



VirtualBrainCloud

Personalized Recommendations for
Neurodegenerative Disease



**EUROPEAN OPEN
SCIENCE CLOUD**



Deliverable report

D7.2: Report on Cloud Implementation Strategy applying EOSC Principles

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Table of content

1.	Introduction.....	3
1.1.	Purpose and Scope	3
1.2.	Approach and Relation to other WPs and Deliverables	3
1.3.	Methodology and Structure of the Deliverable	4
2.	EOSC Cloud principles & TVB-Cloud	5
3.	Implementation Strategy	6
3.1.	Authentication and Authorisation Infrastructure	8
4.	TVB-Cloud & EOSC/EGI Marketplace.....	10
4.1.	What is EGI/EOSC Marketplace?	10
4.2.	What benefits does it bring to join as Service Provider?	10
4.3.	Onboarding Process and Rules for participation in EOSC Marketplace	11
4.4.	Onboarding Process and Rules for participation in EGI Marketplace	14
4.5.	EGI vs EOSC.....	15
4.6.	TVB service candidates for the EOSC/EGI Marketplace	15
5.	Conclusion, next steps.....	16



1. Introduction

1.1. Purpose and Scope

One central goal of WP7 is the enabling of data and compute services in a dedicated cloud environment, based on the principles of the European Open Science Cloud (EOSC), and the provision of the relevant cloud-based infrastructure environments, which serve as data- and compute backend for the development, testing and software integration within the project.

Up to now, the EOSC lacks a proper data security implementation that could be directly used for the projects purposes. Thus, WP7 focused on the development of infrastructure solutions on private cloud resources provided by project partners SCAI and JSC. In parallel, WP7 continuously follows the developments of the evolvement of EOSC and elicits options to collaborate with the initiatives of EOSC and/or make use of individual EOSC services. One particular goal is to make selected TVB-Cloud related services available on a European federated marketplace. Therefore, it is essential that all provided Cloud infrastructure solutions follow the same principles and are interoperable with the EOSC. With this deliverable, we want to explain this context in more detail.

1.2. Approach and Relation to other WPs and Deliverables

This deliverable follows up on deliverable *D7.1- Report on Cloud Implementation Strategy applying „Trusted Cloud“ Principles*, where we discussed the general principles from the perspective of a Cloud Provider striving to build a secure and trusted cloud infrastructure. Based on this, we derived principles and defined a set of security measures for a trusted Cloud infrastructure offered to a community dealing with data related to health.

In this present deliverable we will now enlarge upon on the Cloud principles of the EOSC, which are generally represented by the FAIR principles, and which are much more broadly and not limited to a technical level.

“The process to create the EOSC was initiated by the Commission in 2015. It aimed to develop a trusted, virtual, federated environment that cuts across borders and scientific disciplines to store, share, process and re-use research digital objects (like publications, data, and software) following [FAIR principles](#).”¹

“..the vision of European Open Science is that of a research data commons...”²

They FAIR principles are defined to guide and enable Open Science on a pan European level, considering different aspects. The provision as well as fusion of existing infrastructures, which is relevant for WP7, is only one aspect of this.

On the other hand, this deliverable is used as a preparation for *D7.7*, where we will provide information regarding the onboarding of TVB-Cloud related services on one of the European federated marketplaces. Since WP7 as infrastructure provider does not develop any independent services in the scope of TVB-Cloud, it can only offer support for the onboarding of services to the other WPs in the project. To take a first step, we hence compiled a set of information.

¹ https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science/european-open-science-cloud-eosc_en

² https://eosc-portal.eu/sites/default/files/eosc_declaration.pdf



1.3. Methodology and Structure of the Deliverable

The structure of this deliverable is as follows. In chapter 2, we introduce the topic of FAIR principles, explain the scope of their application within the TVB-Cloud project and narrow it down for the objectives of WP7. Following in chapter 3, we describe how WP7 realizes the implementation of these principles. Thereby we focus on the interoperability of the relevant components of the TVB-Cloud infrastructure and EOSC. In chapter 4, we finally elaborate and present possibilities to make certain TVB-Cloud services available on the European federated marketplaces of EOSC and EGI. Therefore, we first give some basic information on EGI and EOSC marketplaces (4.1) and describe which benefits it may bring to join as Service Provider (4.2). Following, we summarize the onboarding processes and rules for joining the service portfolio of EOSC (4.3) and EGI (4.4). In this context, service onboarding means the process of joining a service to the portfolio and service offerings of the marketplaces. Finally, in subchapters 4.5 and 4.6 we propose an initial approach to take up this procedure and present a first service candidate that could potentially be made available at EGI/EOSC.



