

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*

60

partners

A SUPER panel

7

showcases

32

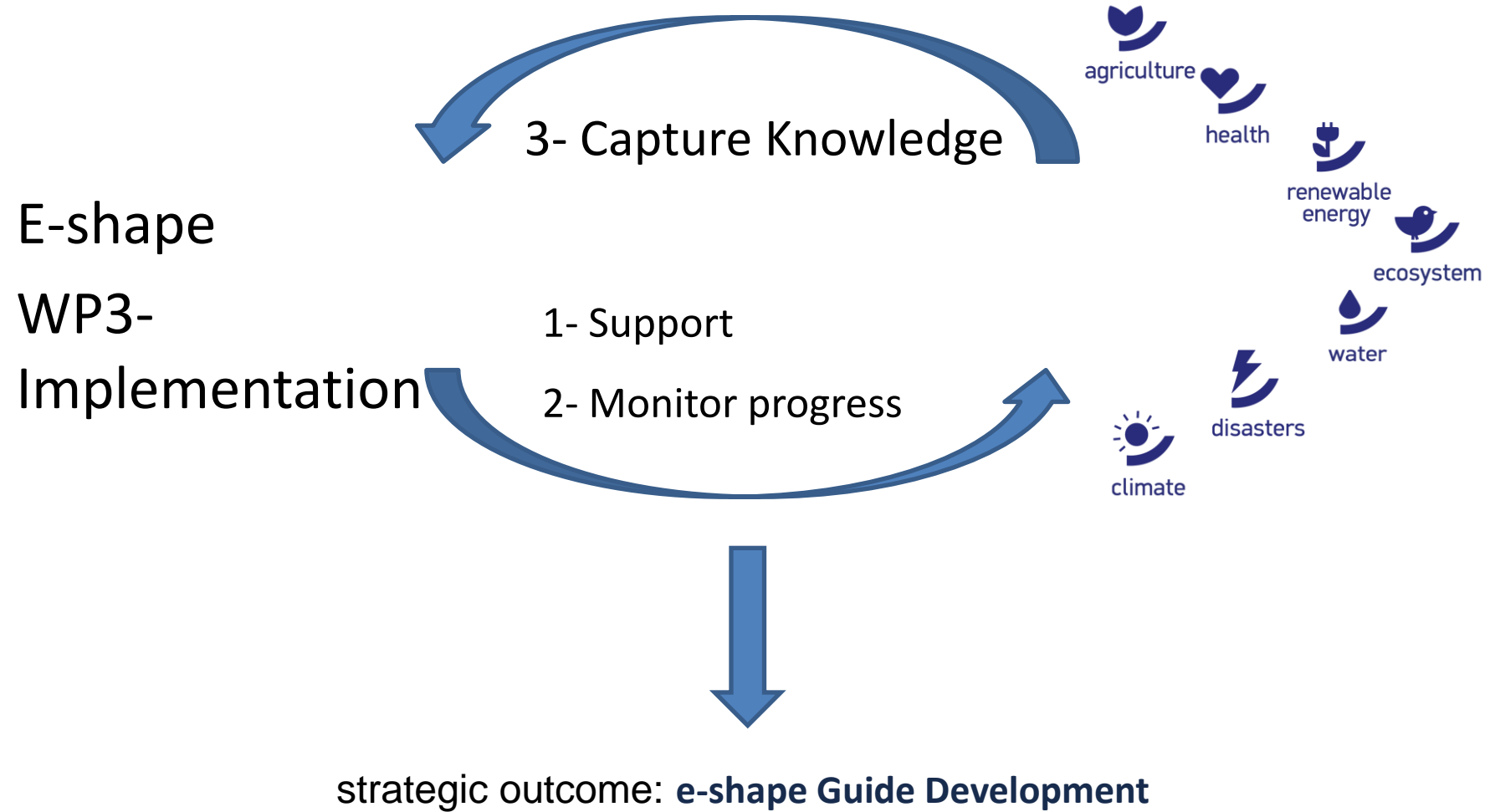
pilots

A lot of return on
experience

4

years grant

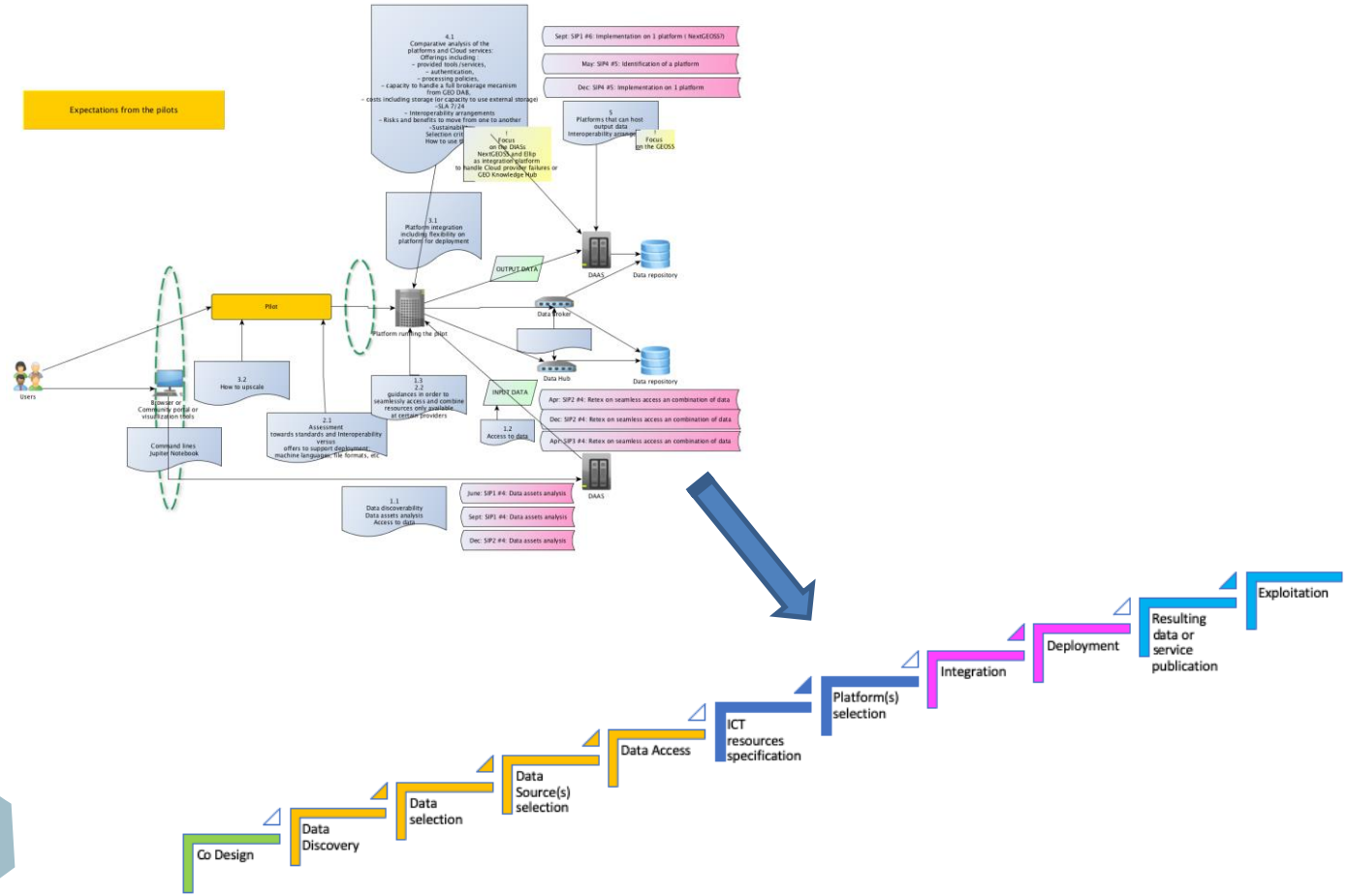
May 2019-May 2023
