



European
Commission

EOSC Architecture Working Group View on the Minimum Viable EOSC

Report from the
EOSC Executive
Board Working
Group (WG)
Architecture

Independent
Expert
Report

EOSC Executive Board
WG Architecture
February 2021

Research and
Innovation

EOSC Architecture Working Group View on the Minimum Viable EOSC

European Commission
Directorate-General for Research and Innovation
Directorate G — Research and Innovation Outreach
Unit G.4 — Open Science
Contact Corina Pascu
Email Corina.PASCU@ec.europa.eu
RTD-EOSC@ec.europa.eu
RTD-PUBLICATIONS@ec.europa.eu
European Commission
B-1049 Brussels

Manuscript completed in February 2021.

The European Commission is not liable for any consequence stemming from the reuse of this publication.
The views expressed in this publication are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

More information on the European Union is available on the internet (<http://europa.eu>).

PDF	ISBN 978-92-76-29813-7	doi: 10.2777/492370	KI-02-21-117-EN-N
-----	------------------------	---------------------	-------------------

Luxembourg: Publications Office of the European Union, 2021

© European Union, 2021



The reuse policy of European Commission documents is implemented based on Commission Decision 2011/833/EU of 12 December 2011 on the reuse of Commission documents (OJ L 330, 14.12.2011, p. 39). Except otherwise noted, the reuse of this document is authorised under a Creative Commons Attribution 4.0 International (CC-BY 4.0) licence (<https://creativecommons.org/licenses/by/4.0/>). This means that reuse is allowed provided appropriate credit is given and any changes are indicated.

For any use or reproduction of elements that are not owned by the European Union, permission may need to be sought directly from the respective rightholders.

Cover page: © Lonely #46246900, ag visuell #16440826, Sean Gladwell #6018533, LwRedStorm #3348265, 2011; kras99 #43746830, 2012. Source: Fotolia.com.

EOSC Architecture Working Group View on the Minimum Viable EOSC

Report from the EOSC Executive Board Working Group (WG) Architecture

Edited by: the EOSC Executive Board

February 2021

Editors

Mark van de Sanden (SURF, ORCID: 0000-0002-2718-8918)

Dale Robertson (JISC, ORCID: 0000-0002-7723-0336)

Owen Appleton (EGI, ORCID: 0000-0002-2571-6860)

Paolo Manghi (CNR, ORCID: 0000-0001-7291-3210)

Contributors

Members of the EOSC Architecture WG (<https://eosccsecretariat.eu/working-groups/architecture-working-group>)



Contents

1	INTRODUCTION	3
2	EOSC ARCHITECTURE.....	5
3	PROPOSED FUNCTIONS OF THE EOSC CORE AND MVE	6
4	RECOMMENDATIONS	14

1 INTRODUCTION

In December 2019 the Sustainability WG (ESWG) released the Tinman¹ report on Solutions for a Sustainable EOSC. Via an open consultation process this report has evolved into the FAIR Lady report² which was published on the 24th of November 2020. The scope of the FAIR Lady report is to explore possible means for sustaining the European Open Science Cloud beyond the initial phase which terminates at the end of 2020. To better understand the elements that are required to be sustained, the ESWG described in the FAIR Lady document a first iteration of a Minimum Viable EOSC (MVE). The present paper provides the view of the EOSC Architecture Working Group on the MVE. It uses the terminology introduced by the ESWG, namely EOSC-Core, EOSC-Exchange and MVE and focuses on the period to the end of 2023, corresponding to the first phase of the EOSC as defined in the Strategic Research and Innovation Agenda (SRIA)³.

In the same period as the release of the Tinman report, the EOSC-hub project published a draft community position paper⁴ describing the community's view on the EOSC Federating Core and OpenAIRE released a position paper⁵ on OpenAIRE's vision and contributions to EOSC.

While all these documents address details of the *Minimum Viable EOSC*, the reports from the ESWG and OpenAIRE define the Minimum Viable EOSC as a set of identified frameworks for the EOSC-Core but lack details on concrete services, and the EOSC-hub paper focussed on the Federating Core (i.e., EOSC-Core), identifying the concrete services of which it should be constituted.

