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Best practices for on-boarding and related policies

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Abstract: Deliverable D3.1 – Best practices for on-boarding and related policies - outlines Rules of Participation as they evolve within the EOSC bodies that are defining them and describes best practices and procedures for on-boarding of the providers using the NI4OS-Europe on-boarding process. It specifically focuses on organizational and technical conditions for service providers to offer services through the EOSC portal.

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References

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- [2] EOSC-Hub project, <https://www.eosc-hub.eu>
- [3] EOSC-Hub D4.1 - Operational requirements for the services in the catalogue
- [4] EOSC-Pilot project, <https://eoscpilot.eu/>
- [5] e-InfraCentral project, <https://www.einfracentral.eu/>
- [6] EOSC Enhance, <https://www.eosc-portal.eu/enhance>
- [7] EOSC-Hub, Criteria for possible inclusion in the EOSC Service Portfolio
- [8] EOSC Secretariat project, <https://www.eoscsecretariat.eu/>
- [9] Join as provider form, <https://eosc-hub.eu/service-provider-form>
- [10] AGORA service management tool, <https://agora.ni4os-europe.eu/ui/>
- [11] OpenAIRE content providers, <https://www.openaire.eu/category/content-providers>
- [12] EOSC Rules of Participation WG, <https://www.eoscsecretariat.eu/working-groups/rules-participation-working-group>
- [13] EOSC RoP working document,
https://docs.google.com/document/d/1_VgNifaiL9cNCJiXPgTj562sQJ9txvwV0S2rMAawrFU/edit#heading=h.ag0d6fvp6uvu
- [14] FitSM, <https://www.fitsm.eu/>
- [15] HOW TO DO RACI CHARTING AND ANALYSIS: A PRACTICAL GUIDE,
<https://www.projectsart.co.uk/how-to-do-raci-charting-and-analysis.php>
- [16] EOSC-Hub contribution to the EOSC open consultation on rules of participation
- [17] Technology Readiness Levels,
https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf
- [18] EOSC-Hub D10.3 - Technical architecture and standards roadmap
- [19] EOSC-Hub D10.4 EOSC Hub Technical Architecture and standards roadmap v2
- [20] Grid Configuration Database (GOADB), <https://wiki.egi.eu/wiki/GOADB>
- [21] Request Tracker, <https://bestpractical.com/request-tracker>
- [22] EGI AAI Proxy, <https://wiki.egi.eu/wiki/AAI>
- [23] eduGAIN, <https://edugain.org/>
- [24] ARGO Monitoring Service, <https://argo.github.io/>
- [25] VI-SEEM project Accounting Service, <http://www.hpc.acad.bg/accounting/>
- [26] APEL, <https://apel.github.io/>
- [27] MediaWiki, <https://www.mediawiki.org/>
- [28] GitLab, <https://about.gitlab.com/>

- [29] Moodle open-source learning platform, <https://moodle.org/>
- [30] BigBlueButton web conferencing system, <https://bigbluebutton.org/>
- [31] Indico Event Management System developed at CERN, <https://getindico.io/>

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List of Acronyms

AAI	Authentication and Authorization Infrastructure
API	Application Program Interface
EOSC	European Open Science Cloud
FAIR	Findability, Accessibility, Interoperability, Reusability
FitSM	Federated IT Service Management
IPR	Intellectual Property Rights
ITSM	IT Service Management
HPC	High Performance Computing
HTC	High Throughput Computing
LMS	Learning Management System
OLA	Operational Level Agreement
ORDM	Open Research Data Management
OS	Open Science
REST	Representational State Transfer
SCTS	Service Catalogue Template Specification
SDT	Service Description Template

Executive summary

What is the focus of this Deliverable?

The main focus of this deliverable is to review the rules of participation and the best practices for service on-boarding relevant to the EOSC environment and adapt them to the needs of the NI4OS-Europe regional community. It focuses on organizational and technical conditions for service providers to offer services through the EOSC portal. It provides detailed recommendations for the on-boarding procedure to be followed by the service providers that will integrate their services to EOSC. It also addresses the different possible levels of integration, along with the desired readiness levels of the services to be on-boarded. The on-boarding and the verification of the services will be done using the NI4OS-Europe pre-production environment, comprised of core services such as AAI, service catalog/portfolio management system, monitoring, accounting, etc.

