

A large, abstract network diagram in shades of blue, consisting of interconnected nodes and lines, serves as a background for the central text.

D5.1b

Front-Office Design, Functional and Technical Specification

Version 1.0

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D5.1b / Front-Office Design, Functional and Technical Specification

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Abstract

This deliverable presents the technical evolution and consolidation of the EOSC Platform Front-Office (which serves as a gateway to information and resources in EOSC) within the scope of the EOSC Future project. The work introduced in the following sections describes the main developments implemented by WP5 since the submission of the previous version of this deliverable, the state-of-play of the Front-Office architecture and technical specification (including the relevant supporting components), and the functional design. The enhancements applied to the EOSC platform, based on the co-creation with the user community, are also described. The elaboration of the Front-Office technical specifications starts with the C4 method, it is followed by the high-level architecture, and then the details of the newly integrated components as well as the supporting components developed by other WPs are presented. For each component, the technical characteristics are described and, where appropriate, architectural diagrams are included.

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List of Abbreviations

Acronym	Definition
AAI	Authentication and authorisation infrastructure
API	Application programming interface
CMS	Content Management System
EOSC	European Open Science Cloud
FAIR	Findable, Accessible, Interoperable and Reusable
KH	(EOSC) Knowledge hub
KPI	Key performance indicator
MP	Marketplace
NOAD	National Open Access Desk
OAG	OpenAIRE research graph
RS	(EOSC) Recommender system
RS-MP	(EOSC) Recommender system for the marketplace
RMF	Recommender Metrics Framework
UD	User Dashboard
UI	User Interface
UX	User Experience
WP	Work package

Glossary

Only terms that are not included in the EOSC glossary [1] appear here.

Term	Definition
EOSC training catalogue	A component of the EOSC knowledge hub. The training catalogue is a catalogue of catalogues.
EOSC knowledge hub	The EOSC knowledge hub builds on top of the EOSC learning/training platform and is a workspace for training and knowledge sharing.
EOSC learning platform	A component t of the EOSC knowledge hub. The learning platform hosts training resources which can be consumed on demand.
EOSC Platform	A set of services implemented in scope of the EOSC Future project to support delivery of EOSC Core and EOSC Exchange
Feature	A tool capability of a system that helps a User to accomplish a goal.
Function	An intended purpose of a product, service, process, practice, system, application, document, component, machine or environment.
Front-Office	A set of components in the EOSC Platform focused on the delivery of user-centric functionalities supporting research activities in Europe. These include the catalogue and marketplace, user dashboard, search service, knowledge hub and others.
Research products	Resources relevant for the scientific research. E.g. Publications, Research Data, Research Software. The definition of the research products is provided by the OpenAIRE Guidelines [4].
User Dashboard (UD)	A component of the Front-Office responsible for managing the interaction with users and providing them with access to EOSC-managed items.
User Experience	User Experience is how a user interacts with and experiences a product, system or service. It includes a person's perceptions of utility, ease of use, and efficiency (Source: [9])
(EOSC) Recommender System	Recommends An information filtering mechanism that suggests a set of items to the EOSC users in a given context, based on users' preferences, background data and algorithms.

1. Executive summary

This deliverable presents the technical evolution and consolidation of the EOSC Platform Front-Office within the scope of the EOSC Future project. The Front-Office serves as a gateway to information and resources in EOSC and a valuable resource for the different audiences of EOSC (researchers, service and data providers, businesses, funders, policy makers), providing updates, resources, and tools to promote collaboration, knowledge sharing, and innovation in the research community. It is designed to be user-friendly and accessible for all researchers and innovators in Europe, regardless of their level of expertise in the field of digital research. To ensure the seamless functioning of the Front-Office, it is important to have well-defined functional and technical specifications in place. In this context, functional specifications refer to the intended behaviours and functionalities of the Front-Office, while technical specifications refer to the underlying technologies and standards that are used to develop and implement the Front-Office. These specifications play a crucial role in ensuring that the Front-Office is designed, developed, and maintained in a consistent and efficient manner, to provide high-quality services and resources to the EOSC community.

The work introduced in the following sections describes the main developments implemented by WP5 since the previous version of this deliverable, the state-of-play of the Front-Office architecture and technical specification (including the relevant supporting components), and the functional design. The enhancements applied to the EOSC platform, based on co-creation with the user community, are also described. The elaboration of the Front-Office technical specifications starts with the C4 method, followed by the high-level architecture, then gives details of the newly integrated components as well as the supporting components developed by other WPs. For each component, the technical characteristics are described and, where appropriate, architectural diagrams are included.

2. Overview

The Front-Office of the European Open Science Cloud (EOSC) serves as a gateway to information and resources related to EOSC, providing various updates and resources to its different audiences.

- For **consumers/researchers**, the Front-Office provides the entry point to all the resources needed during scientific lifecycle (including but not limited to data, publications, software, computing resources, storage etc), information on EOSC governance, the stakeholders involved, and projects that contribute to its realization. Additionally, the Front-Office highlights relevant European and national policies that can impact the research community and recent developments in the field.
- **Service and data providers** can use the Front-Office to stay up to date with the latest EOSC-related developments. Additionally, for those who are not yet providers, the Providers Hub section brings a comprehensive guide to learning about the benefits of becoming an EOSC provider, as well as how to onboard their resources onto the platform, making it easier for non-providers to find out how to contribute to the EOSC ecosystem. By becoming a provider, they can gain increased visibility and connect with researchers and potential business partners, driving innovation and collaboration within the research community.
- For **businesses**, the Front-Office provides an overview of the EOSC ecosystem, including the stakeholders involved, policies, and projects. This information can help businesses understand how they can collaborate with the EOSC community and leverage its resources to develop new products and services.
- **Funders** can use the Front-Office to gain a better understanding of the EOSC ecosystem and its potential impact on research and innovation. By keeping up to date with the latest EOSC-related policies, they can make informed decisions about investing in the research community and contributing to the success of EOSC initiatives.
- **Policy makers** can also benefit from the Front-Office by staying informed about the latest EOSC-related policies and initiatives. This information can help them make evidence-based decisions and policies that promote open science and innovation, leading to a more collaborative and effective research ecosystem.

3. Front-Office functional specification

With the evolution of the EOSC Future project, the understanding of EOSC Front-Office functional main features has not changed. The user-facing part of EOSC Platform is focusing on:

- EOSC-related information promotion and sharing;
- EOSC Resources discoverability;
- EOSC Resources access;
- EOSC Knowledge access and sharing;
- Access to the Open Science statistics;
- EOSC user-support.

3.1 Front-Office functional architecture update

To enable functionalities for the end-user, the EOSC Front-Office team has designed and developed a set of components which act as a unified environment ready to support European Scientists, depending on their use cases. To better define the specification for each of the components, it was crucial to focus on a small number of identified Front-Office users (as detailed in the previous version of this deliverable) and adopt their needs as requirements for the newly developed features.

The main EOSC Platform actors along with their main actions of interest are presented in Figure 3.1.

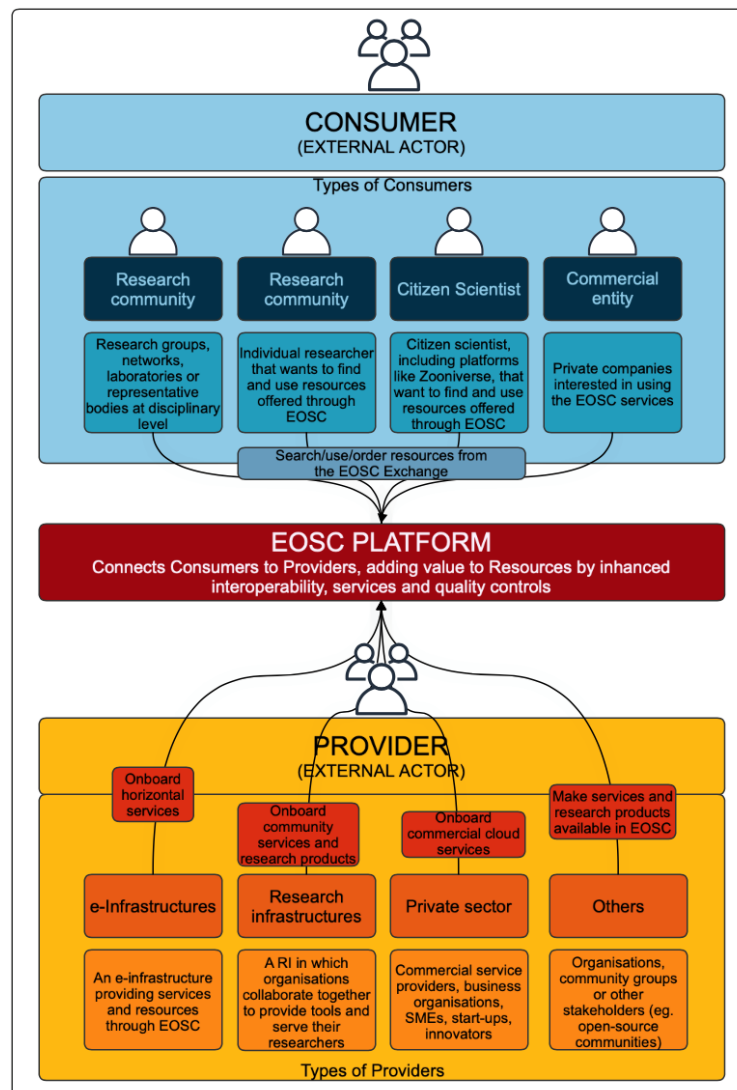


Figure 3.1: Major user types with their main EOSC-related actions of interest

To enable the major EOSC Front-Office capabilities, the following enhancements have been introduced:

