

# Aligned Roadmap for Service Positioning and Sustainability Within EOSC

## EOSC-hub and OpenAIRE-Advance Collaboration Agreement Joint Activity Milestone 3.4

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### About this paper

This paper presents an aligned EOSC-hub-OpenAIRE-Advance roadmap for service alignment within the EOSC, fulfilling Joint Activity Milestone 3.4 of the EOSC-hub-OpenAIRE-Advance Collaboration Agreement. The paper summarises the EOSC-hub Briefing Paper “EOSC Federating Core Governance and Sustainability” and the OpenAIRE White Paper “Achieving Open Science in EOSC”, compares their areas of convergence and complementarity, and presents the roadmap of steps which will be taken towards alignment of EOSC-hub and OpenAIRE-Advance services within the EOSC.

### Delivery slip

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## Glossary

Acronym / Item	Description
EGI Federation	A federation of computing and storage resource providers united by a mission to support research and development. The federation is governed by the participants represented in the EGI Council and coordinated by the EGI Foundation.
e-IRG	e-Infrastructures Reflection Group
EOSC	European Open Science Cloud
EOSC Executive Board	Body of representatives from the research and e-infrastructures communities, appointed by the European Commission
EOSC Governance	Overall Governance Structure for EOSC, comprising EOSC Governance Board, EOSC Executive Board and Stakeholder Forum (latter not yet specified)
EOSC Governance Board	Also “EOSC board”: institutional group gathering the member states and the Commission to ensure effective supervision of the implementation
EOSC-hub	Project creating the integration and management system of the future European Open Science Cloud
ERA	European Research Area: The European Research Area (ERA) is a unified research area open to the world and based on the internal market, enabling free circulation of researchers, scientific knowledge and technology
ESFRI	European Strategy Forum on Research Infrastructures: Strategic instrument to develop the scientific integration of Europe and to strengthen its international outreach.
EUDAT CDI	European e-infrastructure of integrated data services and resources to support

	research
FAIR	Guiding principles to make data Findable, Accessible, Interoperable, and Reusable
Horizon 2020	The European Union Framework Programme for Research and Innovation
INDIGO-DataCloud	Project developing a data/computing platform targeted at scientific communities, deployable on multiple hardware, and provisioned over hybrid (private or public) e-infrastructures
OpenAIRE-Advance	Project supporting Open Access/Open Data mandates in Europe
PRACE	Partnership for Advanced Computing in Europe

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## 1. Introduction

The EOSC-hub and OpenAIRE-Advance projects play a fundamental role in realising the European Open Science Cloud (EOSC). Together, the two projects will provide researchers across Europe with a set of services and resources which will empower them to exploit the potential of data and multidisciplinary research. The overall aim is to give Europe a global lead in scientific data infrastructures and to ensure that scientists reap the full benefits of open data-driven science.

The EOSC-hub project mobilises service providers from the EGI Federation, EUDAT CDI, research infrastructures and INDIGO-DataCloud to allow European researchers and innovators to discover, access, use and reuse a broad spectrum of resources for advanced data-driven research through the EOSC. The OpenAIRE-Advance project has established a socio-technical network and infrastructure supporting open scholarly communication by providing services, support and training to enable the sharing, publishing and discovery of data, publications and software.

The EOSC-hub and OpenAIRE Advance projects concluded a Collaboration Agreement in April 2018 in recognition of the importance of the combined and complementary contribution they will make to the EOSC. The purpose of the Collaboration Agreement's Governance and Strategy Work Package is to ensure strategic alignment between the two Complementary Grants including but not limited to community engagement, service development, and service positioning and sustainability within the EOSC. The aim of this work package is to deliver increased joint impact on the landscape of digital infrastructure for research, and a coordinated contribution to the EOSC implementation roadmap.

The first joint white paper 'Common Vision, Service Provision, and Role in the EOSC Governance'<sup>1</sup> published in June 2019 examined the priorities needed to ensure full delivery of the EOSC vision. It concluded with a number of actions such as the need for an EOSC charter and the need for business planning for EOSC services.

In this context, the Joint Activity Milestone 3.4 of the Collaboration Agreement commits the projects to developing an aligned roadmap for service positioning and sustainability in the EOSC. The roadmap, which is described below, defines a plan for effective collaboration between EOSC-hub and OpenAIRE beyond the end of 2020 in the provision of services to the EOSC, with the intention that this will lead towards a pan-European multi-disciplinary research e-Infrastructure for the provision of data, compute, storage and scholarly communications resources to European researchers.