What is next in the process to deliver the NI4OS-Europe results?

Based on the analyzed Rules of participation and best practices for service on-boarding, WP5 will perform the actual service on-boarding. The detailed description of the pre-production environment will be given in D3.2 - First report on pre-production environment. A reviewed version of this document based on the experience obtained by actual on-boarding of the NI4OS-Europe services will be published in D3.4 - Best practices for on-boarding and related policies 2nd version. Also, this document will be the basis for the deliverable D5.1 - Provider landscape analysis and provider categorization, where specific services will be categorized and scheduled for on-boarding.

What are the deliverable contents?

The deliverable starts with the details of the on-boarding procedure, adapted to the regional capacities and requirements of the NI4OS-Europe project partners, but aligned to the common rules that are expected to be used Europe wide. The procedure will give details on how to adapt and integrate the services, both generic and thematic, according to the EOSC requirements and make them available to the EOSC userbase. Next, an introduction to the rules of participation is given, their requirement and justification toward the establishment of the common European research services catalogue, as envisaged by the EOSC. It describes both organizational and technical rules needed for the achievement of this goal. Next, the different levels of integration are described, offering the services providers to decide, based on their organizational and technical capacities, how they would prefer their services to be integrated into EOSC. Closely correlated to this topic are the readiness levels, the degree of maturity of the services, discussed next in the chapter. Depending on these levels, the users can match their requirements and expectations from the offered services. Finally, technical guidelines are described for the service providers, along with the description of the NI4OS-Europe pre-production environment, which will enable them to strengthen their capabilities, as well as adapt and integrate their services making them EOSC ready.

Conclusions and recommendations

This document provides the foundation for the NI4OS-Europe on-boarding process and including the necessary guidance to incorporate the regional services into the EOSC ecosystem. The document presents the customized NI4OS-Europe on-boarding procedure, fully compatible with the current EOSC processes, while adapted to the needs and capabilities of the regional consortium. Rules of participation, both from technical and organizational aspect are described, along with the current user template for describing services in EOSC. Furthermore, guidelines for technical readiness and integration levels are given to the service provider to help them better understand their current service status and help them advance toward higher quality production environments. The document also contains a short description of the NI4OS-Europe pre-production environment that will be used to validate and on-board the services.

1 Introduction

To achieve its goal of becoming a pan-European point of integration of scientific services and repositories, EOSC must strive toward clearly defined rules and policies. The rules and policies should enable wider inclusion of services and dataset providers in EOSC, while, at the same time, flexibly supporting various levels of service offerings, service quality levels and integration possibilities.

Rules of participation and related policies have been addressed by several EOSC related projects in the past. EOSC-Hub [2] in its Deliverable 4.1 [3], titled Operational requirements for the services in the EOSC catalogue, gives significant details on the different types of rules and integration levels. EOSC Pilot [4] discusses tools, specifications, catalogues, as well as principles and frameworks for the services that will be integrated into the EOSC. The e-InfraCentral [5] project focused on defining the Rules of participation for the EOSC catalogue, by working on the Service Description Template, along with EOSC-Hub. The current development of the template is supported by EOSC enhance [6] project. EOSC-Hub currently uses a set of Criteria for inclusion in the EOSC service portfolio [7], to enable early adopters to be on-boarded to the EOSC catalog.

To ensure collaboration and common understanding of the Rules of participation, the EOSC Secretariat [8] has a dedicated working group. The EOSC Working Groups are official part of the EOSC Governance structure established to ensure a community-sourced approach to the challenges of the EOSC. The RoP WG focusses on recommending a minimal set of clear Rules of Participation that shall define the rights, obligations and accountability governing all EOSC transactions by the various EOSC users, providers and operators.

Since the WGs depend on the input from the EOSC implementation projects, with IFNRAEOSC-5b projects being significant part of them, as well as to provide better coordination between those projects, Task Forces have been established within the 5b collaboration agreement. In addition, an informal Interest Group on Service Catalogue and Onboarding is currently being set up on voluntary basis between a broader EOSC community, integrating participants from many EOSC related projects.

The NI4OS-Europe specific on-boarding procedure is described in this document to help the service providers integrate their services in EOSC. The procedure is supported by the necessary templates and documents as well as the preproduction framework used to validate these services and their integration. This deliverable is also helpful for the services providers to identify the readiness levels for their services, to recognize the importance of good service management practices, as well as to identify and apply the required integration steps, making the services more accessible and reliable.