A clear target

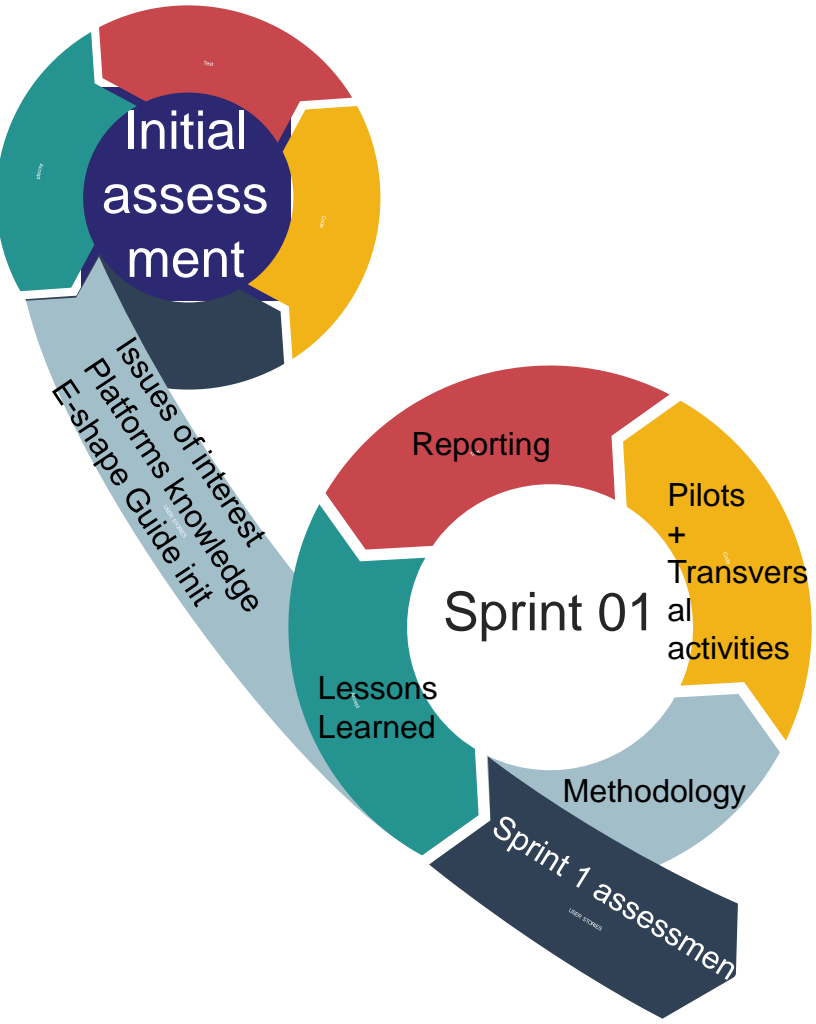




First initial findings:

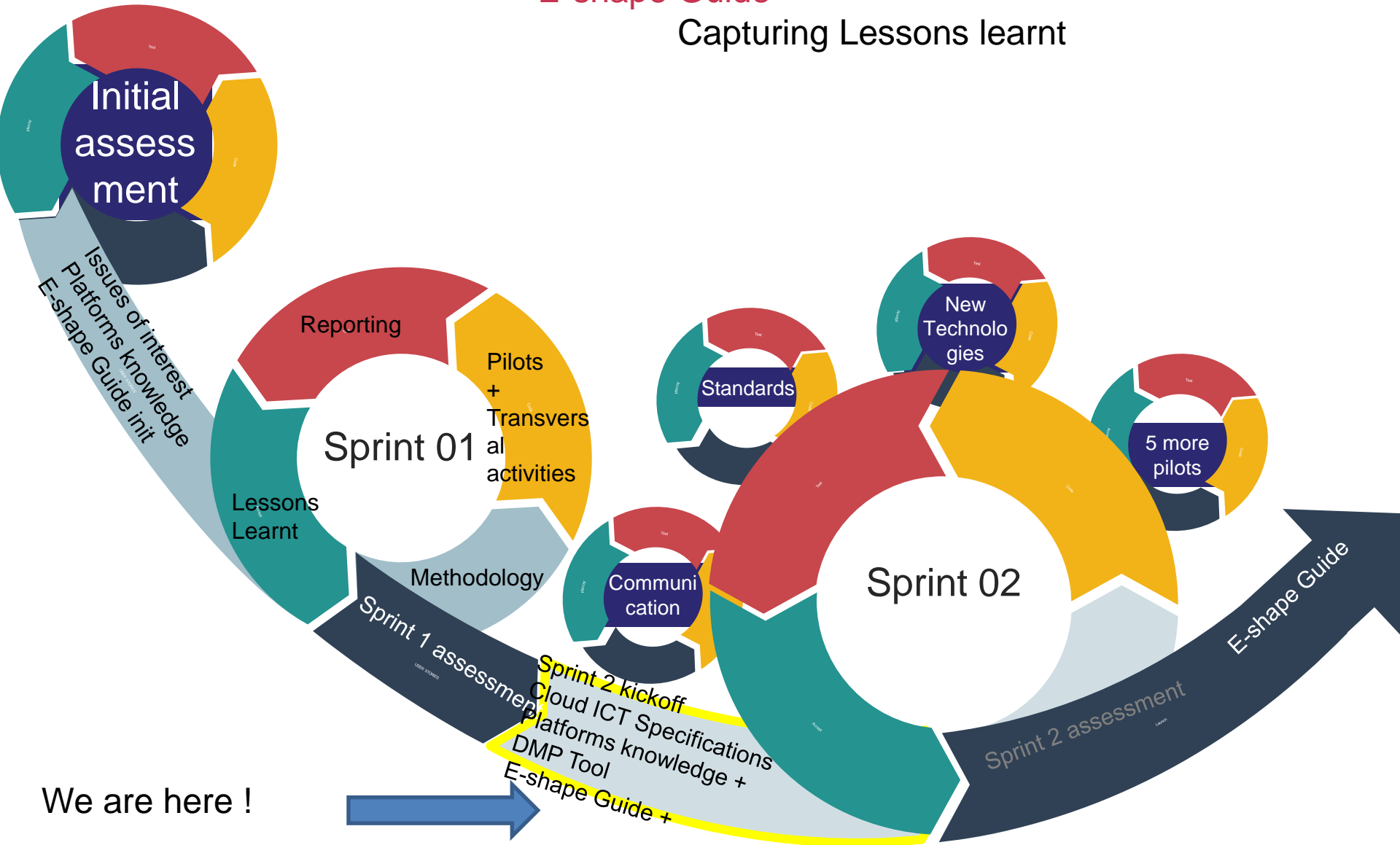
1. GEO Data Management Principles and FAIR principles are not well known:
 - People know what it talks about but they do not know them
 - Webinar to raise awareness: [Data Management and sharing principles](#)
 - Excel tool to support the implementation will be presented at the GEO Symposium in June
2. Big number of EO platforms seen as a source of complexity more than a source of richness