2. EOSC Cloud principles & TVB-Cloud

The idea of a European Open Science Cloud (EOSC) was born out of the idea “[...] to develop a trusted, virtual, federated environment that cuts across borders and scientific disciplines to store, share, process and re-use research digital objects (like publications, data, and software) [...]”³. In this connection, Findability, Accessibility, Interoperability and Reusability of research data are desirable aspects, which finally led to the emergence of the widespread and recognized “FAIR”-concept around the FAIR principles.

FAIR data is a paradigm that addresses some of the obstacles related to data of current research: difficulties to find data that are linked to the inferences made in a publication, a lack of access to data, substantial problems with the interoperability of data and the challenge of re-usability of data. The FAIR-principles however, “[...] should apply not only to research data but also to data-related algorithms, tools, workflows, protocols, services and other kinds of digital research objects.”⁴

In the TVB-Cloud project, we promised, to implement the FAIR data principles wherever ethical and legal considerations allow for that. First and foremost, this affects the development of TVB-Cloud related software solutions, applications, workflows and frameworks (especially in WP3). But this vision also influences the development of the IT infrastructure developed and operated in WP7.

Until 2020 the Commission requested, “[...] to federate existing research data infrastructures in Europe and realise a web of FAIR data and related services for science, making research data interoperable and machine actionable following the FAIR guiding principle.”⁵ To move forward this endeavour, diverse initiatives, projects and working groups emerged in the EOSC ecosystem. In particular relevant for WP7 is the output of the EOSC FAIR Working Group⁶ and the EOSC Architecture Working Group⁷. In cooperation these working groups developed a first draft of the EOSC Interoperability Framework, which builds the basis of the implementation strategy of the FAIR principles in the development of the TVB-Cloud related infrastructure components.

“In the context of the FAIR principles, interoperability is discussed in relation to the fact that “research data usually need to be integrated with other data. In addition, the data need to interoperate with applications or workflows for analysis, storage, and processing”. Our view on interoperability does not only consider data but also the many other research artefacts that may be used in the context of research activity, such as software code, scientific workflows, laboratory protocols, open hardware designs, etc.”⁸

³ https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science/european-open-science-cloud-eosc_en

⁴ https://eosc-portal.eu/sites/default/files/eosc_declaration.pdf

⁵ https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science/european-open-science-cloud-eosc_en

⁶ <https://www.eoscsecretariat.eu/working-groups/fair-working-group>

⁷ <https://www.eoscsecretariat.eu/working-groups/architecture-working-group>

⁸ <https://www.eoscsecretariat.eu/sites/default/files/eosc-interoperability-framework-v1.0.pdf>



3. Implementation Strategy

“As discussed in the “Turning FAIR into Reality” report⁹, the role of interoperability frameworks is to “define community practices for data sharing, data formats, metadata standards, tools and infrastructure, recognising the objectives and cultures of different research communities”¹⁰.

“The EOSC interoperability framework aims to provide a set of recommendations on the components that need to be provided in the ecosystem and on the principles guiding digital object producers and/or consumers on their use. This in order for the framework to set a foundation for an efficient machine-enabled exchange of digital objects within EOSC and between EOSC and the outside world.”¹¹

As described in chapter 2, all work packages in the project address the EOSC FAIR principles. Thereby, for WP7 the interoperability defined as “A characteristic of an Information Technology (IT) system, whose interfaces are completely understood, to work with other IT systems, at present or in the future, in either implementation or access, without any restrictions or with a controlled access (source: Interoperability -Wikipedia)”¹² plays a significant role.

The two EOSC working groups, which are currently discussing and elaborating the EOSC Interoperability Framework (EOSC IF) already, published a first Draft for community consultation. Thereby they build upon the older European Interoperability Framework (EIF)¹³, which considers legal, organisational, semantic and, technical interoperability.

