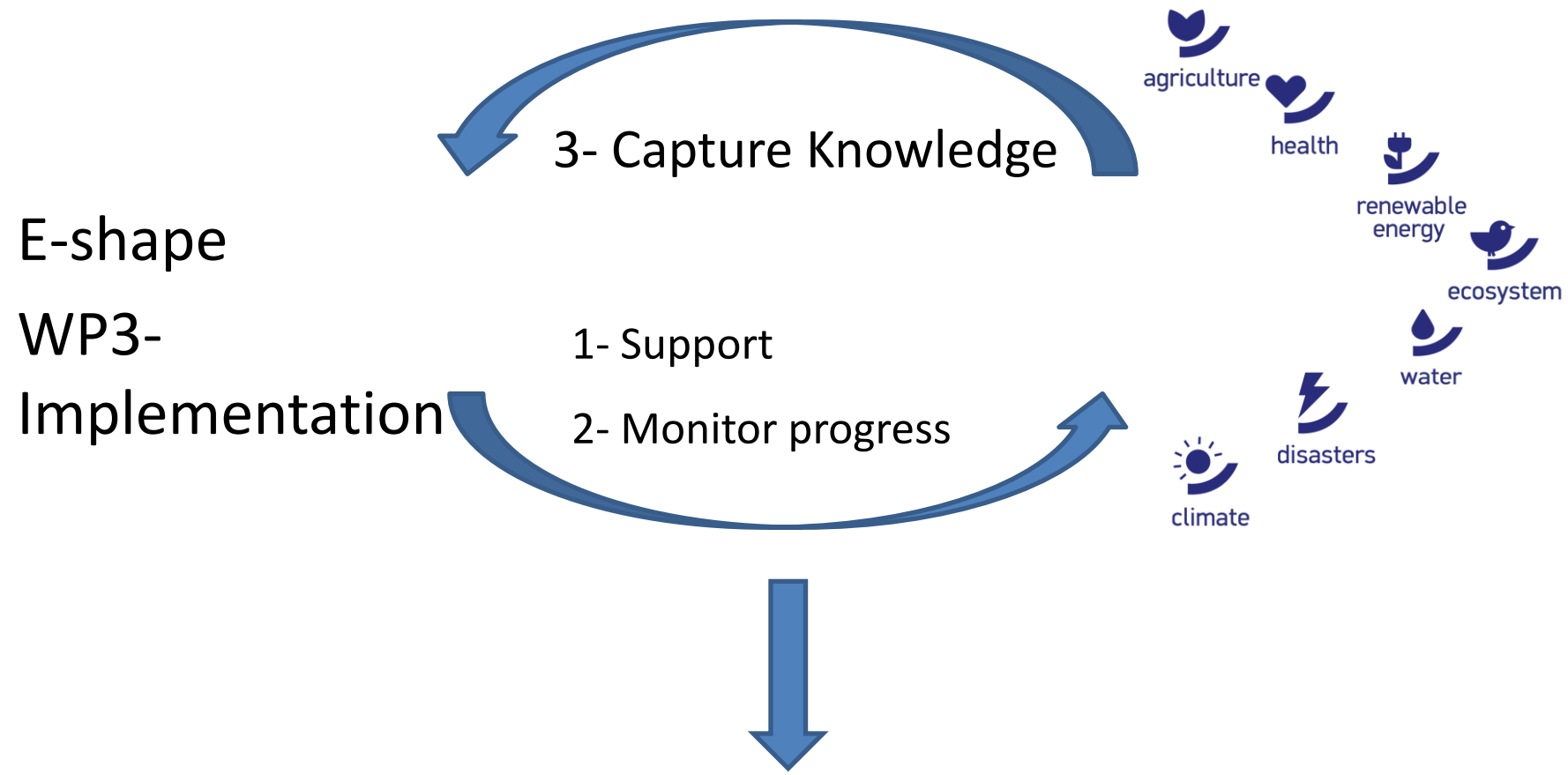
4
years grant

May 2019-May 2023
A clear target

@eshape_eu
www.e-shape.eu

e-shape Implementation process

e-shape



strategic outcome: **e-shape Guide Development**

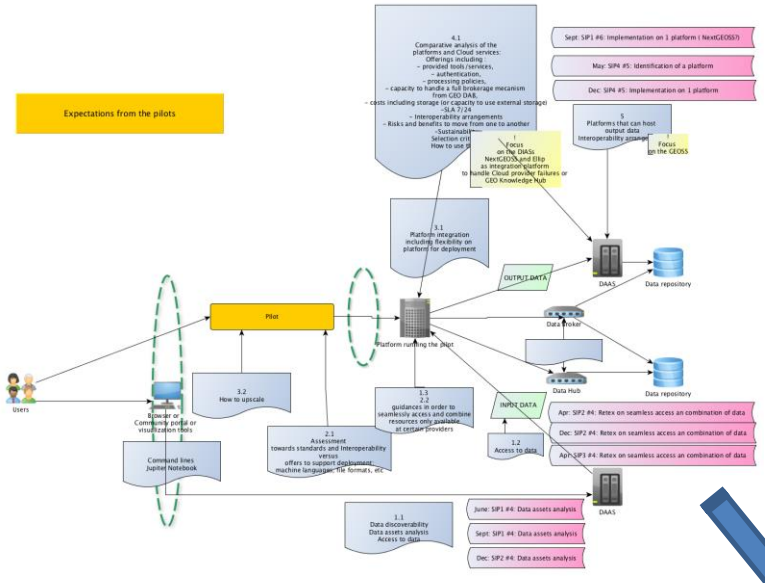
First initial findings:

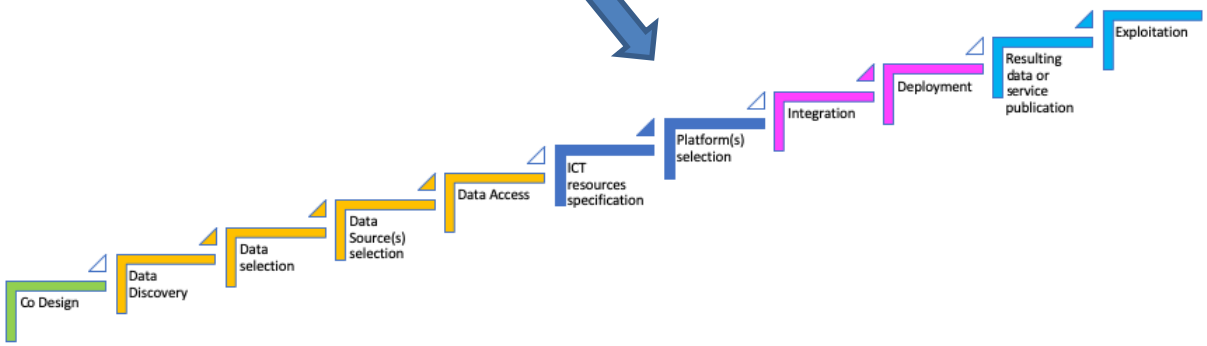
1. GEO Data Management Principles and FAIR principles are not well known:
   - People know what it talks about but they do not know them
   - Webinar to raise awareness: Data Management and sharing principles
   - Excel tool to support the implementation will be presented at the GEO Symposium in June