E-shape Guide

Capturing Lessons learnt



- 20 pilots over 27 mention in situ
- Platforms used as in situ source



agriculture

- **AgroStac**, **Gaiasense**, EUMETCast, Food Security TEP, crowd sourcing, Meteo sources



health

- ACTRIS AQ data, Open AQ data, Citizen observatories

renewable energy

- GEO-CRADLE, CAMS, CMEMS, Meteo sources



ecosystem

- **eLTER-DIP**, DEIMS-SDR, Ecosens, Rijkswaterstaat (RWS), Citizen observatories



water

- NextGEOSS, SMHI, GRDC, CMEMS, private in situ for fisheries,



disasters

- **EUNADICS-AV** with ACTRIS data via **CNR hub**, CLMS, GeoHazards TEP, GNSS, Citizen Observatories, Hydro TEP, **Gaiasense**



climate

- 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 homogenize the in situ data

- Activities

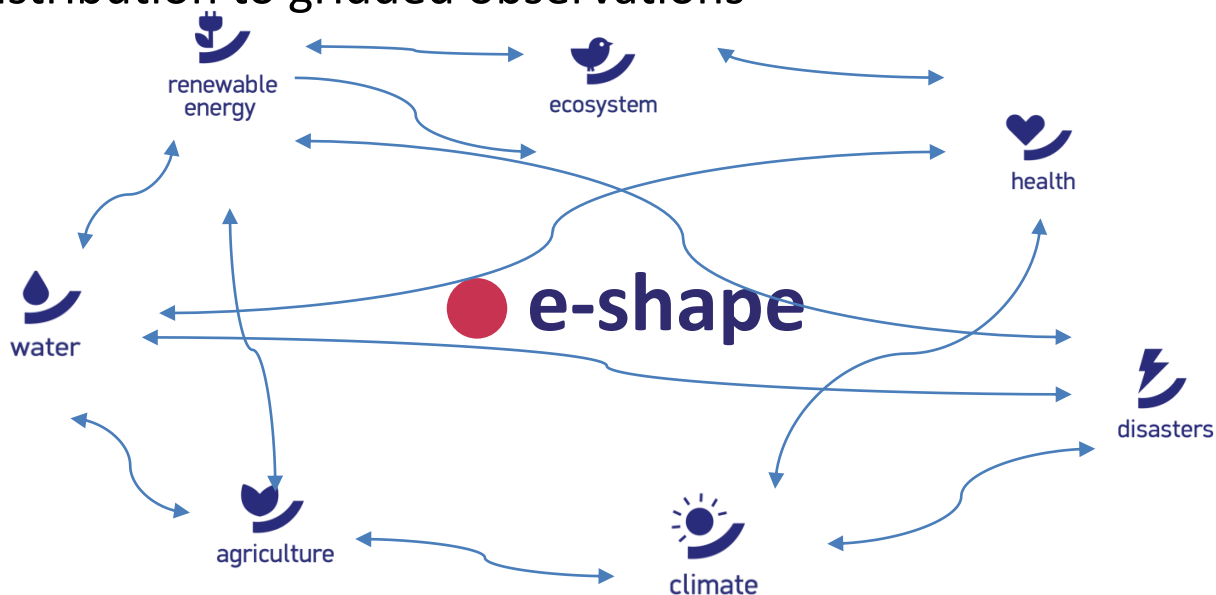
- Data Management

- 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 biases
(=>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