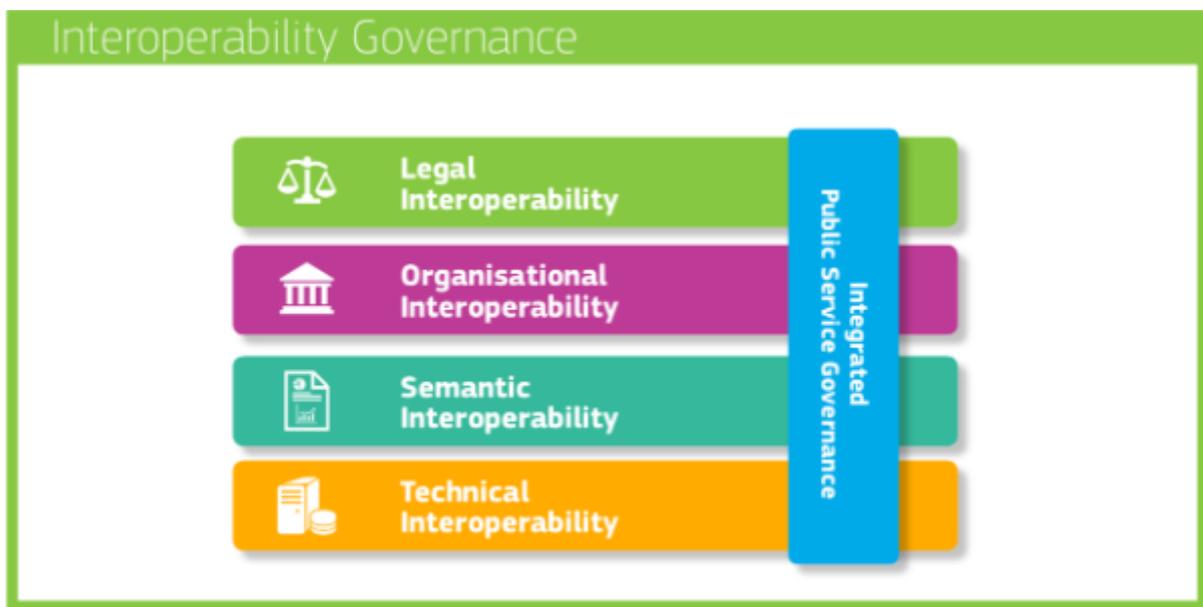


Figure 1: The European Interoperability Framework four levels of interoperability

(Source: <https://www.eoscsecretariat.eu/sites/default/files/eosc-interoperability-framework-v1.0.pdf>)

⁹ https://ec.europa.eu/info/sites/info/files/turning_fair_into_reality_1.pdf

¹⁰ <https://www.eoscsecretariat.eu/sites/default/files/eosc-interoperability-framework-v1.0.pdf>

¹¹ <https://www.eoscsecretariat.eu/sites/default/files/eosc-interoperability-framework-v1.0.pdf>

¹² <https://www.eoscsecretariat.eu/sites/default/files/eosc-interoperability-framework-v1.0.pdf>

¹³ New European interoperability framework. Promoting seamless services and data flows for European public administrations. Directorate-General for Informatics (European Commission). 2017. DOI: 10.2799/78681



It is self-evident that our work package, which deals with the provisioning of Cloud infrastructure and container infrastructure, will be interoperable in the EOSC ecosystem. Therefore, we aim to provide a solution, which will be in agreement with the relevant topics of this EOSC IF and focus on the „technical interoperability” which covers applications, infrastructure linking systems and services, data presentation and exchange, and secure communication protocols. A well-known example to achieve technical interoperability is given by building upon a microservices architecture, where the interoperability is obtained by the usage of RESTful APIs. This strategy is also used in the developments of the TVB-Cloud services.

At the level of technical interoperability, the EOSC IF collected usual problems identified by the consulted communities. These cover the following points:

- Authentication and Authorisation often needs to be performed separately for each community/service, e.g. because of the need to transfer personal information between Identity Providers (IP) and Service Providers (SP). This procedure is also consistent with the two EOSC AAI principles “All trust flows from communities” and “There is no centre in a distributed system” stated in the document “EOSC Authentication and Authorization Infrastructure”¹⁴. Accordingly, the aim here is to create interoperability between the various community-based AAI solutions.
- Research data is often available in general-purpose formats or in community-based models, which are hard to align when reusing datasets across communities. Semantic interoperability problems also appear because of the lack of agreement in attributes or column headers, the absence of headers or adequate documentation, etc.
- Research data from different communities can be hard to find because you do not know how to query their repositories.
- There exist multiple service providers for different types of PIDs. As a result, different sets of policies are enforced to varying degrees, and sometimes the identifiers are not resolvable.

Further information on the first and last of these listed points is already available in the form of reports from EOSC Executive Board Working Groups (WG):

- “EOSC Authentication and Authorization Infrastructure (AAI)”¹⁵ which is a report from the WG Architecture AAI Task Force,
- “A Persistent Identifier (PID) policy for the European Open Science Cloud (EOSC)”¹⁶, which is authored by representatives of the WG FAIR and WG Architecture, and
- “PID architecture for the EOSC”¹⁷, which is a report from the WG Architecture PID Task Force”

¹⁴ <https://op.europa.eu/en/publication-detail/-/publication/d1bc3702-61e5-11eb-aeb5-01aa75ed71a1/language-en/format-PDF/source-188566729>

¹⁵ <https://op.europa.eu/en/publication-detail/-/publication/d1bc3702-61e5-11eb-aeb5-01aa75ed71a1/language-en/format-PDF/source-188566729>