This paper summarises the preliminary work which has taken place to date towards this goal and seeks to draw out convergence and complementary points. It concludes with a Roadmap for the next 15 months.

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<sup>1</sup> <https://eosc-hub.eu/news/joint-vision-future-collaboration>

## 2. Roadmap Foundations - EOSC-hub Briefing Paper and OpenAIRE White Paper

The EOSC landscape continues to evolve rapidly. Initial discussions between EOSC-hub and OpenAIRE Advance explored conceptions about what the architecture for service provisioning should target in the light of both initiatives - a starting point towards defining a joint roadmap for service positioning and sustainability. The projects separately pursued their individual commitments of relevance to the joint roadmapping activity, leading to the publication in July 2019 of the EOSC-hub Briefing Paper “EOSC Federating Core Governance and Sustainability”<sup>2</sup> and the OpenAIRE White Paper “Achieving Open Science in EOSC”<sup>3</sup>. The contents of these two papers are summarised below and are compared in Chapter 3.

### 2.1 EOSC-hub Briefing Paper - EOSC Federating Core Governance and Sustainability

The EOSC-hub Briefing Paper presents proposals for the Federating Core of EOSC and its governance and sustainability. The paper was stimulated by the requirement to define a plan (Governance and Sustainability Roadmap) for collaboration between EGI, EUDAT and INDIGO-DataCloud. The development of viable governance and sustainability proposals requires clear definition and agreement of what needs to be governed, and the Briefing Paper is a first attempt to define this, with the intention that the proposals can be developed further in the future by the addition of a mapping of components or services from EGI, EUDAT, INDIGO-DataCloud or indeed any other organisation to the Federating Core. The paper was published in July 2019 and was the subject of a public consultation to gather feedback.

The Briefing Paper reflects the nature of EGI, EUDAT and INDIGO-DataCloud as data and compute service providers, and the aim of EOSC-hub to mobilise these infrastructures for the EOSC.

The proposals for the definition of the Federating Core are based on the EC’s EOSC Implementation Roadmap<sup>4</sup> and EOSC Strategic Implementation Roadmap<sup>5</sup> documents and interpret their description of the elements of the Federating Core based on recommendations from case studies including the EOSCpilot project Science Demonstrators and Thematic Service Providers and Competence Centres in the EOSC-hub project which include various ESFRI projects and landmarks, international communities of practice and international research projects.

In the paper, the Federating Core is proposed to be composed of three tiers, the **Federating Tier** (Hub Portfolio), the **Resource Tier** (Shared Resources) and the **Regulatory Tier** (Compliance Framework).

- The **Hub Portfolio**: services that implement the federating tier (Hub portfolio) to provide integration, i.e. the activities and tools to provide coordinated access to and management of resources (services and scientific products) provided by multiple suppliers (internal and external to the EOSC organisation). EOSC resources are expected to be delivered at national and European levels, together with the support and expertise necessary to address complex digital needs of the EOSC user communities
- The **Shared Resources**: include the scientific outputs (data, applications, software, pipelines, etc.) and the storage and compute hosting platforms needed to deposit, share and process these outputs

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<sup>2</sup> <https://www.eosc-hub.eu/sites/default/files/EOSC-hub%20Briefing%20Paper%20-%20EOSC%20Federating%20Core%20Governance%20and%20Sustainability%20Public.pdf>

<sup>3</sup> The report is available on Zenodo, DOI: [10.5281/zenodo.3475076](https://doi.org/10.5281/zenodo.3475076)

<sup>4</sup> SWD (2018) 83 final [https://ec.europa.eu/research/openscience/pdf/swd\\_2018\\_83\\_f1\\_staff\\_working\\_paper\\_en.pdf](https://ec.europa.eu/research/openscience/pdf/swd_2018_83_f1_staff_working_paper_en.pdf)

<sup>5</sup> [https://ec.europa.eu/research/openscience/pdf/eosc\\_strategic\\_implementation\\_roadmap\\_large.pdf](https://ec.europa.eu/research/openscience/pdf/eosc_strategic_implementation_roadmap_large.pdf)



- The **Compliance Framework**: defining the policies and processes for the demand side and the supply side to engage with EOSC. This includes the Rules of Participation, the Service Management System and related policies.

