27-29 May 2024

International conference on **M**arine **D**ata and **I**nformation **S**ystems

SeaDataNet AISBL · Havforskningsinstituttet · Ifremer · MARIS · MEDIN · National Oceanography Centre · INGV · iMagine · IODE · eosc Blue-Cloud2026

eosc | Blue-Cloud2026

A federated European FAIR and Open Research Ecosystem for oceans, seas, coastal and inland waters

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on behalf of Blue-Cloud 2026 consortium

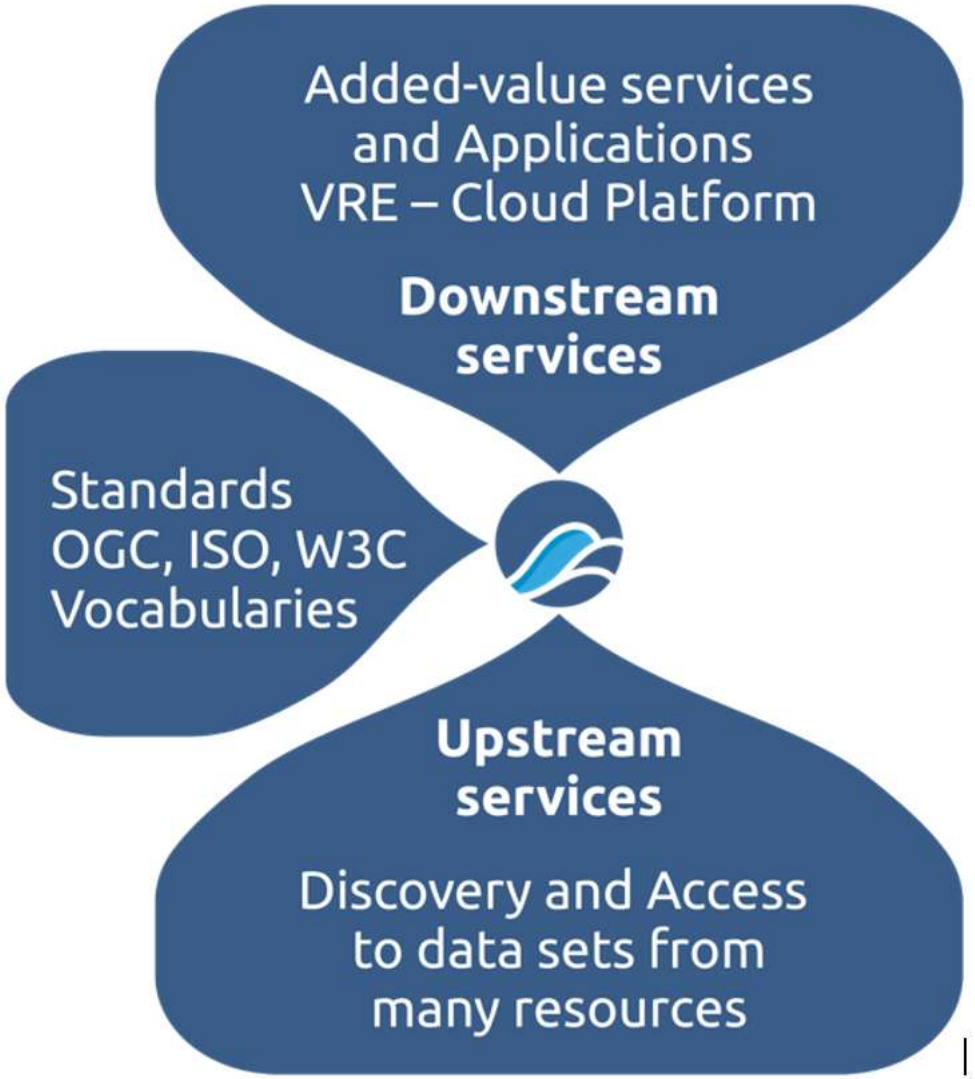
Funded by the European Union

EU H2020 Blue-Cloud project (2019 – 2022)

