EOSC Future

D2.5b

Inventory of Core Functions and Inclusion Criteria

The EOSC Future project is co-funded by the European Union Horizon Programme call INFRAEOSC-03-2020, Grant Agreement number 101017536

Version 1.0
May 2023

D2.5b / Inventory of Core Functions and Inclusion Criteria

Lead by **EGI.eu**
Authored by Montserrat Gonzalez (EGI.eu), Mark van de Sanden (SURF), and Gareth O'Neill (TGB).
Reviewed by Diego Scardaci (EGI.eu), Klaas Wierenga (GÉANT) and Athanasia Spiliotopoulou (JNP)

Dissemination Level of the Document

Public

Abstract

EOSC Future uses a model of EOSC based on the Minimum Viable EOSC view that was established by the former EOSC Executive Board Working Groups and updated through subsequent discussions with the European Commission. This report defines the key capabilities needed to operate and sustain EOSC. EOSC Future populates one of these elements, the EOSC-Exchange, which is a set of federated services and other resources registered into the EOSC by research infrastructures and science clusters to serve the needs of research communities and expand its offering to the public and private sectors. The EOSC-Exchange is populated by soliciting submissions from EOSC providers and onboarding them and their resources into a registry exposed through the EOSC Catalogue and Marketplace. This onboarding is developed according to a set of EOSC-Exchange inclusion criteria that are based on an analysis of the EOSC Rules of Participation, which are expected to evolve.

Version History

Version	Date	Authors/Contributors	Description
V0.1	18/4/2023	Montserrat Gonzalez (EGI.eu), Mark van de Sanden (SURF)	Initiation – Proposed ToC – First draft
V0.2	19/4/2023	Montserrat Gonzalez (EGI.eu)	Abstract, Sections 1, 2, 4, 7
V0.3	20/4/2023	Montserrat Gonzalez (EGI.eu), Catalin Condurache (EGI.eu), Andreas Czerniak (OpenAIRE), Anke Friedrich (GEANT)	Updated section 4
V0.4	21/4/2023	Montserrat Gonzalez (EGI.eu)	Rewrite section 4
V0.5	27/04/2023	S. Venkataraman, Iryna Kuchma	Additions to 4.3.6
V0.6	26/05/2023	Montserrat Gonzalez (EGI.eu), Mark van de Sanden (SURF), Gareth O'Neill (TGB)	Final draft reviewed internally
V1.0	31/05/2023	Montserrat Gonzalez (EGI.eu), Mark van de Sanden (SURF), Gareth O'Neill (TGB), Ron Dekker (TGB), Mike Chatzopoulos (ATHENA)	Final Version submitted to EC

Copyright Notice

Table of Contents

Table of Tables

Table of Figures

Glossary

EOSC Future project Glossary is incorporated by reference: https://wiki.eoscfuture.eu/x/JQCK

List of Abbreviations

Acronym	Definition
API	Application Programming Interface
CO	Catalogue Owner
EAWG	EOSC Architecture Working Group
EIF	EOSC Interoperability Framework
EOSC	European Open Science Cloud
EPOT	EOSC Portal Onboarding Team
ESWG	EOSC Sustainability Working Group
FQDN	Fully Qualified Domain Names
GA	General Assembly
HLE	Hosting Legal Entity
MVE	Minimum Viable/Valuable EOSC
RI	Research Infrastructure
RoP	Rules of Participation
SOB	Strategy and Oversight Board
TCB	Technical Coordination Board
TF RoP-CM	EOSC Association Task Force on Rules of Participation and Compliance Monitoring
TRL	Technology Readiness Level
WG-RoP	Working Group on Rules of Participation
WP	Work Package

1 Executive Summary

The model of the European Open Science Cloud (EOSC) has developed over time through multiple projects, including plans in EOSCpilot, implementation in EOSC-hub and EOSC Enhance, and work on regional and thematic EOSC science cluster projects. The *EOSC Architecture Working Group View on the Minimum Viable EOSC*[1], published in February 2021, described the first iteration of the EOSC-Core capabilities. EOSC Future builds on this vision and defines EOSC across four areas of activity:

- ***EOSC-Core*** is the set of internal services which allow EOSC to operate. It includes a core technical platform (i.e. *EOSC Platform*) and non-technical coordination functions (i.e. *EOSC Platform Coordination*) which operate and facilitate the technical platform, such as the onboarding and security coordination;
- ***EOSC-Exchange*** is the set of federation services and other resources, which are registered in EOSC by e-infrastructures, research infrastructures, and science clusters to serve the needs of research communities, and will widen its offering to the public and private sector;
- ***EOSC Interoperability Framework (EIF)*** provides a flexible framework of standards and guidelines to support the interoperability and composability of resources in the *EOSC-Core* and *EOSC-Exchange*. The EIF will act as the glue to connect services and research products (e.g. publications, datasets, and software) across resources and providers;
- ***EOSC Support activities*** sit alongside the *EOSC-Core* and *EOSC-Exchange,* and comprise the training, engagement, and other human-centric activities which make EOSC more attractive and easier to use, and help users benefit from it more easily once engaged.

EOSC Future defines a set of capabilities across all four areas which make EOSC effective and support the European Research Area. These capabilities are mapped to activities in the project, which will need some level of ongoing support from national and European authorities in the long term. These capabilities are also mapped to envisioned services to be procured in Lot 1 of the Procurement for Managed Services for the EOSC Platform by the European Commission.

A specific area of work is the onboarding of EOSC providers and their resources by soliciting information from community members. In addition, submissions will be evaluated according to the EOSC-Exchange inclusion criteria to determine their appropriateness for inclusion. The EOSC-Exchange inclusion criteria are based on an analysis of the EOSC Rules of Participation (RoP) and feedback from the EOSC Association Task Force on Rules of Participation and Compliance Monitoring (TF RoP-CM). A review of the inclusion criteria will be necessary in the future as the RoP evolve.

[1] https://op.europa.eu/s/uVYu

2 Introduction

The EAWG report *EOSC Architecture Working Group View on the Minimum Viable EOSC*[2], published in February 2021, described the first iteration of the EOSC-Core capabilities. EOSC Future deliverable D2.5a *Inventory of Core Functions and Inclusion Criteria*[3] next described the proposed platform capabilities to be included in the Minimum Viable EOSC (MVE). This deliverable is a follow up on D2.5a and describes the evolution in the EOSC Platform capabilities and inclusion criteria.

Activity A2.2.4. in Work Package (WP) 2 of EOSC Future has established two service portfolios, the first service portfolio contains the portfolio of the EOSC Platform services and the second service portfolio contains the portfolio of the supporting services.

To allow the onboarding of resource providers and their resources (e.g. services and research products) into the EOSC Catalogue and Marketplace: Resource Catalogue[4], a set of practical inclusion criteria was developed by EOSC-hub. The EOSC-Exchange inclusion criteria have been further developed by EOSC Future in 2022 and 2023 and recognise five types of resources to be onboarded, including **services**, **data sources**, **catalogues**, **research products**, **learning resources**, and **interoperability guidelines**. The EOSC Portal Onboarding Team (EPOT), operating in EOSC Future in task T6.1, has developed onboarding procedures based on these criteria and assesses their compliance.

One of the main objectives of the EOSC Future project is to *deliver and to operate the EOSC-Core* and to *expand the EOSC-Exchange with resources across disciplines*. The definition of the EOSC-Core capabilities and inclusion criteria are instrumental to achieve these objectives.

[2] https://op.europa.eu/s/uVYu

[3] https://eoscfuture.eu/wp-content/uploads/2022/12/EOSC-Future-WP2-EGI-D2.5a-Inventory-of-Core-Functions-and-Inclusion-Criteria-2021-12-03.pdf

[4] https://marketplace.eosc-portal.eu/

3 EOSC Capabilities

In deliverable D2.5a, the MVE, initial high-level architecture diagram, and mapping of the EOSC-Core components as identified in the EAWG report *EOSC Architecture Working Group view on the Minimum Viable EOSC*[5] and the proposed capabilities for the EOSC Platform were described.

This section will provide an update on the capabilities provided through the EOSC Platform (EOSC Future implementation of the MVE) as defined in the EOSC Platform architecture and will reflect on the service components requested in Lot 1 of the EOSC Procurement[6]. Describing the architecture of the EOSC Platform goes beyond this deliverable. An update of the EOSC Platform will be described in deliverable D3.2b *EOSC Architecture and Interoperability Framework*.

In section 3.1 an overview of new capabilities that are not covered in D2.5a is provided. Section 3.2 provides an overview of the service value of the components included in the EOSC platform service portfolio, Section 3.3 will provide a mapping between the EOSC Platform capabilities and the service components requested in the EOSC Procurement Lot 1.

3.1 Aligning EOSC Platform Service Portfolio Naming Convention with EOSC Architecture

To maintain the evolution of the EOSC Platform and its components, EOSC Future is maintaining the EOSC Platform service portfolio through the Service Management System Service Portfolio Management process. Due to the development of the EOSC architecture, the naming of EOSC platform service portfolio components has somewhat diverged from the naming of the components within the EOSC architecture. Therefore, an alignment is needed between the EOSC Platform portfolio and the component names used in the EOSC architecture. Table 3-1 provides a mapping of the EOSC architecture and EOSC Platform service portfolio names as well as the proposed names for the EOSC Platform service portfolio.