¹⁶ <https://op.europa.eu/en-GB/web/eu-law-and-publications/publication-detail/-/publication/35c5ca10-1417-11eb-b57e-01aa75ed71a1/language-en>

¹⁷ <https://op.europa.eu/en/publication-detail/-/publication/3136c3e6-4f07-11eb-b59f-01aa75ed71a1/language-en/format-PDF/source-183178379>



For WP7, the report on the EOSC AAI is of primary importance at this point. Especially since an interoperable identity access management (IAM) and an interoperable AA mechanism is the first thing that becomes important in the onboarding process for services on European marketplaces (see chapter 4). Moreover, it is important in order to be able to use infrastructure services (IaaS) within the framework of EOSC.

3.1. Authentication and Authorisation Infrastructure

At the beginning of 2020, the EOSC WG Architecture AAI Task Force started with a 1st draft on how they will establish a common global ecosystem for identify and access control infrastructure. The TVB- Cloud installation at Fraunhofer SCAI and the HPC access at JSC¹⁸ realized the access, based on these discussions, to be interoperable with the upcoming EOSC universe (see for example our Deliverable D7.5.)

The AAI Task Force prepared three deliverables: EOSC AAI First Principles and Requirements, AAI Baseline Architecture, and AAI Federation participation guidelines and Best Practices, which were summarized in the report on EOSC Authentication and Authorization Infrastructure¹⁹ and which was official published in January 2021.

Here they present the “AAI first principles”, which are: “User experience as the only touchstone”; “all trust flows from the communities”; and “there is no center in a distributed system” (for detailed discussion see²⁰).

The EOSC AAI Architecture builds on the AARC Blueprint architecture 2019²¹, which provides a set of building blocks for technical people to design and implement access management solutions for communities. There are mainly five component layers: user identity, community attribute services, access protocol translation, authorization and end-services. Again, you will find a detailed description in the EOSC AAI document.

Of special interest is that the AARC 2019 distinguishes between two types of AAI services: one is focusing on infrastructure management and the other on community management. Both as explained in the document, they compromise the same interfaces (e.g. a proxy) but their functionality differ, “The purpose of the Community AAI is to streamline researchers 'access to services provided by their own infrastructure and provided by infrastructures that are shared with other communities.”²². Typical for TVB-Cloud, the TVB-Cloud community and the access to resources of the HPC community.

¹⁸ <https://www.unicore.eu/about-unicore/case-studies/jupyter-at-jsc/>

¹⁹ <https://op.europa.eu/en/publication-detail/-/publication/d1bc3702-61e5-11eb-aeb5-01aa75ed71a1/language-en/format-PDF/source-188566729>

²⁰ <https://op.europa.eu/en/publication-detail/-/publication/d1bc3702-61e5-11eb-aeb5-01aa75ed71a1/language-en/format-PDF/source-188566729>, p.6

²¹ <https://aarc-project.eu/architecture/>

²² <https://op.europa.eu/en/publication-detail/-/publication/d1bc3702-61e5-11eb-aeb5-01aa75ed71a1/language-en/format-PDF/source-188566729>