- Updates to the EOSC Front-Office Information architecture to provide more intuitive navigation and data exploration.
- Redesign of the EOSC Platform landing page so it captures crucial information from the user perspective.
- Integration of two major catalogues (Service Catalogue and Research Product Catalogue) to act as a **single EOSC Resource Catalogue**.
- Adaptation of the existing UI to serve the integrated catalogue.
- Integration of the EOSC **Recommender System** in various parts of the Front-Office to offer recommendations in the discovery phase.
- Delivery of an entirely new component: **User Dashboard**, a user-centric space dedicated to researcher's resource management in EOSC.
- Delivery of an entirely new component: **Knowledge Hub**, a place dedicated to knowledge discovery and sharing. It combines the EOSC **Training Catalogue** (central discovery point of EOSC training materials) with the **EOSC Learning Platform** (a Moodle platform with online training content).
- Delivery of an entirely new component: the **EOSC Observatory**, a dedicated policy intelligence tool for collecting and presenting data on EOSC readiness among EU Member States and Associated Countries.

These enhancements have extended the components introduced in the previous version of this deliverable and the features are described in Table 3-1.

Table 3-1: Front-Office enhancements (since M6)

Features	Functional area	Description (how the feature is built and what it provides)	Added value for EOSC users
Joint discovery	Discovery	A combination of the service and research products catalogues.	Single place to discover all types of research-related EOSC resources.
Improved resource search	Discovery	Advanced full-text search capabilities which allow users to find matches in various research metadata properties.	Ability to find new tools and resources that support the user's research goals via wider scope of relevant search phrases.
Improved resource filtering and sorting	Discovery	Ability to reduce the result set of the search with the use of filters and various sorting mechanisms.	Possibility to find new tools and resources that might support the user's research goals via dedicated filters that reflect the user's research profile.
Training Resource Presentation Page	Discovery, access	User-optimised display of the metadata properties of training resources. The main space for obtaining training resource access and support.	For the researcher: Possibility to investigate in detail training resources. For the Provider: Possibility to advertise training materials.
Search-related recommendations	Discovery	User-optimised suggestions of resources based both on the search phrase and user history in the system.	Higher chances of a relevant resource match.

User-related recommendations	Discovery	User-optimised suggestions of newly added EOSC resources based on user's preferences and history. All recommendations are presented in a dedicated user space: User Dashboard.	Staying up to date with newly delivered scientific outputs in Europe relevant to an authenticated user.
Training course entry	Access, upskilling, support	User-searchable and filterable training materials relating to EOSC resources.	Increased technical knowledge allowing better use of EOSC resources.
Open Science Statistics	Upskilling	Open-science related metrics visible in a dedicated view per European country.	Increasing awareness on Open Science adoption in Europe.

4. Front-Office technical specification

The technical architecture is presented using a well-known methodology for visualising software architecture: the C4 Model [5]. It has been implemented at the project level, so every technical work package can use the same methodology to present its outputs.

4.1 Front-Office high level architecture

The Front-Office architecture diagram (see Figure 4.1) documents relationship between the following architectural components:

Components currently integrated in the Front-Office:

- EOSC Portal website;
- EOSC Marketplace (EOSC explore + EOSC service Marketplace+ new search service);
- User Dashboard;
- EOSC Recommender System (based on AI/ML technology);
- Recommender Monitoring;
- Knowledge Hub (Training Catalogue and Learning Platform);
- Open Science Monitor.

Supporting components developed by other work packages within the project:

- EOSC AAI;
- EOSC Service Monitoring;
- EOSC Research products;
- EOSC (Core) Helpdesk;
- EOSC Service Registry;
- EOSC Portal Providers dashboard;
- EOSC Research Graph (subset of the OpenAIRE research graph);
- EOSC Digital Innovation Hub.

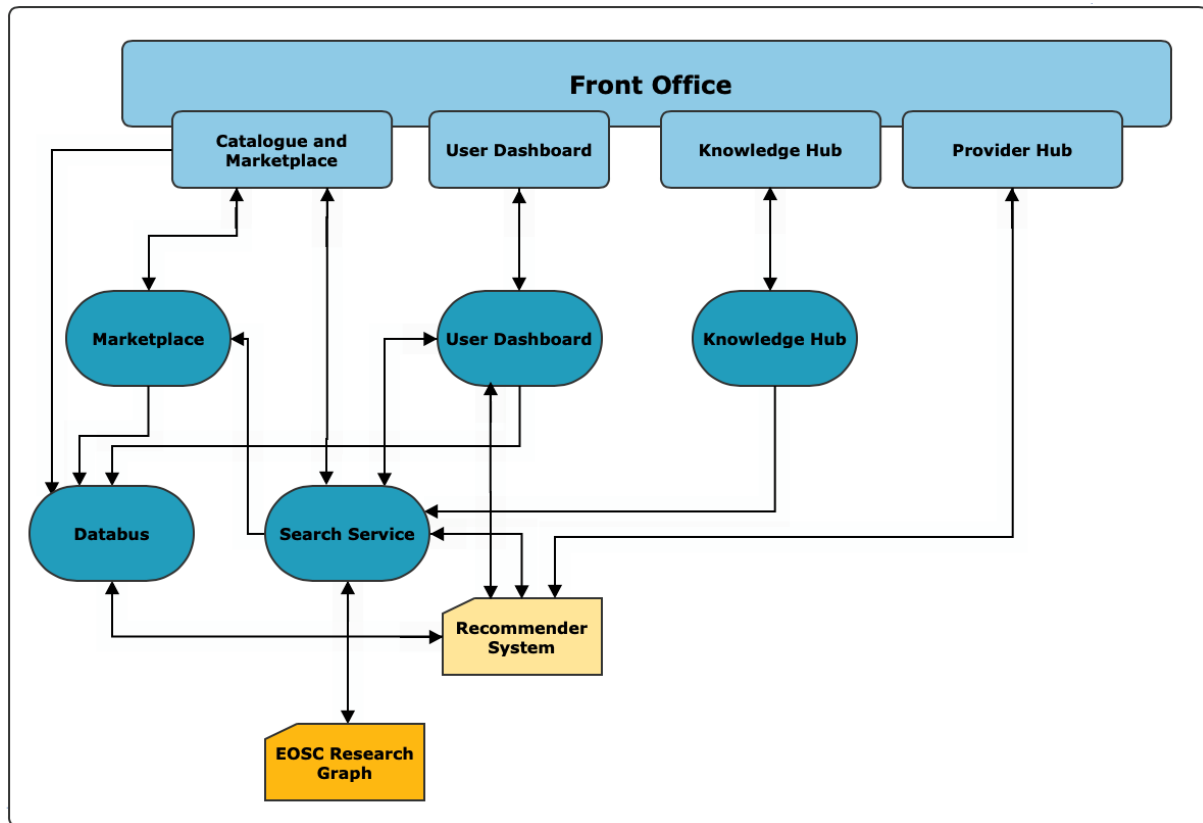


Figure 4.1: EOSC Platform technical architecture from the consumer perspective

4.2 Front-Office components technical specification

The technical specification of the components complements the architectural diagram and describes the technical characteristics of the Front-Office services. This specification reflects the changes implemented to achieve the project goals. Descriptions have been simplified to minimise the content to the necessary essence for the readers.