As a result of the discussions, the Architecture WG defined the EOSC-Core, EOSC-Exchange, EOSC Federation, and MVE as:

- **EOSC-Core:** the set of enabling services required to operate the EOSC (see table 1)
- **EOSC-Exchange:** the set of federation services registered to the EOSC by RIs and clusters to serve the needs of research communities and the widening to the general public and private sector
- **EOSC Federation:** the set of scientific services provided by RIs and Clusters to the respective communities;

The **Minimum Viable EOSC** is intended as a dynamic set of EOSC resources⁶:

- The subset of EOSC resources necessary for forming the added-value and opportunities considered essential to be provided by the EOSC at a given moment in time, i.e., to allow essential services and research products (e.g., publications, datasets, software) to be discovered, composed, accessed and analysed via the EOSC, which could not be otherwise;
- The subset of EOSC-Core components/services required to operate and deliver such resources.

1 https://www.eoscsecretariat.eu/system/files/solutions_for_a_sustainable_eosc_-_tinman_draft_02dec19.pdf

2 <https://op.europa.eu/en/publication-detail/-/publication/581d82a4-2ed6-11eb-b27b-01aa75ed71a1>

3 <https://www.eoscsecretariat.eu/sites/default/files/eosc-sria-v09.pdf>

4 <https://eosc-hub.eu/sites/default/files/EOSC%20Federating%20Core%20Community%20Position%20Paper%20v1.1.pdf>

5 <https://doi.org/10.5281/zenodo.3475076>

6 The EAWG regards the MVE as something which will evolve over time: the first iteration of the MVE focuses, as the ESWG says, on the initial implementation of EOSC that brings value to users beyond their current use of infrastructures. In future however, a more extensive definition of MVE may apply to meet the requirements of the particular scientific challenges at that time.

The relationship between the EOSC-Core, EOSC-Exchange, EOSC-Federation and the MVE as a subset of the EOSC resources is depicted in figure 1.

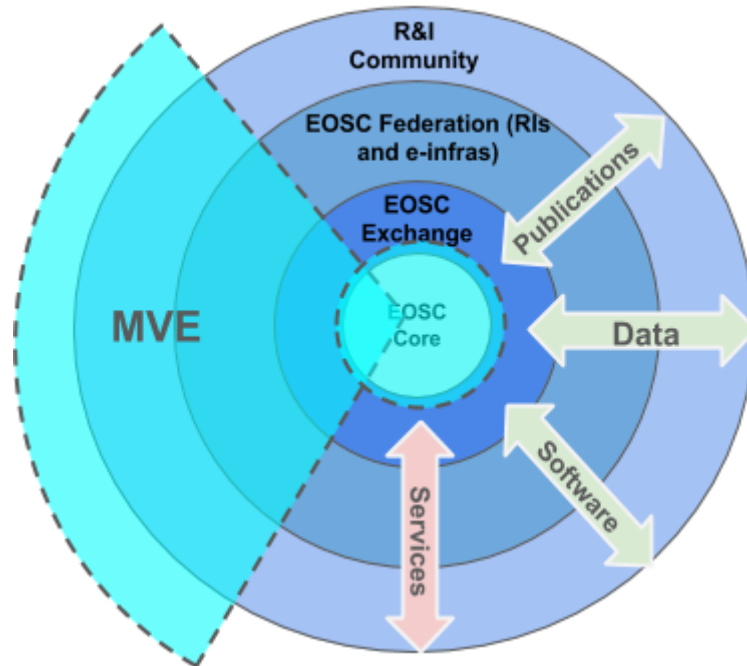


Figure 1. High-level diagram of the EOSC depicting the relationship between EOSC-Core, EOSC-Exchange, EOSC-Federation and the MVE

The EAWG also developed an architectural diagram describing a functional overview of the EOSC and has identified concrete frameworks of the EOSC Interoperability Framework (EIF) and functions to be included in the MVE, with a focus on the essential functions of the EOSC-Core.