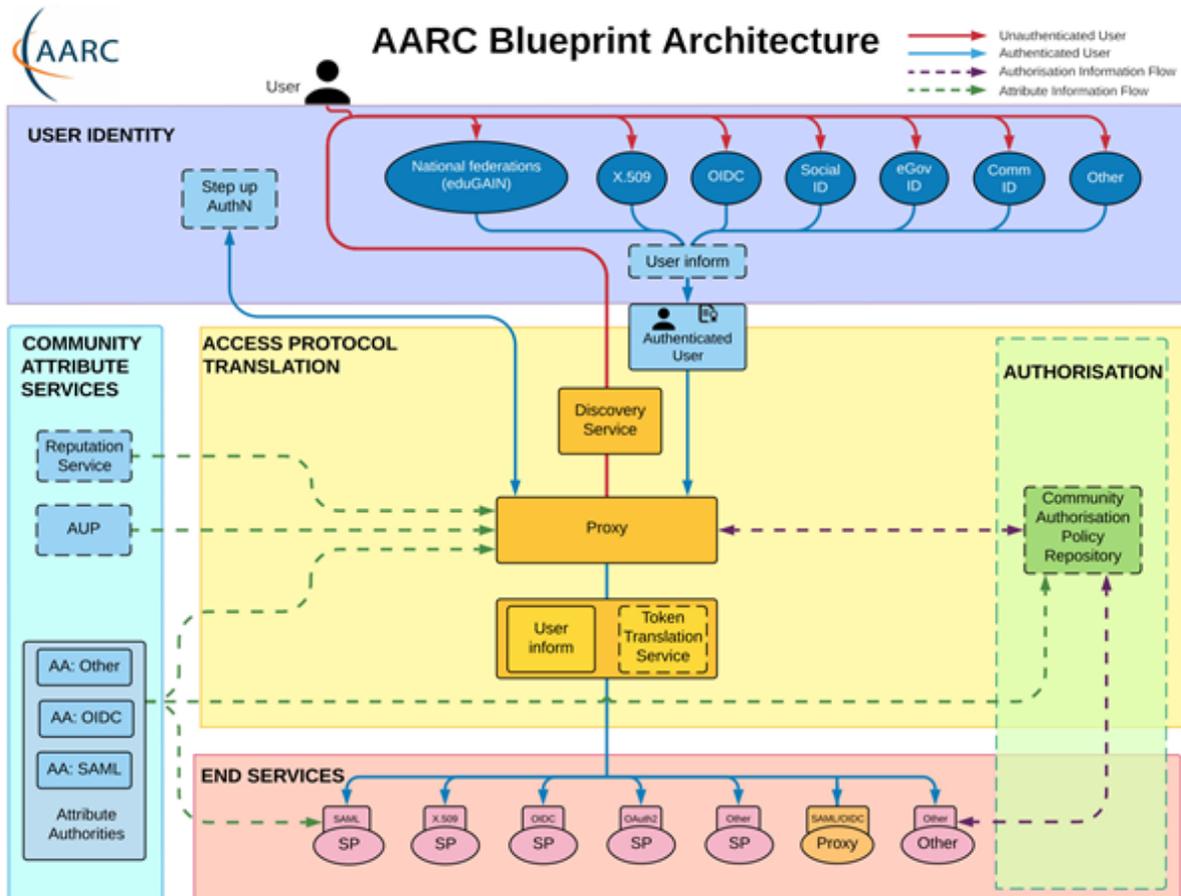


Figure 2: Component Layers of the AARC Blueprint Architecture²³

The community AAI follows the proxy-based architecture as in Fig 2. The community AAI is responsible to deal with different AAI provider. For TVB-Cloud, e.g. JSC is using UNITY²⁴ and Fraunhofer SCAI has implemented a solution based on Keycloak²⁵. Both are configured for a variety of Identity Providers. It should be mentioned that communities do not need to deploy and operate a Community AAI on their own. They can make use of multitenant AAI services as provided by EUDAT or EGI.eu.

Readers of the deliverable should also keep an eye on the EOSC AAI Federation Participation Policy and the EOSC AAI Federation technical framework draft in the EOSC AAI IF document. This will give the TVB-Cloud community some regulation hints.

The EOSC principles are especially relevant for TVB-Cloud project members and service owners, who will provide and publish a service on the EOSC marketplace. Our WP will support such activities and therefore we give an overview about the onboarding processes to the marketplace in the next chapter.

²³ [1] <https://op.europa.eu/en/publication-detail/-/publication/d1bc3702-61e5-11eb-aeb5-01aa75ed71a1/language-en/format-PDF/source-188566729>

²⁴ <https://www.unity-idm.eu/>

²⁵ <https://www.keycloak.org/>



4. TVB-Cloud & EOSC/EGI Marketplace

One goal within the framework of the TVB-Cloud project was to make certain services available on a European federated marketplace. Thereby, WP7 can offer support in the process of service onboarding to the other project partners and may benefit from long lasting relations to the associated communities.

Overall, there are two options to publish services on such marketplace:

- EGI Marketplace
- EOSC Marketplace.

In the following chapters, we will briefly introduce both ways. Moreover, we will present one first service candidate, we could image to be added to the EOSC/EGI service portfolio.

4.1. What is EGI/EOSC Marketplace?²⁶

The idea of a pan-European distributed infrastructure, offering resources and services for data-intensive processing in research, has already been part of the vision of EGI since 2000, when the first projects like e.g. DATA Grid started.

In 2015, this idea was taken up and further developed by the idea of a European Open Science Cloud, building a virtual environment for researchers to store, manage, analyse and re-use data for research, innovation and educational purposes. In this connection, EGI together with the initiatives EUDAT, Indigo-DataCloud and other major European research infrastructures committed to support the implementation of EOSC.

Out of this history, two similar but different online platforms have emerged, offering researchers to easily and efficiently discover, access, use and reuse a wide range of resources and services. On the one hand the EGI Marketplace and on the other hand the EOSC Marketplace, of which the latter one also provides services under the branding of EGI.

Although both marketplaces serve the same purpose, namely the provision of all necessary functionalities for bringing together offering and demand to make research happen, there are somewhat different requirements and procedures for Service Providers to onboard their services.