2 On-boarding procedure

On-boarding of a resource (service or repository) into the EOSC includes all practical activities taken to incorporate a research resource into the EOSC federation. These activities represent a wide range of support actions to be directly offered to the resource provider in the on-boarding process. For example, for a particular resource, this could be the establishment of the support channel, integration with the existing EOSC services, data FAIRification, integration with monitoring, accounting, or authentication/authorization frameworks, preparation of end-user tutorials, access policies, terms of use, etc. Therefore, it is crucial to establish an on-boarding team within the project with wide-ranging expertise and experience to cover all diverse aspects of the on-boarding process. Furthermore, this team should produce a set of reusable guidelines, best practices, and other recommendations to reduce barriers the service providers face in the EOSC integration.

Although the on-boarding process may involve defining some internal rules and policies, in general it operates within the framework set by the rules adopted by the EOSC federation. The EOSC governance coordinates the development of the framework, and to ensure full implementation of its structure, it created five working groups (WGs):

- Landscape WG, which maps existing research infrastructures and services as candidates to be part of the EOSC federation;
- FAIR WG, responsible for the implementation of the FAIR data principles by establishing the corresponding requirements for the development of EOSC services, in order to foster cross-disciplinary interoperability;
- Architecture WG, which works on the technical framework required to enable and sustain an evolving EOSC federation of systems;
- Rules of participation WG, responsible for the Rules of Participation that define the rights and obligations governing EOSC transactions between EOSC users, providers, and operators;
- Sustainability WG, which is responsible for recommendations concerning the implementation of an operational, scalable, and sustainable EOSC federation.

From this perspective, the on-boarding of a particular resource, recognized within the Landscape WG, has to be in line with the rules defined by the FAIR WG, the Rules of participation WG, and the Sustainability WG, and should be performed in the operational environment defined by the Architecture WG.

Within the NI4OS-Europe project, the generic rules defined by EOSC WGs will be adopted according to the project requirements ensuring continuous compliance. In particular, amongst others, the landscape activities and high-level rules of participation are covered by WP2 of NI4OS-Europe, FAIR data principles by WP4, technical architecture and corresponding technical rules of participation by WP3, sustainability issues by WP7, while WP5 will manage the practical on-boarding of the resources following the rules of the previously listed WPs. Of course, these rules and technical architecture of the EOSC federation evolve dynamically, and close monitoring of improvements in these areas is required. Therefore, NI4OS-Europe nominated delegates in all EOSC WGs, and in addition to this, the project signed the Collaboration Agreement between all INFRAEOSC-05 projects to share information, results, and to collaborate in order to avoid the duplication of efforts.

In general, resource on-boarding includes five main steps illustrated in Figure 1:

- a request is sent by the service provider via e-mail or submitted via a dedicated form that officially initiates the on-boarding process;
- relevant information is gathered using a service description template or a corresponding online form, which could be incorporated in the service catalogue/portfolio system;
- the resource is integrated with the existing EOSC tools and federated core, such that it is compatible with the defined rules of participation;
- the resource is validated using tools from the federated core;
- the resource is published in the EOSC catalogue.



Figure 1: Generic view of the on-boarding process phases

This generic procedure may have to be adapted according to specific project needs, but as we mentioned before, also has to remain compliant with the generic EOSC rules of participation. Following this, we have further developed and extended this generic view in order to incorporate all characteristics of the NI4OS-Europe project. Our approach to the on-boarding process is illustrated in Figure 2.

In this project, we have identified the initial set of prospective regional resources during the proposal stage and extended this list based on the WP2 landscape survey information. The WP5 team will categorize resources from this pool based on their desired level of integration, as well as readiness levels, and produce a timeline for their on-boarding. In Section 4, we define metrics based on which we will produce a timeline for the on-boarding of particular services, and document this in the deliverable D5.1 - Provider landscape analysis and provider categorization. Therefore, within the NI4OS-Europe, the service providers will not send particular requests, but the WP5 team will initiate the on-boarding procedure for all resources and send the corresponding requests to the EOSC on-boarding team, on behalf of the service providers.

