

GEO WEEK & MINISTERIAL SUMMIT 2023

Interoperability for Digital Twins

#TheEarthTalks



science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA



GEO WEEK
2023 MINISTERIAL
SUMMIT

GO GROUP ON
EARTH OBSERVATIONS

Interoperability for Digital Twins

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BLB, OGC



Bente Lilja
Bye

OUTLINE

What is a digital twin of the ocean?

Federated interoperable systems - the Iliad approach

Thematic/local twins and citizen science

Interoperable cross-regional marketplace

DIGITAL TWINS

Iliad's Digital Twin of the Ocean provides a virtual environment representing the ocean, capable of running complex, predictive management scenarios. The innovative system integrates cross discipline sensors, models and digital infrastructures.

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Interoperable, data-intensive, and cost-effective Digital Twins of The Ocean



THE ILIAD APPROACH & CONCEPTS



The ocean is vast and complex. It consists of geophysical, biological and numerous interaction between its components and human activity.



To reflect this complexity of **European digital twin of the ocean**, the EU, its members and associates are developing a core infrastructure, Modelling capacity and implementations in local and sector /thematic twins.

This ecosystem of twins and its components are referred to as the European digital ocean twin.



Iliad partnership being part of this dynamic ecosystem is working closely with other projects and initiatives (public & private) to ensure **alignment** by using similar standards, APIs, best practices etc.



Iliad partnership is working towards the implementation of **interoperable** systems, services and assets.

ILIAD IN A SEASHELL



Enabling an ecosystem of **interoperable digital twins** for the ocean trough:

- Connecting to *existing* ocean data infrastructures
- Enhance ocean data infrastructures with *additional* observation technologies and **citizen science**



Create an open **marketplace** accessible for all providers and users by:

- Development of *innovative methods* in open frameworks and platforms
- Enable model *evaluations & comparisons* for many Earth science applications from weather, energy, aquaculture to climate and more



Provide **solutions** to address future societal challenges by:

- Assembling a broad and diverse *user community* of existing and new users,
- Supporting the communities in testing and using the project's *innovative technological solutions*