- To explore and demonstrate the potential of **cloud based open science** supporting research for ocean sustainability, and UN Decade of the Oceans and G7 Future of the Oceans
- To deploy a **cyber platform with smart federation** of multidisciplinary data repositories, analytical tools, and computing facilities
- To develop a **marine thematic European Open Science Cloud (EOSC)** serving the blue economy, marine environment & marine knowledge agendas

Blue-Cloud overarching concept

- Developing and deploying a Virtual Research Environment (VRE) with an array of services for configuring and running virtual labs for specific analytical workflows, use cases and demonstrators
- Applying common standards and interoperability solutions for providing harmonized metadata and data
- Developing and deploying harmonized discovery and access to established European marine data management and processing infrastructures

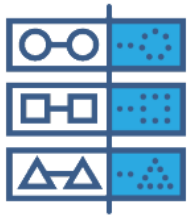


Blue-Cloud federation of major infrastructures

Blue Data infrastructures

E-infrastructures

Blue-Cloud key products and services



- **Blue-Cloud Data Discovery & Access service**, federating key European data management infrastructures, to facilitate users in finding and retrieving multi-disciplinary datasets from multiple repositories
- **Blue-Cloud Virtual Research Environment infrastructure** to provide a range of services and to facilitate orchestration of computing and analytical services for constructing, hosting and operating Virtual Labs for specific applications
- **Blue-Cloud Virtual Labs**, configured with specific analytical workflows to serve as **Demonstrators,** which can be adopted and adapted for other inputs and analyses

1st Release of Blue Cloud Discovery and Access service

- **Facilitates users**:
  - Federated search for discovering interesting data sets (currently more than 10 million) in a two step approach
  - Federated retrieval of identified data sets using a shopping basket mechanism
  - Download of data sets or push to Blue-Cloud VRE
- **Facilitates managers of Blue Data Infrastructures**:
  - Wider outreach to potential users
  - Stay informed about data requests and users for their repository
  - Periodic reporting of downloads from their repository

Blue Cloud Discovery and Access service

Compose and submit shopping request at the granule level

Retrieve the datasets by downloading from the Dashboard

Push datasets to the Blue-Cloud VRE Data Pool

Blue-Cloud Virtual Research Environment

Support researchers and scientists in doing science

Without
- forcing specific approaches and technologies
- asking to focus on matters other than their science

By
- enriching their activities with the information that enables sharing and reuse of their scientific workflows
- making their research objects ready for publication

Virtual Laboratories

Data sharing
- Workspace
- Dataspace
- Repositories

Data analytics
- High Throughput Computing
- Notebook
- RStudio

Social networking
- Messages
- Posts and replies
- User profiling

Research Object Publishing
- Catalogue
- Thredds
- GeoNetwork

Blue-Cloud main results

5 Virtual Labs

3+10 hackathon pilots

Synergies with E-infrastructures, Blue Data Infrastructures, and EU-funded projects

MoU AQUA-LIT
MoU jonas
MoU JERICO RI
MoU EuroSea
Cos4Cloud
DOORS BLACK SEA
FNS - Cloud Food Nutrition Security
AtlantECO
CoastObs
ENVRI FAIR
FORCOAST
NEANIAS
ODYSSEA
BUILDING AN ALL ATLANTIC OCEAN COMMUNITY Implementing the Belém Statement
BE OPEN

Conclusions about Blue-Cloud pilot

- The federation of BDIs by the **Blue-Cloud Data Discovery & Access service** has demonstrated its feasibility and options for optimising
- The modular architecture of the **Blue-Cloud VRE** is scalable and sustainable and provides a platform for configuring more dedicated Vlabs
- The EU marine community is interested in further exploration and exploitation of the Blue-Cloud network and platform for open science
- Roadmap used as basis for new Blue-Cloud 2026 project

Blue-Cloud 2026 (2023 – 2026) in a nutshell

MISSION: To develop further the European federation of marine and inland water data management infrastructures & high quality services

A1. DD&AS

A FAIR compliant Data Discovery & Access Services > access to 10+ million open data sets & products by 13 major BDIs

A2. VRE

An Open Science Virtual Research Environment (VRE) federating multiple e-infrastructures > supporting Analytical Big Data Workbenches & VLabs

