Keywords:
#service, #data, #access, #discovery, #infrastructure, #marine #federation #EOSCinPractice #BlueEconomy

Supporting marine data discovery and accessibility to enable cross-domain research

An EOSC in Practice Story where a common interface is provided for discovery and retrieval of marine data

The project involved

Blue-Cloud
Piloting innovative services for Marine Research & the Blue Economy

Blue-Cloud is the flagship initiative of the H2020 Future of the seas and oceans programme of the European Commission (Grant Agreement no 862409). The project delivers a collaborative virtual environment to enhance FAIR and Open Science in the marine domain. Started in October 2019, Blue-Cloud is deploying a cyber platform with smart federation of an unprecedented wealth of multidisciplinary data repositories, analytical tools, and computing facilities to explore and demonstrate the potential of cloud-based Open Science and address ocean sustainability, EU Green Deal, UN Ocean Decade, and G7 Future of the Oceans objectives.

The Challenge

There are several research infrastructures or other data services running in Europe that cover a multitude of marine-related sciences, providing specific datasets coming from observations collected with different methods. These infrastructures constitute a diverse world, each looking at a piece of the big picture. Blue-Cloud aims to overcome fragmentation and create a bridge between thematic science clusters - such as humanities, climate, food and agriculture sciences - and EOSC, creating a data federation and providing a common access to a so-called thematic EOSC for marine data to enhance the visibility and discoverability of data from marine and environmental domains.

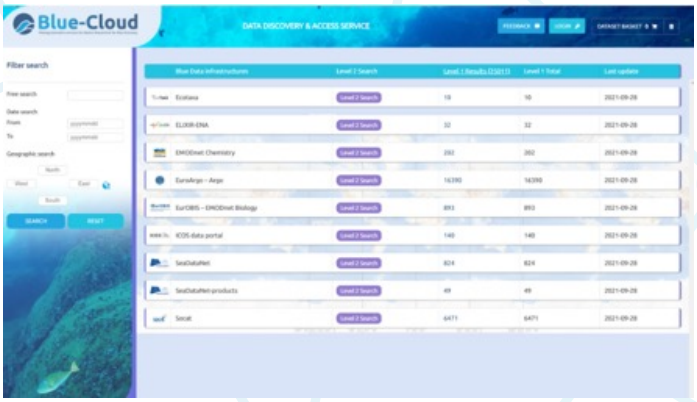
The Blue-Cloud Open platform is a great example of implementation of the three main components of the EOSC Federation - EOSC-Core, EOSC-Exchange and the Federation of Data & Data Services - into a unique Open Science platform accessible and usable by other research communities. Blue-Cloud is a front runner of Data federation in practice, given its success in bringing together 9 data providers covering 10M datasets from the marine domain and making them available via the DD&AS and the VRE to users, allowing interdisciplinary interactions between disciplines, thus demonstrating the value of bringing together a variety of providers and users within EOSC.

The solution – Data Discovery and Access Service

To overcome this fragmentation, a dedicated Data Discovery and Access Service has been implemented. This service facilitates discovery and retrieval of data sets and data products for external users in stand-alone mode, also interoperable with other Blue-Cloud services, such as the Virtual Research Environment. More than 10 million data sets are managed in blue data infrastructures (BDIs) that are connected to this Blue-Cloud service to serve federated discovery and access. A common interface is provided for discovery and retrieval of data sets and data products from each of the federated BDIs. The interface also includes facilities for mapping and viewing the locations of data sets, as this is part of the query dialogue. Moreover, the interface has a shopping mechanism, enabling users to compose and submit mixed shopping baskets with requests for data sets from multiple BDIs. The service is provided on a double level. At the first level, users can identify interesting data collections in an aggregated way in a common catalogue including entries from all the federated BDIs. At the second level, users can get more specific and granular data.

"The future prospective is to realise what is called the Digital Twin of the Oceans (DTO), this is basically the realisation of a perfect, digital, image of the real world. This will be the basis in order to execute a huge variety of "what if" scenarios and data models."
Dick Schaap, Manager at MARIS B.V. and Blue-Cloud Technical Coordinator

Blue-Cloud currently uses **EUDAT's B2FIND** service to ingest and publish metadata referencing Blue-Cloud's data in B2FIND's interdisciplinary discovery portal. This helps make domain-specific Blue-Cloud data resources visible and discoverable on a cross-domain level. This is given even greater visibility by the fact that B2FIND is provided by the EOSC Portal as one of the generic data discovery services.



The service provider

MARIS B.V. is a private company located in Nooddorp (The Netherlands), specialised in developing web-based services and applications in the fields of oceanographic data management, geographical interfaces and websites with complex information ures.

The Users

Researchers in the marine environment can exploit Blue-Cloud services to find a broad variety of marine data and resources. More generally, researchers in other areas, such as environmental and social sciences, climate science, as well as business and industry players, can discover and use marine data for cross-domain research.