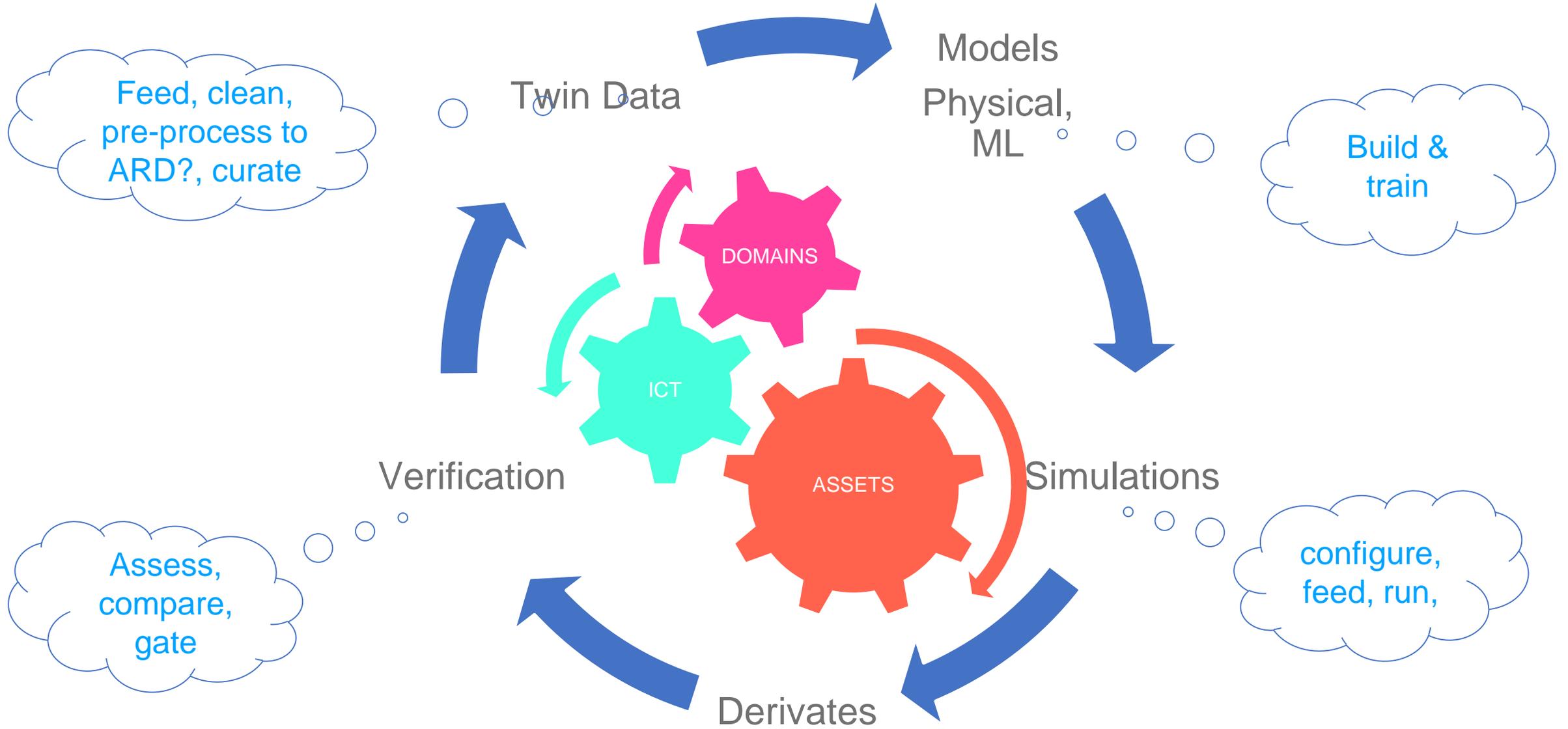


A federated interoperable system

Iliad architecture and technical solutions