2. Big number of EO platforms seen as a source of complexity more than a source of richness

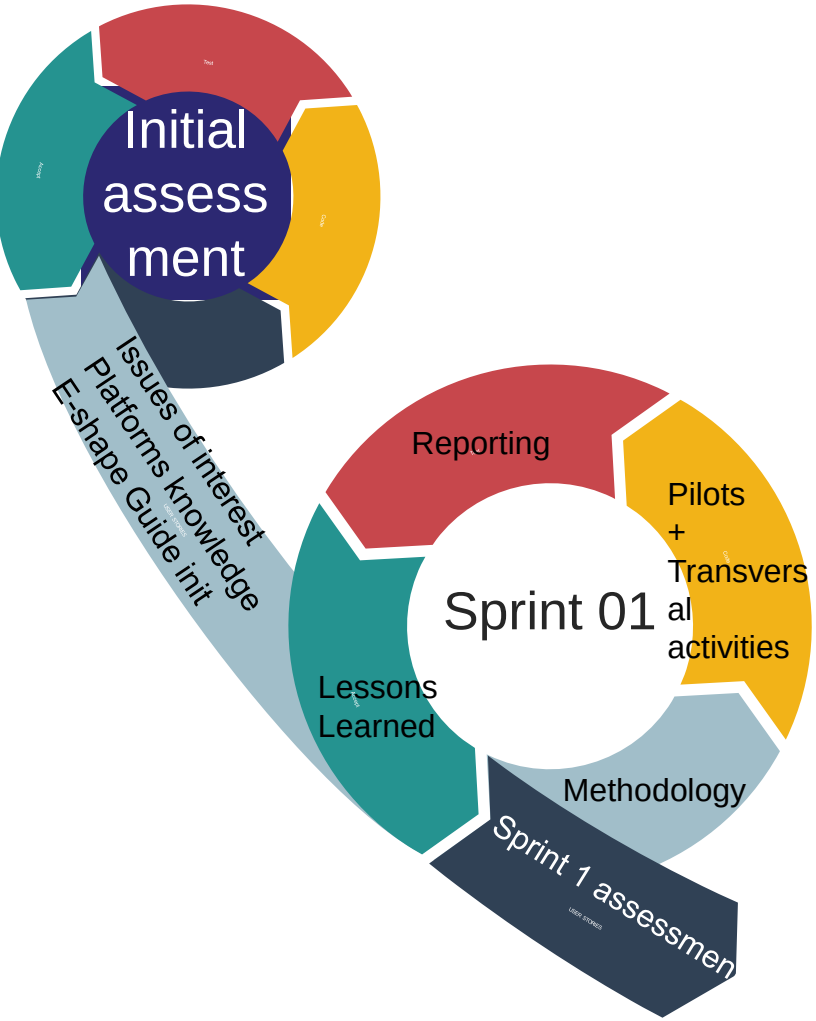
e-shape process

e-shape





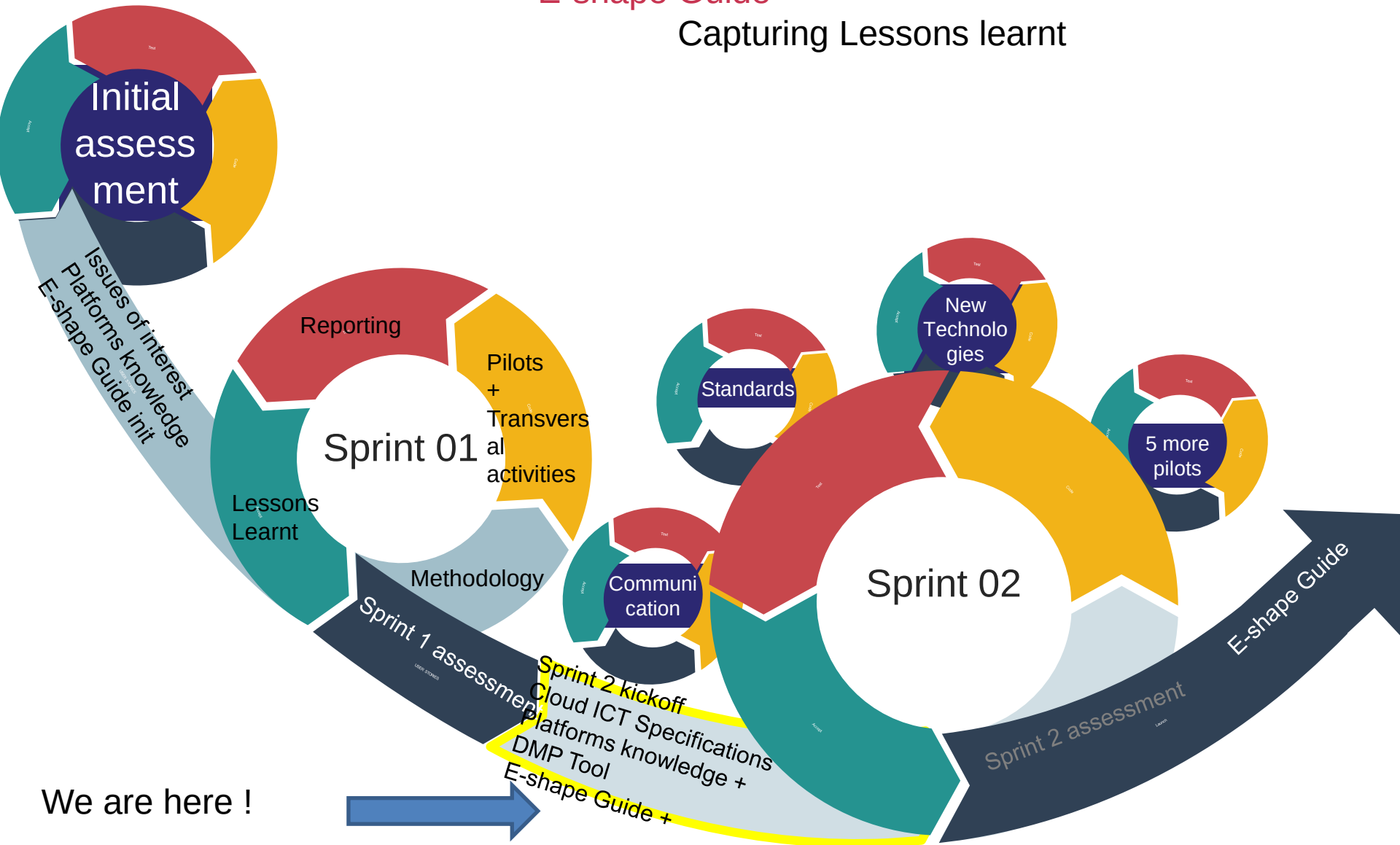
e-shape process



e-shape

E-shape Guide

Capturing Lessons learnt



Pilots using in situ

e-shape

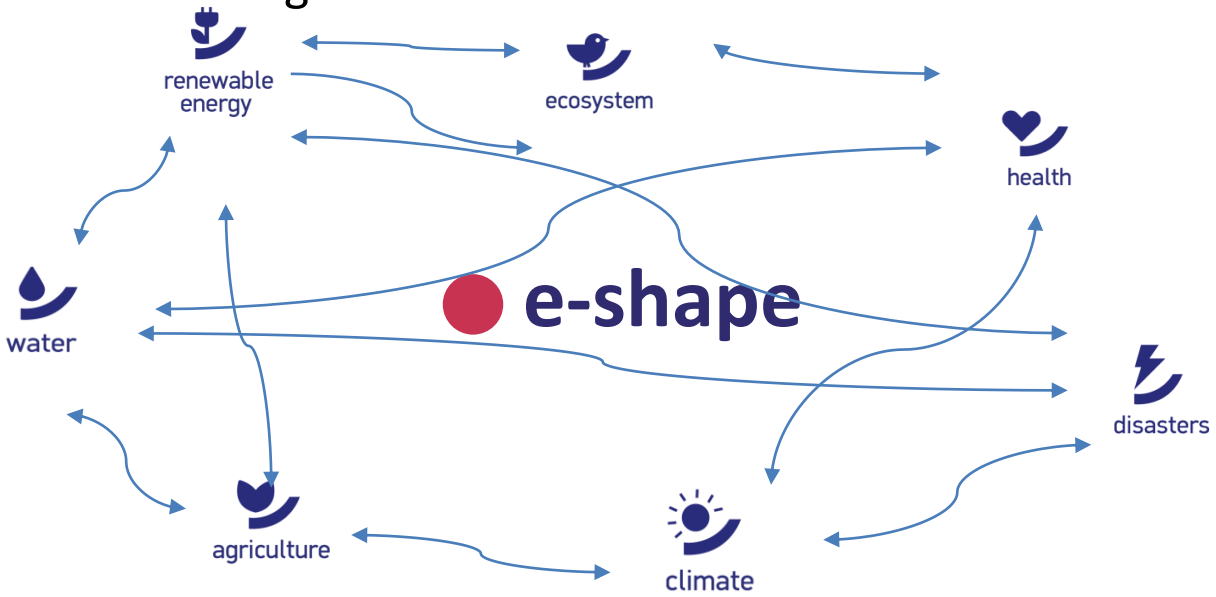
- 20 pilots over 27 mention in situ
- Platforms used as in situ source
  - Agrostac, Gaiasense, EUMETCast , Food Security TEP, crowd sourcing, Meteo sources
  - ACTRIS AQ data , Open AQ data, Citizen observatories
  - GEO-CRADLE, CAMS, CMEMS, Meteo sources
  - eLTER-DIP, DEIMS-SDR, Ecosens, Rijkswaterstaat (RWS) , Citizen observatories
  - NextGEOSS, SMHI, GRDC, CMEMS, private in situ for fisheries,
  - EUNADICS-AV with ACTRIS data via CNR hub, CLMS, GeoHazards TEP, GNSS, Citizen Observatories, Hydro TEP, Gaiasense
  - ICOS, Fluxnet, NEON, AmeriFlux, FluxAsia, ChinaFlux, SMEAR, GAW, LTER, meteo data, private hydro data, gridded in situ
- Types of in situ data
  - In situ /Citizen Observations
  - Public/private networks
  - Automatic/Human observations