Table 3-1: Proposed names to align the EOSC Platform portfolio with the EOSC Architecture

EOSC Architecture		**EOSC Platform Service Portfolio**	
Capability	***Component***	***Current Portfolio Name***	***Proposed Name***
Catalogue and Marketplace	User Dashboard	EOSC User Dashboard	EOSC Catalogue & Marketplace: User Dashboard
	Resource Discovery	EOSC Search Service	EOSC Catalogue & Marketplace: Resource Discovery
	Marketplace	EOSC Catalogue and Marketplace	EOSC Catalogue & Marketplace: Marketplace
	Recommender System	EOSC Recommender System; EOSC Recommend Metrics Framework	EOSC Catalogue & Marketplace: Recommender System
	Explore	EOSC Explore	EOSC Catalogue & Marketplace: Explore
	Onboarding Workflow System	Not yet defined	EOSC Catalogue & Marketplace: Onboarding Workflow System*
	Order Management System	EOSC Order Handling System	EOSC Catalogue & Marketplace: Order Management System
	Service Catalogue	EOSC Service Catalogue; EOSC Service Provider Dashboard	EOSC Catalogue & Marketplace: Service Catalogue
	Research Product Catalogue	EOSC Research Product Catalogue; EOSC Research Product Dashboard	EOSC Catalogue & Marketplace: Research Product Catalogue
Accounting	***	EOSC Accounting for Research Products; EOSC Accounting for Services	EOSC Accounting: Accounting for Research Products
			EOSC Accounting: Accounting for Services

[5] European Commission, Directorate-General for Research and Innovation, Sanden, M., Robertson, D., Appleton, O.et al., *EOSC architecture working group view on the minimum viable EOSC – Report from the EOSC Executive Board Working Group (WG) Architecture*, Publications Office, 2021, https://data.europa.eu/doi/10.2777/492370

[6] https://etendering.ted.europa.eu/cft/cft-display.html?cftId=12087

Monitoring		EOSC Monitoring	EOSC Monitoring
Configuration Management System		EOSC Topology DB	EOSC Configuration Management System
AAI Federation		Not yet defined	EOSC AAI Federation*
Core Infrastructure Proxy		EOSC Infrastructure Proxy	EOSC-Core Infrastructure Proxy
Helpdesk		EOSC Helpdesk	EOSC Helpdesk
Interoperability Framework Registry		Interoperability Framework DB	EOSC Interoperability Framework Registry
Collaboration Tools		Collaboration Tools	EOSC Collaboration Tools
Execution Framework	EOSC Data Transfer Service	Not yet defined	EOSC Execution Framework: Data Transfer Service*
	EOSC Workflow Execution		**
	Automated Access to IT Resources		**

* Existing platform component needs to be included within the EOSC platform service portfolio
** Platform component needs to be included in the EOSC platform service ortfolio at time of availability
*** Components to be included in the EOSC architecture diagrams

3.2 EOSC Platform Newly Introduced Capabilities

The overview of EOSC Platform capabilities provided in D2.5a described the proposed capabilities at Month 6 (September 2021) of the EOSC Future project. This section provides an overview of the newly introduced capabilities in the EOSC Platform.

Table 3-2: Overview of the newly introduced Platform capabilities after Month 6 (September 2021)

Service name	Service description	Service features	Lifecycle status
EOSC Catalogue & Marketplace: Resource Discovery	The Resource Discovery is a component of the EOSC Catalogue & Marketplace of the EOSC Platform. It is the service where users can search through a variety of resources, including publications, data, software, services, and training. The component allows users to search available resources using many selected filters, so that it is possible to extract the most precise content. In addition, based on the user's activity, they can receive personalised recommendations regarding content that may be of interest to them	Access to wide range of research categories: • Publications • Data • Software • Services • Data sources • Training • Other Wide range of search filters available, e.g.: • Research data lifecycle steps • Type of product • Access right • Scientific discipline • Language • Country • Publisher • Document type • Provider • Research community • Search bar: allows the user to enter any phrase in order to receive suggestions broken down by available categories	Production

		Recommendations: registered users, based on their activity on the website, receive suggestions regarding content that may be of interest to them	
EOSC Catalogue & Marketplace: Recommender System	The EOSC Recommender System helps researchers to find quickly and efficiently the relevant resources within a large, diverse set of EOSC data. The recommendations, generated based on AI-enabled reasoning, use the metadata of EOSC services and EOSC research products that can be discovered and utilised via the EOSC Platform	Delivers online and semi-online recommendations, based on similarity of various data about the user (e.g. user actions and user profile) Extensible: new types of recommendations, based on new sources of information, can be easily added GDPR-compliant: users can manage consents concerning processing sensitive data	Beta
EOSC Catalogue & Marketplace: User Dashboard	AI-based user-personalised environment to navigate the EOSC Catalogue. The EOSC User Dashboard is a visual display of a user's personal website space. Each user can define and design their own scientific profile and, based on their profile, receive resources tailored to their needs	The user dashboard creates the space where the users will find the following functionalities: • Individual, authenticated profile • Feed: a panel for selecting the displayed content from a variety of categories, including project, trainings, services, order, statistics, calendar, community, and favourites • Community widgets: brief information about research communities and links to community websites • Social media widget: up-to-date tweets about EOSC and a link to the Twitter website • Upcoming events widget: users have access to the latest information about EOSC-related events and can click to be redirected to event websites • Personal recommendations: AI-based on scientific interests and activity on the portal predicts which resources will be most interesting for a specific user	Alpha
EOSC Interoperability Framework Registry	Interoperability Framework Registry is a database service containing all interoperability guidelines used for compatibility and composability between EOSC-onboarded Resources and for compatibility with EOSC Platform components. Implementation allows the onboarding of interoperability guidelines and linking of guidelines to resources through the Providers Portal User	Interoperability Framework Database main features are (grouped by use-case users): • For providers: – Onboarding of interoperability guidelines that can be used by others to interoperate with a provider's resources – Management of already onboarded Interoperability guidelines	Beta

	Interface. There is also an API to allow CRUD operations on IF DB records	– Link a resource with an onboarded interoperability guideline using a user interface integration in the Providers' Portal – REST API supporting all operations above – Support the ability to define configuration templates for creating 'configurations' of interoperability guidelines for resources (to be released) • For EPOT team members: – Initial onboarding approval/rejection of interoperability guidelines – Auditing and curation of interoperability guideline entries • For other EOSC Platform Components: – Vice: Provides listings of interoperability guidelines that are adhered to by a resource – Versa: Provides listings of resources that are marked as compatible with a specific interoperability guideline	
EOSC Execution Framework: Data Transfer Service	The EOSC Data Transfer Service is a horizontal service that is integrated with the EOSC Platform and enables easy transfer of datasets (e.g. for analysis) from data repositories, which are onboarded to the EOSC Marketplace, - to computing infrastructure accessible to EOSC users The EOSC Data Transfer Service is comprised of two main components: the graphic user interface that is integrated with the EOSC Platform and the EOSC Data Transfer REST API that implements an abstract layer for data transfers by wrapping the available data transfer services in the EOSC Marketplace (e.g. EGI Data Transfer). Integrating a data transfer service or data repository with the EOSC Data Transfer Service means integrating it with the EOSC Data Transfer REST API, while the graphic user interface remains the same	Users can browse the EOSC Platform to find datasets, then initiate data transfers to the storage in an accessible computing infrastructure. In particular, the EOSC Data Transfer Service facilitates 3 sets of functionalities: • Parsing igital object identifiers • Creating and managing data transfers • Managing storage elements	Beta

3.3 EOSC Platform Capabilities and their Service Values

Table 3-3 provides an overview of the EOSC Platform capabilities and their service values which describe:

- **Customer group:** the group of stakeholders at which the capability is targeted to provide added value
- **User group:** the targeted audience benefitting from the use of the capability

- **Value proposition:** describes the benefits and added value of the capability for the users

Table 3-3: Overview of the service values of the EOSC Platform capabilities

EOSC Platform services		Service Value		
Service Name	***Service Description***	***Customer Group***	***User Group***	***Value Proposition***
EOSC Catalogue & Marketplace: User Dashboard	AI-based user-personalised environment to navigate the EOSC Catalogue. The EOSC User Dashboard is a visual display of a user's personal website space. Each user can define and design their own scientific profile and, based on their profile, receive resources tailored to their needs	EOSC EU node operators, Other operators of regional or thematic nodes of EOSC, External service providers	Businesses, Funders, Innovators, Policy makers, Provider managers, Providers, Publishers, Research communities, Researchers, Research groups, Research infrastructure Managers, Research managers, Research networks, Research organisations, Research projects, Resource managers, Students, Other	The EOSC User Dashboard is a user-centric interface that puts the user's preferences first. It is the private space for users to control and customise content as necessary. Every user can define and design his own scientific profile and, based on this profile, receive resources tailored to their needs. This space will be made available to users, free of charge, toreceive relevant information and options to use the services. Users, after logging in to their own dashboard, will be able to maintain access to the history of their interactions with the EOSC Platform and its components, as well as personalised recommendations for future activities
EOSC Catalogue & Marketplace: Resource Discovery	The Resource Discovery service enables users to search through a variety of resources, including publications, data, software, services, and training. The service allows users to search available resources using a variety of filters, so that it is possible to extract the most precise content. In addition, based on the user's activity, they can receive personalised recommendations on content that may be of interest to them	EOSC EU node operators, Other operators of regional or thematic nodes of EOSC, External service providers	Businesses, Funders, Innovators, Policy makers, Provider managers, Providers, Publishers, Research communities, Researchers, Research groups, Research Infrastructure managers, Research managers, Research networks, Research organisations, Research projects, Resource managers, Students, Other	The Resource Discovery service gives users access to the interface, in which appropriate filters may be applied to let users find the most suitable results for their research needs. In general, the most valued features of the Resource Discovery service are: • Research-oriented user's journey • Inclusion of all types of available resources • Recognition of the research data workflow and researcher's actions • User's discovery path adapted to researchers' expectations • Personalised recommendations • Views adapted to importance recognised by the researchers
EOSC Catalogue &	The Marketplace is the EOSC Platform tool	EOSC EU node operators, Other	Businesses, Funders,	The Marketplace facilitates cross-country and cross-

Marketplace: Marketplace	where researchers can discover, order and access the services, analytical tools, data management tools, storage and computing resources they need for their work. It is an integrated platform that allows easy access to services for various research domains along with data and integrated data analytics tools. Furthermore, the Marketplace offers the opportunity to advertise services and resources from local, national, and international providers, such as European e-infrastructures and research infrastructures, with the aim of promoting access to a broader international user group	operators of regional or thematic nodes of EOSC, External service providers	Innovators, Policy makers, Provider managers, Providers, Publishers, Research communities, Researchers, Research groups, Research infrastructure managers, Research managers, Research networks, Research organisations, Research projects, Resource managers, Students	domain collaborations among researchers, the public sector, and private companies. It offers a wide range of services in many scientific domains, eg. medical and health sciences, engineering and technology, natural sciences, and social sciences. The Marketplace allows European scientists to find scientific service providers and services, offering access to technologies that are not easily available and optimise their ability to use existing European solutions for research and research collaboration. The Marketplace allows service providers to showcase their technology and promote services among European researchers and private companies
EOSC Catalogue & Marketplace: Explore	The Explore service supports the discovery of research products and services onboarded in the EOSC-Exchange in the wider context of scientific research outcomes, research funding, and research organisations. The EOSC Research Graph, powered by the OpenAIRE Research Graph, provides links from research products and services to authors, funders, projects, organisations, communities and even Sustainable Development Goals. The portal exploits the EOSC Interoperability Framework to identify relationships between research products in the graph and EOSC services in the Marketplace to facilitate and enable composability of resources	Researchers, Providers, Funders, rganisations interested in the discovery of scientific results and analysis of scholarly trends	Businesses, Funders, Innovators, Policy makers, Provider managers, Providers, Publishers, Research communities, Researchers, Research groups, Research infrastructure managers, Research managers, Research networks, Research organisations, Research projects, Resource managers, Students	The Explore service supports discoverability of research products beyond research publications, including data and software, and across disciplines. Explore supports navigation through the EOSC Research Graph to facilitate reproducibility of science by providing evidence of the context surrounding every product (e.g. research data can be contextualised by related articles and software or by related projects and services). Reproducibility cannot be supported by focusing on the EOSCExchange alone, and for this reason, Explore can take the user beyond the boundaries of the EOSC Catalogue
EOSC Catalogue & Marketplace: Recommender	The Recommender System helps researchers to find quickly and efficiently relevant	EOSC EU node operators, Other operators of regional or	Businesses, Funders, Innovators, Policy makers, Provider	The Recommender System will contribute to the faster identification of relevant resources in EOSC.