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EOSC Future

EOSC in practice story #11

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Why do I need EOSC?

Blue-Cloud services will bring the following benefits to their users being a provider on EOSC:

» A pilot **thematic EOSC as a role model** for the development of other thematic clouds. The cyber-platform of Blue-Cloud provides FAIR access to multidisciplinary data, analytical tools and computing and storage facilities that support research.

» **Blue-Cloud Services** showcased through five Demonstrators for oceans, seas and freshwater bodies for ecosystems research, conservation, forecasting and innovation in the Blue Economy, and making innovative use of seamless access to multidisciplinary data, algorithms, and computing resources - accelerating cross-discipline science.

» A **methodology for researchers interacting with e-infrastructure developers** to establish a cyber platform with tools and services, which support multiple scientific challenges and are fit-for-purpose, while built upon generic core principles and services.

» A **mechanism to easily access and discover blue data**. Blue-Cloud partners manage important volumes of blue data (e.g. SeaDataNet, EMODnet, CMEMS, etc.) and links have been established with major European observing networks to increase the data volume.

» APIs to access blue services that will **complement EOSC base services** providing blue thematic functionalities.

» Dynamic examples of how a framework like Blue-Cloud can **address one or several of the policy challenges** defined in the Bioeconomy Strategy, the Circular Economy Strategy, the Blue Growth Strategy, the Common Fisheries Policy, the Maritime Spatial Planning Directive, the Marine Strategy Framework Directive, the International Ocean Governance Communication and the UN SDGs.

» **A global Blue Economy community** close to the EOSC vision, including the marine and maritime industry.

» The opportunity of **bringing EOSC in the Blue Economy long-term vision** via the policy-oriented Blue-Cloud Roadmap to 2030 which seeks a series of EU Calls for further development and uptake of the Blue Cloud by multiple VRE applications and connecting additional marine data infrastructures.

Societal impact

The Marine Strategy Framework Directive, the European strategy for green management governance, the Sustainable Development Goals set up by the United Nations and obviously the EU Green Deal represent major political measures whose implementation is supported also by the enhanced awareness and sensitivity that initiatives like Blue-Cloud have on the socio-political European and international environment. BlueCloud's role is also to inform interested stakeholders that in order to implement these initiatives and understand if a sustainable practice is feasible, scientists need to study its economical and social impacts. Therefore, a multidisciplinary approach is fundamental to plan future business practices.

Across disciplines

The collaboration between EOSC and Blue-Cloud is thus an effective way to foster the adoption of a multidisciplinary approach. In this particular case, interaction among marine and socio economic domains is critical to understand their feasibility and impact.

Future developments

Blue-Cloud aims to receive more feedback from the user base about the services developed. A first step is the Strategic Roadmap to 2030, for which interviews were conducted with key stakeholders to understand if the services developed indeed meet the user's needs. A wide variety of dissemination and promotional activities have been planned and carried out to increase the visibility of Blue-Cloud services and stimulate their uptake, such as: articles, conferences, workshops, joint workshops and a highly successful Hackathon. Widening the user base is fundamental for feedback collection, and provides developers with important information to refine the Blue-Cloud services.
In addition, Blue-Cloud is set to improve quality of data through the validation of data sets so that the data models can run better.

Sustainability for an EOSC in practice

Copernicus Marine Service and EMODnet are the two main Research Infrastructures (RI) that are funded and sustained by the European Commission. Blue-Cloud is federating data from both Copernicus Marine Service and EMODnet RIs, aiming to create an environment with shared resources from multiple domains.

Future funding model scenarios

Blue-Cloud supports the creation of the Digital Twin of the Ocean (DTO), the realisation of a digital image of the real ocean. The DTO is also part of the Digital Ocean Knowledge System under the EU Mission Restore our Ocean and Waters. The way forward is to build a business plan to detail options and scenarios on how the strong network of Blue-Cloud stakeholders could ingest and exploit the results of the initiative. The recently awarded Blue-Cloud 2026 project (January 2023 - June 2026) will further evolve this pilot ecosystem into a **Federated European Ecosystem to deliver FAIR & Open data and analytical services**, instrumental for deepening research of oceans, EU seas, coastal & inland waters. Blue-Cloud 2026 will expand the federated approach of Blue-Cloud, involving more aquatic data stakeholders, and interacting with EOSC developments, in support of the EU Green Deal, UN SDG, EU Destination Earth, and the EU Mission Starfish on healthy oceans, seas, coastal and inland waters, mobilising and making available major additional data resources as validated and harmonised in-situ data by means of Data Lakes.

Useful material related to this story

» Blue-Cloud Data Discovery & Access Service
» Blue-Cloud Hackathon pilots

Want to learn more about the other services being developed by **Blue-Cloud**? Read here

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