Red are the platforms/hubs used in the pilots to collect and homogeneize the in situ data

Pilots using in situ

e-shape

- Activities
  - Data Management
    - Metadata standards to catalogue the data
    - Encoding homogeneization
    - Standards to serve the data: (ex OGC SOS for in situ Time Series data…
  - Data used for Calibration/Validation of Satellite products and models (seasonal forecasts downscaling, hydrological model, satellite flood detection, « visibility score »…)
  - Integration of In situ and satellite data through modelling
  - From irregular distribution to gridded observations



First findings on in situ challenges

01 **Very heterogeneous**

Many different sensors and networks of sensors (**lack of global networks**)

- Human/Automatic
- Public/Private
- More and more completed by Citizen Observations

02 **Variable validity**

- In space and time

(=> adequate sampling)

03 **Legaly complex**

- Data Privacy issues
- Have complex Usage rights restrictions
- Political sensitivities

04 **Very Valuable**

- Accessibility to in situ is always mentioned as a challenge or a bottleneck to upscaling
- Alternative sources can be hard to find
- Their value is not linked to the volume
- **Value goes over the initial collection project**

05 **Very sensitive**

- Risks for collection (covid)
- Measurement accuracy or sensor biaises

(=>uncertainty)

06 **Can require an intermediaite hub to :**

- collect,control,
- harmonize metadata, encodings, curate
- Document Provenance
- Credit the sources

(ex: Agrostac, eLTER, CNR hub, NextGEOSS …)

Trends

01

Increasing Variety and Volume

- Citizen observations
- Drones
- IOT

+

02

Distributed monitoring, processing

HPC

CLOUD / EDGE

+

03

Increasing value

Artificial Intelligence

Machine Learning

Real Time and Long series

+

04

Increasing distribution heterogeneity

- Manage the abundance and the deserts

+

05

Increasing pressure due to ML, AI, Climate Change…

- data sharing
- data quality
- Standards at all levels
- Interoperability including semantics

+

06

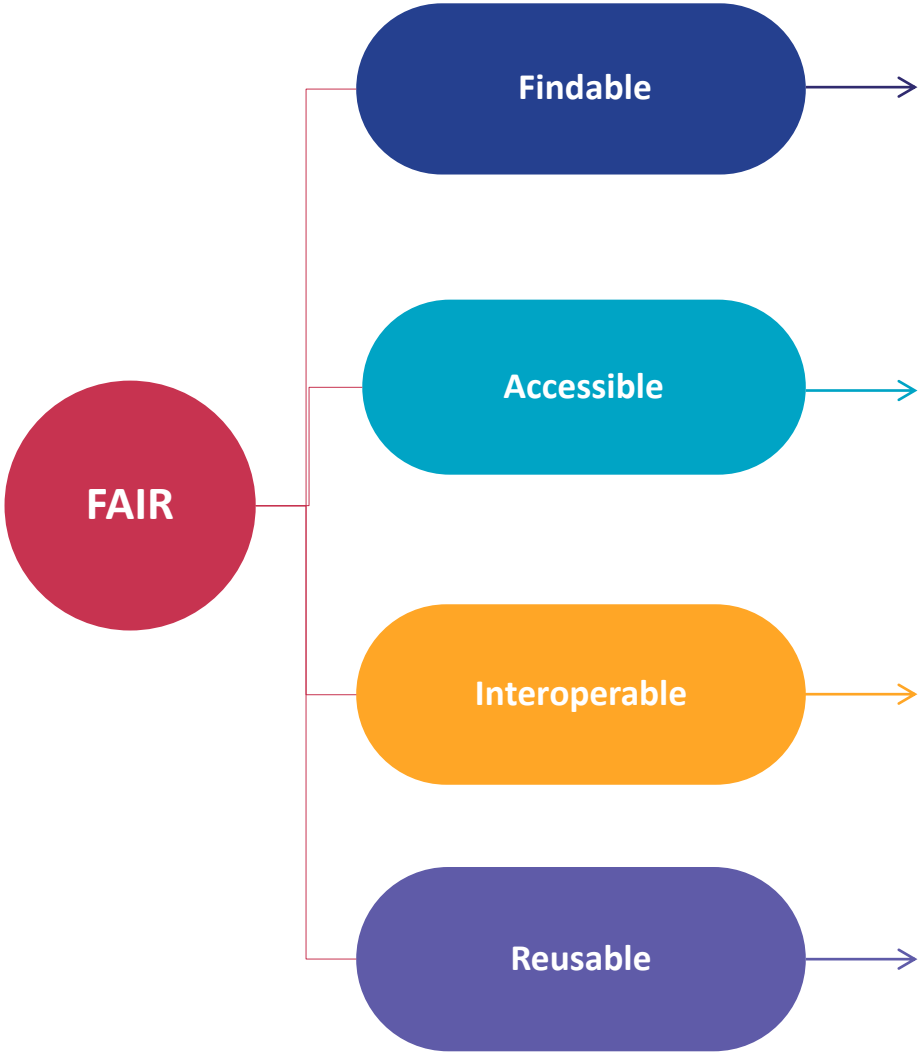
From Raw data to ARD

- Quality controls, location calibration, Temporal collections, semantics, uncertainty
- Documenting the processing applied

+

Recommendations: Always think FAIR

In situ data is very valuable.
It has to be shared, protected, rescued, managed carefully, curated,



- Metadata Standards: Dublin Core, ISO19115, …including provenance, credits, licences or restrictions of use…
- Catalogue accessible via a standard protocol : OAI-PMH, Opensearch, OGC CSW, OGC WFS, OGC SOS, …
- Update data location if needed
- Share your data: If private maybe with a delay to contribute to climate change studies

- Standards: HTML, **OGC APIs**, OpenDAP, Opensearch GEO and EO
- Single Sign On
- …