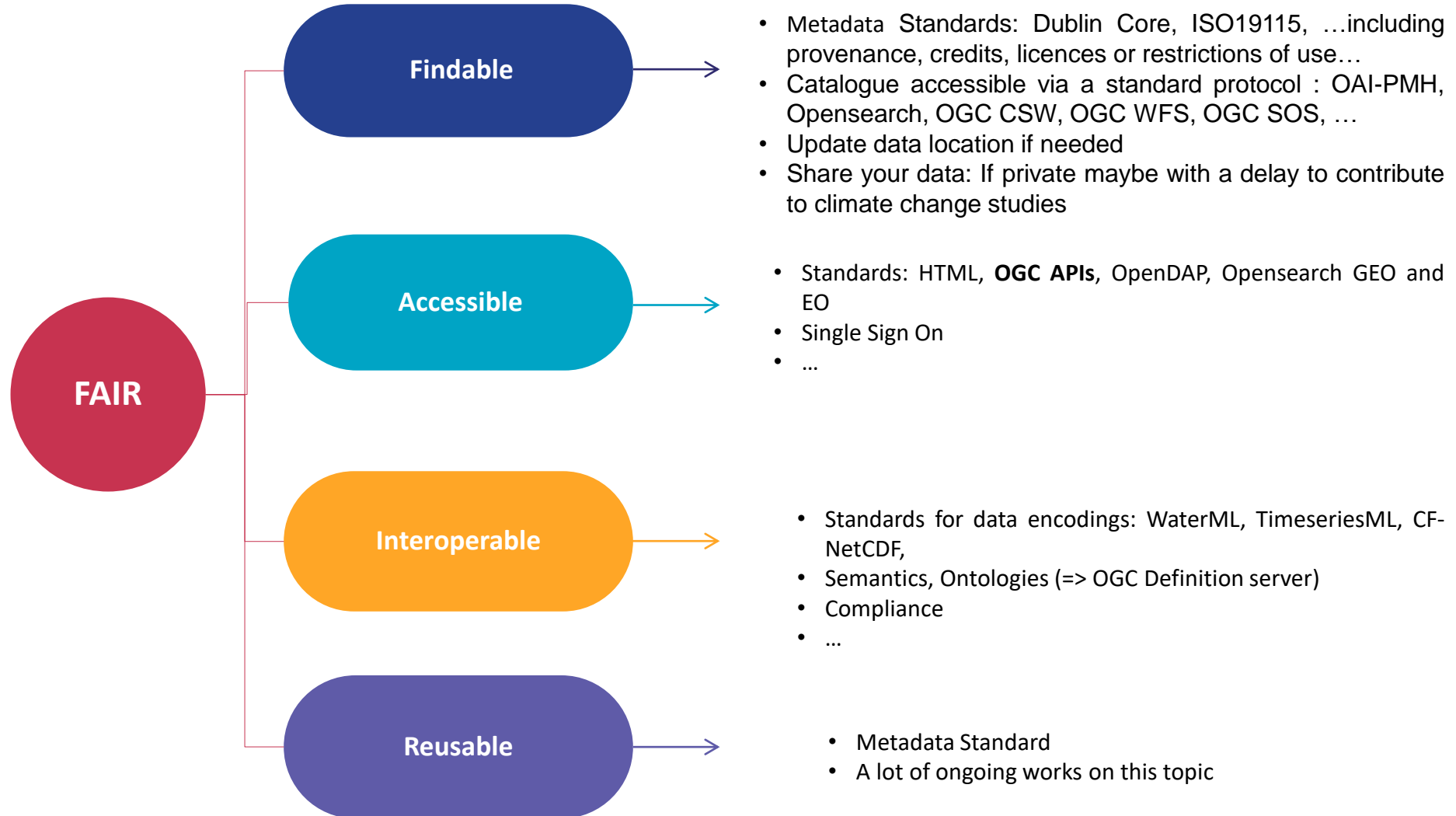
- Quality controls, location calibration, Temporal collections, semantics, uncertainty
- Documenting the processing applied

+

Recommendations: Always think FAIR

In situ data is very valuable.

It has to be shared, protected, rescued, managed carefully, curated,



Build on previous works: GEO Data Management Principles

Discovery



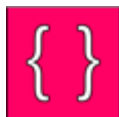
DMP-1: Metadata for Discovery

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 Services Architecture

Visualization / Decision Tools and Applications



GeoAPI

OpenLS

Data Models and Encodings

GML IndoorGML NetCDF GMLJP2 GeoSparql SLD KML WMC
Moving Features CityGML CDB WaterML GeoXACML FE SE OpenGeoSMS GeoPackage