The EOSC **Service Portfolio** complements the Federating Core by providing additional added-value services (common and thematic) which exploit the Federating Core and are discoverable through the EOSC Portal.

The paper also makes proposals concerning the governance, sustainability, access and costing of the Federating Core:

- The entire Federating Core should be governed by the EOSC. Its sustainability - including the costs of federating existing digital infrastructures - should be assured by funding from Member States, the EC and international research organisations
- The Hub Portfolio and Compliance Framework elements of the Federating Core should be accessible through the Wide Access mode to all suppliers participating in the EOSC federation. Wide access mode, excellence-driven access mode and market-driven access mode<sup>6</sup> are all likely to be supported by Shared Resources
- Services in the EOSC Service Portfolio should be independently owned and governed by their respective providers, as now, but be discoverable and accessible (non-exclusively) through the EOSC portal
- The paper recommends that EOSC access modes should be appropriate to the size of the demand in relation to the scarcity of the resource, and that a mechanism based on unit costs would create a synergy between the different access modes at the funding level whilst achieving consistency in the compensation mechanisms of public and commercial sector service providers
- The paper also includes a partial costing estimate for the Hub Portfolio and Compliance Framework derived from the cost of relevant activities within the scope of EOSC-hub.

## 2.2 OpenAIRE White Paper - OpenAIRE in EOSC

This white paper focuses on strengthening and enforcing Open Science practices across Europe through active participation in and contribution to the EOSC, and sets out how OpenAIRE can deliver this goal.

The paper stresses that the EOSC should function as a 'Research Commons'. All research communities could actively contribute to deliver a network of digital resources to access, store, manipulate, publish and re-use data. This is enhanced by harnessing scholarly communication practices including new ways of publishing and monitoring Open Science, and FAIR data practices. These activities will be fuelled by engaged social participation and Open Science policy activities across Member States. OpenAIRE views the EOSC as consisting of two main layers: the Technological Layer and the Human Layer.

The EOSC's **Technical and Service Layer**, which will be driven by participatory design, is envisaged in four layers:

- The **Services Layer** consists of all services in institutional, national, European/RIs settings. A nucleus of the decentralized Research Commons, reflecting the diversity of Europe with local practices and investments, providing the agility and flexibility for innovation
- The **Content Interoperability Layer** is based on a **compliance framework** that (i) dictates and applies the rules of how the data elements are published, shared and re-used, and (ii) implements

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<sup>6</sup> Access modes are defined in the European Charter for Access to Research Infrastructures [https://ec.europa.eu/research/infrastructures/pdf/2016\\_charterforaccessto-ris.pdf](https://ec.europa.eu/research/infrastructures/pdf/2016_charterforaccessto-ris.pdf)

the Open Research Graph, i.e., an interlinked space where every research output comes with its context (related entities), provenance (full data and science path) and access and usage information

- The **Access Interoperability Layer** assures a uniform delivery of services and data for EOSC. Through a **B2B mechanism for sharing and access** it brings non-regulatory measures such as recommended standard contract terms for services and data access, specifications for quality (certification), security and privacy (including trust and identity), and ensures these are applied throughout. It also supports categorization (to simplify browsing), curation (to deliver quality), cataloguing (to offer intelligent discovery), crowdsourcing (to engage researchers for active participation)
- The **Monitoring Layer**: Usage of all outputs needs to be tracked by their policies or services of data. OpenAIRE collects and normalises this data for all EOSC services, reflecting user uptake and also contributing to overall monitoring and assessment in research.

Complementary to the technical layer is the **human layer** which supports the following two elements:

1. **Open Science policy implementation** at all levels: this includes national helpdesks who advise on Open Science, legal issues, data scientists and domain experts to support the work carried out by policy makers and research performing organisations
2. **A training infrastructure**: relevant support networks have to be established at national and thematic level. This core support mechanism needs to establish certification mechanisms and a registry of materials.

In order to support the implementation of Open Science in EOSC, a number of players need to be in place, namely experts in Open Science, experts on legal issues, and information and data experts. These actors should be embedded within RPOs and RFOs. EOSC is a multi-level endeavour and OpenAIRE offers at national and EU level this support to embed Open Science in national-level EOSC structures.

Another core aim is to integrate the long tail of research data with large scale data creation and to encourage sharing and reproducibility of data through a storage and computing cloud, which will support the creation of larger datasets and their application and reuse.