System	resources within a large diverse set of EOSC data. The recommendations, generated based on AI-enabled reasoning, use the metadata of EOSC services and research products that can be discovered and utilised via the EOSC Platform	thematic nodes of EOSC, External service providers	managers, Providers, Publishers, Research communities, Researchers, Research groups, Research infrastructure managers, Research managers, Research networks, Research organisations, Research projects, Resource managers, Students, Other	Availability of datasets in the Recommender System will facilitate the faster findability of datasets that are relevant for particular users
EOSC Catalogue & Marketplace: Service Catalogue	EOSC Service Catalogue offers the underlying storage functionality and interoperability tools for the programmatic access, registration, and management (CRUD) of providers, services, and catalogues. It also offers the necessary API functionality for the interoperability of service catalogues from individual providers or aggregators (e.g. thematic or regional catalogues) with the EOSC Platform.	EOSC Platform components, Providers, Infrastructures, Research communities, EOSC Providers Onboarding Team, External resource catalogue owners	Providers, Research communities, Infrastructures, EOSC Platform service providers, EOSC Providers Onboarding Team, External resource catalogue owners	The Service Catalogue provides functionality for: • providers to register to EOSC to become eligible for the onboarding of resources • providers to onboard their services/research products into EOSC • providers to view the list of services registered in the EOSC Platform and perform a variety of actions such as activate, deactivate, view usage statistics • EOSC Portal Onboarding Team members to manage the onboarding process (approve or reject an application), manage the catalogue of providers and services and audit the validity of the catalogue entries • providers of catalogues to add entire regional or thematic catalogues to the EOSC ecosystem
EOSC Catalogue & Marketplace: Research Product Catalogue	The Research Product Catalogue collects and interlinks metadata records about EOSC research products (including publications, data, and software) and EOSC services (from the EOSC Service Catalogue)	EOSC Data Sources to onboard research product in the EOSC Resource Catalogue, Services to access APIs for discovery of research products, End-users to access	Researchers, Service providers	The Research Product Catalogue aggregates and validates metadata about research products from a set of data sources previously onboarded into the EOSC Service Catalogue. The map tracks research products, services, data sources,

	with authors, communities, organisations, services, funders, and projects. The Research Product Catalogue supports resource onboarding via the EOSC Research Product Provider Dashboard. Research product profiles are automatically collected (harvested) from EOSC data sources onboarded into the EOSC Service Catalogue and validated to verify their compliance with EOSC research product profile schemas and vocabularies. The EOSC Resource Catalogue enables discovery and navigation of EOSC resources and views for statistics. The Research Product Catalogue is powered by the OpenAIRE Research Graph[7]	dumps and perform data analytics		researchers, funders, projects, and organisations together with the semantic relationships between them
EOSC Catalogue & Marketplace: EOSC Order Management System	The Order Management System is a web tool design to operate all the service orders registered in the Marketplace. It is accessible through the EOSC Federated AAI	EOSC resource providers	Any user of the EOSC Platform	A central and easy-to-use means of ordering all services available within the Marketplace. This service avoids the need for the user to go to separate services' ordering pages and become acquainted with different ordering workflows by providing a uniform ordering interface for multiple services
EOSC AAI Federation	To be defined			
EOSC-Core Infrastructure Proxy	The EOSC-Core Infrastructure Proxy is an AAI service that connects the EOSC-Core and EOSC Support services to the EOSC Federated AAI. Services that are eligible for connecting to the EOSC-Core Infrastructure Proxy are: • EOSC Platform services • EOSC Support Services operated in the	To be defined	Large research groups, Individual researchers, Service providers	To be defined

[7] https://graph.openaire.eu/

	context of the EOSC-Future project • EOSC Support Services operated by the EOSC Secretariat and/or the EOSC Association The EOSC Core Infrastructure Proxy implements the AARC Blueprint Architecture and interoperability guidelines[8]. Specifically it acts as an infrastructure proxy allowing users to use their institutional, social, ORCID, and community digital identities for accessing EOSC Platform and EOSC Support services			
EOSC Helpdesk	EOSC Helpdesk acts as a single point of contact for all EOSC customers for help, support, and other requests. It provides ticket management and allows tracking inquiries related to EOSC services, resources, and projects	EOSC Platform providers, Operators of regional or thematic nodes of EOSC, EOSC resource providers, Research and e-infrastructures, EOSC related stakeholders	Large research groups, Individual researchers, Service providers, Citizen scientists	The EOSC Helpdesk service provides a uniform communication channel for customers of EOSC. It provides ticket management and allows tracking inquiries related to EOSC services, resources, projects, and general questions. It enables multiple support units, collection of incident statistics and facilitates SLA, personal dashboard, history and current status of submitted requests. For EOSC providers, the EOSC Helpdesk delivers support solutions as a service for integration in their operational processes. EOSC providers could benefit from using the EOSC Helpdesk as a service to establish user support for their services
EOSC Collaboration Systems	A group of tools to facilitate communication and collaboration for service delivery. These tools include mailing lists, EOSC wiki (Confluence), EOSC issue tracker (Jira), and Microsoft Teams	Different partners in EOSC Future	Participants in the EOSC Future project including those involved in EOSC Platform service provision	Common communication toolset to facilitate coordination and participation within the EOSC Future project
EOSC Monitoring	Monitoring is the key service needed to gain insights into an infrastructure. It needs to	EOSC-Core services, Research infrastructures, Other operators of	Providers, Research communities, Infrastructures,	The key functionalities offered by the EOSC Monitoring service are:

[8] https://aarc-project.eu/architecture/

	be continuous and on-demand to quickly detect, correlate, and analyse data for a fast reaction to anomalous behaviour. The challenge of this type of monitoring is how to quickly identify and correlate problems before they affect end users and ultimately the productivity of the organisation. Management teams can monitor the availability and reliability of services from a high-level view down to individual system metrics and monitor the conformance of multiple SLAs. The EOSC Monitoring service combines two operational monitoring services: the EOSC Platform and EOSC-Exchange Monitoring services	regional or thematic nodes of EOSC, External service providers	EOSC Platform service providers	• Monitoring of: – EOSC Platform services – EOSC-Exchange services • Reporting availability and reliability • Visualisation of the services status • Provide dashboard interfaces for providers and end users • Sending real-time alerts to providersand EOSC Platform service operators to varying levels of complexity (e.g. for the purpose of alerting operators to availability issues or to alert the EOSC Provider Onboarding Team of issues with resource profiles) The dashboard design enables easy access and visualisation of data for end users. APIs are supported to allow third parties to gather monitoring data from the system
EOSC Accounting: Services	The EOSC Accounting for Services is a platform that is responsible for collecting, aggregating, and exchanging the virtual access and other types of metrics between different infrastructures, service providers, and INFRAEOSC-07 projects	INFRAEOSC-07 projects, Research Infrastructures, e-infrastructures, Other operators of regional or thematic nodes of EOSC, External service providers	Providers, Research communities, Infrastructures, EOSC Platform service providers	To be defined
EOSC Accounting: Research Products	The EOSC Accounting for Research Products collects, processes, and publishes usage statistics for research products from EOSC providers, using automated and standardised scientific methods. The service is built upon the UsageCounts service of OpenAIRE	EOSC Data Source providers	Resource provider managers, Research managers, Funders, Policy makers, Research infrastructure managers	The EOSC Accounting for Research Products service provides metrics, by means of numbers of metadata views or item downloads, which can be used as an impact measure to supplement other traditional impact metrics such as citation counts. Moreover, they provide a tool to evaluate the success and performance of data sources
EOSC Configuration Management System	The EOSC Configuration Management System (GOCDB) is a repository for storing and presenting topology and	EOSC EU node operators, Other operators of regional or thematic nodes of	Service (component) administrators	Underpins other service and service components within the EOSC-Core, such as EOSC Monitoring, by allowing automated service

	resource information (i.e. services, service components, contacts, and downtime schedules among others)	EOSC		discovery
EOSC Execution Framework: Data Transfer Service	The Data Transfer Service is a horizontal service that is integrated with the EOSC Platform and enables easy transfer of datasets (e.g. for analysis) from data repositories, discoverable in the EOSC Marketplace, to computing infrastructure accessible to EOSC users. The Data Transfer Service is comprised of two main components: the graphic user interface which is integrated with the EOSC Platform and the EOSC Data Transfer REST API which implements an abstract layer for data transfers by wrapping the available data transfer services in the EOSC Marketplace (e.g. EGI Data Transfer). Integrating a data transfer service or data repository with the EOSC Data Transfer Service means integrating it with the EOSC Data Transfer REST API, while the graphic user interface remains the same	EOSC EU node operators, Other operators of regional or thematic nodes of EOSC, Data Transfer Service providers	Providers, Research communities, Infrastructures, EOSC Platform service providers, External resource catalogue owners	Data transfer is the copying or movement of data from one storage system to another. Storage systems support transfer of data over one or more data transfer protocols. Data transfer services, particularly those that can do bulk data transfers of massive amounts of dataacross heterogeneous storage systems with advanced features (such as retries, priorities, error checking and correction, and policy based scheduling) are extremely complex products. Implementation of such a product is out of scope for the EOSC Data Transfer Service. And although there are many such data transfer services, each supporting transfers over multiple transfer protocols, there is no universal transfer service that supports transfers over all protocols. Nor is there one that (a) has a pluggable architecture that can be easily extended to support new transfer protocols, and (b) is available to EOSC users. There is a myriad of data transfer services available to EOSC users, with each offering a different API, different user interface, supporting a different set of transfer protocols, sometimes even supporting just a subset of features depending on the transfer protocol used. The EOSC Data Transfer Service wraps all these existing data transfer services with a generic interface