Other Services
Workflow, Alerts

Processing Services

TJS WPS WCPS OpenMI

Discovery Services

CSW OpenSearch Geo ebRIM

Access Services

3DPS WFS WMTS I3S
Simple Features Access WCS WMS

Geospatial Feature Data

Geospatial Browse/Maps

Geospatial Coverage Data

Other Data

Sensor Web Enablement

SPS SensorML O&M SOS Sensor Things

Discover

Task

Access

Geospatially Enabled Metadata



Sensors

Puck

OGC APIs

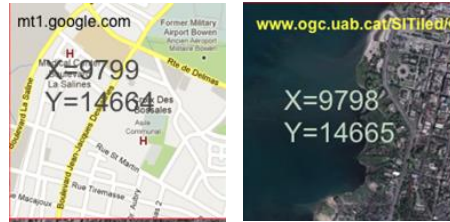
OGC API – DGGS



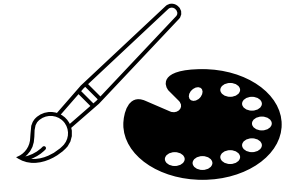
OGC API – Records



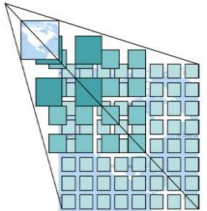
OGC API - Maps



OGC API - Styles

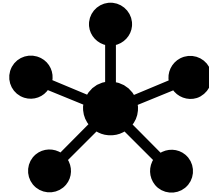


OGC API - Tiles

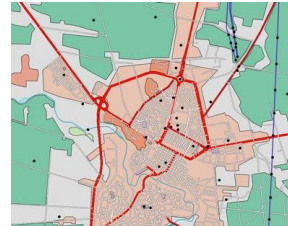


Tile Matrix Set

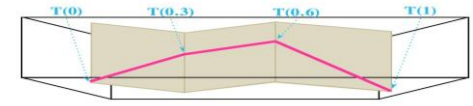
OGC API - Common



OGC API - Routes

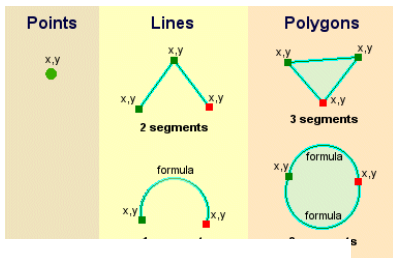


OGC API - EDR

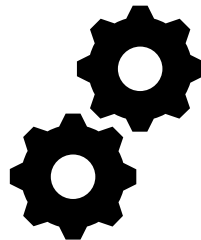


Trajectory

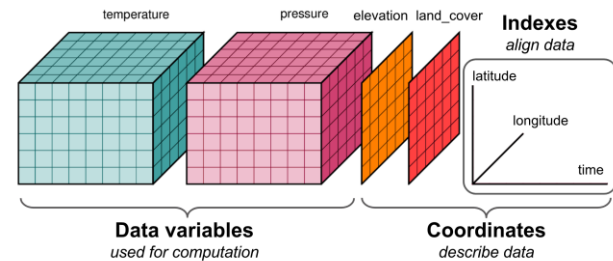
OGC API - Features



OGC API - Processes



OGC API – Coverages

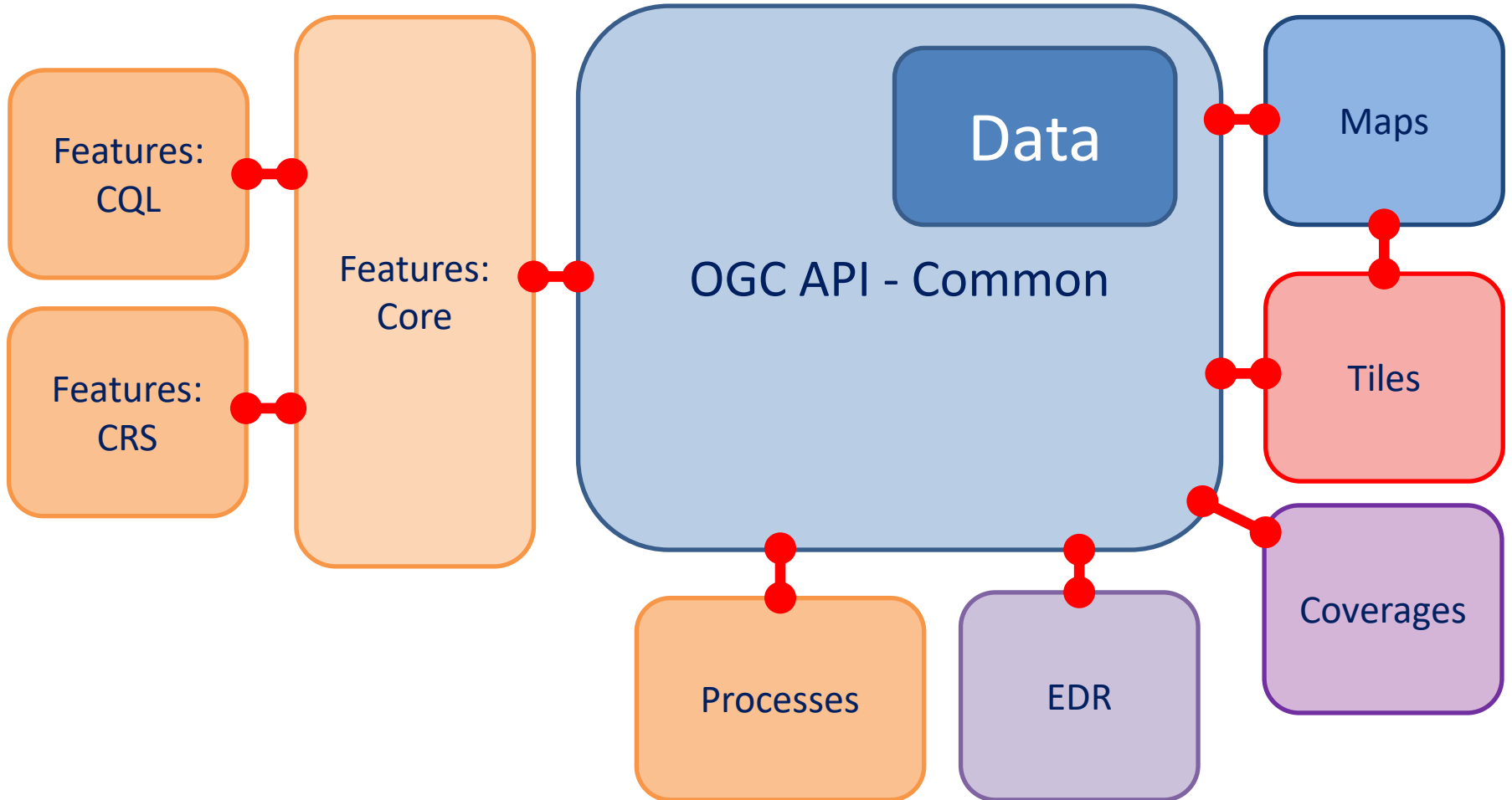


Data variables
used for computation

Coordinates
describe data



OGC APIs: Building Block Vision



OGC APIs: All defined in OpenAPI

The image shows the Swagger Editor interface. On the left, the OpenAPI specification is written in YAML. On the right, the rendered API documentation is displayed.

```
1 openapi: 3.0.2
2 info:
3   title: "Building Blocks specified in OGC API - Features - Part 1: Core"
4   description: |-