Once we perform the provider landscape analysis within the WP5, we will start with the information gathering process. This process is based on the EOSC Service Catalogue Template Specification (SCTS), whose structure is described in Section 3.3.1. In the first phase of the project, SCTS will be implemented as an Excel document, to be filled out by a service provider with support of the WP5 team, and manually or semi-automatically transferred to the project's service portfolio/catalogue system. Later on, it will be implemented as an online form within the portfolio/catalogue system. Our portfolio/catalogue management tool, AGORA [10], must strictly follow the proposed template.

The information-gathering process fully describes a service and its previously achieved development and management stage, as well as the desired level of EOSC integration to be delivered within the framework of NI4OS-Europe. The integration will be done following

the technical rules defined by WP3 in the form of a matrix, based on recommendations provided by EOSC WGs, WP2, WP4, WP6, and WP7. Rows in such a RoP matrix of packages, illustrated in Figure 2, are service type-specific, while the columns are federating core-specific or generic service-specific. It means that we will create a set of rules per particular type of service and per particular service from the pre-production environment or generic service pool. For example, P1 packages could be AAI-specific rules, and P2 packages could be helpdesk-related rules that have to be followed during the integration, and so on. Similarly, the integration with a particular generic service will be followed by the corresponding set of rules defined for it. The operational tools provided by WP3 and WP4 will dynamically verify implementation of these rules. Rules we have defined so far within the NI4OS-Europe project are listed in Section 3.

Once NI4OS-Europe verifies the service or repository, it will be published within the project catalogue, and the WP5 team will proceed with its EOSC registration. This should go smoothly since our procedures and rules will be compatible with the EOSC ones. For service registration, we will use the EOSC portal Join as a provider form [9], while for repositories, we will use the Open AIRE content provider dashboard [11].

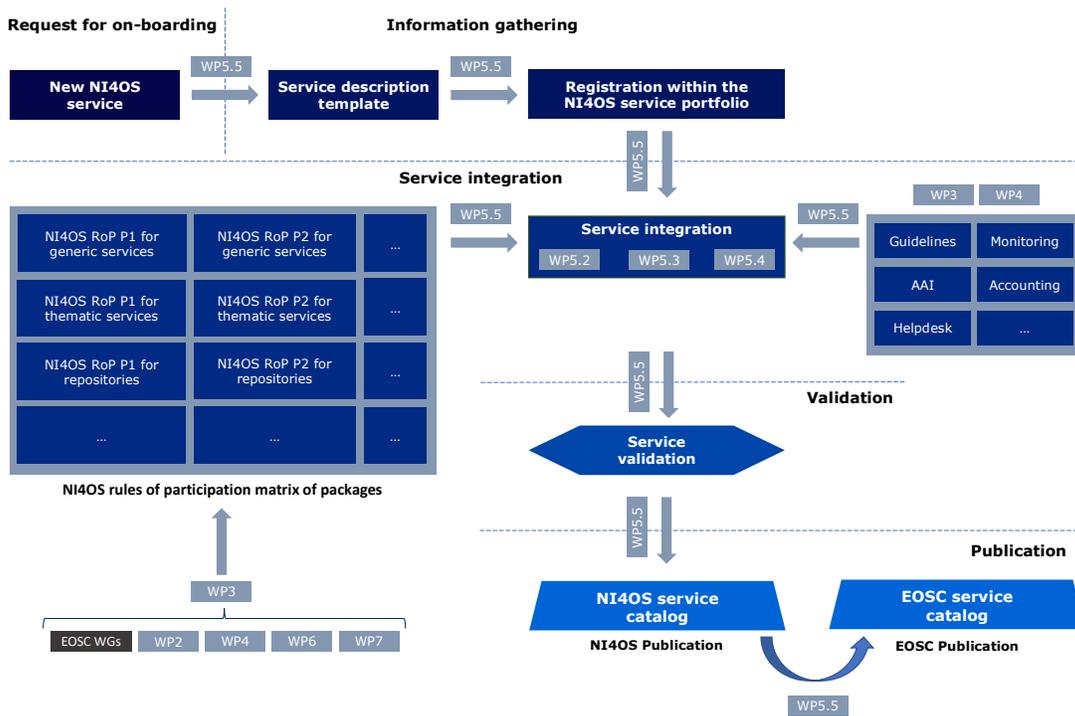


Figure 2: NI4OS-Europe view of the on-boarding process

2.1 On-boarding of different service types

During the proposal stage of the NI4OS-Europe project, we have organized regional services in a hierarchical structure, based on their functions and relationships:

- pre-production environment service;
- generic services;
- thematic services;
- repositories.