4.2. What benefits does it bring to join as Service Provider?

For Service Providers there are some advantages by contributing their services/resources to such online marketplaces. The first one is obviously the possibility to display services on an internationally recognized platform and to grow the user base of a service by promoting its adoption to new communities. A second benefit is that Service Providers get statistics about access requests and receive regular and constructive customer feedback from users of different fields of research.

Furthermore, EGI/EOSC offers support to leverage and integrate with federation services to improve the own services. The online platform e.g. can help to easily manage service requests, interact with

²⁶ <https://www.egi.eu/wp-content/uploads/2019/10/Inspired-Issue-35.pdf>



users and provide support to them, to handle the accounting as well as to manage Authentication and Authorization of users and future users of delivered services.

Altogether, the participation and involvement in these initiatives enables to collaborate with other organisations, to increase the exploitability and innovation capacity of service offerings and offers different possibilities to participate in the development of these heavily subsidised initiatives (esp. EOSC).

4.3. Onboarding Process and Rules for participation in EOSC Marketplace

In the next two subsections, we will shortly present the procedures for onboarding services to EOSC and EGI Marketplace. To start, we first summarize the procedure for EOSC, which is in alignment with the Service Portfolio Management (SPM) process of the EOSC IT Service Management System (SMS) developed in the scope of EOSC-hub²⁷.

Prerequisite for the registration of services to EOSC Portal/Marketplace, there are diverse fundamental requirements and rules for participation. The “Integration handbook for service providers”²⁸ e.g., stated the following fundamental requirements:

- The service falls within the remit of the EOSC activities, i.e. it brings value to users and facilitates them to implement Open Science.
- It is either an online service (e.g. a web application portal, a web service) or a 'human' service, such as training and consultancy. (plain datasets and software artefacts should not be directly onboarded to EOSC. There are other ways to do that.)
- The service is mature, reaching ‘Technology Readiness Level 7 (TRL7)’. TRL7 services are ‘System prototype demonstration in operational environment’, practically meaning that they have been already used by early adopter scientists.
- The compulsory fields of the service description template are filled during onboarding.

On the EOSC portal, the following conditions are required²⁹:

- The service is accessible by users outside its original community.
- The service is described through a common template focused on value proposition and functional capabilities.
- At least one service instance is running in a production environment available to the user community.
- Publish Research data is Findable, Accessible, Interoperable and Reusable [reference to FAIR].
- Release notes and sufficient documentation are available.
- Helpdesk channels are available for support, bug reporting and requirements gathering.

²⁷ <https://www.eosc-hub.eu/eosc-hub-key-exploitable-results/#KER2>,

²⁸ <https://eosc-portal.eu/sites/default/files/EOSC-hub%20Integration%20Handbook%20for%20Service%20Providers.pdf>

²⁹ <https://eosc-portal.eu/for-providers>



In the presentation “EOSC Portal Service onboarding and Rules of participation”³⁰ by Mark van de Sanden, the following minimal set of rules was defined:

- Main Rule: EOSC services shall be registered in an EOSC compliant or compatible service catalogue visible to the global EOSC Gateway.
- Machine readable metadata: EOSC Services must be described in Machine readable format by means of a common and persistent identification
- Portability: Whenever possible, the Service Provider should support and enable the portability of data and services.
- Terms of Use: EOSC Services must have Terms of Use including Access and Data Policies
- Access Model: Service Providers may apply users changes/fees, which could vary by type of service, type of service provider and location of users.
- Accessibility: EOSC Service Providers must describe how they ensure accessibility and interoperability, e.g. their metadata, APIs, standards, protocols
- Quality of Service: Service Providers should adhere to a minimal set of quality guidelines, these may include TRL and certain Certifications.

To verify that a service satisfies all these prerequisites, it must pass the onboarding process for services joining the Service Portfolio. To illustrate this procedure, the EOSC provides the following diagram.

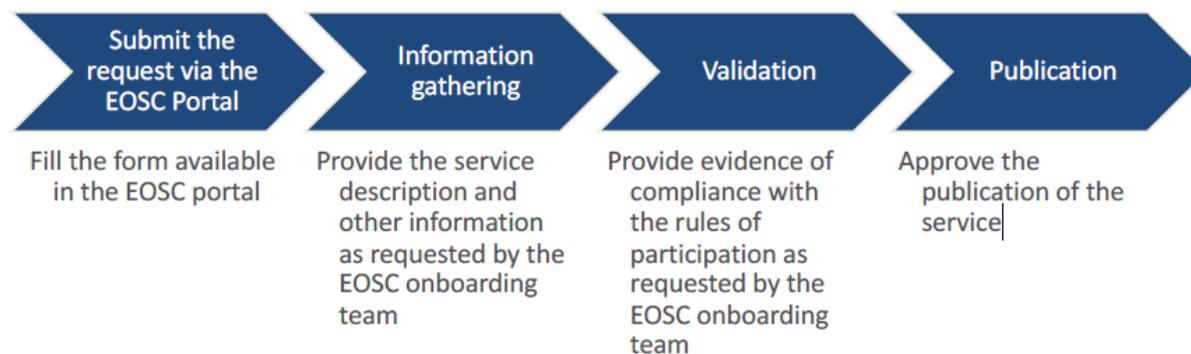


Figure 3: EOSC service onboarding - main steps from the service provider viewpoint³¹