2 EOSC ARCHITECTURE

To support the discussion within the EAWG, an architectural diagram for the EOSC, see figure 2, has been developed. It provides a functional overview of the EOSC, identifying:

- EOSC Users demand side and EOSC Resource Providers supply side
- EOSC-Core functions and capabilities
- EOSC Interoperability Framework with interoperability guidelines to support the integration and composability of resources across providers and for connecting resources to the EOSC-Core functions

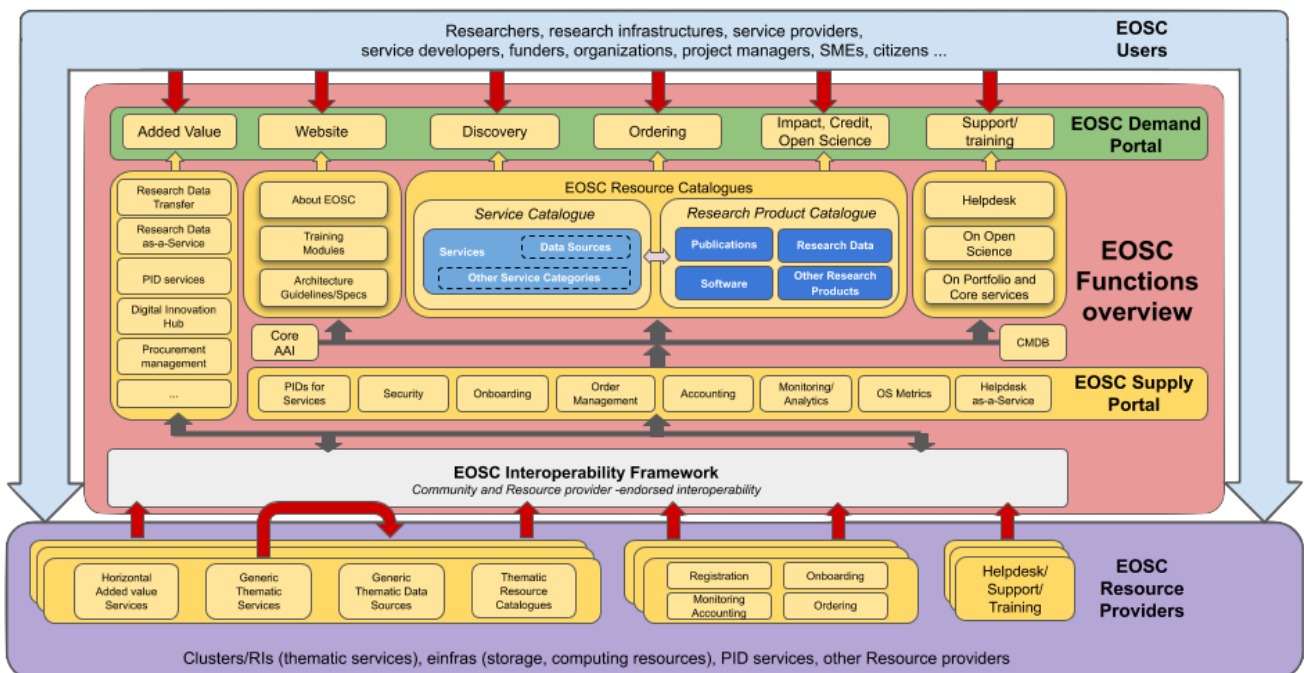


Figure 2. Architectural diagram illustrating EOSC-Core functions supporting the EOSC

This functional overview may be expected to develop over time as the EOSC evolves.

3 PROPOSED FUNCTIONS OF THE EOSC CORE AND MVE

Because the Sustainability WG report, EOSC-hub and OpenAIRE position papers address the EOSC-Core functions differently, the Architecture WG initiated the task to identify the MVE at the function level. The result of this task is table 1.

All the frameworks and functions which are identified in the FAIR Lady, EOSC-hub and OpenAIRE documents are included in the table. Via consensus gained from discussions within the regular EAWG meetings, the members of the EAWG have created a proposal of the functions to be included in the MVE, with a focus on the functions of the EOSC-Core, and assigned time phases in which each function should be enabled (see end notes for details). For each of the functions a short description and references to related sections in the FAIR Lady report and the SRIA are provided.