At the first level of this hierarchy, we have grouped the pre-production environment services that provide the functionality of the federation and access-enabling or Federated core services, such as monitoring, helpdesk, AAI, accounting, etc. These allow unique access to all other services and create a unique metric for the measurement of service performance in terms of utilization, provided support, availability, and reliability. In other words, Federation and access-enabling services build an environment able to measure delivered value to the researcher. Details on services from this level are given in Section 5.

Common services provide generic capabilities and address technical needs that are common to various research areas, so that they can be used by multiple thematic services. The services from this level of the hierarchy, support different aspects of the data lifecycle, from creation to processing, analysis, preservation, access, and reuse. Typically, here we have generic HTC/HPC computing, Platform-as-a-Service (PaaS) solutions, generic storage, data preservation/curation/provenance, cloud containerization and orchestration resources, etc., as well as advanced services for data discovery, management, processing, workflow management, etc.

Thematic services are research community-specific services that provide value to the researchers. In this category, we have grouped highly cross-disciplinary services that typically provide access to the community-specific data resources through the software layer that unifies tools for various analyses, comparison, visualization, study, and all other numerous aspects of post-processing. Besides the integration with the Federation and access-enabling services, the thematic services usually depend on the generic services, whose integration will be realized within the framework of the project.

At the highest level of the hierarchy, we have grouped various literature and data repositories that hold and preserve scientific information. In contrast to the generic and common services, which will be directly on-boarded to the EOSC, the repositories will be on-boarded using the OpenAIRE platform. Thus, during the on-boarding process, we have to ensure compliance with the OpenAIRE policies, while the OpenAIRE team will perform integration of their complete platform to the EOSC.

Figure 3 illustrates the hierarchical organization of the services. In addition to the services from the Federation and access-enabling level, generic and thematic services, and repositories, Figure 3 also includes the portfolio management level (as the lowest level) to illustrate different options for integration that could be achieved within the EOSC. Starting from the lowest level, all types of services have to be described consistently by a portfolio management schema, which is described in Section 3.3, and usually incorporated into the Service catalogue/portfolio system. This applies to services from the pre-production environment level as well. Both the templates, and the pre-production environment have to be fully EOSC compatible, so their structure will be further aligned based on the EOSC requirements, which, as already mentioned, will evolve dynamically. In addition to the portfolio management compatibility, the generic services will be integrated with the services from the pre-production environment, which will enable measurement of their performance. Similar requirements apply to the thematic services,

which, in addition to the pre-production environment unification, could be enhanced by the integration with services from the generic level. On top of our hierarchical structure, we put the repositories, since their content is usually generated using services from the lower levels. Following these levels of integration, we can foresee an ideal EOSC workflow - it is a repository generated from thematic service(s), which utilize(s) (various) generic services, monitored by tools from the pre-production environment. Elements of such a workflow are fully documented in terms of the templates, while its execution is fully automated.