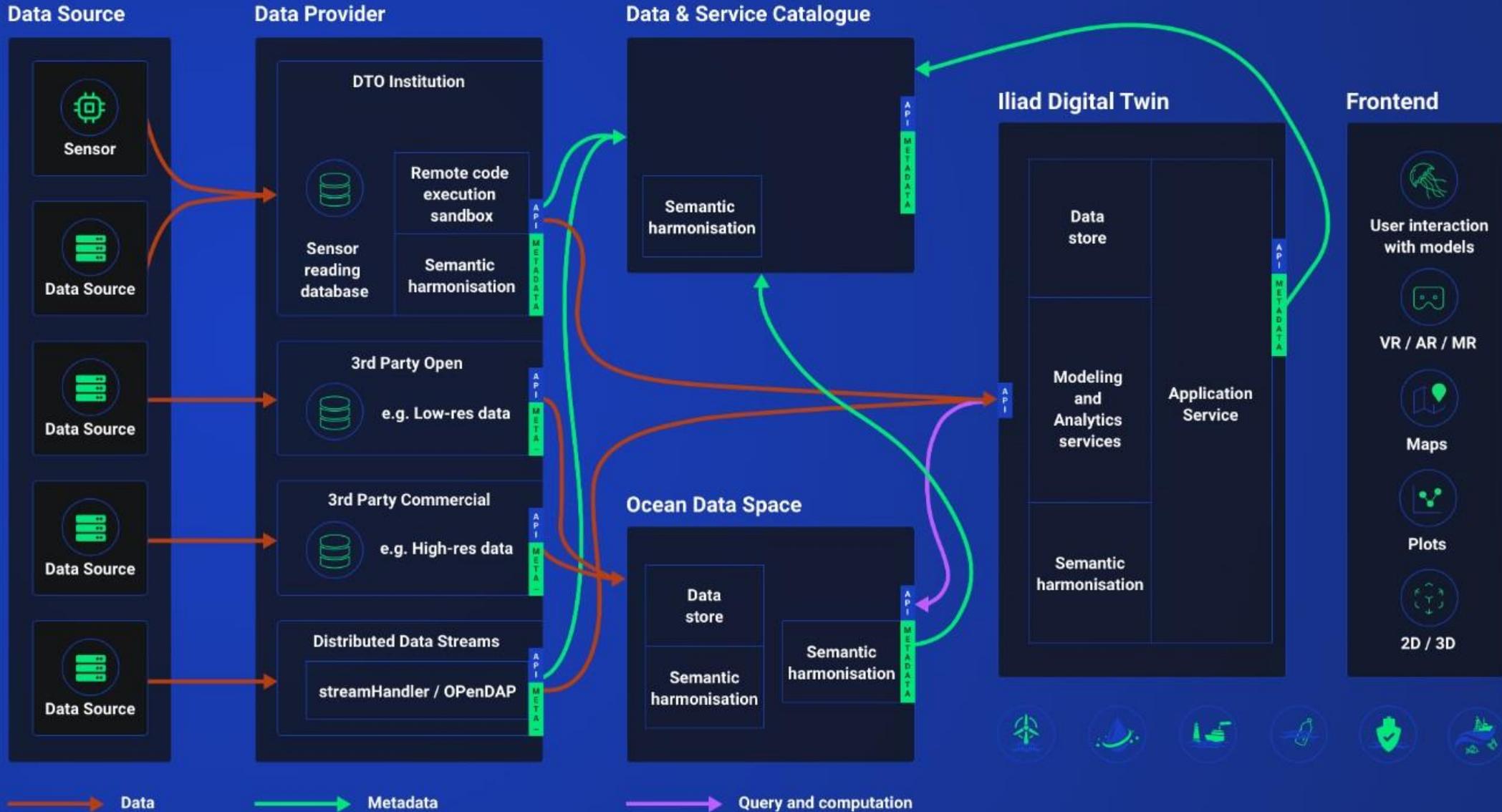


Mechanics



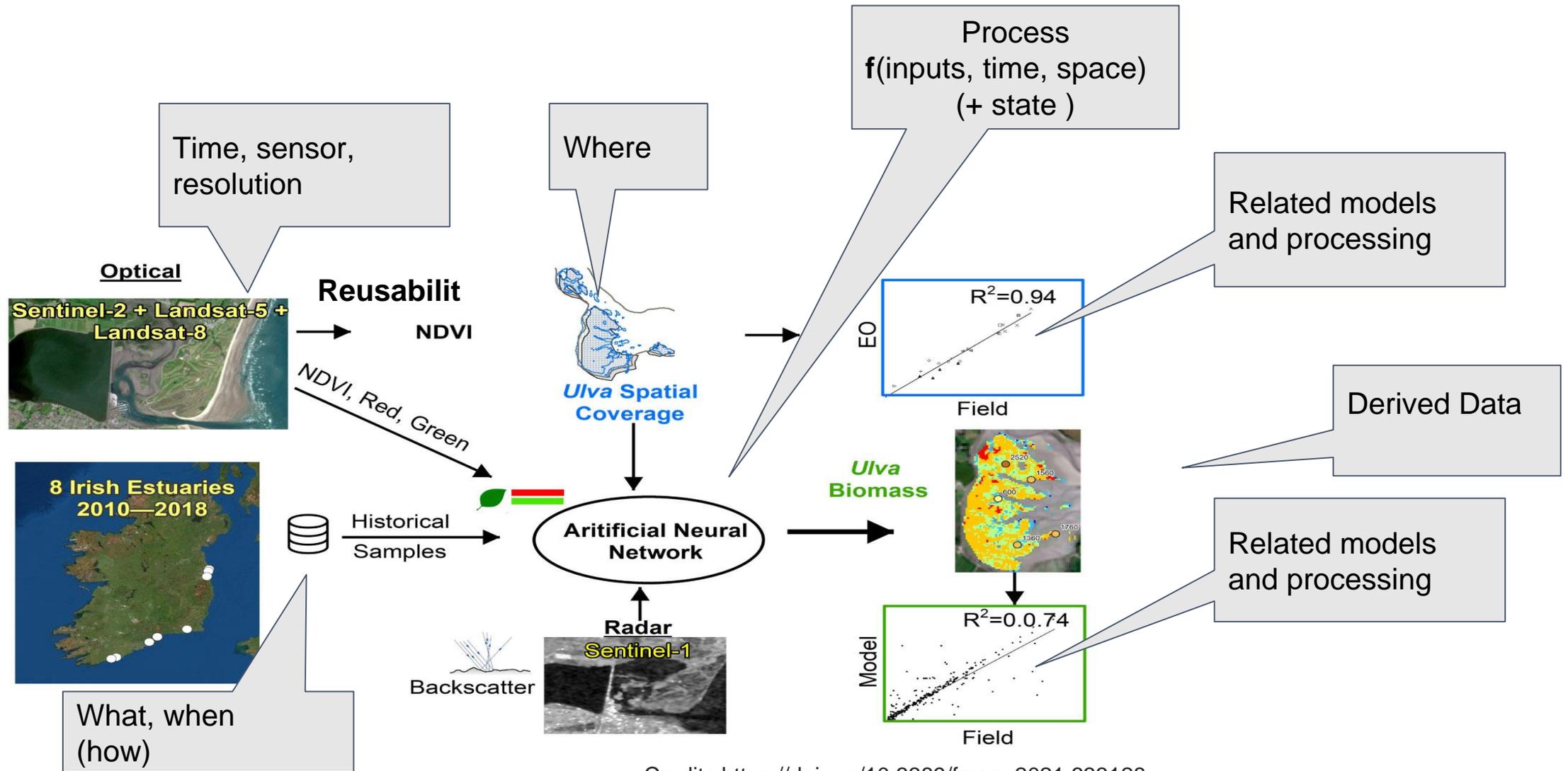
Designing Digital Twins of the Ocean

Designing an architecture to deliver digital twins of the ocean requires a multi-disciplinary approach that integrates data science, engineering, and computer science.