The White Paper proposes that the federating core should be complemented by a framework of activities, resulting in a 'Research Commons' approach:

- **Shared Policies** around rewarding the practice of Open Science across countries and funders. These need to be consistent, standardised and machine readable
- **A robust and pervasive Training Programme** for researchers that can be tailored to individual national members' needs and make use of local expertise: Train-the-trainers approach
- **An increasingly common legal framework** expressed in common and interoperable policies and RoPs on **IPR, Personal Data, and for data re-use**, and the eventual straightforward sharing of all research outputs (software, algorithms, lab books, etc.). This should also include clear and simple guidelines and platforms in relation to procurement as well as competition law/state aid rules guidance

- Access policies, whose fundamentals are accepted and embedded in research policy and national strategy by Member States<sup>7</sup>.

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<sup>7</sup> e-IRG Reflection Group, Holmgren et al., 'National Nodes - Getting Organised; How Far Are We? Implementing e-Infrastructure Commons and the European Open Science Cloud', p.4

### 3. Discussion of EOSC-hub Briefing Paper and OpenAIRE White Paper

The two papers view the EOSC from different perspectives - from a data and compute service perspective in the case of the EOSC-hub paper, and from a research enabling services perspective, manifested through a scholarly communications infrastructure, in the OpenAIRE White Paper. An early challenge for the aligned roadmap is to converge or merge the perspectives of the two papers to form a position paper proposing the main functions and priorities for EOSC and including the Minimal Viable Ecosystem (MVE)<sup>8</sup>, of the EOSC. No contradictions have been identified between the two papers and they are broadly compatible; the challenge lies rather in aligning models and vocabularies. A joint position paper will help to define the value the EOSC will add for users and providers compared to their current ways of working by providing a description of the functions EOSC-hub and OpenAIRE can together provide to the EOSC, and will help to address the two main but separate objectives of the EOSC, that it will support Open Science and that it will consolidate and sustain the European e-Infrastructures. It will be used, firstly, for further discussion with other members of the research community to develop a community position paper on the MVE/Federating Core, and secondly to elaborate details of the collaboration between EGI, EUDAT CDI, INDIGO-DataCloud and OpenAIRE to deliver a coordinated contribution to the EOSC. The joint position paper will provide a foundation to projects bidding to future EOSC calls like INFRAEOSC-03 and 07 in response to which the European e-Infrastructures are expected to collaborate. This is recognised in the roadmap in Chapter 4 below.

#### 3.1 Areas of Convergence

Both papers take a structured approach involving layers or elements to services. A preliminary comparison of the two approaches shows that several aligned aspects are proposed in both papers. These converging areas include:

- **Functions to support access to data or services:** EOSC-hub targets data centres, and all aspects of data management within, and OpenAIRE targets those research communities who wish to add a layer of publishing, linking and sharing to their workflows
- A concerted effort to expand **skills and training:** whether for data stewardship and open science or for service operation and use, EOSC needs a trained workforce. It also requires a number of helpdesk functionalities: technical as well as policy-related in scope
- **Policy framework** including the EOSC Rules of Participation and other policies relating to interoperability, Open Science and other aspects. This policy framework is seen as a core function of EOSC
- **A commitment to open governance in EOSC.**

##### 3.1.1 Policy and the Compliance Framework

The EOSC-hub briefing paper proposes a Compliance Framework as part of the Federating Core, which includes the Rules of Participation, the Interoperability Framework and other policy-related elements of the EOSC. These would be developed or contributed from a range of sources or providers.

Both EOSC-hub and OpenAIRE promote a common set of data policies in order to make data interoperable. Additional policies are addressed by EOSC-hub to ensure interoperability and security of the access services.

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<sup>8</sup> The Minimal Viable Ecosystem (MVE) is proposed in the 2nd EOSC High-Level Expert Group report “Prompting an EOSC in Practice”, whereas the Federating Core term is proposed in the EC’s EOSC Implementation Roadmap

Implementing Open Science requires policies and this capacity to support implementation should also be in any Minimum Value Framework. In addition, both EOSC-hub and OpenAIRE place great emphasis on the 'human' layer of EOSC. This is an essential social layer that supports use and uptake of EOSC. A layer of experts in Member States supports the creation and implementation of national level policy for Open Science and a key part of OpenAIRE's business as an e-Infrastructure is to run a Helpdesk for Open Science policies at national levels. Activities to promote and establish Open Science policies and support structures at funder and institutional levels are an essential part of making EOSC work at a national level.