Table 3-4 provides an overview of the EOSC Support Services and their service values which describe:

- Customer group: the group of stakeholders at which the support service is targeted to provide added value
- User group: the targeted audience benefitting from the use of the support service
- Value proposition: describes the benefits and added value of the support service for the users

Table 3-4: Overview of the service values of the EOSC Support services

EOSC Support Services		Service Value		
Service Name	***Service Description***	***Customer Group***	***User Group***	***Value Proposition***
EOSC Knowledge Hub	The EOSC Knowledge Hub focuses on free (as well as paid-for, where applicable) training content pertinent to EOSC, its services, and related FAIR and Open Science concepts. By bringing together disparate sources of information, the EOSC Knowledge Hub acts as a centralised learning hub for all things EOSC. The learning management system is based on Moodle (for content delivery) and Articulate (for authoring). Through the creation of modularised CC-BY licensed training resources, and promotion of reuse of those resources, the EOSC Knowledge Hub delivers tailored content to its users	EOSC EU node operators, Other operators of regional or thematic nodes of EOSC, External service providers	Researchers, Providers, Policy makers, Funders, Librarians, IT staff, Data stewards, Trainers, EOSC Future participants	The EOSC Knowledge Hub concentrates the learning and training content of EOSC and enables a better uptake of all other services and data available in EOSC
EOSC Observatory	The EOSC Observatory is a policy intelligence tool for monitoring the implementation and uptake of EOSC and Open Science at national and institutional levels in Europe. The EOSC Observatory consists of an interactive dashboard to collect and display validated data on policies, practices, and investments related to EOSC and Open Science across the eight thematic categories of publications, data, software, services, infrastructure, skills/training, assessment, and engagement. The EOSC Observatory supports the research and innovation community in tracking the progress of the implementation of EOSC and Open Science as well as helping policy makers, research-performing and research-funding organisations, and interested stakeholders in developing policies and practices for EOSC and Open Science. The EOSC Observatory furthermore supports the monitoring activities and alignment of relevant surveys related to EOSC of the EOSC Tripartite Governance	The EOSC Observatory supports the European Commission, EOSC Steering Board, and EOSC Association in their monitoring of the implementation and uptake of EOSC and Open Science in Europe	The EOSC Observatory is firstly targeted at representatives of Member States and Associated Countries in Europe as well as representatives of members of the EOSC Association to collect and share their data on the implementation and uptake of EOSC and Open Science. The EOSC Observatory is secondly targeted at the wider research and innovation community to access and exploit this validated data	The EOSC Observatory provides a single joint capacity to support the monitoring of the implementation and uptake of EOSC and Open Science in Europe with validated data from national and institutional stakeholders. The EOSC Observatory supports the need of the EOSC Tripartite Governance for a single tool to monitor and align the implementation and evolution of EOSC and Open Science in Europe. The EOSC Observatory also supports Member States and Associated Countries in collecting and sharing data as well as the mutual learning and development of policies and practices related to EOSC and Open Science. The EOSC Observatory further supports research-performing and research-funding organisations as well as the wider research and innovation community in tracking the evolution and development of local policies and practices

				related to EOSC and Open Science

3.4 Mapping between EOSC Procurement Services and EOSC Platform Capabilities

On the 20th of December 2022 the EC launched a procurement for *Managed Services for the European Open Science Cloud (EOSC) Platform*[9]. The procurement consists of 3 lots:

Lot 1	Managed Services for the Development, Integration, Deployment, and Operations of the Federated EOSC-Core Platform
Lot 2	Managed Container Platform and Virtual Machine Services for the EOSC-Exchange (Infrastructure Services)
Lot 3	Managed Collaborative Data Platform, Interactive Data Analytics Platform, and Visualisation Services for the EOSC-Exchange (Application Services)

Analysing the lot descriptions, the capabilities requested in Lot 1 match to a large extent with the capabilities provided through the EOSC Platform developed within EOSC Future. In this section, a mapping is made between the service components requested in Lot 1 and the capabilities provided through the EOSC Platform developed in EOSC Future.

Table 3-5: Mapping between EOSC Procurement Lot 1 and EOSC Platform capabilities

EOSC Procurement Lot 1			**EOSC Platform**	
Service		*Service Components*	*Capability*	*Comment*
1	Web Portal (CMS) and Training Platform (LMS) with Personal/Project Workspace and Support/Feedback Mechanism	Web Portal (Content Management System) Front Office	EOSC Portal website	No comment
		Training Platform (Learning Management System) Functions	EOSC Knowledge Hub: Training Catalogue and Learning Platform	No comment
		Personal/Project Workspace	Not applicable	Not provisioned through the EOSC Platform
		Support and Feedback Mechanism	EOSC Helpdesk	No comment
2	Multifaceted Resource Catalogues and Registry Services with PIDs Resolution and Metadata Knowledge Graph	Multifaceted Resource Catalogues and Registry Services	Components of the EOSC Catalogue and Marketplace: Research Product Catalogue and Services Catalogue	No comment
		Metadata Knowledge Graph	Research Discovery Graph is a component of the EOSC Catalogue & Marketplace: Research Product Catalogue	No comment
		PIDs for EOSC Services, Tools, and Recipes	PIDs for Services	No comment
3	Application Workflow Management and Tools Market	Application Workflow Management	Not applicable	Not yet provisioned through the EOSC Platform. The component could be seen as a further extension of the EOSC Execution Framework
		Tools Market	Components of the EOSC Catalogue and Marketplace: Search, User	No comment

[9] https://etendering.ted.europa.eu/cft/cft-display.html?cftId=12087

			Dashboard, Marketplace, and Recommender System	
		Configuration Management System	EOSC Configuration Management System	No comment
4	Identity Management (Single-Sign-On) for the EOSC Node and support for Federated Authentication and Authorisation Infrastructure (AAI	Identity Management (Single-Sign-On) for the EOSC Node	EOSC-Core Infrastructure Proxy	No comment
		Support for Federated Authentication and Authorisation Infrastructure (AAI)	EOSC AAI Federation	No comment
5	Monitoring and Accounting Systems with Service Limits/Credits Allocations and Messaging Service	Monitoring Framework	EOSC Monitoring	No comment
		Accounting System Capable of Handling Service Limits and User Credits Allocation	EOSC Accounting for Services	Focus of the current implementation of EOSC Platform is usage reporting
		Order Management System	EOSC Catalogue & Marketplace: Order Management System	No comment
		Messaging Service	EOSC Messaging Service	Component of both EOSC Monitoring and EOSC Accounting for Services
6	Service Management System (ITSM) with Policy Compliance, Assessment and Assurance Framework, Security Coordination, and Helpdesk	Service Management System (ITSM)	Service Management System based on FitSM processes	No comment
		Policy Compliance Assessment and Assurance Framework	Onboarding Procedures (including Audit Procedures), Inclusion Criteria, Information Security Coordination and CSIRT, EOSC Helpdesk	No comment

4 EOSC-Exchange Inclusion Criteria

To make EOSC effective, it must be clear which providers and resources may be included (and not included) in EOSC-Exchange. These issues are explored in the high-level EOSC Rules of Participation10 and the more practical EOSC-Exchange Inclusion Criteria are derived from them. These criteria are described in the following sections.

4.1 EPOT and Onboarding and Auditing of Resources

When the EOSC Future project started, there were basic guidelines to onboard services created during the EOSC-hub and EOSC Enhance projects. The EOSC Portal Onboarding Team (EPOT) now has the EOSC-Exchange inclusion criteria (created in the EOSC Future project by Activity A2.2.4 in WP2 with contributions from WP3, WP6, and WP9 among others) as well as detailed procedures to onboard and audit different types of resources.

The current EPOT procedures are:

- EPOT Procedure-01: Onboard a Provider;
- EPOT Procedure-02: Audit a Provider;
- EPOT Procedure-03: Onboard a Service;
- EPOT Procedure-04: Audit a Service;
- EPOT Procedure-06: Identify a Horizontal Service;
- EPOT Procedure-07: Onboard an External Catalogue;
- EPOT Procedure-08: Audit an External Catalogue;
- EPOT Procedure-09: Onboard a Data Source and Research Products;
- EPOT Procedure-10: Audit a Data Source and Research Products;
- EPOT Procedure-12: Onboard a Learning Resource;
- EPOT Procedure-13: Audit a Learning Resource.

The EPOT also counts on the support of the the EOSC Onboarding Strategy Group[11] (E-OSG) which pursues the following objectives:

- Ensure an efficient mapping of the rules produced by the RoP-TF and understanding of the EOSC-Exchange inclusion criteria being developed by EOSC Future A2.2.4;
- Provide a platform to gather feedback for EPOT to create operational procedures to onboard and audit providers and different types of resources into the EOSC Catalogue and Marketplace;
- Facilitate the implementation of the RoP within the EOSC Future project and the alignment of the RoP and inclusion criteria across other EOSC projects (e.g. INFRAEOSC-04/-05/-07 projects).

Hence, the boundary conditions imposed on providers and resources come in two parts: the first is the EOSC-Exchange inclusion criteria which are translated in the information gathered by the metadata schema used for providers and resources known as EOSC Profiles and the second are EPOT procedures to process applications.

There are two distinct paths for onboarding resources to the EOSC Catalogue:

- A single provider registers and onboards their services, data sources, and/or research products;
- A catalogue owner (CO) representative onboards a single catalogue (i.e. a collection of resources). After the catalogue is approved, multiple providers and services, data sources, and research products can be onboarded by the CO representative by using the appropriate API for each resource type.