In table 1, those functions defined as belonging to the EOSC-Core and planned in phase 1 constitute part of the initial MVE. EOSC-Core functions assigned to phases 2 or 3 can be implemented later and may become part of a later version of the MVE. Some functions in the table are part of the initial MVE, but are considered outside of the EOSC-Core. Some of the functions proposed in the table are considered by the EAWG not to be part of the initial MVE.

Area	Function in the MVE	ESWG FAIR Lady	EAWG Proposal	Phase (1-3)	Functional description	Reference to SRIA action area
PID Services	PID for EOSC services	1.1 EOSC-Core: PID	EOSC needs to select and run a service (part of the EOSC-core) for providing PIDs for EOSC services	2	A way to mint/resolve PIDs for services in the EOSC landscape (core services plus onboarded ones) to allow for unique identification, citing, avoiding duplication and tracking of impact. This may be a service to generate, resolve and validate persistent identifiers (PID) or a service to connect existing PID systems.	Action Area (AA)1 Identifiers
	PIDs for research entities in EOSC	1.1 EOSC-Core: PID	Policy framework for PIDs to be defined by EOSC	1	Policy framework for PIDs for research entities, (data, sw, publications, organisations, researchers, funders, etc) TBD by WG-Arch PID task force.	AA1 Identifiers
Portal, Catalogues & Orders	EOSC portal (website)	1.1 EOSC-Core: Web-portal	Part of EOSC-Core	1	Website with basic information about EOSC, embeds the catalogue(s) in it. Features basic user management functions.	AA5 User Environments, AA6 Resource provider Environments

EOSC Architecture Working Group View on the Minimum Viable EOSC

Area	Function in the MVE	ESWG FAIR Lady	EAWG Proposal	Phase (1-3)	Functional description	Reference to SRIA action area
	EOSC Portal Service Catalogue and federated portfolio	1.1 EOSC-Core: Web-portal	Part of EOSC-Core	1	<p>User facing frontend of the portal which exposes services to the customers. Allows searching, discovering and ordering of services.</p> <p>Backend to collect list for services, allow them to be published as a catalogue, and to allow data on services to flow between thematic, regional and national catalogues. Includes onboarding.</p>	AA2 Metadata and Ontologies , AA5 User Environment (frontend) , AA6 Resource Provider Environments (backend) , BC1 RoP
	EOSC Data source portfolio / catalogue and onboarding of data sources (registering, validating, discovering)	1.1 EOSC-Core: Web-portal	Part of EOSC-Core	1	<p>User facing frontend of the portal which exposes data sources to the customers. Allows registration/onboarding , searching, discovering, validation/certification of data sources.</p> <p>Backend to collect data source information for registration, support onboarding/validation/certification against guidelines (expected quality of the metadata describing the scientific products within the data source), and to allow information on data sources to flow between thematic, regional and national catalogues of data sources.</p>	AA2 Metadata and Ontologies , AA5 User Environment (frontend) , AA6 Resource Provider Environments (backend) , BC1 RoP
	EOSC Portal scientific product portfolio/catalogue	1.1 EOSC-Core: Web-portal	Part of EOSC-Core	2	Backend to collect list of research products, allow them to be published as a catalogue, and to allow data on research products to flow between thematic, regional and national catalogues. Includes onboarding.	AA2 Metadata and Ontologies , AA5 User Environment (frontend) , AA6 Resource Provider Environments (backend) , BC1 RoP