### **3.1.2 Both Support Open Governance**

EOSC has to remain in the public domain at all costs. Via a set of governance structures running at national level, by the relevant experts, which also link to international infrastructures. EOSC-hub proposes that the Federating core continues to be governed by the EOSC governance. Funding for this approach would come from Member States, the EC and international organisations. OpenAIRE also supports the Open Government Partnership which places Open Science in a strong position on national agendas. It embeds and strengthens support for Open Science by ensuring that research policies make reference to the needs of the wider society. This can also be leveraged to support EOSC as an openly governed infrastructure.

Access policies for data are also relevant here. Adequate information and support need to be set up for SLAs, and data sharing and service provisioning agreements along with licensing information. Data policies and licenses are also crucial in order not to run the risk of acquisition by private enterprises.

### **3.1.3 Both support a concerted push for Skilling and Training in the context of EOSC**

Both EOSC-hub and OpenAIRE promote a strong training angle within EOSC including coordinated training with certification mechanisms. There is a clear need for digital skills, Open Science knowledge and above all to empower individuals to roll out dialogues to adopt new responsible research and scholarly communication practices within their institutions and at the level of research groups.

Both papers flag up the need for a helpdesk, albeit EOSC-hub's offering is more technical, it would be possible to link them to requests around Open Science, research data management, FAIRification of data and support for the EOSC portal.

## **3.2 Areas of Complementarity**

The EOSC-hub Federating Core proposals focus on functions to support federation, interoperation or integration of services but this includes support for scholarly communications services, and the Federating Core components could be enhanced by the inclusion of further functions to support Scholarly Communications. The OpenAIRE Advance paper focuses on scholarly communications services but this can be complemented by the functions or services supplied by the EOSC-hub partners, which are required to support interoperability of scholarly communications services such as those for assigning PIDs. Both papers envisage public funding continuing to support the EOSC.

The papers differ in their focus, in that the OpenAIRE paper addresses the publishing and sharing element of scholarly research serving the institutional, national or European or Research Infrastructures settings. It defines the data interoperability, data access, and monitoring layers. The EOSC-hub paper is focussed on attempting to define the functions which should constitute the EOSC Federating Core, which it proposes should be governed by the EOSC and sustained by public funding from Member States, the EC and international organisations.

**In developing a joint position paper it will be important to specify which aspects of the Technological Layer and the Human Layer in OpenAIRE's model belong to the Federating Core or Minimal Viable Ecosystem of the EOSC, which should be governed by the EOSC, and how they should be sustained.**

These aspects of the two papers are discussed in more detail below.

### 3.2.1 Service User Perspectives

Two different perspectives are employed in the respective white papers in terms of **who the services are targeted to**. This can be seen largely as a strength and complementarity area between the projects.

- EOSC-hub's consortium includes research communities which need to produce, store, manage, transfer, process and analyse large-scale datasets. From the OpenAIRE perspective the services are targeted via its scholarly communications layer which helps researchers to publish their data. An important motivation for engaging in the implementation of the EOSC however is to make large datasets and other research resources more widely available
- OpenAIRE services serve several stakeholders in the research life-cycle: researchers, research communities and infrastructures, research and academic organisations, funders, research administrators (e.g. project officers), scholarly communication content providers. In terms of where OpenAIRE's services in EOSC sit, for content providers OpenAIRE offers an entry point to EOSC via the PROVIDE Dashboard registration and validation services, with the **Guidelines for Content Providers** (publication, data, software repositories, CRIS, and usage statistics) as an envisioned part of EOSC RoP; for researchers, and research communities, technical services offer tools to publish, share, discover, plan production, and access of all kinds of scientific products (publications, datasets, software, and others); for policy makers (RPOs, RFOs and RIs), tools to monitor research impact and Open Science trends, with the OpenAIRE Research Graph in the centre as a key asset of EOSC. While training and dissemination services make sure that at the national, institutional, thematic and global levels all aspects of Open Science and data management are well understood by scientists, organisations, and funders and are as aligned as possible
- The national perspective comes heavily into play in OpenAIRE's White Paper, contributing to the shared open science policy framework, its alignment and implementation in national settings. The NOADs, the relevant bodies and national 'nodes', set the scene for policy creation and align local needs with those at European level. From a scholarly communications perspective, OpenAIRE wishes to support users to enhance their scientific output, such as research groups to establish dashboards and publishing and linking of artefacts. Each researcher can be provided with a meaningful set of tools to support publishing and promote innovative ways of disseminating research and subsequent monitoring.