[10] European Commission, Directorate-General for Research and Innovation, *EOSC rules of participation* – , Publications Office, 2021, https://data.europa.eu/doi/10.2777/30541

[11] The E-OSG consists of representatives from the INFRAEOSC-04-2018 Clusters/ INFRAEOSC-05-2018-2019 Regional and INFRAEOSC-07-202 Horizontal projects to ensure implementation/alignment of onboarding with external catalogues

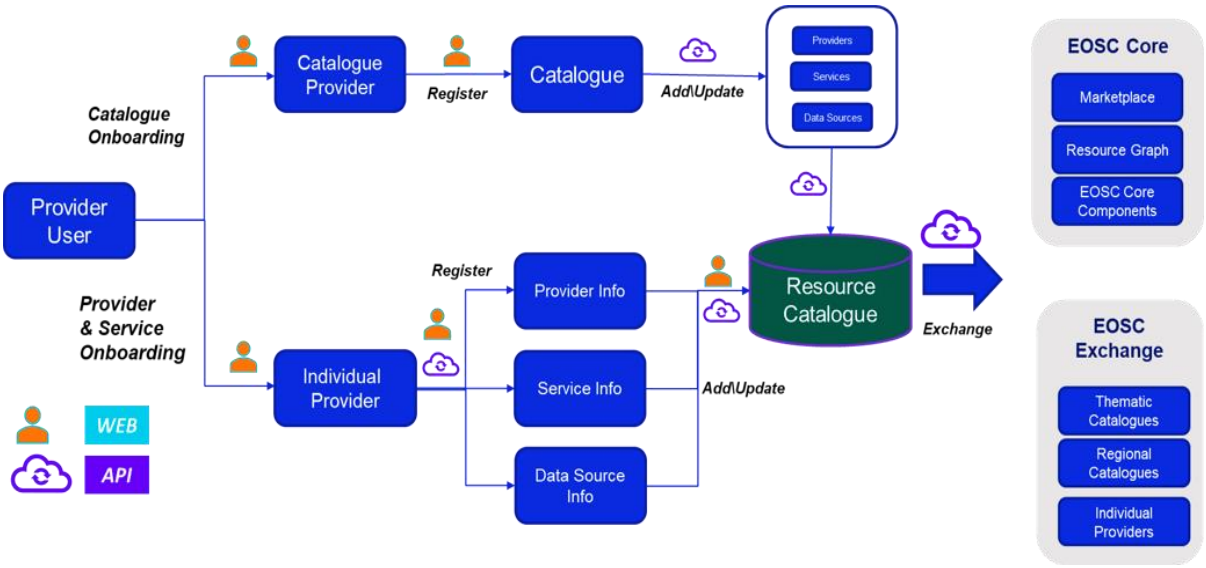

Figure 4.1: The EOSC Onboarding Process[12]

The profiles for onboarding Providers and resources are explained more below together with links to their specific content.

4.2 EOSC Profiles

EOSC Profiles are specifications that define common data models for EOSC entities (such as providers and resources) and related code lists, taxonomies, and classifications. They contribute to the unified framework for describing and offering EOSC resources to end users in a harmonised way, guaranteeing the interoperability of resource metadata with open APIs. They allow automated exchange and management of EOSC resource information and accompanying metadata without human intervention (e.g. for harvesting).

The EOSC Profiles are divided into two categories as seen in Figure 4.2:

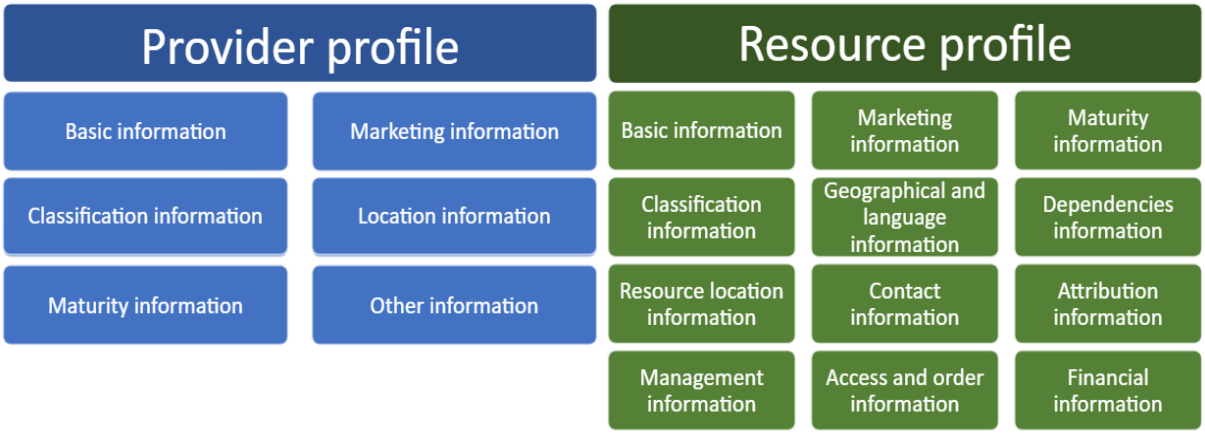

Figure 4.2: Section structures of the EOSC Provider and Resource profiles

Each of these sections requires specific sets of information, including an identifier, a type, multiplicity[13], definition, and value type, along with whether the requested information is mandatory or optional.

Version 4.00 of the EOSC Profiles is now available and was in preparation as part of the conclusion of the EOSC Enhance project when D2.5a was submitted. This version has brought a number of improvements based on initial experiences implementing the EOSC Profiles and is supported by new use cases that have arisen through

[12] Available at the EOSC Providers Hub https://eosc-portal.eu/eosc-providers-hub/how-become-eosc-provider/how-become-eosc-provider-a-general-overview

[13] https://en.wikipedia.org/wiki/Multiplicity_(mathematics)

implementation of EOSC components. The transition guide from V3.00 to V4.00[14] explains the relevant changes.

The EOSC Profiles are maintained by EOSC Future and can be seen in the EOSC Future Public Wiki:

- V4.00 EOSC Provider Profile[15]
- V4.00 EOSC Resource Profile[16]
- V4.00 EOSC Multi-Provider Catalogue Profile[17]
- V4.00 EOSC Data Source Profile[18]
- V4.00 EOSC Research Product Profile[19]
- V4.00 EOSC Learning Resource Profile[20]

4.3 Inclusion Criteria

While correctly filling in the EOSC Profiles covers a significant amount of the inclusion criteria for EOSC, it still leaves a number of other issues to consider. In order to capture these, the EOSC-hub project published on the basis of the RoP a set of EOSC onboarding inclusion criteria as a living set of requirements or guidance on onboarding in order to explain what should or should not be included in EOSC. This was necessary due to both a significant number of 'spam' type submissions under EOSC-hub, and some requests which did not break any existing rules but nonetheless did not seem appropriate for EOSC. The EOSC-Exchange inclusion criteria have been further developed in 2022 and 2023 by EOSC Future, and recognise five types of resources to be onboarded, including services (with data sources being a specific type of service), catalogues, research products, learning resources, and interoperability guidelines. The current full text of the inclusion criteria is provided in Appendix A . This section provides the key points and commentary on the inclusion criteria, which clearly define and differentiate what is required to onboard a provider or resource. The i*talic bullet text* represents the current criteria text, followed by commentary and explanation.

4.3.1 Inclusion Criteria to Onboard an EOSC Provider

This section addresses inclusion criteria that apply to all providers willing to onboard any type of resource to EOSC-Exchange.

- *Provide accountability for the resources onboarded to EOSC, every EOSC provider must either be a legal entity itself or must identify a legal entity of which it is a part or with which it is affiliated, which is accountable for the resources being onboarded to EOSC. The legal entity in question is called the 'hosting legal entity' and will need to be registered in the EOSC Resource Catalogue before an affiliated provider or its services can be onboarded.*

As mentioned in D2.5a, there is a need to identify which groups may be onboarded to EOSC as providers. There are significant advantages and disadvantages to requiring only legal entities to onboard or to allowing more arbitrary groups to onboard to EOSC.

Allowing non-legal entities to onboard tends to drive significant onboarding from less formally constituted groups, especially from funded projects. These are keen to promote themselves and their outputs, but are fundamentally transitory, and tend to stop updating information once the project concludes. This means that their submissions would have a tendency to drown out currently available providers with expired ones. In addition, as EOSC catalogues become more formalised, non-legal entities are not able to enter into agreements and contracts. This means, for instance, that they could not make a contract to deliver a service against

[14] https://wiki.eoscfuture.eu/display/PUBLIC/Migration+v3.00+to+v4.00-Transition+guide
[15] https://wiki.eoscfuture.eu/display/PUBLIC/A.+v4.00+EOSC+Provider+Profile
[16] https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile
[17] https://wiki.eoscfuture.eu/display/PUBLIC/C.+v4.00+EOSC+Multi-Provider+Catalogue+Profile
[18] https://wiki.eoscfuture.eu/display/PUBLIC/D.+v4.00+EOSC+Data+Source+Profile
[19] https://wiki.eoscfuture.eu/display/PUBLIC/E.+v4.00+EOSC+Research+Product+Profile
[20] https://wiki.eoscfuture.eu/display/PUBLIC/F.+EOSC+Training+Resource+Profile

payment. It also means they could not sign a data processing agreement with a data controller in order to conform with the structures of the GDPR legislation or its local equivalents.

In dealing with this issue, the EPOT were initially considering allowing only legal entities, but there were a number of organisations that this might exclude who were significant contributors to EOSC. As a result, the EPOT adopted a compromise position, backed up by changes in the EOSC Profiles. Onboarding providers who are legal entities can start this. Groups that are not legal entities can onboard, but must link to another onboarded provider which is a legal entity to act as a hosting organisation. This means that e.g. a project coordinator can be the host for a funded project they run. This lets them promote projects or other transitory entities and ensures that there is a legal entity that can be dealt with. This gives EOSC a group to follow up with in case a provider record goes out of date when a project concludes, and offers bodies which can potentially sign agreements where this might be required. As a downside, it does require that the hosting legal entity is onboarded first.

The legal status of a provider is stated by the provider representative. If it is a legal entity, a drop-down menu is available to select the most appropriate type. In the past, until the Month 18 (September 2022) release, 'Other' was a valid choice. As of now, 'Other' is a choice that needs to be corrected because it offers the option to propose a new 'legal status'. If it is not a legal entity, then a Hosting Legal Entity (HLE) needs to be chosen (from the existing onboarded providers), of course with their formal approval.