EOSC Architecture Working Group View on the Minimum Viable EOSC

Area	Function in the MVE	ESWG FAIR Lady	EAWG Proposal	Phase (1-3)	Functional description	Reference to SRIA action area
	EOSC Order Management Tool	1.1 EOSC-Core: Service management and access framework, 1.2 EOSC-Exchange	Not part of MVE		Software platform to manage orders for services made through central EOSC catalogue (directly from researcher-facing portal or potentially passed from other catalogues which display services pulled from central catalogue). Collect customer/user requests with relevant data, pass to providers via API, email or other means. Support collection of order metrics.	AA5 User Environment
	EOSC Data Transfer Services	1.1 EOSC-Core: Data Access Framework	Not part of MVE		Data Transfer services enable the movement of data files asynchronously between source and destination storage endpoints, including mechanisms to ensure automatic retry in case of failure and for optimisation of performance for large files or large numbers of files.	
Data Services	Research Data as a Service	1.1 EOSC-Core: Data Access Framework	Part of MVE	3	Data access framework, whose primary role is to offer data as a service, enabling open interfaces where data consumers are able to discover and retrieve best-fit data to meet their needs. Of particular interest is the architectural model conceived in industry from the International Data Spaces Association which details the different roles and addresses data sovereignty, parts of which may apply in sharing (open) research data.	AA7 EOSC Interoperability Framework
AAI & Security	EOSC AAI in support of EOSC Service portfolio	1.1 EOSC-Core: AAI	Part of EOSC-Core	1	Providing a distributed federated AAI infrastructure which allows for sharing of login and access to services and data across EOSC.	AA4 AAI

EOSC Architecture Working Group View on the Minimum Viable EOSC

Area	Function in the MVE	ESWG FAIR Lady	EAWG Proposal	Phase (1-3)	Functional description	Reference to SRIA action area
	EOSC AAI for EOSC core services	1.1 EOSC-Core: AAI	Part of EOSC-Core	1	Providing an AAI infrastructure to provide a SSO environment on basis of Federated Identities across the EOSC (Federated) Core services.	
	EOSC Security Policies and Security Coordination Functions	1.1 EOSC-Core: Security policies and procedures	Part of EOSC-Core	1	Central coordination of security activities ensures that Trust and Identity policies, operational security, and maintenance are compatible amongst all partners, providing monitoring services to check for security vulnerabilities and other security-related problems in the infrastructure: it guarantees that incidents are promptly and efficiently handled, that common policies are followed by providing services such as security monitoring, and by training and dissemination with the goal of improving the response to incidents.	AA4 AAI
Helpdesk	EOSC portal/core Helpdesk	1.1 EOSC-Core: Operational support services	Part of EOSC-Core	1	Basic helpdesk to cover incidents for the portal and for the core services.	
	EOSC Helpdesk as a service		Not part of MVE		A. Framework for connecting existing help desks so that they can move tickets between them.	
	EOSC Helpdesk as a service		Not part of MVE		B. Offer helpdesk to those communities without one, or that don't want to deploy one themselves.	
Support Services	EOSC Core Collaboration Software	1.1 EOSC-Core: Service management and access framework	Part of EOSC-Core (exactly which of its services and tools are required for the EOSC-Core must be assessed)	1	Software platform to track documentation, tasks, communication of the operations of the core of EOSC. Wikis, ticketing systems, mailing lists, video calling systems etc.	

EOSC Architecture Working Group View on the Minimum Viable EOSC

Area	Function in the MVE	ESWG FAIR Lady	EAWG Proposal	Phase (1-3)	Functional description	Reference to SRIA action area
	EOSC Support Services	1.1 EOSC-Core: Operational support services	Part of EOSC-Core (exactly which of its services and tools are required for the EOSC-Core must be assessed)	1	Consultancy and training on how to use and benefit from EOSC core services	Boundary Condition (BC)4 Skills and training
	EOSC Open Science training and support	1.1 EOSC-Core: supports the Shared open science policy framework	Part of EOSC-Core only if not adequately addressed elsewhere (e.g., provided by ESFRIs)	1	Organise and operate a distributed human-driven and hierarchical structure with the countries and disciplines in the centre, addressing the technical-organisational and legal aspects of data and service Interoperability. Topics include FAIRness of scientific products, FAIRness of services, IPRs, RDM, DMP, Open Access to publications, reproducibility of science, etc.	BC4 Skills and training
	EOSC Open Science Help Desk and Collaborative tools	1.1 EOSC-Core: Operational support services	Part of EOSC-Core only if not adequately addressed elsewhere (e.g., provided by ESFRIs)	1	Open Science helpdesk, a Collaborative Dashboard for a network of OS experts to be in contact with EOSC users/providers; Learning Material Registry, federating country/thematic registries, to aggregate European training/support OS material.	BC4 Skills and training
Monitoring , metrics and accounting	EOSC Service monitoring	1.1 EOSC-Core: Open metrics framework	Part of EOSC-Core: Passive service monitoring is mandatory. Active service monitoring is optional	Passive: 1 Active: 2	Monitoring of service use for services, to report on their availability in various ways. Includes a CMDB database of entities that contribute to delivery of the core services to support: support, change management, monitoring and accounting. The service can be used to integrate EOSC portfolio services for compositionality.	BC1 RoP, BC3 Funding Models