- Standards for data encodings: WaterML, TimeseriesML, CF-NetCDF,
- Semantics, Ontologies (=> OGC Definition server)
- Compliance
- …

- Metadata Standard
- A lot of ongoing works on this topic

Build on previous works: GEO Data Management Principles

Discovery

DMP-1: Metadata for Discovery

Accessibility

DMP-2: Online Access

Usability

DMP-3: Data Encoding

DMP-4: Data Documentation

DMP-5: Data Traceability

DMP-6: Data Quality-Control

Preservation

DMP-7: Data Preservation

DMP-8: Data and Metadata Verification

Curation

DMP-9: Data Review and Reprocessing

DMP-10: Persistent and Resolvable Identifiers

- e-shape tool will be presented at the GEO Symposium

Meteorology, Oceanography and Hydrology need standards

Met Ocean and Hydro Domain working Groups have been created in 2009

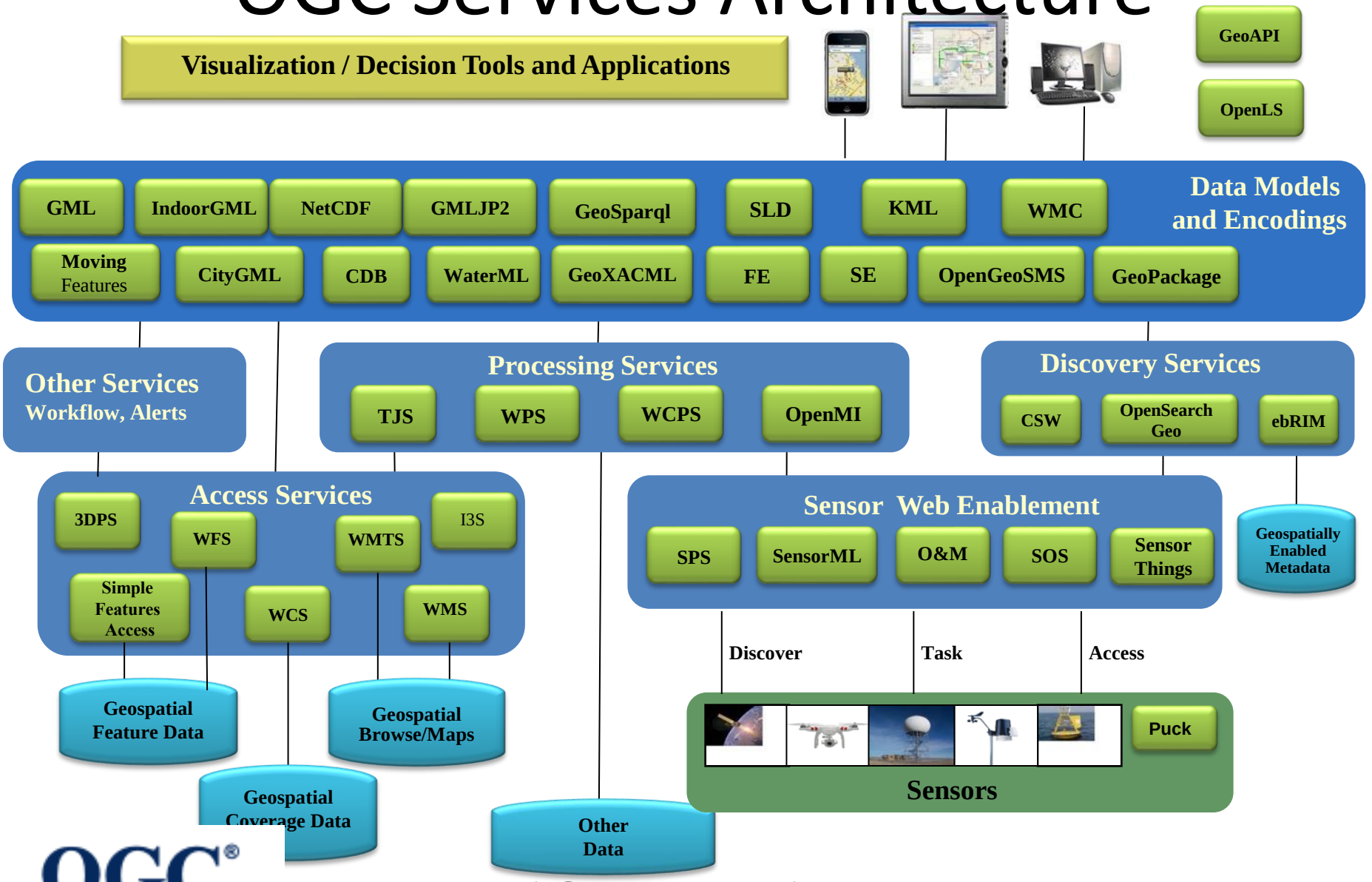
- WaterML