Iliad logical architecture

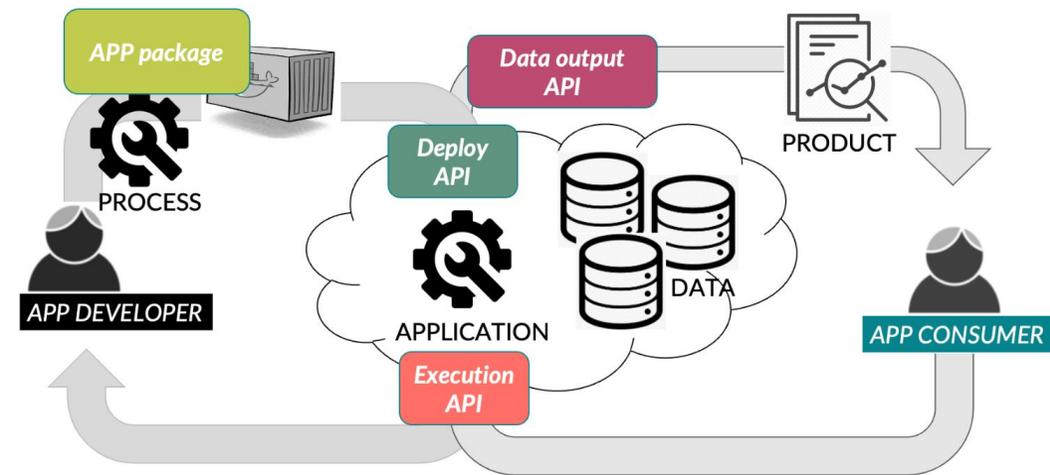
Reusability in action



Credits <https://doi.org/10.3389/fmars.2021.633128>

OGC Best Practice

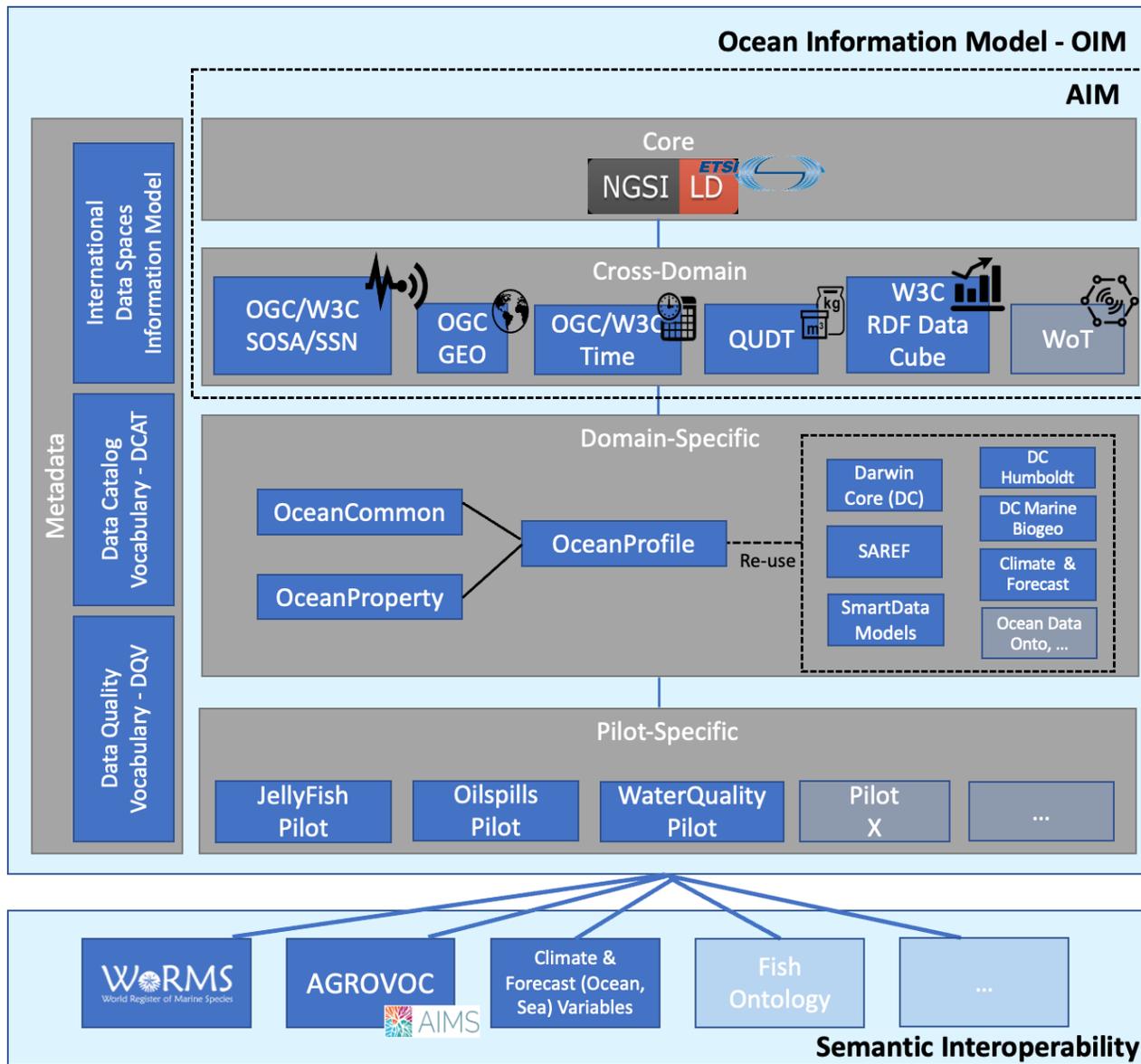
- OGC 20-089 defines guidance for:
 - A Developer to adapt an application
 - An Integrator to package an application
 - An Platform to deploy and execute the application
- 12 submitters organisations