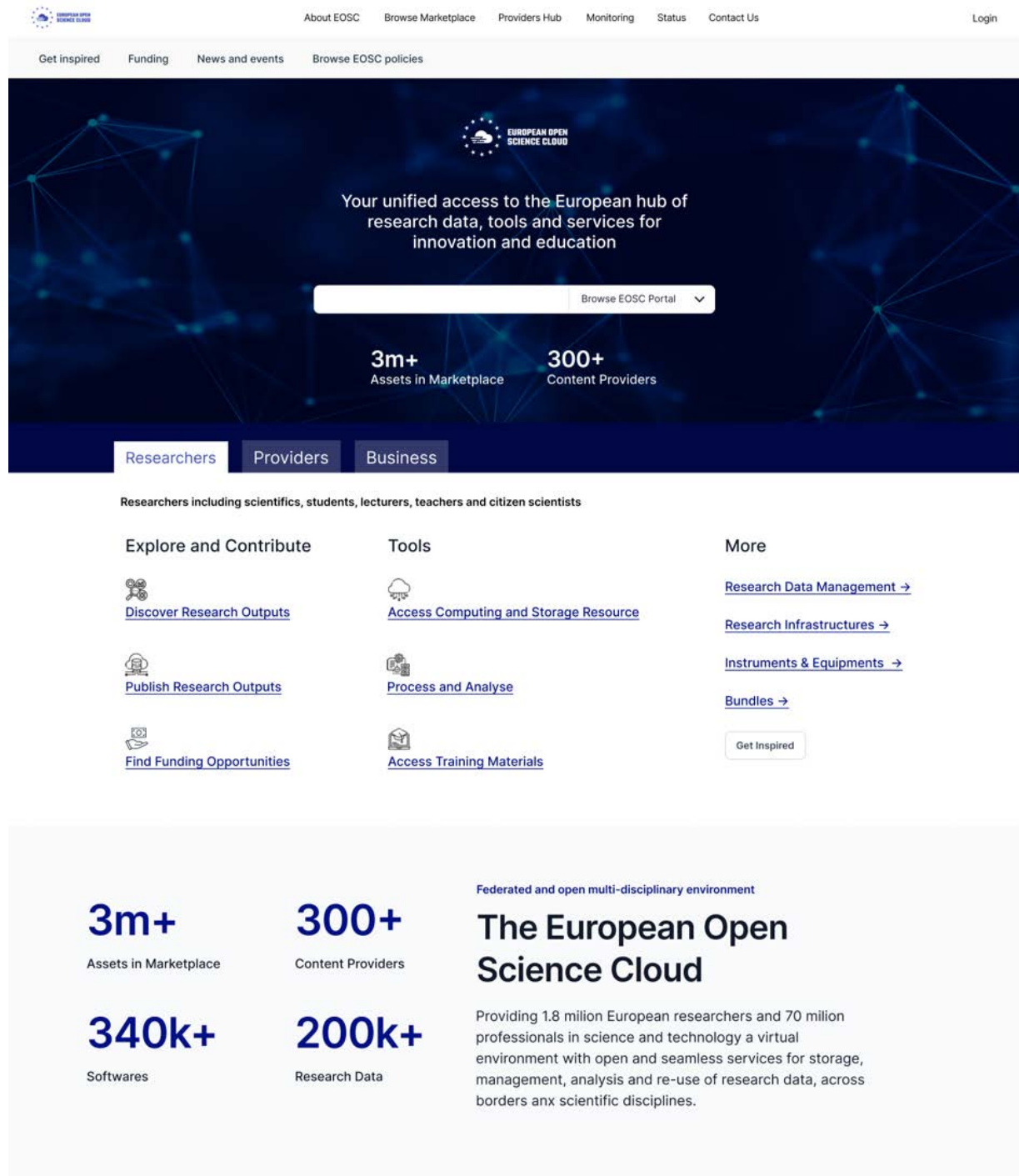
4.2.1 EOSC Portal website

A graphical redesign of the EOSC Portal website is currently underway, with coordination across work packages. The aim is to provide visitors with a seamless experience in terms of layout and menu structure when moving between the different Front-Office components such as the Portal and Marketplace. Although the changes are not yet live at the time of writing, preview mock-ups can be seen in Figure 4.2, Figure 4.3 and Figure 4.4.

In the meantime, the existing navigation by category (Figure 4.5) has been replaced with a navigation by research activity (Figure 4.6). This change has been introduced to improve the clarity of the categorisation, as identified and validated with end-users during co-design activities.

The new homepage will feature several key changes to enhance the user experience. The main and most immediate changes are a static hero section, replacing the current image slider, with an improved and clearer value proposition statement. It also features a more visible search field to serve as a better entry point for the stakeholder audience. The navigation is further improved by using a tabbed system to provide the main target audiences (researchers, providers, businesses) with quick links to the most relevant marketplace sections and documentation pages. The Portal's features are described in Table 4-1.

Furthermore, eleven 'EOSC in Practice' stories have already been published [9], highlighting real-world use cases and demonstrating how EOSC resources, services, and tools have been used to advance research and innovation. Researchers and service providers can use these stories as inspiration and guidance when developing their own EOSC projects and initiatives. Additionally, they can submit their own success stories and use cases to be featured on the EOSC Portal website, helping to promote their work and contribute to the EOSC community's collective knowledge. The project aims to feature a total of thirty stories from the work package 6 (WP6) Science Clusters and RDA calls.



The screenshot shows the redesigned EOSC Marketplace landing page. At the top, there is a navigation bar with links: 'About EOSC', 'Browse Marketplace', 'Providers Hub', 'Monitoring', 'Status', 'Contact Us', and 'Login'. Below this is a secondary navigation bar with 'Get inspired', 'Funding', 'News and events', and 'Browse EOSC policies'. The main header features the 'EUROPEAN OPEN SCIENCE CLOUD' logo and the text: 'Your unified access to the European hub of research data, tools and services for innovation and education'. A search bar with the placeholder 'Browse EOSC Portal' is present. Below the search bar, two statistics are displayed: '3m+ Assets in Marketplace' and '300+ Content Providers'. A tabbed interface shows 'Researchers', 'Providers', and 'Business'. Under 'Researchers', it lists 'Researchers including scientifics, students, lecturers, teachers and citizen scientists'. The 'Explore and Contribute' section includes links for 'Discover Research Outputs', 'Publish Research Outputs', and 'Find Funding Opportunities'. The 'Tools' section includes links for 'Access Computing and Storage Resource', 'Process and Analyse', and 'Access Training Materials'. A 'More' section on the right lists 'Research Data Management', 'Research Infrastructures', 'Instruments & Equipments', and 'Bundles'. At the bottom, a large section titled 'The European Open Science Cloud' describes it as a 'Federated and open multi-disciplinary environment' providing services for 1.8 million researchers and 70 million professionals. It lists statistics: '3m+ Assets in Marketplace', '300+ Content Providers', '340k+ Softwares', and '200k+ Research Data'.

Figure 4.2: Redesigned EOSC Marketplace landing page

EOSC Portal

EOSC Portal – A gateway to information and resources in EOSC

The latest news, success stories, updates on community and events.

EOSC in Practice Story #11

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



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

This story derives from a market need identified by the service provider. There are thousands of applications in the natural sciences field who were asking for an automated plant identification system within their own applications.

[Read More →](#)

EOSC in Practice Story #7

Enabling the maximal re-use of data while ensuring IPR compliance.



Enabling the maximal re-use of data while ensuring IPR compliance.

Based on NI4OS-Europe's research, legal uncertainty about usage rights and high costs in clearance of licensing issues are very often a matter of concern when it comes to newly produced content but mostly the creation of derivative works.

[Read More →](#)

EOSC in Practice Story #8

Developing an interoperable central hub for Social Sciences and Humanities resources.



Developing an interoperable central hub for Social Sciences and Humanities resources.

The Social Sciences and Humanities communities needed a central point to gather and exchange information about their tools, services, and datasets.

[Read More →](#)

EOSC in Practice

Stories from users and service providers will inspire the further uptake of EOSC tools and services.

[Discover more](#) [Get featured](#)

Figure 4.3: Redesigned EOSC Portal landing page (upper)

Recent News

[Read All →](#)



Monitoring the European Open Science Cloud (EOSC)

The EOSC Observatory is a policy intelligence tool being developed by the EOSC Future project for monitoring policies, practices, and impacts related to the European Open Science Cloud (EOSC). It will support the EOSC community in tracking the implementation of EOSC and the policy makers in developing actionable policies.

Introducing the EOSC Observatory

The EOSC Observatory is a policy intelligence tool for monitoring policies, practices, and impacts related to EOSC and Open Science at national and institutional levels in Europe. The Observatory is being developed by OpenAIRE and Technopolis Group in the EOSC Future project, which is also building the foundations of EOSC with the EOSC Platform.



Research Data Alliance 20th Plenary Meeting
Celebrating 10 years of the RDA
A Decade of Data

GOTHENBURG, SWEDEN
21-23 March 2022

Developing an interoperable central hub for Social Sciences and Humanities resources.

The Social Sciences and Humanities communities needed a central point to gather and exchange information about their tools, services, and datasets. Although plenty of project websites, service registries, and data repositories existed, they were mostly fragmented.



A/EOSC Future Call for Interoperability Framework

Deadline: 13 DECEMBER 2022

EOSC Future Call for Interoperability Framework Contributions

The EOSC Future project and the Research Data Alliance (RDA) are pleased to announce a call seeking European consortia or interdisciplinary groups to test out, and demonstrate the value of, the new EOSC Interoperability Framework.