- TimeSeriesML
- CF-NetCDF

…

Standards need to cover Meteorology, Oceanography and Hydrology requirements

OGC®

OGC Services Architecture



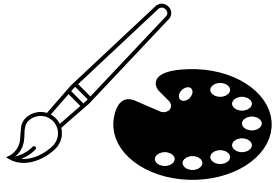
OGC APIs

OGC API – DGGS

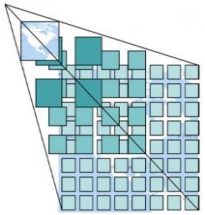
OGC API – Records

OGC API - Maps

OGC API - Styles

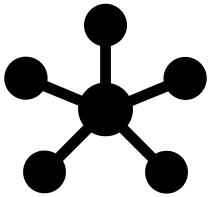


OGC API - Tiles

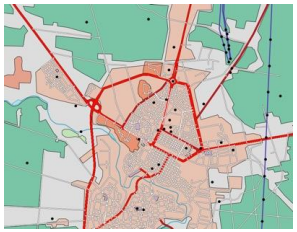


Tile Matrix Set

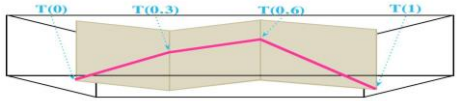
OGC API - Common



OGC API - Routes

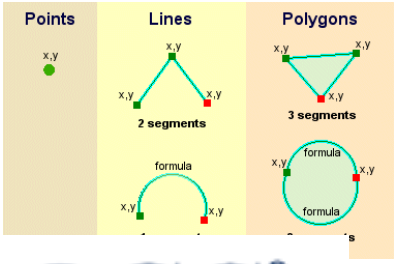


OGC API - EDR

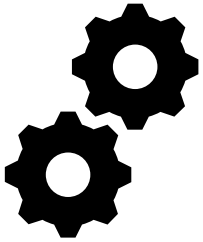


Trajectory

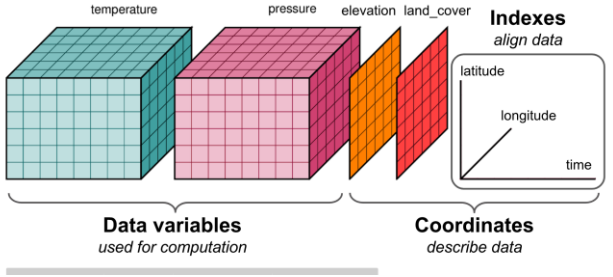
OGC API - Features



OGC API - Processes



OGC API – Coverages



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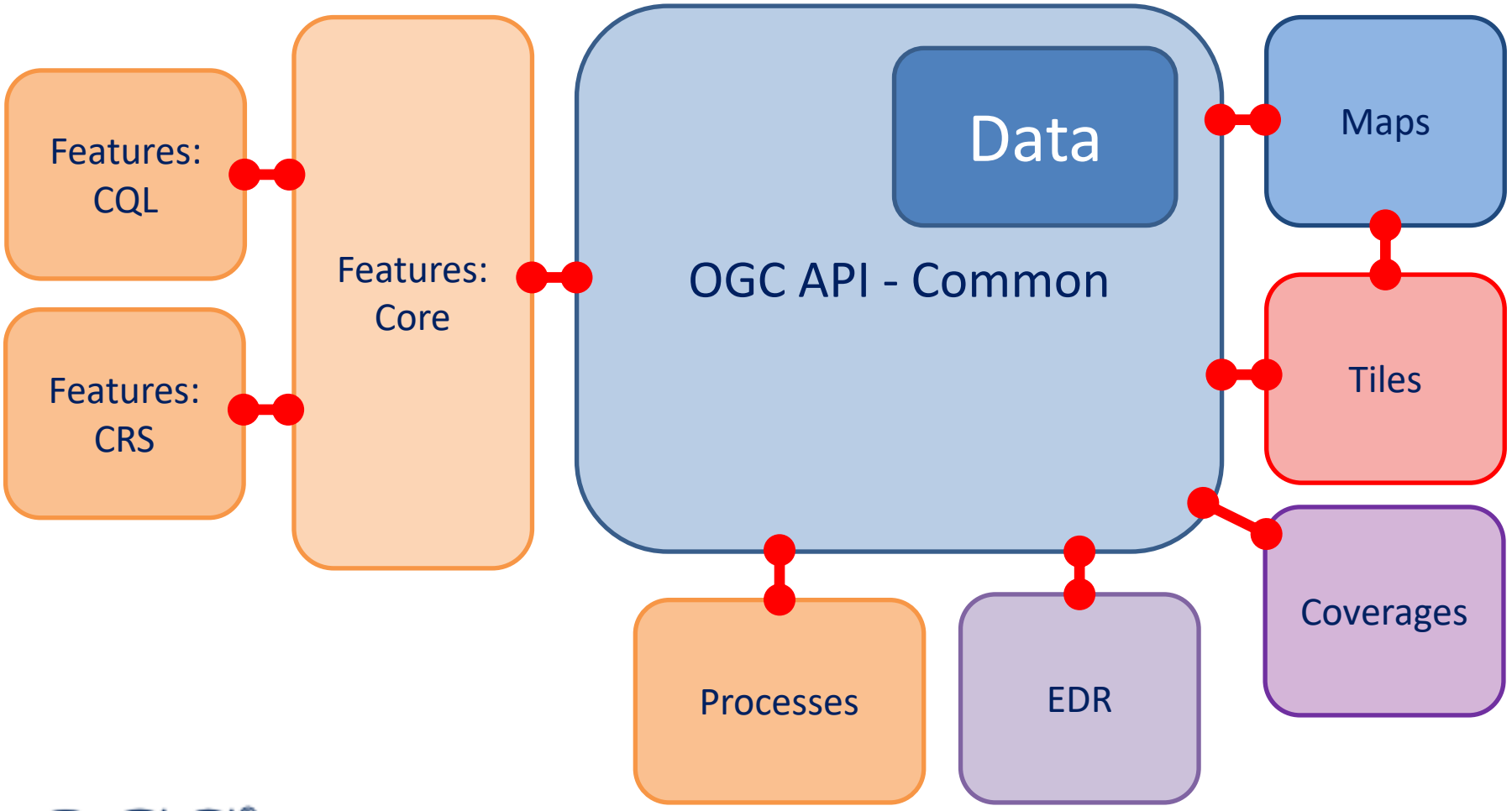
OGC APIs: Building Block Vision