There was also a situation to be solved when providers were already onboarded which were non-legal entities without a HLE, from before the rule was in place. These providers were contacted by EPOT during the audit procedure and asked to fix their legal entity status by either revising the options for legal status, or by looking for an onboarded provider to act as their HLE. In some cases, their 'parent' organisation was onboarded as a provider only to act as HLE (i.e. without planning to onboard any resources).

- *Intends to onboard resources to EOSC-Exchange that are targeted to EOSC and EOSC communities, or built on or leverage EOSC capabilities to serve some other community.*

This requirement is explicitly mentioned in the RoP.

- *Agree on periodically updating data on service providers and their resources. This includes removing resources that are no longer operational or available.*

This requirement clarifies the responsibility for keeping up-to-date information about resources onboarded to EOSC-Exchange.

- *Provider profile information must be provided in English.*

The mandatory language to fill in the provider profile is English.

4.3.2 Inclusion Criteria to Onboard All Resource Types

Only onboarded providers are able to onboard resources to EOSC-Exchange. There are currently five resource types recognised: services (with data sources being a specific type of service), catalogues, research products, learning resources and interoperability guidelines. This section describes general requirements for all EOSC-Exchange resource types, which are complemented by specific requirements for each type of resource to be onboarded to EOSC-Exchange.

- *Providers must first be onboarded as an EOSC provider before being able to onboard resources.*

The onboarding process needed to be clarified in that the provider should be onboarded before any resource is onboarded.

- *The resource to be onboarded is targeted to EOSC and EOSC communities, or built on or that leverage EOSC capabilities to serve some other community.*
  - *Examples of resources targeted at EOSC and EOSC communities include: services created by researchers or for researchers, or a commercial service with an offer specifically addressed to EOSC and research customers, rather than a generic commercial service. A joint procurement framework or a call programme for requesting resources targeting EOSC and/or EOSC communities are examples of the latter;*

- *Examples of resources built on or that leverage EOSC capabilities to serve some other community include: offerings from the Digital Innovation Hubs, which rely on EOSC expertise, resources, and capabilities to create new, innovative commercial services;*
- *Examples of learning resources targeted at EOSC and EOSC communities are the ones related to Open Science, research data management, and how to use EOSC resources.*

While the RoP explicitly mention this requirement, it was somewhat unclear, so examples of the most common types of resources were needed. If a service is "targeted to EOSC or EOSC communities", this means that it explicitly addresses particular needs of the research community, or in a more generic service, is marketed in such a way as to address the research community. This might be a service which e.g. simulates fundamental particles in a particle accelerator whereby the service itself addresses a research function, or a generic data management platform which highlights features relevant for clinical research and provides some combination of added value features, informational materials, or training and support (making it attractive to researchers).

- *For federated or jointly provided resources, the resource onboarding must be done by the coordinating or lead provider (i.e. the coordinating or lead provider is the 'resource organisation' in the resource profile). Other providers may also onboard as EOSC resource providers if they wish to appear as supplementary or supporting providers. Such providers will be listed as 'resource providers' in the resource profile.*

A common challenge for the inclusion criteria and RoP is the authority or right to represent a group or resources. While this cannot be entirely guaranteed, the EPOT decided it was good to explicitly state that providers need to assert some level of responsibility for services as well as to accommodate multi-provider and federated services. This includes both situations where there is a lead provider and supplementary providers, and also where one group promotes a service, but actual delivery is by another member of their federation or cluster of organisations.

- *The resource provider commits to maintain resource descriptions up-to-date, this includes removing resources that are no longer operational or available.*

This requirement clarifies the responsibility for keeping up-to-date information about resources onboarded to EOSC-Exchange.

- *Resource profile information must be provided in English.*

The mandatory language to fill in the resource profile is English.

4.3.3 Additional Inclusion Criteria to Onboard a Community Catalogue

In addition to meeting the common inclusion criteria to onboard all resource types, the following criteria must be met to onboard a community catalogue.

- *To have a documented and methodical approach for the validation of information about resources that have been included in CO's own catalogue.*
- *To ensure that records are kept up-to-date and that providers are prepared to correct errors if and when they are identified during the verification (auditing) procedures of EOSC Resource Catalogue records.*
- *To onboard and synchronise records with the EOSC Resource Catalogue.*

In order to make good use of their catalogue, the provider needs to validate the quality of the records that are included in the catalogue of resources that they intend to enter into EOSC-Exchange, as well as keeping information up-to-date and records properly synchronised.

- *To cooperate with the operators of the EOSC Portal[21] in ensuring that policies across catalogues are consistent by participating in the EOSC Onboarding Strategy Group (E-OSG).*

[21] https://eosc-portal.eu/

The E-OSG facilitates the implementation of the RoP within the EOSC Future project and the alignment of the RoP across the INFRAEOSC-04/-05/-07 projects. Hence, providers and community representatives are invited to participate in the E-OSG meetings in order to improve and clarify the implementation of the RoP and inclusion criteria.

- *To follow the EOSC Security Operational Baseline[22], as implemented by EOSC Future.*

This security measure ensures the safe use of the catalogue provided.

- *To declare conformance to the inclusion criteria to onboard a resource catalogue by sending an EOSC Catalogue Onboarding Agreement[23].*

An EOSC Catalogue Onboarding Agreement must be submitted by the provider which explicitly states that the provider will comply with the inclusion criteria. As part of the onboarding process, it must also follow the EOSC Catalogue onboarding workflow, which includes the following high-level overview of the process:

- To be done by the (CO): Registration of the service provider hosting the community EOSC catalogue as a HLE, provision of details on the community catalogue and records that will be onboarded in the EOSC Resource Catalogue, and declaration of conformance with the EOSC Catalogue Onboarding Agreement;
- To be done by the EPOT: Verification of the community catalogue content (or subset of it which will be onboarded) and review of the declaration of conformance with the EOSC Catalogue Onboarding Agreement;
- To be done by the CO: Testing and validating the successful push and pull of community catalogue records in the EOSC Resource Catalogue using 'Sandbox' API methods[24] (e.g. test and validate compatibility with EOSC Profiles and EOSC Resource Catalogue APIs);
- To be done by the CO: Use of the production APIs to push and pull the community catalogue records in the EOSC Resource Catalogue;
- To be done by the CO: Use of the CO dashboard in the EOSC Providers Portal for read-only access to the providers and resources managed and updated by the community catalogue.

4.3.4 Additional Inclusion Criteria to Onboard a Service

In addition to meeting the common inclusion criteria to onboard all resource types, the following criteria must be met to onboard a service.

- *Be a single and distinct service (i.e. not a generic list of services but a service in its own right). It can be an IT service, a consulting, or training service, among others (research products such as documents, datasets, and a piece of software are not considered services).*

EOSC should support a wide range of resources which support researchers and bring added value to their research workflows. Relevant services for EOSC not only include IT services, but also other services including consulting and training. Software on which an organisation can develop and offer a service is not considered a service by itself as the organisation needs to deploy the software, operate the infrastructure on which the software is deployed, and provide support. Software is thus instead considered as a research product and not as a service.

- *Be available and offer value on its own.*

For services, there is a need to ensure that the items onboarded are of a similar broad 'type'. First, it needs to be a value generating service, which brings relatively discrete benefit to a customer, i.e. something you would take 'on its own' rather than which requires you to already use some larger service first. Hence, providers cannot

[22] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Security+Operational+Baseline
[23] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Catalogue+Onboarding+Agreement+and+Onboarding+Workflow
[24] https://providers.eosc-portal.eu/openapi

onboard elements of a platform, just the platform itself. To avoid research products masquerading as services, it should also include some form of operational activity (not e.g. a 'service' which simply shows a pdf).

- *Be mature, meaning a Technology Readiness Level (TRL)[25] 8 or higher, or beta services (TRL7)[26] that are clearly labelled as beta. Beta services are not orderable. Beta services are less mature and are expected to evolve, therefore using beta services is at your own risk.*

Service maturity is also requested, and a minimum maturity of TRL 7 according to the EC H2020 definitions of TRL[27] in order to be listed. TRLs below this are not sufficiently mature for wide use. A minimum of TRL 8 is required to support some additional integration with services, such as ordering through EOSC.

- *Use URLs that are Fully Qualified Domain Names (FQDNs) and follow security best practices; for example, using TLS with the service presenting a certificate issued by a certificate authority trusted by most web browsers.*

This requirement supports security when using services. To ensure that services are identifiable, when links are provided, they need to be actual domain names not e.g. just IP addresses. This can be checked in the EOSC Providers Portal but is also highlighted here.

- *The service must be accessible from one or more European countries (EU countries plus EEA, UK) and to European researchers.*
- *If the default language of the service is not in English, but in one or more other European language(s) (European languages[28] in which the resource could be available), basic information in the user interface of the service must be available in English.*
- *The service provider must provide all key information such as Privacy statement, Service Level Agreements, Specifications and Descriptions in English, or Data and Metadata policies and licences. Other documentation may be in a different language to English.*
- *The service helpdesk or support channel must be able to answer questions in English.*

These requirements relate to language and location. First, there is a requirement that the service is available to researchers in Europe and in one of the European languages, otherwise it is unlikely to benefit the EOSC community. There is also the practical requirement that key information, including key required documents and support structures, can present information and process requests in English. This is not to say that English is the required language for EOSC in the long term, but that practically this is the language in which EOSC Future is currently operating. Validation and auditing of resource profiles by EOSC is in English, and there is no capacity to provide such validation and auditing reliably in other languages.

- *The service provider must follow the EOSC Security Operational Baseline[29], as implemented by EOSC Future.*

Adherence to this policy is required for EOSC Platform services, based on the EOSC-Core Provider Agreement. All other services should consider this as a best practice and are recommended to follow this guidance.

When the service to onboard is a data source, the following criteria must also be met.

- *The data source must make research products discoverable and accessible in a FAIR way.*

Providing researchers with good data and other related outputs, such as software, methods, and publications, is crucial to supporting data-driven research. It is increasingly important to ensure that both humans and machines can find and understand research outputs, as research in all domains is increasingly dependent upon computational analysis.