Figure 4.4: Redesigned EOSC Portal landing page (lower)



Figure 4.5: Before: Marketplace navigation by category

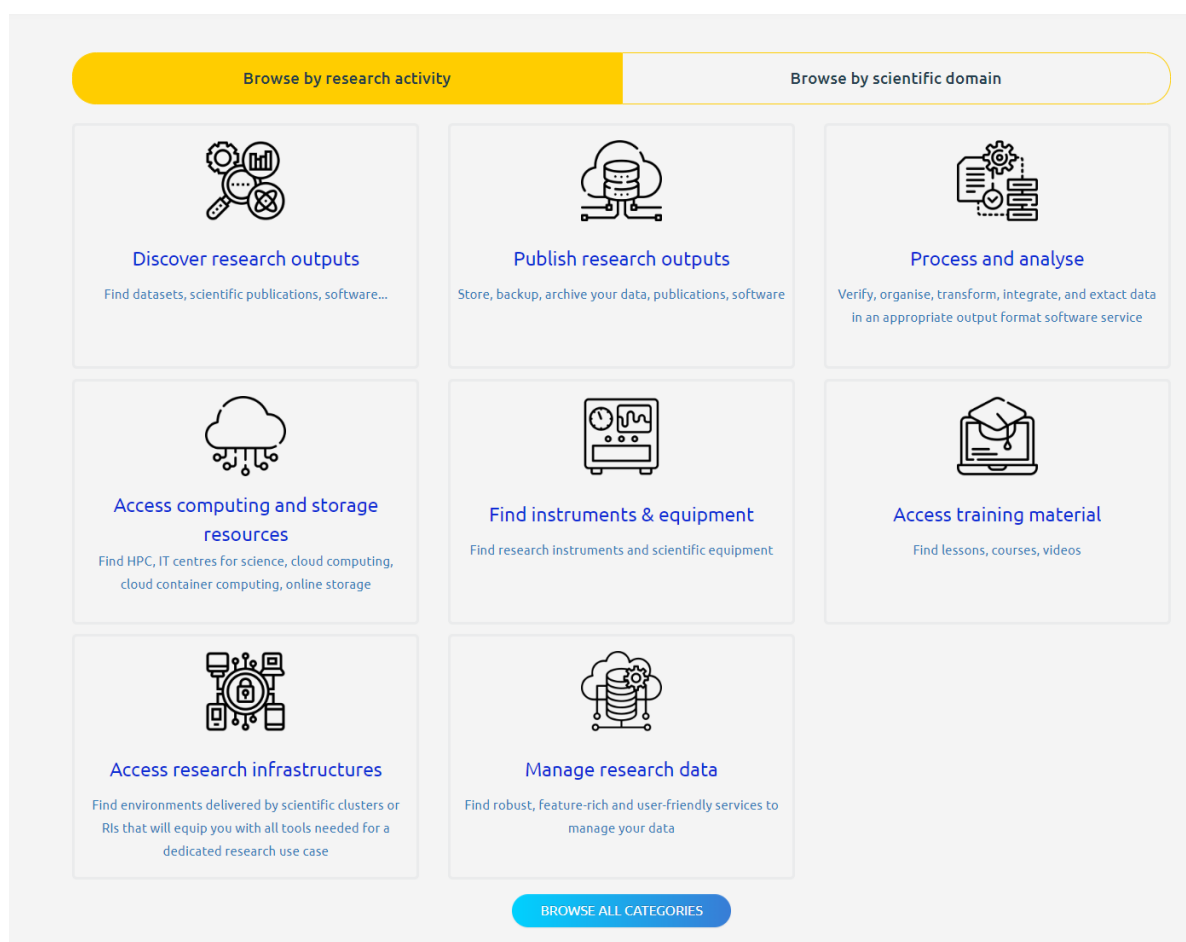


Figure 4.6: After: Marketplace navigation by research activity

Table 4-1: Portal CMS technical feature summary

Component Name	EOSC Portal website
Main features	• Main Front-Office entry point • EOSC related news and events • Information about EOSC Projects and the EOSC Association • EOSC Glossary • Information about relevant policies • Research activity categorization (new) • Community use cases & EOSC in practice stories (new) • Providers Hub (new) • Public documentation space
URLs	Website: https://eosc-portal.eu/ About: https://eosc-portal.eu/about-eosc-portal
Documentation	Drupal documentation: https://www.drupal.org/documentation ; Common navigation/login components: https://github.com/cyfronet-fid/eosc-portal-common
API types and use-cases	No API
EOSC-Future components interacting with this component	Integrated navigation for the front-end layer of Catalogue and Marketplace, User Panel, EOSC KH, Open Science Monitor and the Open Science Helpdesk

4.2.2 EOSC Marketplace

The EOSC Marketplace is an integrated platform that allows easy access to resources from many European providers for various research domains along with integrated data analytics tools.

With the use of the Marketplace, it is possible to operate a scalable and well-managed EOSC resources-oriented ecosystem with a growing service portfolio and with a transparent governance model. From the researcher's point of view, the key benefits include the ability to:

- Discover and compare multiple research products, services and training materials - such as scientific outputs, applications, data management services, compute services and thematic services;
- Order EOSC services;
- Organise services of interest and services orders into logical blocks in Marketplace Projects, to reflect a common scientific purpose and gain EOSC expert support for the created project;
- Access services using a common authentication/authorisation process;
- Pick up on best practices and practical examples featuring research communities benefitting the most from EOSC;
- Provide feedback about services and information to contribute to building the EOSC service portfolio.

The most crucial change is the evolution of the EOSC Marketplace so now it is a merger of 3, used-to-be-separate, tools:

- EOSC Service Marketplace
- EOSC Explore
- And the EOSC Search Service.

Thanks to the integration and development of new features, users can reach a single, consistent catalogue of research products, services and training materials without the need to switch between different webpages. From now on, the user can refer to EOSC Marketplace as to a single discovery experience, including a dedicated landing page that allows for easy access to the EOSC resources and a refreshed user interface that is adapted to the current expectations of users (see Figure 4.7).

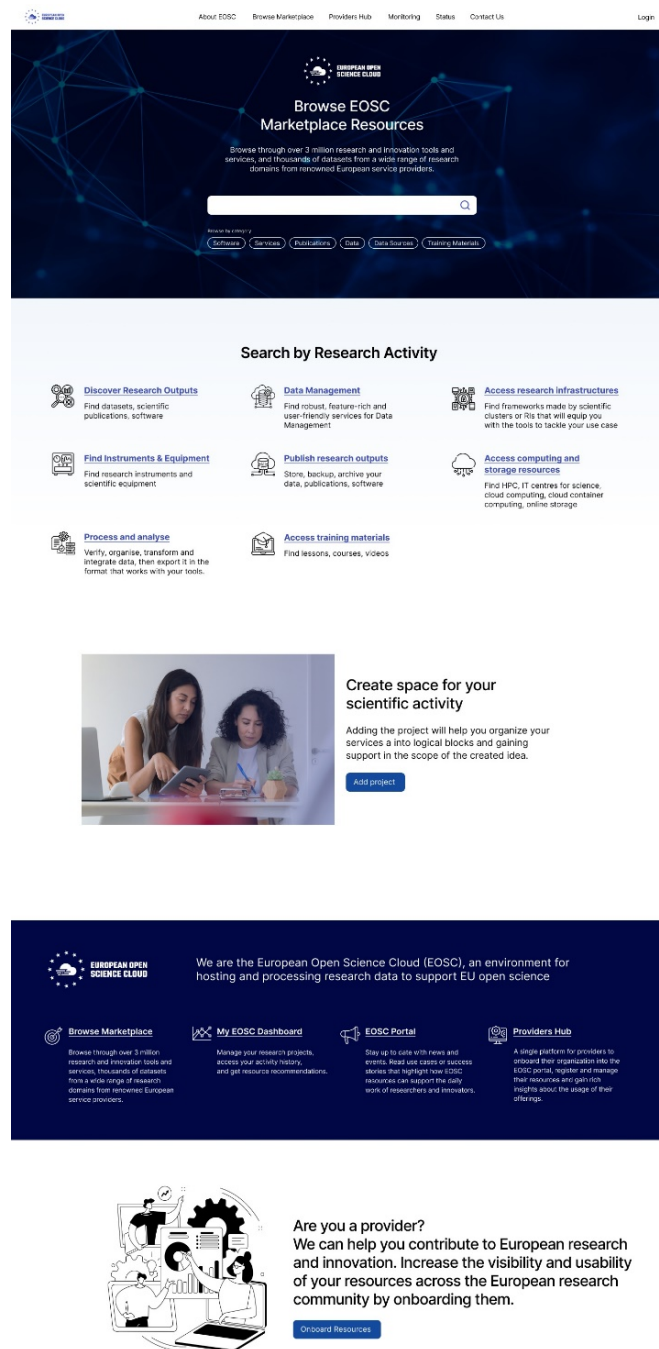


Figure 4.7: Redesigned Marketplace landing page

New EOSC Marketplace offers one, single (enhanced) search mechanism that lists all of the available EOSC resources. It redirects to the entries of services, research products, training etc. so more data can be discovered. Data like interconnections of the resources (based on the data from OpenAIRE Research Graph), data on interoperability, monitoring, accounting and other, depending on the nature of the resource.