EOSC Architecture Working Group View on the Minimum Viable EOSC

Area	Function in the MVE	ESWG FAIR Lady	EAWG Proposal	Phase (1-3)	Functional description	Reference to SRIA action area
	EOSC Open Science metrics	1.1 EOSC-Core: Open metrics framework, Shared open science policy framework	Framework is part of EOSC-Core. Delivery of accounting data by services is optional (not part of MVE)	1	For Open Science to gain traction, EOSC must embed an infrastructure for scientific reward which gathers all types of usage data for all types of resources (citations, usage events for data, services, software) and offer Analytics Services to support reproducible/transparent calculation of indicators and provide measures of assessment and evaluation at the community level	AA6 Resource Provider Environments, BC1 RoP, BC3 Funding Models
	EOSC Accounting	1.1 EOSC-Core: Open metrics framework	Framework is part of EOSC-Core. Delivery of accounting data by services is optional (not part of the MVE)	1	Usage statistics on services in the EOSC-Exchange to support billing and accounting of services through e.g., Virtual Access. When the EOSC Accounting service is offered to service providers then the EOSC CMDB is required as a component.	BC1 RoP, BC3 Funding Models
	Core Services CMDB	1.1 EOSC-Core: Operational support services	Part of EOSC-Core	1	Database of entities that contribute to delivery of the core services to support: support, change management, monitoring and accounting.	
EOSC Interoperability Framework	Shared open science policy framework	1.1 EOSC-Core: Shared open science policy framework	Part of EOSC-Core	1	for ensuring openness and interoperability, privacy and security (copyright status, disclosure limitations, patents pending, other IPR on the datasets or workflows, the existence of personal data, designation of data as PSI, etc.)	4.5.2 EOSC-Core
	Interoperable metadata framework	1.1 EOSC-Core: Interoperable metadata framework	Part of EOSC-Core	1	Minimum and common understanding of metadata schemas, mapping between schemas, registering schemas, ontologies. Profiles for metadata schemas, ontologies, crosswalks, and also tools for metadata management. This profiling should drive	4.5.2 EOSC-Core

EOSC Architecture Working Group View on the Minimum Viable EOSC

Area	Function in the MVE	ESWG FAIR Lady	EAWG Proposal	Phase (1-3)	Functional description	Reference to SRIA action area
					the development of registries and recommendation systems in this domain.	
	Compliance framework: Rules of Participation , including a Resource Description Framework	1.1 EOSC-Core, but it defines the guidelines for resources to be included in the EOSC-Exchange	Part of EOSC-Core	1	Not a technical service, Initial Rules of Participation defined by the RoP WG. Resources included within the EOSC-Exchange are required to conform to the predefined Rules of Participation and need to be described according to the EOSC Resource Description Framework, for example with Resource Profiles for Services, Data Sources, Research Products.	4.5.2 EOSC-Core, AA5 Resource provider environments, AA7 EOSC Interoperability Framework: Organisational, BC1 Rules of Participation
	Service management and access framework	1.1 EOSC-Core: Service management and access framework	Part of EOSC-Core	1	Not a technical service, but a management framework that allows services and operational roles in delivering core services and supporting external services to be delivered. Includes a set of roles, responsibilities, documents, policies and other documentation and tooling to support management of services.	4.5.2 EOSC-Core
	Compliance Framework: Interoperability policies	1.1 EOSC-Core, but it defines the guidelines for resources to be included in the EOSC-Exchange	Part of EOSC-Core	1	Not a technical service, but a set of policies, recommendations and de facto standards on how EOSC services can be built and interact, so has a strong impact on technical services.	4.5.2 EOSC-Core
	Compliance Framework: Policies	1.1 EOSC-Core: Service management and access framework	Part of EOSC-Core	1	Not a technical service, a collection of policies that need to be applied in the EOSC domain to ensure the coherence and value generation of EOSC.	4.5.2 EOSC-Core