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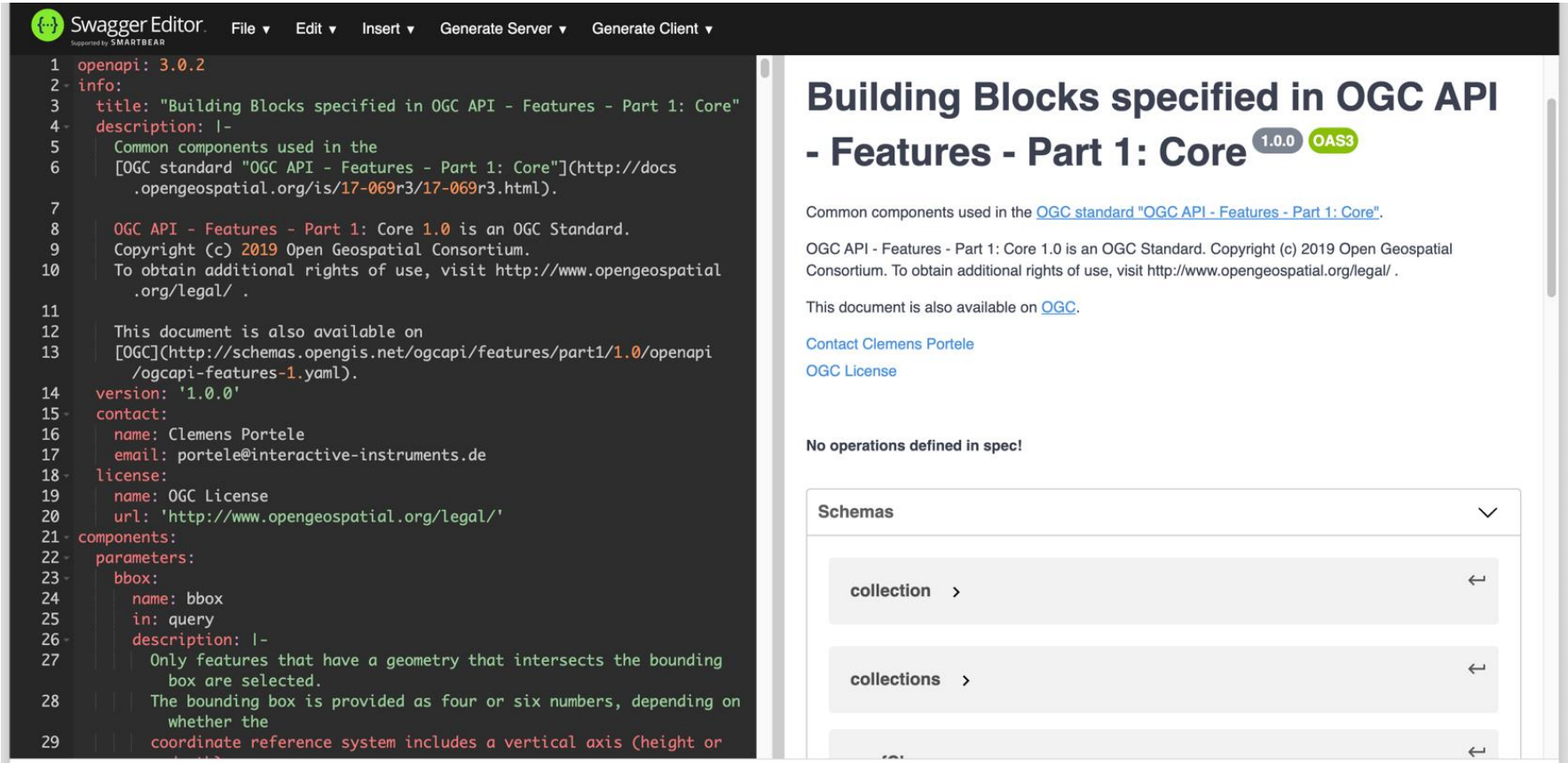
OGC APIs: All defined in OpenAPI



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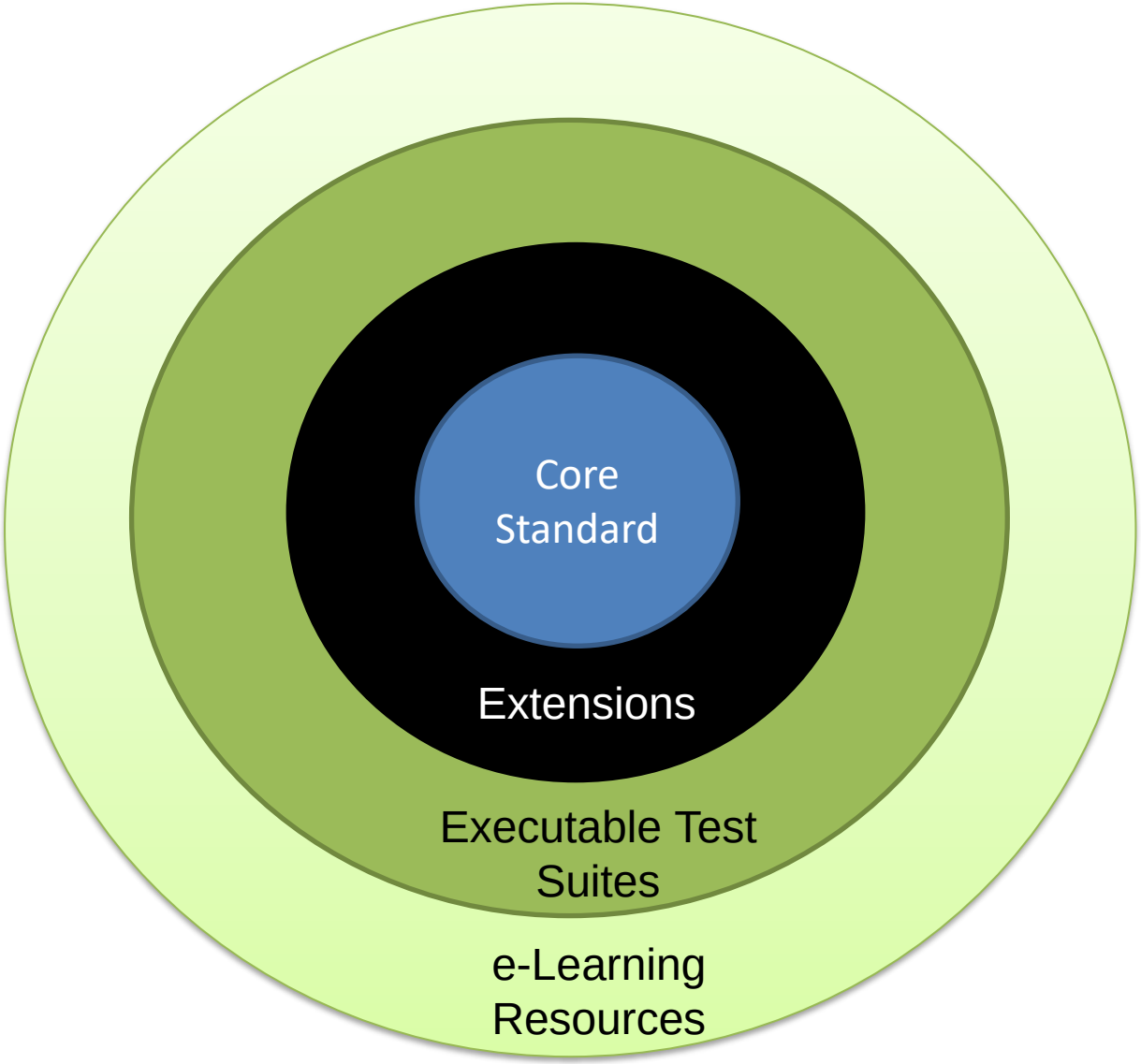
OGC API Standards and Augmentation