Integration between the three components makes the user journey more intuitive and complete - all research products (publications, software, datasets, data sources, training materials) are accessible in one catalogue. The new designs, e.g. of the Search User Interface (see Figure 4.8), has been aligned so in the end, EOSC Marketplace creates a complex but uniform environment.

The designs that still need to be updated are the detailed entries of services and research products which are already undergoing.

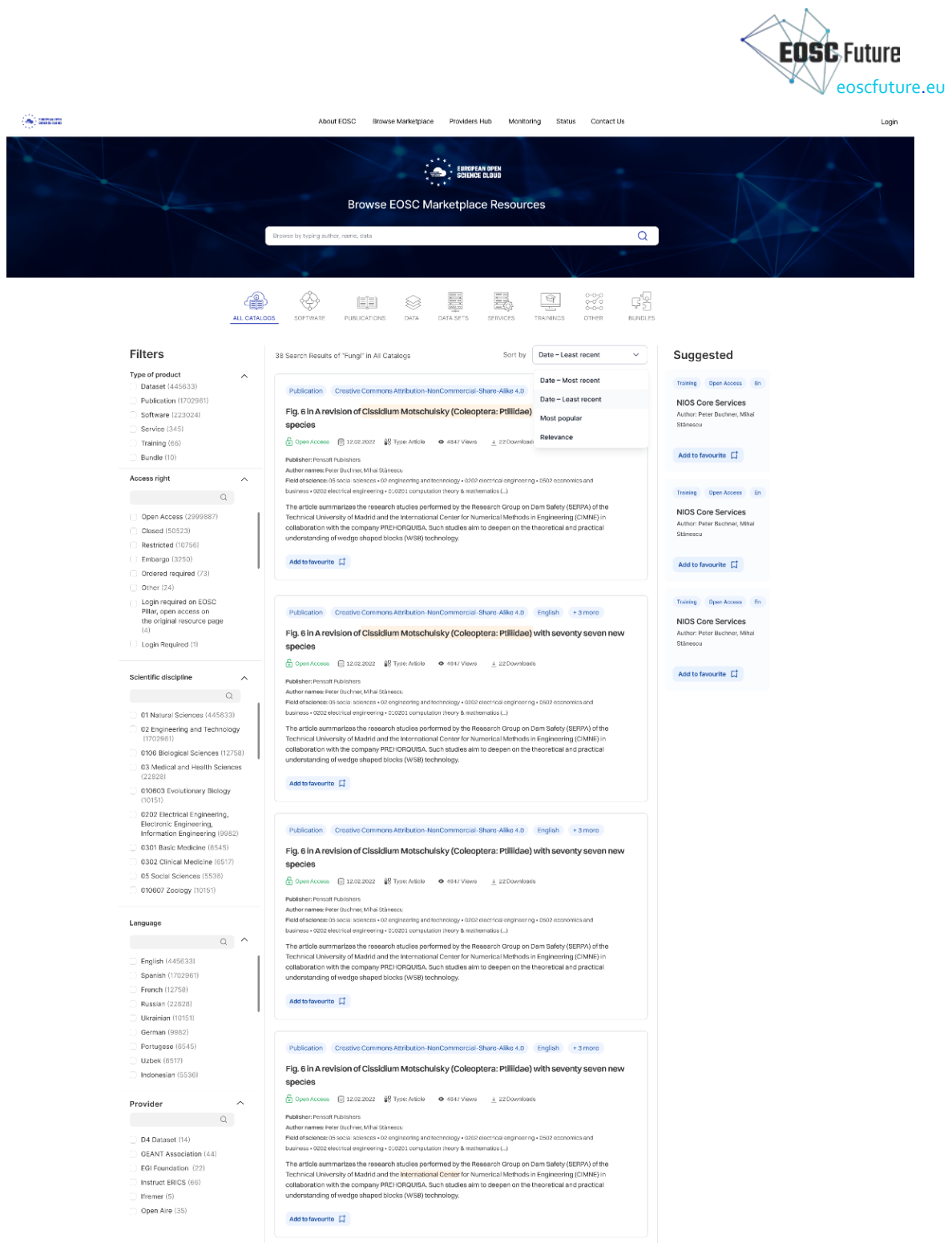


Figure 4.8: User interface for the Marketplace's search capabilities

The Marketplace architecture is shown in Figure 4.9.

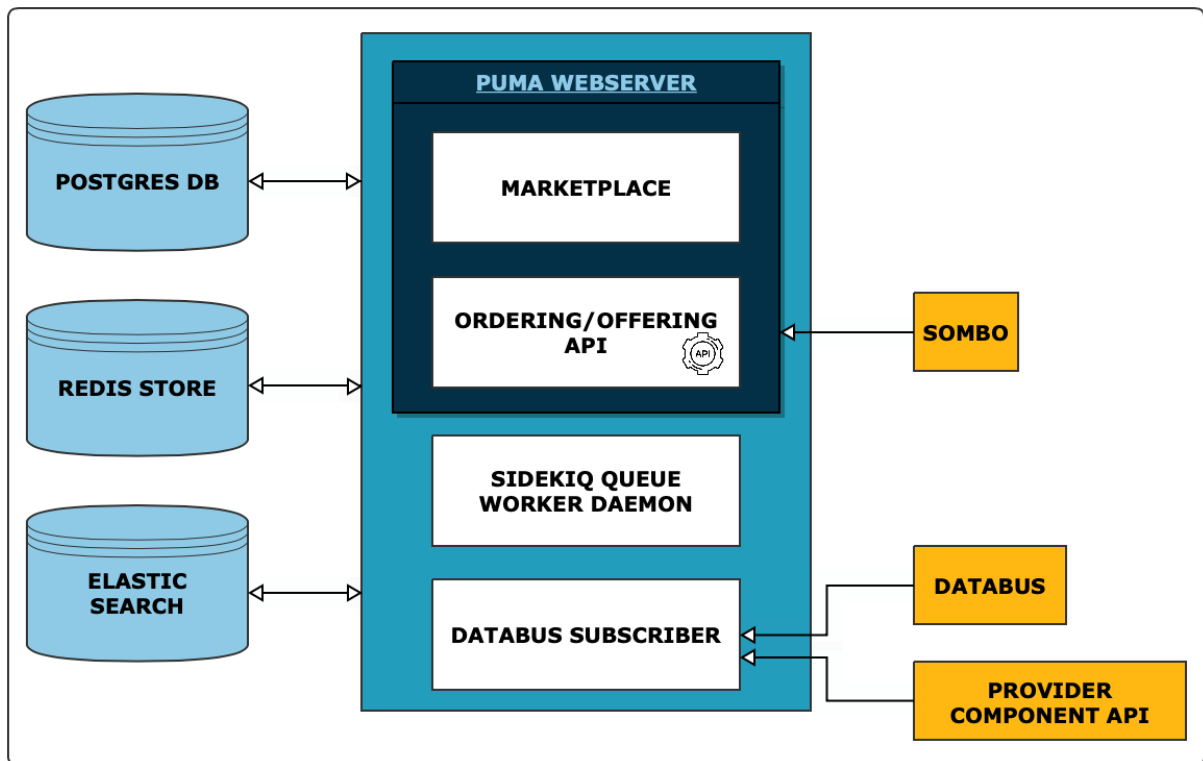


Figure 4.9: Marketplace architecture

When it comes to the search engine itself, the search process has been enhanced and improved: Searching by author, highlighting the search phrase in the results, and improved relevance of results to search phrases have been added. Additionally, search results are supplemented by AI-based recommendations based on the user preferences and history. The search service architecture is shown in Figure 4.10.