A3. EOVs

3 EOV Workbenches for highly qualified data collections

3.000 DATA ANALYTICS SESSIONS PER MONTH - 5,000 HTC DATA ANALYTICS JOBS PER MONTH

A4. VLABs - FIVE DOMAIN-BASED VIRTUAL LABS

Coastal Ocean observations along Europe

Coastal currents from observations

Carbon-Plankton Dynamics

Marine Environmental Indicators

Global Fisheries Atlas

A7. COMMUNITY

- **All EU countries** engaged
- **3k+** engaged Blue- Cloud community users
- **5k+** followers across all the platforms
- **10+** External Stakeholders

OUTREACH

- **1** Blue-Cloud Hackathon
- **1** Blue-Cloud TV
- **18** Newsletter issues
- **11** Webinars on Blue-Cloud VRE, DDAS & EOV Workbenches
- **3** Blue-Cloud Annual Impact Events
- **3** Ocean Literacy Webinars
- Videos & Interviews

A6. TRAINING ACADEMY & CATALOGUE

- **3** Online training course on Best Practices for FAIR data principles
- **3** Info session & course on the EOV Workbenches
- **2** online webinars dedicated to the BlueCloud VRE
- **2** dedicated to the DDAS and the innovations introduced
- A series of training sessions on how to use the VLabs

POLICY

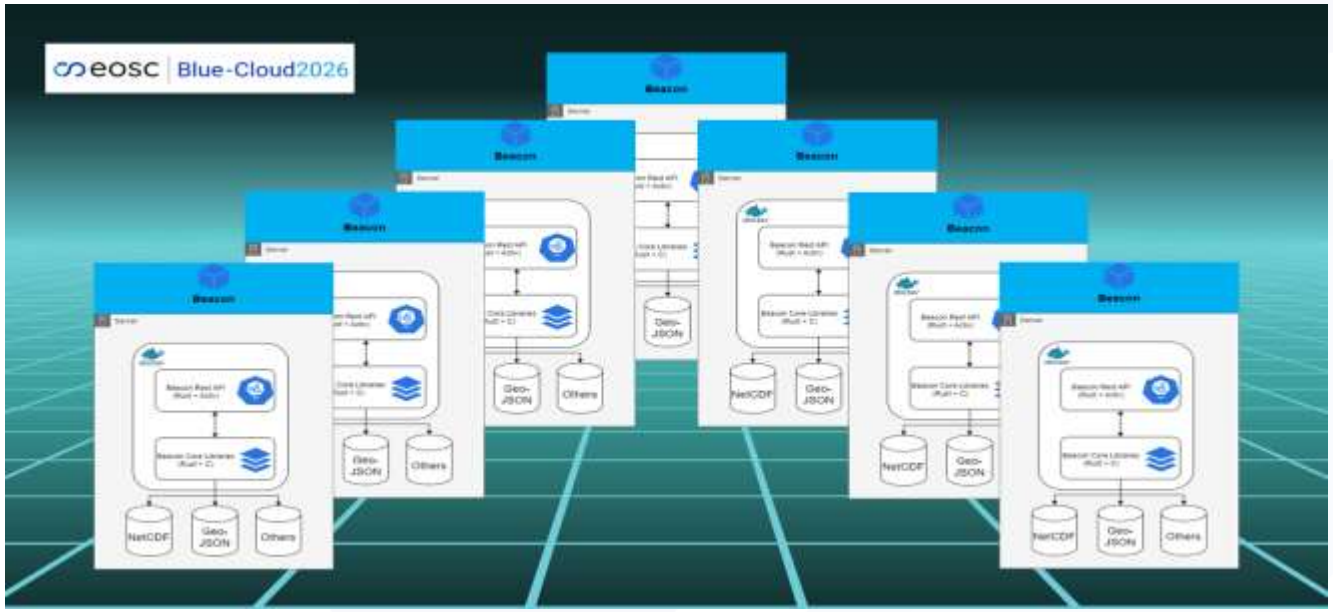
- Scientific papers & articles
- Restoring healthy oceans, seas, coastal & inland waters in Europe
- Strategic Roadmap 2030 A5. ROADMAP
- Cross-domain expansion factsheets
- Sustainability Business model