### 3.2.2 Incorporating the Two Sets of Layers

The EOSC-hub briefing paper presents proposals for the EOSC federating core as a step on the Governance and Sustainability Roadmap for collaboration between EGI, EUDAT and INDIGO-DataCloud beyond the end of 2020. The paper proposes that the Federating Core is governed by the EOSC, whereas services in the EOSC Service Portfolio would continue to be governed as they are now. EGI, EUDAT and INDIGO-DataCloud expect to provide some of the functions of the EOSC Federating Core including the Shared Resources, but they will also provide services as part of the Service Portfolio. In developing a joint paper with OpenAIRE, it is intended to include OpenAIRE's services as part of the proposed Federating Core, while some will form part of the EOSC Service Portfolio.

EOSC-hub can contribute to the proposed Federating Core, through various key exploitable results:

- EOSC-hub contributes to the **EOSC service portfolio** via data, data analytics and general solutions for data management and processing that are provided by research collaborations, Resource Infrastructures, e-Infrastructures like EGI and EUDAT CDI, and Indigo DataCloud
- EOSC-hub contributes to the implementation of the **EOSC shared resources** via distributed computing and storage resources sourced by the EGI Federation and the EUDAT CDI. These resources can be used as data hosting platforms supporting data analytics contributed by publicly funded and commercial suppliers providing them as managed services
- EOSC-hub contributes to the **Hub Portfolio** (the EOSC-hub federating tier) via a number of technical and human enabling services
  - Human Services for skills and training
    - Training courses and materials: the project is developing a Knowledge Hub containing tools, consulting models and material to provide tailored training services. It is performing data management planning and user support relating to generic and thematic services, which can also contribute towards EOSC Support Services
    - The Digital Innovation Hub and the Competence Centres: to help expanding the EOSC user base within research infrastructures and industry and SMEs
  - Technical Services
    - EOSC Portal and Marketplace: including website, marketplace, service metadata catalogue and content provisioning<sup>9</sup>. The EOSC Portal widens access to services for users and helps increase demand for EOSC services by improved discoverability, login and order management of resources and services. The EOSC Portal AAI supports federated identity management and access through a federated AAI proxy, credential translation services and hosted identity provisioning compatible with the AARC Blueprint Architecture<sup>10</sup>
    - Service management System: a set of policies, processes and supporting tools for integrated service provisioning through the EOSC Portal that benefits current and prospective data and service providers. Examples of processes and tools are: customer relationship management, service provider relationship management and order management (supported by the EOSC Portal backoffice), incident and problem management (through an integrated helpdesk accessible through the EOSC Portal), SLA management (through tools for federation monitoring and SLA and OLA management), and service portfolio management. These are complemented by an operations portal, configuration management database and collaboration software to provide several of the key functions of the EOSC Hub Portfolio.
- EOSC-hub is also developing several components likely to form part of the EOSC Rules of Participation to ensure quality and conformance of resources provided through the EOSC and build trust for users. They include Technical Interoperability Guidelines, EOSC usage policies including acceptable use and security, and policies for EOSC providers including service level agreements and operations level agreements. The Interoperability Guidelines will minimise the technical design and development effort needed to access the EOSC services market and remove fragmentation of service provisioning and access.

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<sup>9</sup> The EOSC Portal is developed in collaboration with eInfraCentral and OpenAIRE

<sup>10</sup> <https://aarc-project.eu/architecture/>

A number of OpenAIRE services are relevant to EOSC. OpenAIRE would view its long-established guidelines and Provide service as a gateway for EOSC data providers to become registered as data sources and this layer will set up access mechanisms for content providers. This will allow a validation of research data sets, via a minimum set of metadata fields, to ensure a certain level of findability as well as coming from trustworthy institutions who curate and provide validated data. Central to this is the OpenAIRE research graph which enables a vast set of metadata to be searched across datasets, publications, software, as well as relevant links to associated research information such as project information, researcher ID, funder IDs. This catalogue in turn enables the monitoring of usage of EOSC services as well as a more granular approach, enabling a view on individual usage of datasets. In terms of scholarly communications, the publishing, curating, and sharing of research artefacts can be provided by the OpenAIRE services such as Zenodo, Argos (DMP) and individual curated research dashboards via OpenAIRE connect.