5     Common components used in the
6     [OGC standard "OGC API - Features - Part 1: Core"](http://docs
7       .opengeospatial.org/is/17-069r3/17-069r3.html).
8
9     OGC API - Features - Part 1: Core 1.0 is an OGC Standard.
10    Copyright (c) 2019 Open Geospatial Consortium.
11    To obtain additional rights of use, visit http://www.opengeospatial
12      .org/legal/ .
13
14    This document is also available on
15    [OGC](http://schemas.opengis.net/ogcapi/features/part1/1.0/openapi
16      /ogcapi-features-1.yaml).
17
18 version: '1.0.0'
19 contact:
20   name: Clemens Portele
21   email: portele@interactive-instruments.de
22 license:
23   name: OGC License
24   url: 'http://www.opengeospatial.org/legal/'
25 components:
26   parameters:
27     bbox:
28       name: bbox
29       in: query
30       description: |-
31         Only features that have a geometry that intersects the bounding
32         box are selected.
33
34         The bounding box is provided as four or six numbers, depending on
35         whether the
36         coordinate reference system includes a vertical axis (height or
```

Building Blocks specified in OGC API - Features - Part 1: Core 1.0.0 OAS3

Common components used in the [OGC standard "OGC API - Features - Part 1: Core"](#).

OGC API - Features - Part 1: Core 1.0 is an OGC Standard. Copyright (c) 2019 Open Geospatial Consortium. To obtain additional rights of use, visit <http://www.opengeospatial.org/legal/> .

This document is also available on [OGC](#).