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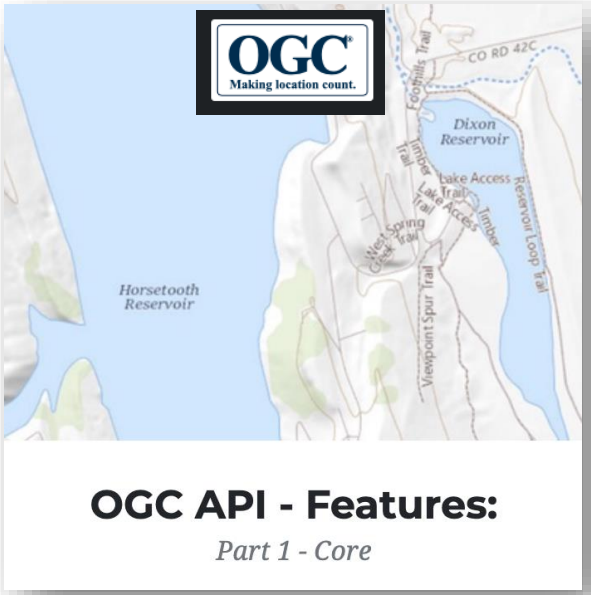
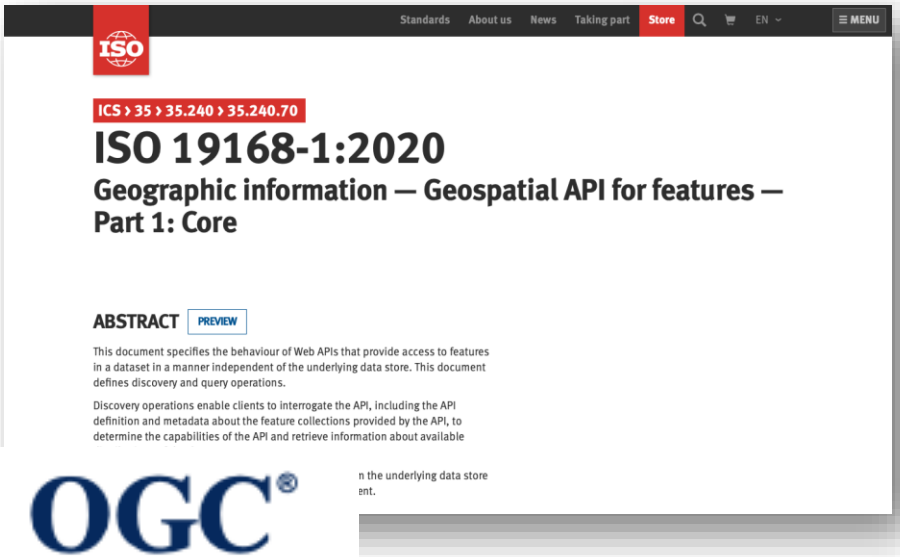
Towards Global Impact of OGC APIs





INSPIRE Infrastructure for Spatial Information in Europe

OGC API – Features as an INSPIRE download service

OGC

Summary :

- In situ observations are crucial to the success of any global observing system
- They are also crucial to the success of any postprocessing
- The value of products fusionning remote sensing and in situ can be higher than any of them
- Historical trend to have 1 problem, 1 project, 1 network but data have value beyond the initial project
- Pressure on in situ is going to grow

Recommendations :

- Always think FAIR
- Share your in situ data
- Adopt the GEO Data Management Principles
- Use Open Standards whenever possible
- Implement good quality Metadata (including Credit, Provenance, licences…)
- Test the compliance of your implementations

Thank You!

Community

500+ International Members
110+ Member Meetings
60+ Alliance and Liaison partners
50+ Standards Working Groups
45+ Domain Working Groups
25+ Years of Not for Profit Work
10+ Regional and Country Forums

Innovation

120+ Innovation Initiatives
380+ Technical reports
Quarterly Tech Trends monitoring

Standards

65+ Adopted Standards
300+ products with 1000+ certified implementations
1,700,000+ Operational Data Sets Using OGC Standards