In the first step, the service proposer initiates a contact with EOSC-hub by submitting a request for onboarding via the online form of the EOSC Portal at <https://eosc-portal.eu/join-provider>. By filling out the online form (see figure 4) the prospective service provider submits some basic information and service descriptions.

³⁰ <https://www.slideshare.net/TheEOSChubproject/overview-of-the-onboarding-and-validation-process-and-the-rules-of-participation-from-a-service-provider-point-of-view>

³¹ <https://www.slideshare.net/TheEOSChubproject/overview-of-the-onboarding-and-validation-process-and-the-rules-of-participation-from-a-service-provider-point-of-view>



EOSC Portal – Become a Provider

Become an EOSC provider

Interested in becoming an EOSC service and/or resource provider? Fill in the below webform and we will get back to you soon.

Please describe the service you would like to provide via the EOSC portal (1 paragraph): *

Website(s) of the service: *

Entry point (URL) of the service: *

Your motivation and expectations concerning becoming an EOSC provider: *

What are the key selling points/benefits of the service to potential users? *

Which institute(s) is/are the service provider(s)? *

Who is the main contact for the service? (name): *

Who is the main contact for the service? (E-Mail) *

How large is the current user base of the service? How do you expect this to change after joining the EOSC portal? *

Under what conditions would you like to make the service available for EOSC users? Select the line(s) that apply *

- Available for anyone without login
- Need to login, but free to use
- Need to login and conditions/restrictions apply
- Fee based access (e.g. pay-for-use, monthly fee)

If other, please elaborate under what conditions would you like to make the service available for EOSC users *

SUBMIT

Figure 4: EOSC service onboarding – online form

In the second step, the prospective SP needs to complete a longer form called Service Description Template (SDT) to provide more detailed and further information requested by the EOSC onboarding team, e.g. covering areas such as the service classification and maturity, licenses, helpdesk contacts, performance indicators, accessibility etc. Once all required information is provided, the service moves into validation.

In the validation step, the EOSC team examines the gathered information, ensures that the service meets all requirements and rules of participation, validates the quality of referenced content, requests clarifications if required and finally enters the service in the Service Portfolio of EOSC.

In the final step, the data from the service description template is added to the marketplace and the provider receives access to draft an entry for the service and to check and request/make changes if necessary. Finally, the service is officially published.

Reaching the published status in the EOSC Portal and Marketplace is the minimum level of EOSC integration. Next to the portal registration, EOSC offers additional integration options. Those are optional but can bring further added value to providers and users and include the integration with the federated user authentication, available and reliable monitoring services, the accounting service, the EOSC Helpdesk and the integration with the various services to more easily manage research data (e.g. B2Drop, B2Share, B2Find, etc.). More detailed information to this can be found in the “Integration handbook for service providers” published by EOSC-hub.



4.4. Onboarding Process and Rules for participation in EGI Marketplace

Now, we will sketch out briefly the procedure for onboarding services to EGI Marketplace. Thereby we mainly stick to the session “Service design WS (part 1): How can EGI bring your service to the world?”³² and the information presented by Diego Scardaci³³ and Matti Heikkurinen³⁴ at EGI Conference 202035.

Altogether, EGI offers two possibilities to onboard your services, on the one hand the standard way and on the other hand a new way offering a more lightweight integration with EGI.

Like the process for EOSC, the standard way is based on the Service Portfolio Management (SPM) process of the EGI SMS and uses the Service Design and Transition Package (SDTP)³⁶, which step by step must be completed by the SP to propose a new service. To support the SP, EGI offers a guide³⁷ providing instructions to complete the SDTP.

In the first step, the section “Value Proposition Design” of the SDTP must be completed. It is the minimum set of information required by the Service and Solutions Board (SSB) to be able to review and provide feedback to the proposal.

In the second step, section 2 “Business Case Design” needs to be completed. Both sections 1 and 2, are following given to the EGI Executive Board by the EGI.eu Director or Technical Director.

Once the service is endorsed by the EGI Executive Board and EGI Council, in the last step sections 3 “Service Design” and 4 “Service Transition Plan” must be completed by the service owner.