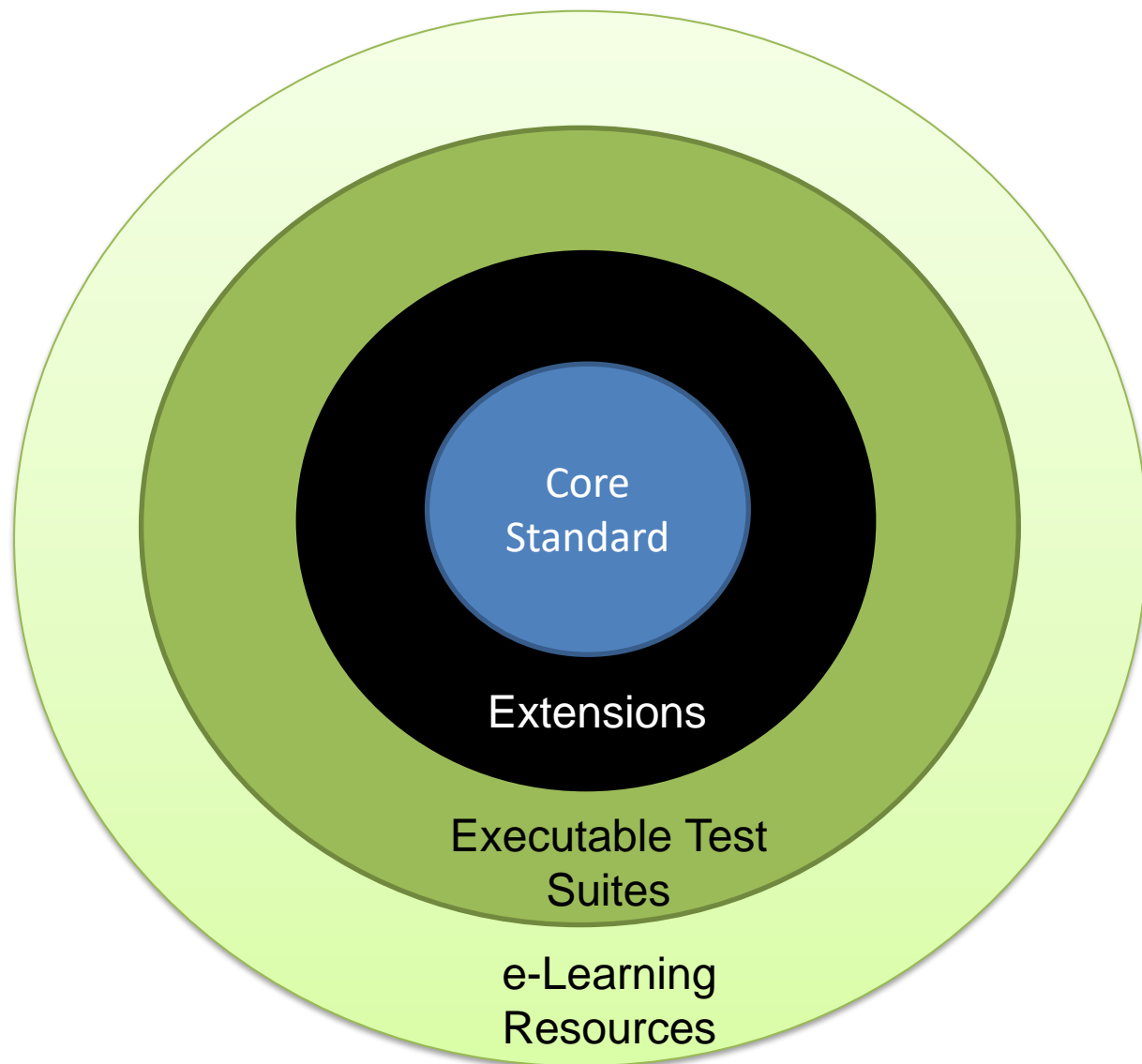
[Contact Clemens Portele](#)
[OGC License](#)

No operations defined in spec!

Schemas

- collection >
- collections >

OGC API Standards and Augmentation



Towards Global Impact of OGC APIs



Standards About us News Taking part Store Q EN MENU

ISO

ICS > 35 > 35.240 > 35.240.70

ISO 19168-1:2020

Geographic information — Geospatial API for features — Part 1: Core

ABSTRACT [PREVIEW](#)

This document specifies the behaviour of Web APIs that provide access to features in a dataset in a manner independent of the underlying data store. This document defines discovery and query operations.

Discovery operations enable clients to interrogate the API, including the API definition and metadata about the feature collections provided by the API, to determine the capabilities of the API and retrieve information about available

OGC

n the underlying data store ent.

INSPIRE - Infrastructure for Spatial Information in Europe

OGC API – Features as an INSPIRE download service

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

OGC

e-shape

**MARIE-FRANCOISE
VOIDROT**
mvoidrot@ogc.org

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



MAX - 54 - 685
KL - 17 - 5678 - 986

2995