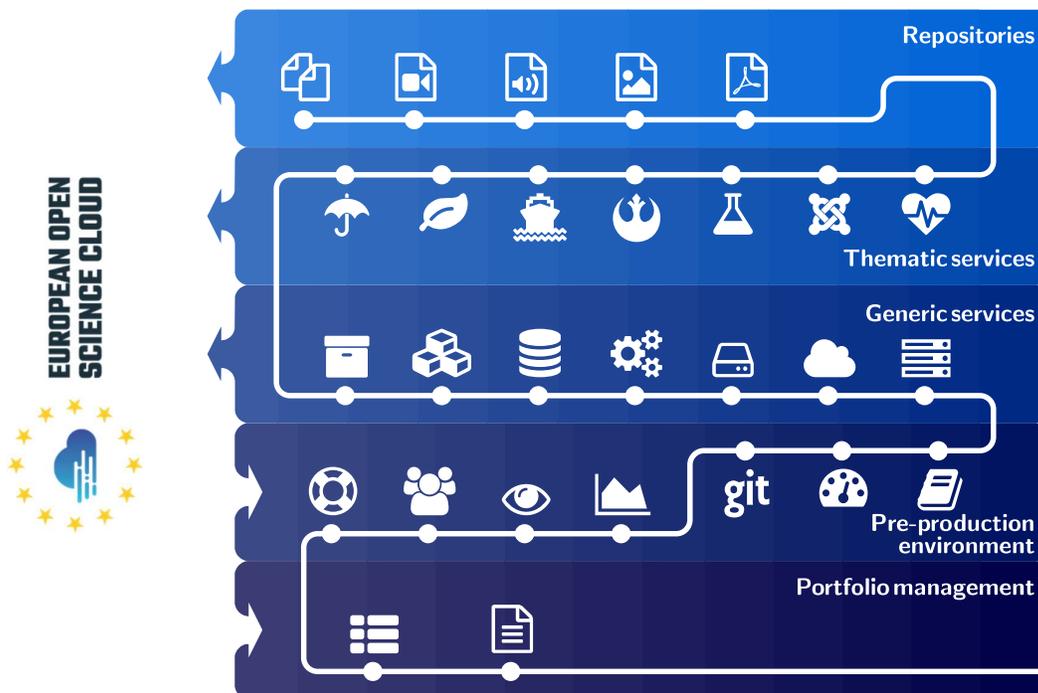


Figure 3: Hierarchical organization of services within the NI4OS-Europe project

2.2 Best practices for on-boarding

Once we collect information of prospective regional services and produce a timeline for their on-boarding, the produced result is a list of heterogeneous services. Some of them rely on widely used technologies that established a wealthy set of APIs and interfaces, while others will be in-house developed solutions, implemented in an ad hoc manner, without any or with very limited number of exposure mechanisms. In both cases, in order to enable integration and reuse of the service features, we will need to identify the main technical functions that give additional value to researchers, and whose reuse will benefit the wider community. Such key technical functions should be documented in a similar technical manner for services from all levels illustrated in Figure 3. Their technical specification has to include at least a description of a provided feature, used or adopted standards, APIs and interfaces, as well as interoperability guidelines, as suggested in [19]. In addition to this, the specification has to list services that already implement particular

functionality and, the most important for service providers, procedures and guidelines on how to integrate and reuse the particular functionality.

By focusing ourselves on key technical functions relevant to the community, and by isolating the service on the basis of these features, we will be able to produce reusable and EOSC-compatible building blocks ready for quick integration with existing and new services. For example, one building block could be a component that establishes the integration of the Apache webserver with the project's AAI infrastructure. The technical specification of this building block has to list main features, the standards used, interoperability information, and guidelines on how to use the component. This particular building block is very important since it is interoperable with the service from the pre-production environment (AAI) and with the frequently used technology, such as Apache webserver. Practically, such a building block could integrate the project's AAI with any thematic service developed on top of the Apache webserver. Another example of a building block is a component that publishes accounting information from the Portable Batch System (PBS) of an HPC cluster into the project's accounting system. This component can be reused by all HPC resource providers that are running PBS.

Identification of the building blocks and production of the corresponding technical guidelines is a complex and time-consuming work. It is clear that the total number of building blocks can become quite large, and thus a way to identify and focus on the most relevant functions is needed. Therefore, we will prioritize the creation of building blocks taking into account the user requirements. The prioritizing will be done based on the feedback on the desired level of integration with the pre-production environment services that we are collecting at the moment, as well as on the rules of participation. For example, all services will have to establish a support channel in the project's helpdesk system, and therefore, the technical specification of this building block has a high priority. The initially prepared specification will be iteratively improved by collecting feedback from service providers that have incorporated a particular block into their service.

The architectural design introduced above will reduce barriers the service providers face in the process of integration by reusing available common, Federation and access-enabling services, enabling streamlined implementation of common features and efficient exploitation of the offered generic computing, storage and data resources. We expect that, following this approach, a number of thematic services will increase their integration level with the EOSC federation core (AAI, monitoring, accounting), as well as their level of integration with the common services. Furthermore, the production of fully interoperable building blocks will allow the creation of novel fully automated scientific workflows, ultimately leading to the implementation of the ideal EOSC workflow.

3 Rules of participation

At the time of writing this deliverable, the EOSC Rules of Participation WG [12] has drafted a generic set of rules of participation for consultation [13] that provide an abstract description of the vision and the expectations about the content of the finalized official Rules of participation. Thus, NI4OS-Europe has to adapt this initial input into its own Policies and Best Practices in order to start collecting and preparing services to be on-boarded according to the procedures described in the previous section.