EOSC Architecture Working Group View on the Minimum Viable EOSC

Area	Function in the MVE	ESWG FAIR Lady	EAWG Proposal	Phase (1-3)	Functional description	Reference to SRIA action area
Industry and business ecosystem	EOSC Digital Innovation Hub	2.5 Digital Innovation Hubs	DIH platform potentially part of the MVE, but resources provided through DIH are outside the MVE	1	An ecosystem of start-ups, SMEs, large industries, researchers, accelerators and investors that fosters the creation of partnerships to stimulate innovation.	2.3 The European strategy for data: Future action to initiate collaboration with Digital Innovation Hubs network
	Procurement framework	5 Recommendations Pre-commercial Procurement	Procurement Framework potentially part of the MVE, the procurements themselves are performed outside of the scope of the MVE	1	Framework to support aggregated procurements activities for commodity commercial resources for publicly funded research communities via for example Public Private Partnerships (PPP) and/or Pre-Commercial Procurements (PCP)	7.2 Development of innovative services and products

Notes:

- Phases as defined in the SRIA document: Phase 1: 2021 - 2023; Phase 2: 2024 - 2025; Phase 3: 2026 - 2027
- AA: Areas of Action as described in section 5 of the SRIA³
- BC: Boundary Conditions as described in section 6 of the SRIA³

4 RECOMMENDATIONS

The EAWG recommends that:

- The proposals for the initial EOSC MVE functions in table 1 (i.e., planned in phase 1) are adopted by the EOSC governance, the first multi-annual roadmaps include developments to enable them, and efforts are made to ensure these functions are available for the benefit of EOSC users, suppliers and other stakeholders.
- The availability of the initial set of MVE functions is communicated clearly as part of dissemination of the capabilities and value of the EOSC.
- Those functions which should be delivered in phases 2 and 3 are noted by the new EOSC governance and used to inform the definition of work plans for the coming years, to ensure that these are delivered in the timescales suggested.

Finally, the EAWG recommends that the EOSC Association constitutes a body to oversee the establishment, contents and evolution of the MVE. This body should include representatives from the e-Infrastructures and ESFRI clusters, which are amongst the main stakeholders of the MVE.

Getting in touch with the EU

IN PERSON

All over the European Union there are hundreds of Europe Direct information centres.

You can find the address of the centre nearest you at: https://europa.eu/european-union/contact_en

ON THE PHONE OR BY EMAIL

Europe Direct is a service that answers your questions about the European Union.

You can contact this service:

- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
- at the following standard number: +32 22999696, or
- by email via: https://europa.eu/european-union/contact_en

Finding information about the EU

ONLINE

Information about the European Union in all the official languages of the EU is available on the Europa website at: https://europa.eu/european-union/index_en

EU PUBLICATIONS

You can download or order free and priced EU publications from:

<https://op.europa.eu/en/publications>. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see https://europa.eu/european-union/contact_en)

EU LAW AND RELATED DOCUMENTS

For access to legal information from the EU, including all EU law since 1952 in all the official language versions, go to EUR-Lex at: <http://eur-lex.europa.eu>

OPEN DATA FROM THE EU

The EU Open Data Portal (<http://data.europa.eu/euodp/en>) provides access to datasets from the EU. Data can be downloaded and reused for free, for both commercial and non-commercial purposes.

The EOSC Architecture Working Group has assigned the Authentication and Authorization Infrastructure Task Force (AAI TF) the task to establish a common global ecosystem for identity and access control infrastructures for the European Open Science Cloud (EOSC).

This document is the final deliverable of the EOSC AAI Task Force, operating in the context of the EOSC Architecture Working Group and will be handed over to the EOSC Association.

Research and Innovation policy



Publications Office
of the European Union