New OGC Best Practice for EO Application Packages  Open Geospatial Consortium



Ocean Information Model



Overview of the layers of the first release of the ILIAD Ocean Information Model (OIM)



Thematic/local twins and citizen science



ILIAD DIGITAL TWINS OF THE OCEAN



Existing Wind Farm Capacity



Ocean Energy Potential



Coastal Sediment Transport



Plastic Pollution Monitoring



Oils Spill Simulation



Insurance For Marine & Maritime Activities



Jellyfish Swarm Forecast



Harbour Safety



Met Ocean Hind, Now & Forecast



Fisheries Productivity & Sustainable Aquaculture

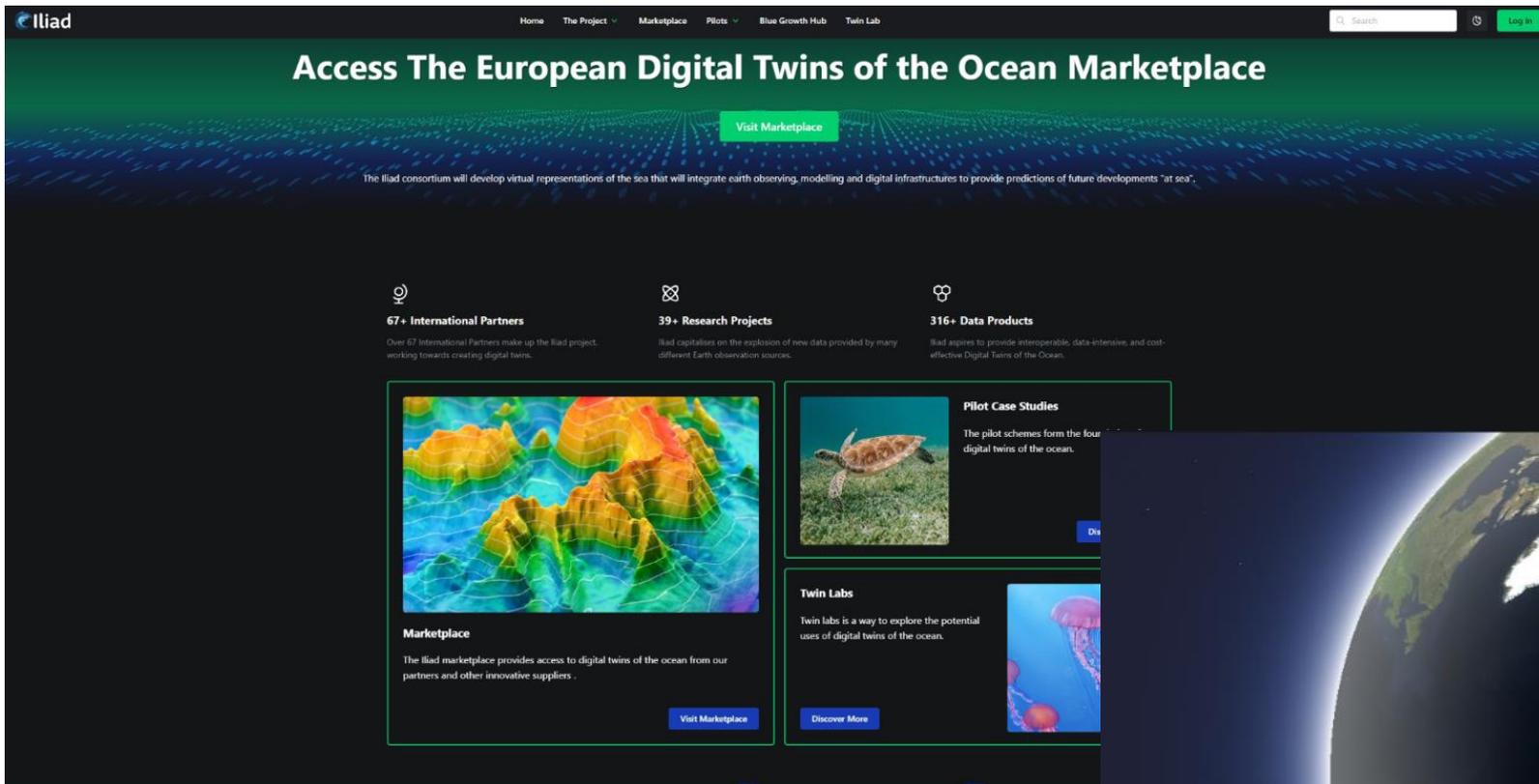


Ballast Water Monitoring



Aquaculture & Harmful Algae, Water Quality & Ship Traffic





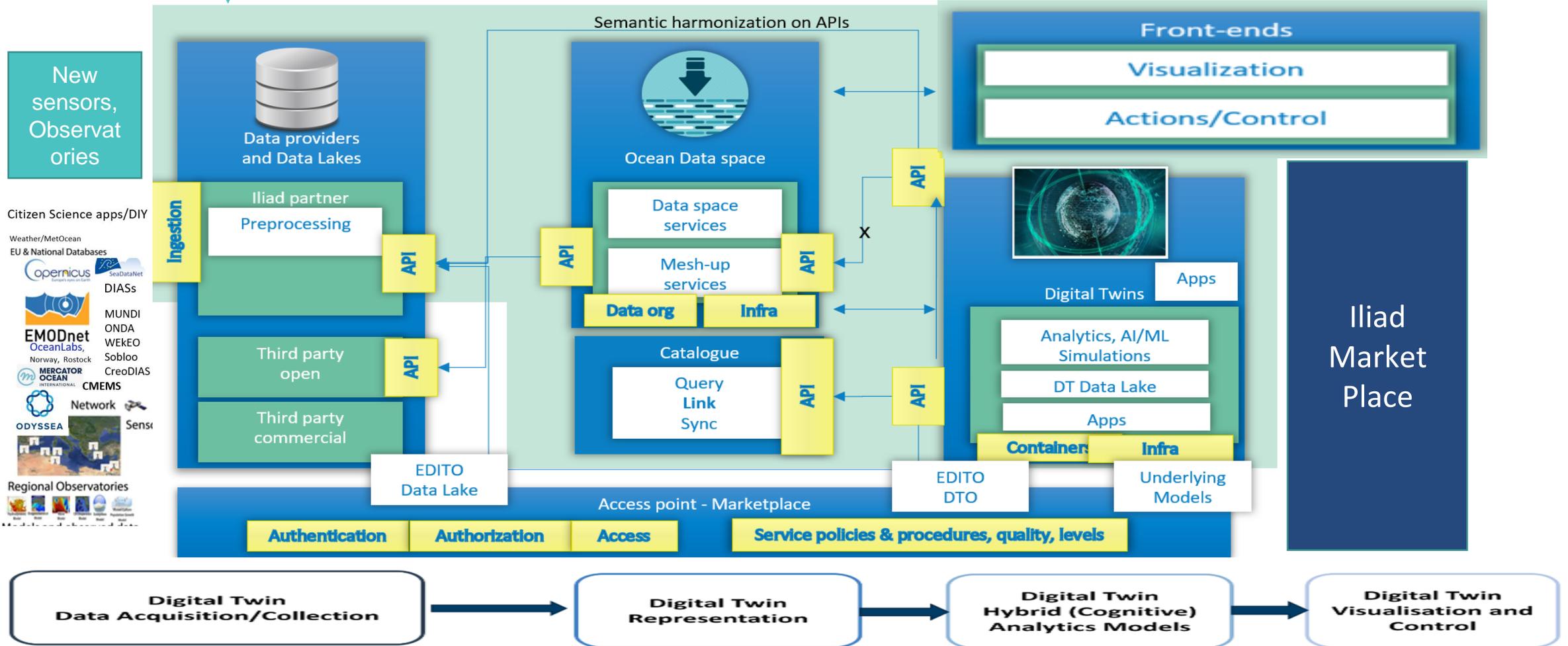
DIGITAL TWINS OF THE OCEAN



Interoperability across regions

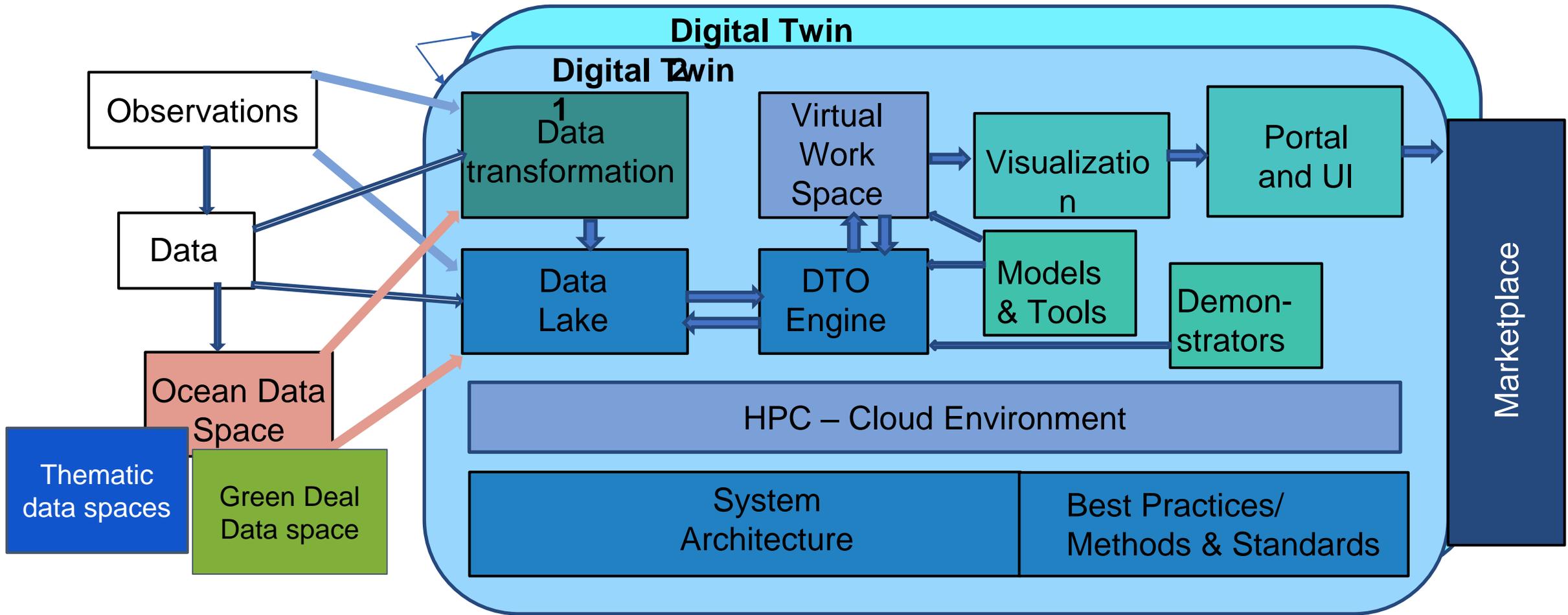
Marketplace





- New sensors, Observatories
- Citizen Science apps/DIY
- Weather/MetOcean
- EU & National Databases
- Openicus
- SeaDataNet
- DIASS
- MUNDI
- ONDA
- EMODnet
- OceanLabs, WEKEO
- Norway, Rostock, Sobloo
- MERCATOR OCEAN INTERNATIONAL
- CreoDIAS
- CMEMS
- Network
- ODYSSEA
- Sens
- Regional Observatories

Digital Twins



Jay Pearlman, 2023

Engagement



ILIAD is part of a vibrant ever evolving ecosystem of digital twins, including its great variety of resources ranging from data providers, cloud services, ocean modeling, biodiversity, data spaces all organized by a plethora of institutions and projects in Europe and beyond.



ocean-twin.eu



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Thank You!

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