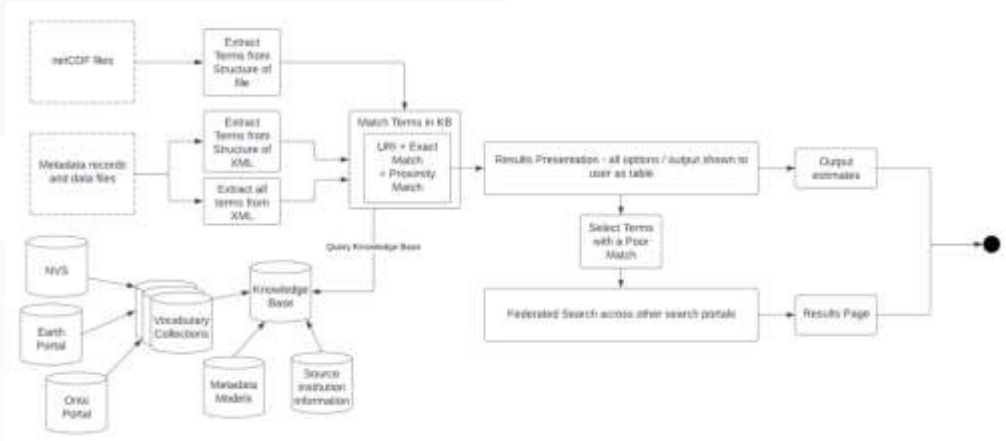
DTO Task Force

Key targets Blue-Cloud 2026

*Expanding and optimising the **Blue-Cloud Data Discovery & Access service:***

- harmonising and expanding functionality of web services as operated by each BDI
- developing and deploying semantic brokering
- federating additional BDIs: **EMSO, SIOS, EMODnet Physics, MGnify**
- developing and deploying data sub-setting and extracting services
- establishing data lakes for selected data types and parameters





Beacon instances, each for a selected BDI, will be deployed at the Blue-Cloud VRE for public use by Blue-Cloud users

Key targets Blue-Cloud 2026

*Expanding and evolving the **Blue-Cloud Virtual Research Environment**:*

- Evolving the computing, storage and services capacities
- federating multiple e-infrastructures, such as EGI, Galaxy, others, including expanding analytical services
- Providing more support to Virtual Labs and Work Benches

*Expanding and evolving the **Blue-Cloud Virtual Labs**:*

- Evolving existing Vlabs by streamlining, more integration, and added functionalities
- Initiating new Vlabs from consortium and from synergies with other projects
- Developing and deploying three Work Benches for generationg EOV collections

physical workbench for temperature, salinity

chemical workbench, linked to eutrophication: nutrients, chlorophyll, oxygen

ecosystem workbench for plankton biomass and diversity

DTO Taskforce for tuning Blue-Cloud data lakes with DTO developments

The **European Digital Twin Ocean (EU DTO)** initiative aims to use digital technology to provide comprehensive knowledge of the ocean: an innovative set of user-driven, interactive and decision-making tools backed by the best science and data.

Core development is underway through the **European Digital Twin Ocean (EDITO) R&D projects: EDITO-Infra and EDITO-Model Lab**.

Blue Cloud 2026 could contribute by mobilising and making available major **additional data resources** next to those already managed by CMEMS and EMODnet, as well as **analytical Vlabs and e-infrastructure resources**. For an operational basis, the Blue-Cloud DTO Task Force promotes and elaborates technical synergies and interoperability between EDITO and the Blue-Cloud architectures, data and services.

Short term: synergy will be demonstrated at the Digital Ocean Forum 2024 (DOF 2024) by a Vlab on EDITO
Longer term: structural cooperation and connectivity will be desired: **Blue-Cloud – DTO roadmap**

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Blue Cloud 2026 stimulates synergy and encourages other projects to onboard the e-infrastructure for developing their own Vlabs, resulting in Blue-Cloud building **an aquatic open science community**

Blue-Cloud 2026 Consortium

A solid, multidisciplinary, committed team of **40** partners from 13 EU countries

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