As soon as the onboarding process is successfully finished, the service is added to the EGI service portfolio and becomes publicly accessible at the EGI web-site, the EGI Marketplace and also the EOSC Portal & Marketplace. After the cooperation between EGI, service provider and users is defined by an respective OLAs/SLAs, the service is offered with an EGI brand and managed according to the processes of the EGI ITSM.

The new way of onboarding provided by EGI, is based on the provision of a new catalogue of external/community services, that are more lightweight integrated with EGI. In concrete this means, that service providers preserve the branding, and enter in direct interactions with customers. This possibility requires weaker conditions to be satisfied.

³² <https://indico.egi.eu/event/5000/sessions/4521/#20201104>

³³ <https://indico.egi.eu/event/5000/contributions/14515/attachments/13446/16330/Innovate%20the%20EGI%20service%20offer.pptx>

³⁴ <https://indico.egi.eu/event/5000/contributions/14516/attachments/13462/16363/The%20EGI%20SMS%2C%20the%20SPM%20process%20and%20the%20current%20EGI%20service%20offer.pptx>

³⁵ <https://indico.egi.eu/event/5000/>

³⁶ <https://documents.egi.eu/public/RetrieveFile?docid=2550&filename=EGI-SDTP-Template.docx&version=24>

³⁷ https://documents.egi.eu/public/RetrieveFile?docid=2550&filename=Guide_EGI-SDTP_v4.pdf&version=17



4.5. EGI vs EOSC

Within the framework of TVB Cloud, we would suggest to first try to make the chosen services available on the EOSC Marketplace. There, it is possible in a first step to register and publish the service on the marketplace and, independently of this, to integrate them in a second step with the already offered service offerings like e.g. the federated user authentication, monitoring services, accounting service, etc. Furthermore, the onboarding process at EOSC seems to us being very well documented.

In direct comparison with this, the onboarding process at EGI seems to be a bit stricter and more extensive at the moment. However, as mentioned above, EGI is working on a further possibility to add external services to their portfolio, which are more lightweight integrated and requires weaker conditions to be satisfied. As soon as this possibility is available, the publication at EGI can also be taken up.

4.6. TVB service candidates for the EOSC/EGI Marketplace

As already mentioned, WP7 as infrastructure provider does not develop any independent services, that could be offered on one of the two presented marketplaces. Furthermore, the project has not yet reached the point to make operational services from the other WPS publically available.

Nevertheless, in the scope of WP7, we have tried to identify a service candidate with whom we could imagine to enter the above described onboarding process. This candidate is the SCAIView³⁸ service, which is an information retrieval system that allows for semantic searches in large text collections by combining free text searches with the ontological representations of entities derived by ProMiner³⁹.

In parallel to our ambitions to publish the SCAIView service on the EOSC Marketplace, we will also continue to see whether other services that are currently being developed in the other WPs of TVB-Cloud turn out to be potential candidates. However, some of these services are strongly linked to the input data (health data), which makes publication on a public marketplace rather difficult.

In these cases, it seems only possible to make the developed services available as locally installable software packages, where users would have to use own data sets. Such a software repository is not yet offered by EOSC and EGI. Should it be possible in the future to publish software packages in a repository provided by EOSC/EGI, also the desktop application BrainX might be a possible candidate.

³⁸ <https://www.scai.fraunhofer.de/en/business-research-areas/bioinformatics/products/scaiview.html>

³⁹ <https://www.scai.fraunhofer.de/de/geschaeftsfelder/bioinformatik/produkte/prominer.html>



5. Conclusion, next steps

In this deliverable, we reported on the research and work performed in WP7, to achieve interoperability between EOSC and the IT solutions developed in the scope of the TVB-Cloud project. Therefore, we introduced the EOSC principles (FAIR principles) and discussed their relevance in the scope of Cloud and container infrastructure provisioning. Moreover, we presented the most relevant outputs and documents out of the EOSC ecosystem, highlighting the relevant aspects and briefly outlining how these were considered and implemented in the scope of the TVB-Cloud related IT solution.

Furthermore, to initiate the process of onboarding TVB-Cloud related services on one of the European federated marketplaces, we provided first information, which might be relevant for the other project partners.

In the further course of the project, we will continue to evaluate the relevant emerging documents and outputs of the EOSC Executive Board and try to ensure interoperability with the EOSC. In addition, we are pursuing the goal of further advancing the onboarding process of TVB-Cloud related services, identifying further candidates for this and attempting to publish them on the EOSC marketplace in cooperation with the responsible partners. Next, we will report on this in *D7.7- Report on VBC operation report and published services on EOSC/EGI Marketplace*, which will be provided at the end of November 2021.