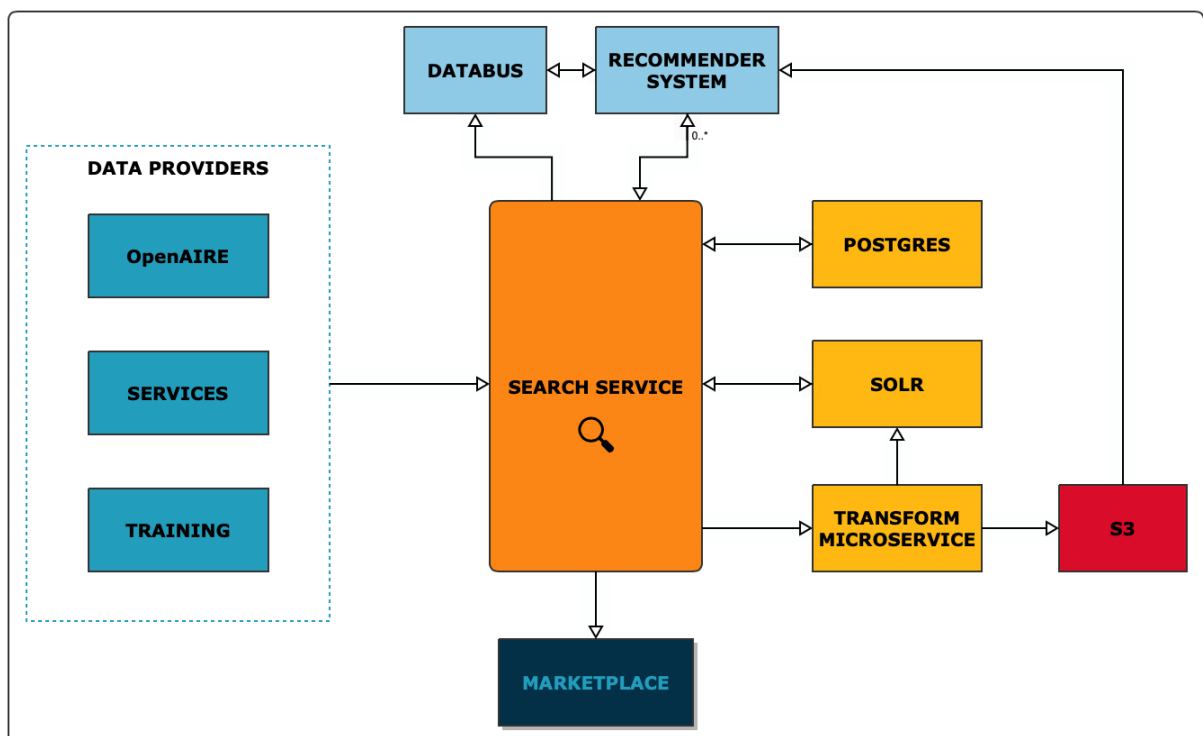


Figure 4.10: Search Service architecture

The features of the Marketplace are described in Table 4-2.

Table 4-2: Marketplace technical feature summary

Component Name	EOSC Marketplace
Main features	• Discovery of all kinds of EOSC resources with supporting filtering capabilities • Detailed views of EOSC Resources adjusted to the type of resource • Sorting capabilities • Comparison function for EOSC services (based on EOSC service profile) • Availability of the Monitoring data for EOSC services • Availability of the Accounting data for EOSC research products • Relations between research products allowing to track their evolution • Relations between research products and services allowing to track tools used for production of data • Relations between Data Sources (a specific type of EOSC Service) and underpinned Research Products • User-centric recommendations of all kinds of EOSC resources for logged and unlogged users • Discovery of European Scientific Communities • Discovery of EOSC Providers • Management of EOSC user profile • Access mechanism to EOSC resources adjusted to their access policies • Dedicated Marketplace Projects panel supporting the definition of a scientific purpose to utilise EOSC resources • Inclusion of EOSC Order management process - Possibility to order one or more resource of interest - Direct contact to the Resource Provider - Updates on the order status - API enabling handling the EOSC tickets in provider's on-site Order Management System • Favourites functionality • Contact with a provider of a given service • Possibility to submit a HD ticket • Possibility to submit feedback for the MP functionalities
URLs	Service URL: https://marketplace.eosc-portal.eu Source code repository: https://github.com/cyfronet-fid/marketplace API endpoint: https://marketplace.eosc-portal.eu/api
Documentation	Introduction: https://eosc-portal.eu/using-the-portal Tutorial video: https://www.youtube.com/watch?v=T2G7oyZ52Kc API documentation: https://marketplace.eosc-portal.eu/api_docs
API types and use-cases	Offering API • Allows providers to publish information about the services'/resources' offers via a dedicated API. No need to use user interface for onboarding, bulk onboarding possible. • Allows to create/update/delete the offers • Allows to manage the technical parameters of the offers which are essential for the order management process

	Ordering API • Allows to retrieve information about the customer orders • Order status handling • Channel for the user support (user/provider/OMS team messages exchange) • Passing user details (credentials, SLAs etc) • Passing MP project details (information about the scientific use case the customer is bringing)
EOSC-Future components interacting with this component	EOSC Recommender System OpenAIRE Research Graph

4.2.3 User Dashboard

The EOSC portal user dashboard is a completely new component that an authenticated individual can use to control and customize their user experience. The user defines the data they wish to see in a pre-set layout. The overall pattern for the dashboard's implementation is to provide at-a-glance access to information relevant to the user, to offer data about the current status of EOSC resources, to create projects with multiple users, to control the recommendations given to the user, to show news, urgent information and alerts, and to provide navigation capabilities, profile information and quick links to favourite resources and notifications. Recommendations presented in the dashboard are personalized for the user, based on information about them extracted by AI-supported Recommender System (discussed in Section 4.2.4). The architecture is shown in Figure 4.11 and the detailed features are presented in Table 4-3.

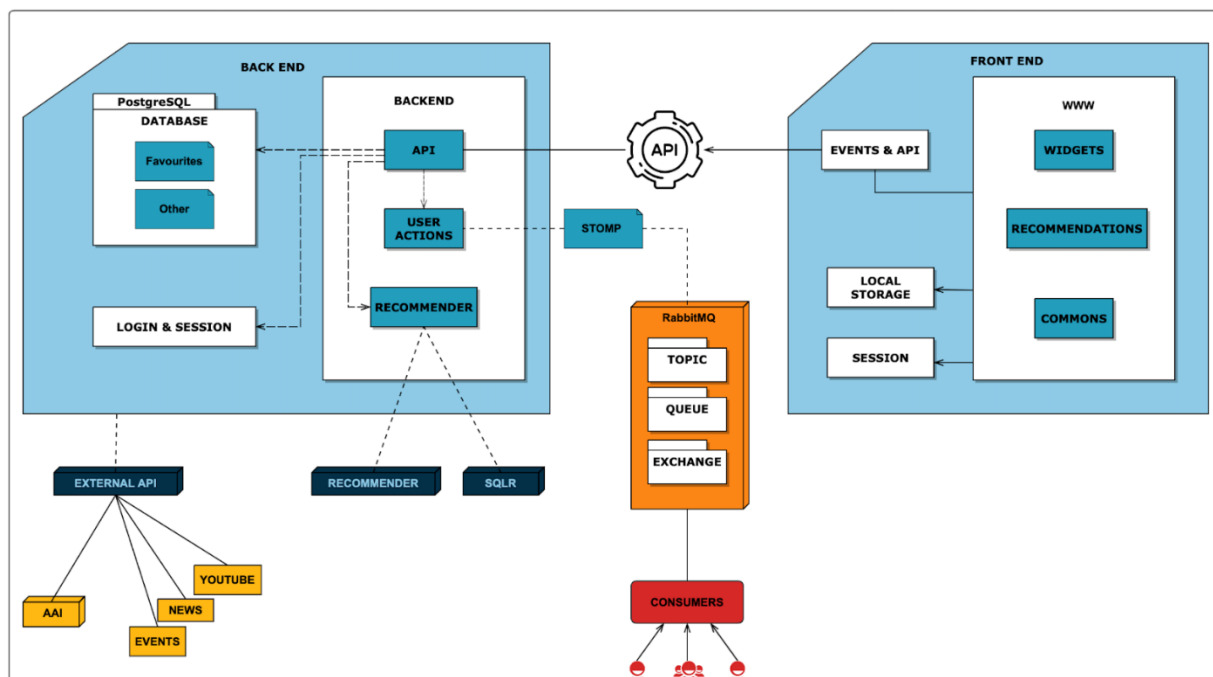


Figure 4.11: User Dashboard architecture

Table 4-3: User Dashboard components

Component Name	User Dashboard
Main features	• A personalized environment for users is facilitated by an AI-based recommender system, enabling seamless navigation of the EOSC Catalogue and facilitating access to other valuable resources. • Visual display of user's personal customized space. Each user can define and design his own scientific profile and - based on it - receive resources tailored to their needs.

	It consists of two components: • User Dashboard landing page – designed especially for unauthenticated users to provide information about the Dashboard itself. This is a starting point to sign-in to one's personalized dashboard (which provides recommendations based on the user's actions). Depending on the banner selected, the user can be redirected, e.g. to the research product catalogue (Marketplace). UD landing page is also the place from which the user can move to the website for providers, available communities' websites and to the EOSC portal. Personalized User Dashboard - available only for authenticated users. This dashboard site provides a space for users to find many useful widgets. Current development includes: • User Profile widget - with basic information about the user. • Recommended resources (services, software, publications, data, trainings and other) • Community widgets - with a brief description and the possibility to redirect to each community website. • Statistics widget - providing latest information of EOSC in numbers. • Upcoming events widget- providing information of the EOSC-related events all over the world. • Videos - YouTube videos about EOSC issues. • EOSC in Social Media widget - latest tweets from EOSC Portal account (Twitter). • PROJECT space where the user can collect all the data and resources needed for a specific scientific project.
URLs	Service URL (test instance): https://eosc-user-dashboard.docker-fid.grid.cyf-kr.edu.pl/main Source code repository: https://github.com/cyfronet-fid/eosc-user-dashboard
Documentation	https://wiki.eoscfuture.eu/display/EOSCF/User+Dashboard
API types and use-cases	User Preferences API • Favourites • Channel for keeping information about user preferences
EOSC-Future components interacting with this component	EOSC Marketplace

4.2.4 EOSC Recommender System

The AI-driven Recommender System (RS) is a novel component in the EOSC Portal. It replaces the previous recommender system, which was limited to the EOSC Marketplace. It provides EOSC users with recommendations concerning the items (resources, services, training material, datasets, and publications and other research products) that could be of interest, based on multi-focal model that the system has about the user. RS improves the user experience (UX) by guiding the users and supporting them in suggesting items they would likely use, which will result in more comfortable and intuitive access to EOSC resources. Support for providers is currently in development.