[25] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Future+Glossary#EOSCFutureGlossary-TRL
[26] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Future+Glossary#EOSCFutureGlossary-TRL
[27] https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf
[28] https://european-union.europa.eu/principles-countries-history/languages_en
[29] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Security+Operational+Baseline

4.3.5 Additional Inclusion Criteria to Onboard a Research Product

The following inclusion criteria address the onboarding of research products.

- *The Data sources must first be onboarded as a service in the EOSC Catalogue & Marketplace before the research products can be onboarded into EOSC Research Product Catalogue. Research products such as the following are not considered services, hence they cannot be directly onboarded but are onboarded through data sources:*
  - documents
  - datasets
  - software

Research products are typically made available through data sources, including repositories, journal archives, publisher archives, scientific databases, research information systems, and aggregators (of EOSC data sources). The data sources must first be onboarded as a service in the EOSC Catalogue & Marketplace before the research products can be onboarded into the EOSC Research Product Catalogue.

- *Further to meeting the common inclusion criteria to onboard all resource types, these criteria must be met to onboard research products:*
  - *OpenAIRE Guidelines for institutional and thematic Repositories v4.0 and Literature v3.0*[30]
  - *OpenAIRE Guidelines for Data Archives*[31]
  - *OpenAIRE Guidelines for CRIS Managers v1.1*[32]

Other criteria are under discussion for the future, such as a minimum FAIR score for metadata records according to the RDA FAIR Maturity Model Working Group - Specification and Guidelines[33].

4.3.6 Additional Inclusion Criteria to Onboard a Learning Resource

In addition to meeting the common inclusion criteria to onboard all resource types, the following criteria must be met to onboard learning resources.

- *Provide metadata in English when filling in the EOSC Training Resource Profile.*

The default language for the input of all metadata in EOSC, whether for learning resources or any other type of resource, is English.

- *Specify the learning outcomes, resource type (e.g. recorded lesson, textbook, or activity plan), content resource type (e.g. video, slides, or audio), and estimated duration (e.g. estimated work hours).*

Providing rich metadata on the nature of the learning resource is crucial for the end user and these fields will allow informed choices to be made by them. The metadata will also have an impact on the accessibility of these resources as some types of media, for instance, may not be suitable for certain end users.

- *Be in one of the European language(s).*

Since the learning resources are being made available through EOSC, it is expected that only one of the European languages will be the primary language used in the content.

- *Incorporate information about the expected level of training and expertise to be achieved (beginner, intermediate, advanced, all) and required qualifications to access the learning resource.*

[30] https://guidelines.openaire.eu/en/latest/literature/index.html#openaire-guidelines-for-literature-institutional-and-thematic-repositories
[31] https://guidelines.openaire.eu/en/latest/data/index.html#openaire-guidelines-for-data-archives
[32] https://guidelines.openaire.eu/en/latest/
[33] https://zenodo.org/record/3909563#.ZEDzT-xBzRZ

Learning resources can come in varying levels of complexity and many may require prerequisites to be understood. It is essential that the learner is made aware of this and can therefore make informed choices.

- *Comply with the FAIR principles, open and reproducible science practices, and have a defined approach to adherence to them. The provider also ensures file technical integrity (such as completeness of metadata to facilitate discovery and reuse and PIDs). In addition to ensuring the technical integrity of files, the provider should provide the most accurate metadata possible: all mandatory metadata is provided; all copyright, usage conditions, access constraints, and licensing are declared; and all sources are credited when pre-existing resources are reused.*

As with any other digital (research data) object being made available through EOSC, learning resources should adhere to the same FAIR principles to ensure their proper management and ultimately their reusability and sustainability.

- *Provide information about the resource's provenance.*

Learning resources can combine many pre-existing sources of information and thus the provenance of the content is crucial to provide useful information to the learner and also to provide credit to the sources where applicable.

- *Be periodically updated and include the date of the last update to prevent outdated content. In the event that a learning resource is not well maintained but is still useful, the provider must include a note that maintenance has been discontinued.*

The Open Science and EOSC landscape is constantly evolving and there may be occasions when some functionality in a, for instance, EOSC service changes (or even becomes defunct) and therefore the corresponding learning resources for that service need to reflect that. Versioning is essential to keep track of the resources that will likely be of most use to the learner.

- *Ensure preservation (e.g. resources are deposited in a repository/platform that can ensure that they are accessible for a reasonable (3-5 years) period of time, preferably in trusted repositories with a long-term preservation policy). EOSC does not offer long-term preservation.*

The ability to access learning resources confidently in the long-term and with as few obstacles as possible is a necessary requirement to ensure their usefulness. Trusted repositories, in this case typically being training and learning resource catalogues and learning management systems, that are not susceptible to project lifetimes are the preferred choice.

4.3.7 Additional Inclusion Criteria to Onboard an Interoperability Guideline

In addition to meeting the common inclusion criteria to onboard all resource types, the following criteria must be met to onboard an interoperability guideline.

- *The guidelines documentation and profile (i.e. the metadata defined by the provider) is actively maintained.*
- *Use a well-supported, commonly used and open public repository to host or publish the guidelines that is capable of version control for future versions of the documentation or software, and that will assign a PID.*
- *Ensure that the described technical interoperability has been demonstrated in a relevant environment.*
- *Ensure the guideline is mature, meaning that it is version 1+, or higher, that it is actively maintained and/or that it has evidenced uptake. This refers to at least part of the available software (necessary for) implementing the guideline and that it includes adequate support documentation.*
- *The guideline must comprise the minimum required information as specified in the templates found at* https://eosc-portal.eu/eosc-interoperability-framework.

- *The guideline must have a documented and methodical approach to the description of how to implement its recommendations and related software.*
- *URLs cited in the guideline documentation or the guideline's EOSC-hosted metadata should have a Fully Qualified Domain Name (FQDN).*
- *Also and specifically for EOSC-Exchange interoperability guidelines (thematic and horizontal interoperability guidelines as defined in the EOSC Glossary[34]):*
  - *The provider must be able to show evidence of prior utilisation of the guideline in the given communities if asked to do so by the evaluation team. This could be evidenced by descriptions of uptake and/or maturity;*
  - *The provider must be able to show evidence of prior consultation with the relevant community/ies if asked to do so by the EPOT.*

Since the interoperability guidelines will be used to inform the development of additional services, it is important to ensure users have continuous and free access to relevant and up-to-date versions of the guidelines.

[34] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Future+Glossary

5 Conclusions

Deliverable D2.5b is the follow up of deliverable D2.5a and is the final EOSC Future report on the Inventory of the Core Functions and Inclusion Criteria. Deliverable D2.5a described the status of the capabilities of the EOSC Platform and the inclusion criteria for the onboarding of resources at Month 6 (September 2021). Since then, the EOSC Platform has advanced and introduced new capabilities:

- **EOSC Catalogue & Marketplace**: **Resource Discovery** allowing searches through all resources made available through EOSC;
- **EOSC Catalogue & Marketplace: User Dashboard** providing an AI-based personalised environment to navigate EOSC;
- **EOSC Catalogue & Marketplace:** Recommender System providing AI-based recommendations;
- **EOSC Interoperability Framework Registry** allowing the onboarding of interoperability guidelines and linking these to resources;
- **EOSC Execution Framework**: Data Transfer Service as first service of the Execution Framework to support data transfers across resources made available through EOSC.

Also an overview is provided on the service values for each of the EOSC Platform services, describing the customer and user group and value proposition. At the time of writing this deliverable, not all information on the service values is available. Updating the EOSC Portfolio and completing this information for the different services is planned in the remaining time of the EOSC Future project.

In the period between D2.5a and D2.5b, the EC has launched a procurement to procure managed services for the development, integration, deployment, and operations of the Federated EOSC Core (Lot 1). In this deliverable, a mapping has been made between the requested service and service components in Lot 1 and the current capabilities offered through the EOSC Platform. According to this mapping, most of the EOSC Platform capabilities can be mapped onto services components defined in Lot 1, with only 2 exceptions:

- **Personal/Project Workspace:** Not provisioned through the EOSC Platform;
- **Application Workflow Management:** Not yet provisioned through the EOSC Platform although the component can be seen as a further extension of the Execution Framework.

EOSC must support a wide range of resources. Earlier work on onboarding resources concentrated solely on services, and not on other forms of resources such as research products. As a result, the initial platform for onboarding and the initial versions of the EOSC Profiles and inclusion criteria were service-focused. Significant time has been spent in extending the inclusion criteria to cover all kinds of resources. Activity A2.2.4 in WP2 has been supporting WP3 to define the inclusion criteria for the interoperability guidelines, WP9 to define the inclusion criteria for learning resources, representatives of OpenAIRE to define the inclusion criteria for Research Products, and representatives from the cluster and regional projects in the E-OSG to define the inclusion criteria for community catalogues. The current inclusion criteria cover:

- Providers;
- Resource types:
  - Community catalogues (new);
  - Services;
  - Research products (new);
  - Learning resources (new);
  - Interoperability guidelines (new).

In the overview of the inclusion criteria, for each of the defined criteria a commentary text is provided to explain the background reasoning of the criteria. Deliverable D2.5b describes the EOSC Platform capabilities, support services, and inclusion criteria as these have been delivered through the EOSC Future project. After the EOSC Future project ends, the EOSC Platform operational activities will be handed over to the successful consortium of the EOSC Procurement Lot 1.

It is recommended to maintain the definition of the MVE, the set of capabilities offered through the EOSC Platform, and the inclusion criteria for EOSC-Exchange independently from a project and/or procurement. It is advised this is governed/managed by the EOSC Association.

6 Appendix A: Current EOSC-Exchange Inclusion Criteria

6.1 Objective of the Inclusion Criteria for EOSC-Exchange Providers and Resources

The following inclusion criteria are used to validate that providers and resources willing to join EOSC-Exchange are fulfilling a set of requirements based on the EOSC Rules of Participation[35]. The EOSC Rules of Participation are expected to evolve, with the involvement of the EOSC Association Rules of Participation Task Force[36], and will be formally adopted by the governance structures of the EOSC (including the EOSC Association General Assembly, European Commission and the EOSC Steering Board).

6.2 Inclusion Criteria to Onboard as EOSC Provider

This inclusion criteria applies to all Providers willing to onboard any type of resource to EOSC-Exchange.