In its White Paper, OpenAIRE sets out a technical vision for EOSC which is primarily seen as a co-created activity. It is collaboratively developed and can be seen as a system of systems. The layers it puts forward are an essential part of the federating core, especially the following:

1. Data interoperability layer: a large body of data which can be reused and shared and made FAIR. It incorporates standards, APIs and information on licenses
2. Access interoperability layer: this deals with accessing in a uniform way all the data output. It ensures a trustworthy environment and a set of data catalogues and a minimum level metadata framework
3. Monitoring layer: this collects in a normalized and agreed-upon manner all types of usage and performance-related data for all individual components of EOSC.

Many services already exist at the national level, these funded localised services should be leveraged into the EOSC, thus ensuring the service offering is as decentralised and inclusive as possible.

Ultimately however it can be possible that these extra layers can be subsumed into the Minimum Viable Product set forward by the EOSC Sustainability Working Group. This should be the focus of the next iteration of the roadmap.

### **3.2.3 Supporting Large Scale Data Production and The Long Tail of Data With 'Added Services'**

Via the EOSC-hub-OpenAIRE collaboration, services in support of data-driven 'large scale' research - producing large scale research data - can have added value by adding context and links, facilitated ultimately by Open Science processes, in order to make them more intelligible. This is a complementarity effort: these two infrastructure provider services can therefore meet in the middle in order to provide 'value added' data outputs to the scholarly community. EOSC-hub can promote the use of these publishing services and research community dashboards and OpenAIRE can harness the long-tail research data output of institutions.



## 4. Roadmap

The table below summarises the roadmap which will lead to aligned service positioning and sustainability of EGI, EUDAT, INDIGO-DataCloud and OpenAIRE services in EOSC.

Timeline	Milestone	Output
May-August 2019	Initial discussions on alignments of roadmaps, leading to production of EOSC-hub Briefing Paper and OpenAIRE White Paper	EOSC-hub Briefing Paper - "EOSC Federating Core Governance and Sustainability"; OpenAIRE Advance White Paper - "OpenAIRE in EOSC"
October 2019	Publication of EOSC-hub-OpenAIRE Advance JAM3.4 Milestone, Aligned roadmap for service positioning and sustainability within EOSC (this document)	EOSC-hub-OpenAIRE Advance aligned EOSC service and sustainability roadmap
October 2019	Publication of joint EOSC-hub-OpenAIRE Advance position paper on service positioning and sustainability of the EOSC	Joint EOSC-hub-OpenAIRE Advance position paper on service positioning and sustainability of the EOSC
November 2019	Sustainability discussion meeting - mapping activities/outputs for the INFRAEOSC-03 and -07 proposals Partners: EGI, EUDAT, INDIGO-DataCloud, OpenAIRE	Functions/activities for inclusion in -03 proposal and in -07 proposals
November 2019	Consultation workshop on EOSC Federating Core/MVE, value proposition, governance and sustainability at EOSC Symposium, Budapest	Feedback on joint position paper
By end of November 2019	Present proposal of which of EGI, EUDAT, INDIGO-DataCloud and OpenAIRE's services/activities will be continued in which of the -03 and -07 projects	Proposed services/activities for the -03 and -07 projects
December 2019	EC EOSC Implementation Roadmap milestone: initial EOSC federating core in place	EOSC Federating Core
To end of March 2020	Preparation of proposals for H2020 calls INFRAEOSC-03 and -07 – drawing on community position paper and business plan	INFRAEOSC-03 project proposal

April 2020	INFRAEOSC-03 and -07 proposals submission deadline	INFRAEOSC-03 and -07 project proposals
August/September 2020	Result of evaluation of INFRAEOSC-03 and -07 proposals from EC	Evaluation results
January 2021	Start of INFRAEOSC-03 and -07 projects	

## 5. Conclusions

The roadmap proposed in this paper describes the path which will be taken towards aligned service positioning and sustainability in the EOSC for EGI, EUDAT, INDIGO-DataCloud and OpenAIRE, leading to collaboration along with other partners in the project to be funded from January 2021 by the INFRAEOSC-03 call, which will carry on from the EOSC-hub and OpenAIRE Advance projects. A significant and early part of the roadmap is production of a joint position paper which will propose those functions or services EGI, EUDAT, INDIGO-DataCloud and OpenAIRE will provide as part of the EOSC federating core, along with proposals for their governance and sustainability and will help to further define the value-add of the EOSC for its prospective users and suppliers.