The technical specification of the Recommender System is given in Table 4-4.

Table 4-4: Recommender System technical specification

Component Name	Recommender System for EOSC Marketplace
Main features	- Artificial Intelligence (AI) framework that integrates machine learning libraries, AI models, and APIs for the Front-Office - Provides recommendations for Consumers (researchers). Recommendations for Providers are in development - Recommendations are presented in two UI components: User Dashboard (UD) and Search Service (SS). - Recommendations are personalized (adjusted to specific users, their profiles and behaviour in EOSC Portal) or based on general popularity among users - They are mostly based on the analysis of user actions made in the EOSC Portal (visited, viewed and used in the past). The data will also include information about the user preferences or be based on the resources that were viewed by similar users. - Three operational modes of RS components: Online, providing immediate recommendations on user request. They are least accurate due to time limitations, but provide a quick, dynamic response. Nearline, which are also dynamic, but the data processed by them could be saved internally for later and used in the future by other components. It is primarily used for processing events representing user actions. Offline, for which results are most accurate, as they are generated in background and presented to the user at a later time. It is used for processing new volumes of data added to EOSC. RS is capable of incorporating new recommendation engines in the future. There is an evaluation mechanism to collect feedback, and to measure the impact of AI-enhanced services and user satisfaction with them, to align recommendations with the feedback.
URLs	Services: https://search.eosc-portal.eu (Search Service) https://my.eosc-portal.eu/ (User Dashboard) Source code repositories: https://github.com/cyfronet-fid/recommender-system (EOSC Marketplace) https://git.man.poznan.pl/stash/projects/EOSC-RS (Search Service and User Dashboard) https://github.com/athenarc/EOSCF-ContentBasedRS
Documentation	https://wiki.eoscfuture.eu/display/EOSCF/T5.4+Recommender+system+-+Functional+and+Technical+specification
API types and use-cases	https://wiki.eoscfuture.eu/display/EOSCF/RS+facade https://wiki.eoscfuture.eu/display/EOSCF/Use+cases+map
EOSC-Future components interacting with this component	EOSC Marketplace EOSC Research Graph (based on the OAG) Other Front-Office components (User Dashboard, Search Service, Provider Hub)

4.2.5 Recommender Metrics Framework

The Recommender Metrics Framework (RMF) is an independent service that supports the evaluation and adaptation of recommendation mechanisms. Using RMF to measure the success of the EOSC Recommender

System is crucial to get valuable insights in many aspects that affect the user experience. The use of additional diagnostic metrics and visualizations offers deeper insights into a model's performance. The evaluation is quantitatively being performed by processing information such as resources, user actions, ratings, and recommendations to measure the impact of the AI-enhanced services and user satisfaction as well as to incorporate this feedback and to improve the services provided, via a user-friendly API and dashboard UI. The architecture is shown in Figure 4.12 and the components are described in Table 4-4.

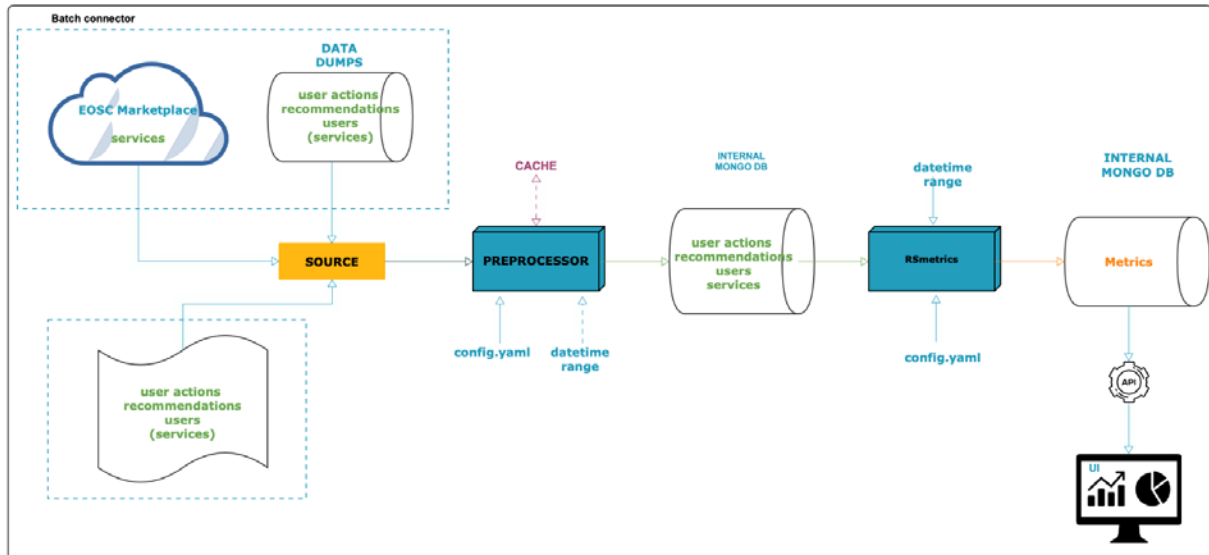


Figure 4.12: Recommender Metrics Framework architecture

Table 4-5: Recommender metrics framework

Component Name	Recommender metrics framework (RSmetrics)
Main features	It consists of the following independent components: Pre-processor performs: - data retrieval through a connector module that gathers and transforms data from various sources - service-associated knowledge correlations - dummy or dissociated data removal - tagging of various associations in the data - generation of statistics information RSmetrics is responsible for processing the data, computing the metrics and producing the necessary information in a homogenized manner. There is a REST API and a rich UI/dashboard. It supports date ranges, multiple resources and recommendation systems. It currently delivers the following metrics: - Catalogue Coverage - Diversity Gini Index - Diversity Shannon Entropy - Novelty - User Coverage - Accuracy - List of KPIs indicating measurable values that demonstrate how effectively key business objectives are achieved. It also delivers the following KPI measures: - Click-Through Rate

	• Hit Rate • Top 5 ordered Services • Top 5 recommended Services • Top 5 categories for recommendations • Top 5 categories for orders • Top 5 domains for orders • Top 5 domains for recommendations In the graphs section it exposes information graphs concerning attributes defined in the RS and monthly user actions and recommendations.
URLs	https://rseval.eosc.grnet.gr/
Documentation	Source code: https://github.com/ARGOeu/eosc-recommender-metrics API: https://argoeu.github.io/eosc-recommender-metrics/openapi/explore Documentation: https://argoeu.github.io/eosc-recommender-metrics/
API types and use-cases	https://argoeu.github.io/eosc-recommender-metrics/openapi/explore
EOSC-Future components interacting with this component	EOSC Marketplace Recommender System for EOSC Marketplace

4.2.6 Knowledge Hub

The Knowledge Hub (KH) is the gateway to all the highly curated training/learning/skills resources in the EOSC Portal. It is dedicated to fostering knowledge sharing within peer groups. The main target audience consists of researchers, service providers, policy makers, funders, librarians, IT departments, data stewards, trainers etc.

The KH contains the Training Catalogue, the Learning Platform and a dedicated helpdesk. The components are described in Table 4-6 and the design of the landing page for the Knowledge Hub is available in the [Knowledge Hub Figma](#).

Table 4-6: Knowledge Hub components

Component Name	Knowledge Hub
Main features	The training catalogue • offer discovery of EOSC-related training resources available in the EOSC learning platform as well as in other connected catalogues The learning platform (OpenPlato) • e-learning platform (based on Moodle) to create and publish EOSC-related? training resources Helpdesk • Provides assistance in redirecting tickets • Serves as a point of contact to forward initial requests to the training provider's mailing list.
URLs	https://knowledge-hub.docker-fid.grid.cyf-kr.edu.pl/
Documentation	https://eoscfuture.eu/ker/eosc-knowledge-hub/
API types and use-cases	None
EOSC-Future components interacting with this component	None directly, as they can interact instead with the training catalogue or learning platform.