- Provide accountability for the resources onboarded to EOSC, every EOSC Provider must either be a legal entity itself or must identify a legal entity of which it is a part or with which it is affiliated, which is accountable for the resources being onboarded to EOSC. The legal entity in question is called the "hosting legal entity" and will need to be registered in the EOSC Resource Catalogue before an affiliated provider or its services can be onboarded.
- Intends to onboard resources to EOSC-Exchange that are targeted to EOSC and EOSC communities, or built on or leverage EOSC capabilities to serve some other community.
- Agree on periodically updating data on service providers and their resources. This includes removing resources that are no longer operational or available.
- Provider profile information must be provided in English.

6.3 Inclusion Criteria to Onboard Resources

6.3.1 Common Inclusion Criteria to Onboard all Resource Types

Only onboarded providers will be able to onboard different types of resources to EOSC-Exchange. The resource types can be: services (being data sources a specific type of service), catalogues, research products, learning resources and interoperability guidelines. This section describes general requirements for all EOSC-Exchange resource types, which are complemented by specific requirements for each type of resource to be onboarded to EOSC-Exchange that are detailed below.

Common inclusion criteria to onboard all resource types:

- Providers must first be onboarded as an EOSC Provider before being able to onboard resources.
- The resource to be onboarded is targeted to EOSC and EOSC communities, or built on or that leverage EOSC capabilities to serve some other community.
  - Examples of resources targeted at EOSC and EOSC communities include: services created by researchers or for researchers, or a commercial service with an offer specifically addressed to EOSC and research customers, rather than a generic commercial service. A joint procurement framework or a call program for requesting resources targeting EOSC and/or EOSC communities are examples of the latter.
  - Examples of resources built on or that leverage EOSC capabilities to serve some other community include: offerings from the Digital Innovation Hubs, which rely on EOSC expertise, resources, and capabilities to create new, innovative commercial services.
  - Examples of learning resources targeted at EOSC and EOSC communities are the ones related to open science, research data management, and how to use EOSC resources.

[35] https://op.europa.eu/en/publication-detail/-/publication/a96d6233-554e-11eb-b59f-01aa75ed71a1/language-en/format-PDF/source-184432576#:~:text=The%20Rules%20of%20Participation%20(RoP,the%20resources%20accessible%20through%20EOSC

[36] https://www.eosc.eu/advisory-groups/rules-participation-compliance-monitoring

- For federated or jointly provided resources, the resource onboarding must be done by the coordinating or lead provider (i.e. the coordinating or lead provider is the "Resource organisation" in the resource profile). Other providers may also onboard as EOSC Resource Providers if they wish to appear as supplementary or supporting providers. Such providers will be listed as "Resource providers" in the resource profile.
- The resource provider commits to maintain resource descriptions up-to-date, this includes removing resources that are no longer operational or available.
- Resource profile information must be provided in English.

6.3.2 Additional Inclusion Criteria to Onboard a Community Resource Catalogue [37]

In addition to meeting the common inclusion criteria to onboard all resource types, these criteria must be met to onboard a community catalogue:

- To have a documented and methodical approach for the validation of information about resources that have been included in CO's own catalogue.
- To ensure that records are kept up-to-date and that providers are prepared to correct errors if and when they are identified during the verification (auditing) procedures of EOSC Resource Catalogue records.
- To onboard and synchronise records with the EOSC Resource Catalogue.
- To cooperate with the operators of the EOSC Portal[38] in ensuring that policies across catalogues are consistent by participating in the EOSC Onboarding Strategy Group (E-OSG).
- To follow the EOSC Security Operational Baseline[39], as implemented by EOSC Future.
- To declare conformance to the inclusion criteria to onboard a resource catalogue by sending an EOSC Catalogue Onboarding Agreement[40].

6.3.3 Additional Inclusion Criteria to Onboard a Service[41]

In addition to meeting the common inclusion criteria to onboard all resource types, these criteria must be met to onboard a service:

- Be a single and distinct service (i.e. not a generic list of services but a service in its own right). It can be an IT service, a consulting, or training service, among others (note 2).
- Be available and offer value on its own.
- Be mature, meaning a Technology Readiness Level (TRL)[42] 8 or higher, or beta services (TRL7)[43] that are clearly labelled as beta. Beta services are not orderable. Beta services are less mature and are expected to evolve, therefore using beta services is at your own risk.
- Use URLs that are Fully Qualified Domain Names (FQDNs) and follow security best practices; for example, using TLS with the service presenting a certificate issued by a certificate authority trusted by most web browsers.
- The service must be accessible from one or more European countries (EU countries plus EEA, UK) and to European researchers.
- If the default language of the service is not in English, but in one or more other European Language(s) (note 1), basic information in the User Interface of the service must be available in English.
- The service provider must provide all key information such as Privacy statement, Service Level Agreements, Specifications and Descriptions in English, or Data and Metadata policies and licences. Other documentation may be in a different language to English.
- The service helpdesk or support channel must be able to answer questions in English.

[37] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Future+Glossary#EOSCFutureGlossary-Service
[38] https://eosc-portal.eu/
[39] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Security+Operational+Baseline
[40] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Catalogue+Onboarding+Agreement+and+Onboarding+Workflow
[41] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Future+Glossary#EOSCFutureGlossary-Service
[42] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Future+Glossary#EOSCFutureGlossary-TRL
[43] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Future+Glossary#EOSCFutureGlossary-TRL

- The service provider must follow the EOSC Security Operational Baseline, as implemented by EOSC Future.

When the service to onboard is a data source, these criteria must also be met:

- The data source must make research products discoverable and accessible in a FAIR way.

6.3.4 Additional Inclusion Criteria to Onboard a Research Product[44]

Research products are made available through Data Sources of the following kinds: repository, journal archive, publisher archive, scientific database, research information systems, and aggregator (of EOSC data sources). The Data sources must first be onboarded in the EOSC Catalogue & Marketplace before the research products can be onboarded into EOSC Research Product Catalogue (Research products such as literature, datasets, and a piece of software are not considered services). Further, the OpenAIRE Guidelines[45] apply to onboard research products:

- OpenAIRE Guidelines for institutional and thematic Repositories v4.0 and Literature v3.0[46]
- OpenAIRE Guidelines for Data Archives[47]
- OpenAIRE Guidelines for CRIS Managers v1.1[48]

Other criteria are under discussion for the future, such as a minimum FAIR score for metadata records according to the RDA FAIR Maturity Model Working Group - specification and guidelines[49].

6.3.5 Additional inclusion criteria to onboard a learning resource[50]

In addition to meeting the common inclusion criteria to onboard all resource types, these criteria must be met to onboard learning resources:

- Provide metadata in English when filling-in the EOSC Training resource profile.
- Specify the learning outcomes, resource type (e.g. recorded lesson, textbook, activity plan, etc.), content resource type (e.g. video, slides, audio, etc.), and estimated duration (e.g. estimated work hours).
- Be in one of the European language(s) (note 1)
- Incorporate information about the expected level of training and expertise to be achieved (beginner, intermediate, advanced, all) and required qualifications to access the learning resource.
- Comply with the FAIR principles, open and reproducible science practices, and have a defined approach to adherence to them. The provider also ensures file technical integrity (completeness of metadata to facilitate discovery and reuse, PIDs, etc.). In addition to ensuring the technical integrity of files, the provider should provide the most accurate metadata possible: all mandatory metadata is provided; all copyright, usage conditions, access constraints, licensing are declared; and all sources are credited when pre-existing resources are reused.
- Provide information about the resource's provenance.
- Be periodically updated and include the date of the last update to prevent outdated content. In the event that a learning resource is not well maintained but is still useful, the provider must include a note that maintenance has been discontinued.
- Ensure preservation (e.g. resources are deposited in a repository/platform that can ensure that they are accessible for a reasonable (3-5 years) period of time, preferably in trusted repositories with a long-term preservation policy). EOSC does not offer long-term preservation.

[44] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Future+Glossary#EOSCFutureGlossary-ResearchProduct
[45] https://guidelines.openaire.eu/en/latest/
[46] https://guidelines.openaire.eu/en/latest/literature/index.html#openaire-guidelines-for-literature-institutional-and-thematic-repositories
[47] https://guidelines.openaire.eu/en/latest/data/index.html#openaire-guidelines-for-data-archives
[48] https://guidelines.openaire.eu/en/latest/
[49] https://zenodo.org/record/3909563#.ZEDzT-xBzRZ
[50] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Future+Glossary

6.3.6 Additional Inclusion Criteria to Onboard an Interoperability Guideline[51]

In addition to meeting the common inclusion criteria to onboard all resource types, these criteria must be met to onboard an interoperability guideline:

- The guidelines documentation and profile (i.e. the metadata defined by the provider) is actively maintained.
- Use a well-supported, commonly used and open public repository to host or publish the guidelines that is capable of version control for future versions of the documentation or software, and that will assign a PID.
- Ensure that the described technical interoperability has been demonstrated in a relevant environment.
- Ensure the guideline is mature, meaning that it is version 1+, or higher, that it is actively maintained and/or that it has evidenced uptake. This refers to at least part of the available software (necessary for) implementing the guideline and that it includes adequate support documentation.
- The guideline must comprise the minimum required information as specified in the templates found at https://eosc-portal.eu/eosc-interoperability-framework
- The guideline must have a documented and methodical approach to the description of how to implement its recommendations and related software.
- URLs cited in the guideline documentation or the guideline's EOSC-hosted metadata should have a Fully Qualified Domain Name (FQDN).
- Also and specifically for EOSC-Exchange Interoperability Guidelines (thematic and horizontal interoperability guidelines as defined in the EOSC Glossary[52]):
  - The Provider must be able to show evidence of prior utilisation of the guideline in the given communities if asked to do so by the evaluation team. This could be evidenced by descriptions of uptake and/or maturity.
  - The Provider must be able to show evidence of prior consultation with the relevant community/ies if asked to do so by the EPOT.

Notes of clarifications:

1. European languages in which the resource could be available
2. Research products such as documents, datasets, and a piece of software are not considered services
3. There is not a minimum TRL required to onboard research products as they are products of science (e.g. articles and datasets) and this concept does not apply to them.
4. There is not a minimum TRL required to onboard learning resources as this concept does not apply to them.

[51] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Future+Glossary#EOSCFutureGlossary-Service
[52] https://wiki.eoscfuture.eu/display/PUBLIC/EOSC+Future+Glossary