4.2.7 Training catalogue

The EOSC Training Catalogue is a central catalogue of available training sources integrated as a single-access point to learning sources of different providers regarding all thigs EOSC. The catalogue can be enriched via the Provider Portal to advertise available training materials. Where appropriate, the catalogue will be linked to the EOSC learning platform.

The Training Catalogue has been developed and incorporated in the EOSC Marketplace and its components are described in Table 4-7.

Table 4-7: Training Catalogue components

Component Name	Training Catalogue
Main features	Single-point of discovery and access to EOSC-related learning materials. Filters: access right, resource type, content type, language, organization providing the module, level of expertise, target group, qualification, version date Keyword search capability
URLs	https://search.eosc-portal.eu/search/training?q=*
Documentation	https://wiki.eoscfuture.eu/display/EOSCF/Training+catalogue+definition
API types and use-cases	None
EOSC-Future components interacting with this component	The helpdesk core service can be used by individual onboarded trainings. EOSC Helpdesk, EOSC Learning platform, EOSC AAI

4.2.8 Learning platform

The Learning platform used by the Knowledge Hub is OpenPlato, which is accessible via links from the Knowledge Hub. OpenPlato is a newly deployed external free-to-use open-source platform based on Moodle [6] which is expected to become the EOSC-related learning platform. As an integral part of the Knowledge Hub, the Learning Platform will provide users with access to highly interactive training resources. The Learning Platform provides online training courses (for example <https://openplato.eu/blocks/catalog/detail.php?id=3> which provides access to an externally produced training course), thus making the most of the original training and ensuring the content is widely available and reusable.

This implementation is aimed at three groups: researcher communities, training providers, and system administrators.

Researchers use the learning platform to find and access training materials. System administrators have access to usage statistics and can manage user groups, notifications, and all functions of the platform, such as feedback, the dashboard, and interaction with the recommender system. The Learning Platform has adopted the minimal metadata standards from the RDA Education and Training on Handling of Research Data (ETHRD) interest group [7], which will help increase the FAIRness of the learning content and their sustainability. Its components are described in Table 4-8.

Table 4-8: Learning Platform components

Component Name	Learning Platform
Main features	• Learning management system: A trusted platform by which training can be delivered both synchronously and asynchronously. E-learning is facilitated through building activities and modules, and which can also include content that has been created through external authoring tools that can generate SCORM packages. • Learning paths: Resources from the catalogue can be used to mix and match where necessary to create learning paths, guiding learners on a journey to, say, a particular learning objective. • Catalogue: Public and private resources populate a catalogue which will act as a “repository” of learning, and which will be subject to minimum metadata specifications and adherence to a standard so that their long-term value will be increased. • Virtual classrooms: OpenAIRE has integrated Zoom into OpenPlato, currently with 20 licences and each capable of accommodating 300 participants, so that virtual classes can be conducted, offering a platform for teachers and learners to interact.
URLs	https://openplato.eu/

	https://learning.eosc-portal.eu
Documentation	https://openplato.eu/mod/page/view.php?id=280
API types and use-cases	None
EOSC-Future components interacting with this component	EOSC Helpdesk, EOSC training catalogue, EOSC AAI

4.2.9 EOSC Observatory

The EOSC Observatory was launched at the EOSC Symposium 2022, in November. The EOSC Observatory is a policy intelligence tool with the aim of monitoring policies, practices, and impacts related to Open Science and the European Open Science Cloud (EOSC). The observatory essentially tracks the EOSC readiness of Member States and Associated Countries (MS/AC) including their contributions, investments, and implementation of EOSC. The observatory consists of a back-end for running surveys and analysing responses as well as a front-end for visualising and exploiting collected data. The observatory is online and presents the data from the EOSC Steering Board (EOSC-SB) survey on National Contributions to EOSC 2021. Data will be collected every year through annual surveys which will allow longitudinal tracking on the progress of implementing EOSC in Europe. Another section of the EOSC Observatory is completed by the National Open Access Desk (NOAD)s in the upcoming 'EOSC Observatory Country Pages', which provide the updated state-of-play, key statistics, and relevant contacts and links for EOSC in each country. Its components are described in Table 4-9.

Table 4-9: EOSC Observatory components

Component Name	EOSC Observatory
Main features	For end users: - In the back end: - Collect data from key stakeholders (namely the EOSC Steering Board) on EOSC - Country pages (country fiches) to present individual indicators per country (in development) - In the front-end: - Present collected data in an interactive and public dashboard - Monitor the implementation and progress of EOSC in Europe via surveys and narrative reports - Publish data on National Contributions to EOSC starting from 2021
URLs	https://eoscobservatory.eosc-portal.eu/home
Documentation	https://eoscobservatory.eosc-portal.eu/
API types and use-cases	None
EOSC-Future components interacting with this component	As a consumer: - EOSC Research Graph (OpenAIRE Graph) to get data for all offered indicators. - Open Science Observatory to retrieve selected indicators to prefill some of the data for the EOSC Steering Board Survey and to present in the EOSC Country fiches

4.2.10 Open Science Observatory

The Open Science Observatory is a tool collecting data from the OpenAIRE/EOSC graph and external data sources to provide statistics for evidence-based policymaking with the aim to better understand the European Open Science landscape. This tool shows indicators on Open Science (adherence of metadata to OpenAIRE

guidelines and FAIR principles and openness metrics, such as information on access rights and open access routes), tracking the open access research outputs (production and contribution of publications, data, software, and other research products), and upcoming composite indicators (Country level openness, findability, FAIRness score, and country contributions to sustainable development goals).

Table 4-10: Open Science Observatory components

Component Name	Open Science Observatory
Main features	• Collect data from key stakeholders and data sources on EOSC via the OpenAIRE Graph. • Show indicators and metrics on Open Science. These include: – Infrastructure supporting Open Science, e.g., repositories, OA Journals, etc. and their validation in OpenAIRE/EOSC. – Uptake of Open Science, e.g., OA to publications and different flavours, Open/FAIR data, open software. – Collaborations and interdisciplinarity (pending). • Use in national monitoring systems, also, currently being updated to include additional facets for EOSC services (as registered in the EOSC Portal).
URLs	https://osobservatory.openaire.eu
Documentation	https://osobservatory.openaire.eu/methodology
API types and use-cases	Same API as the OpenAIRE Graph
EOSC-Future components interacting with this component	As a consumer: • OpenAIRE Graph to get data for all offered indicators. As a producer: • EOSC Observatory Country Pages will have a link pointing to the respective Open Science Observatory Country Pages • Retrieval of some selected indicators to prefill some of the data for the EOSC Steering Board Survey

5. Conclusions

This deliverable has presented the technical evolution and consolidation of the EOSC Platform Front-Office since its previous incarnation. These enhancements are based on co-creation with the user community via workshops and will be subjected to further scrutiny by that community via more workshops, leading to additional feedback and future improvements.

Some components have recently been released and are available for use, whilst other are close to being ready for release.

Further improvements to the Front-Office are expected within the lifetime of the project:

- Make the User Profile more extensive and enriched with new functions to be more attractive and useful for users. It is intended to be a single point where users can express their interests and preferences in order to tailor recommendations of services and research products that will better suit their needs.
- Extend the search functionality of the EOSC Marketplace by adding advanced search features that will help retrieve more specific search results.
- Improve the handling of projects in the EOSC Marketplace by consulting with users to better understand their requirements. At present, the roadmap includes providing the ability to add research products and training to projects, the option to share projects with others, and improving the visibility of the parameters of the service offers in the projects. However, it will be shaped by the consultations with the end users.

- The next objective is to complete the Knowledge Hub landing page that integrates the EOSC training catalogue and the Learning Platform. This landing page will provide users with a fully functional and user-friendly interface to access the EOSC training resources. Furthermore, the Knowledge Hub helpdesk will be made directly accessible from selected training resources, allowing users to request assistance with training-related issues.

There are also some recommendations for further enhancements to components that could be carried out after the completion of the project. The EOSC Future project has developed, together with the EOSC Steering Board, a new 'Monitoring Framework for National Contributions to EOSC' [8]. This monitoring framework should be used to structure the future annual surveys and present the data on National Contributions to EOSC. New country pages need to be developed in the Observatory for every Member State and Associated Country in the EOSC Steering Board. These country pages would provide an updated narrative and contact points for each country on EOSC and Open Science. In addition, they would present validated data, relevant statistics, and use cases from the annual surveys on National Contributions to EOSC and other external data sources, including the novel indicators that will be developed in the Open Science Observatory.

The Recommender System is another component with a significant potential for development and enhancement. In the future, recommendations could serve Providers who want to offer their services to users via the EOSC Portal. Providers need different recommendations than researchers, which will require changes to the RS to embrace that. Future plans may also include identification and addition of new sources of data that could be used for profiling users to provide more customised and aligned recommendations.

Summarizing, a lot has been achieved since the previous version of this deliverable was published and more functionality will be added to the Front-Office components before the end of the project.

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