3.1 Organizational rules

Each service provider organization should ensure that it has enough work force available and is familiar with the technical rules defined below in order to be able to respond in a timely manner for any request or incident for the services offered. The providers will be encouraged to implement appropriate organizational governance, ensuring required staffing and competences. Using models like RACI [15] can help the service providers to map the work force to the service delivery. The organizational rules typically deal with requiring service providers to implement a certain level of Service Management. Multiple levels of requirements will be in place, and service providers will be able to choose the level of implementation suitable to them. The requirements will be directly related to the perspective defined in Section 4, ranging from lower levels, which will require only exposure to broader communities and appropriate access and support methods, to upper levels, which include AAI integration and harmonization, service monitoring and accounting, incident management, etc.

3.2 Technical rules

Technical rules deal with functional capabilities that need to be met by the providers, including access policies, authentication and authorization, actual service management frameworks, Service Level Agreements (SLAs), user support, required level of technology readiness (TRL), etc. Only services with high TRL will be supported toward EOSC integration in WP5. Thus, each service provider should organize its own Service provisioning procedures and adhere to the generic principles listed below, or be able to participate in the procedures defined by NI4OS-Europe or EOSC as requested.

Below is a list of the important procedures, based on FitSM [14], that each Service Provider should be compatible with.

- **Service portfolio management (SPM):** to define and maintain a service portfolio.
- **Service level management (SLM):** to maintain a service catalogue, and to define, agree and monitor service levels with customers by establishing meaningful service level agreements (SLAs), supportive operational level agreements (OLAs) and underpinning agreements (UAs) with suppliers.

- **Service reporting management (SRM):** to specify all service reports and ensure they are produced according to specifications in a timely manner to support decision-making.
- **Service availability and continuity management (SACM):** to ensure sufficient service availability to meet agreed requirements and adequate service continuity.
- **Capacity management (CAPM):** to ensure sufficient capacities are provided to meet agreed service capacity and performance requirements.
- **Customer relationship management (CRM):** to establish and maintain a good relationship with customers receiving services.
- **Information security management (ISM):** to manage information security effectively through all activities performed to deliver and manage services, so that the confidentiality, integrity and accessibility of relevant information are preserved.
- **Supplier relationship management (SUPPM):** to establish and maintain a healthy relationship with suppliers supporting the service provider in delivering services to customers, and monitor their performance.
- **Incident and service request management (ISRM):** to restore normal/ agreed service operation within the agreed time after the occurrence of an incident, and to respond to user service requests.
- **Problem management (PM):** to investigate the root causes of (recurring) incidents in order to avoid future recurrence of incidents by resolving the underlying cause, or to ensure workarounds/temporary fixes are available.
- **Configuration management (CONFM):** to provide and maintain a logical model of all configuration items (CIs) and their relationships and dependencies.
- **Change management (CHM):** to ensure that changes to CIs are planned, approved, implemented and reviewed in a controlled manner to avoid adverse impact of changes to services or the customers receiving services.
- **Release and deployment management (RDM):** to bundle changes of one or more CIs to releases, so that these changes can be tested and deployed to the live environment together.
- **Continual service improvement management (CSI):** to identify, prioritize, plan, implement and review improvements to services and service management.

3.3 Service Catalogue Management System

A key element of the NI4OS-Europe pre-production environment is the service portfolio management system. The Service Portfolio Management Tool (AGORA) [10] is aimed at facilitating service management in IT service provision, including pre-production environment. AGORA presents a complete list of the services managed by a service provider. Some of these services are visible to the customers, while others are internal. AGORA allows maintaining and managing the descriptions of services in the portfolio and it allows managing the transition from the portfolio to the catalogue. The service management system has been designed to be compatible with the requirements for service portfolio management according to FitSM IT service management standards and is extended to be compatible with the EOSC Service Catalogue Interoperability Framework. For NI4OS-Europe, a production instance of SPMT is available and will be used to cultivate the NI4OS-Europe Catalogue and publish most of them to EOSC catalogue. Figure 4 depicts the agreed Architecture for the EOSC Portal and its interconnection with

the external components – providers. The AGORA system is built around the data model defined by EOSC-Hub and other projects, known as Service Description Template. The EOSC-Enhance project upgraded and extended this concept, to the Service Catalogue Interoperability Framework, described in Section 3.3.1.

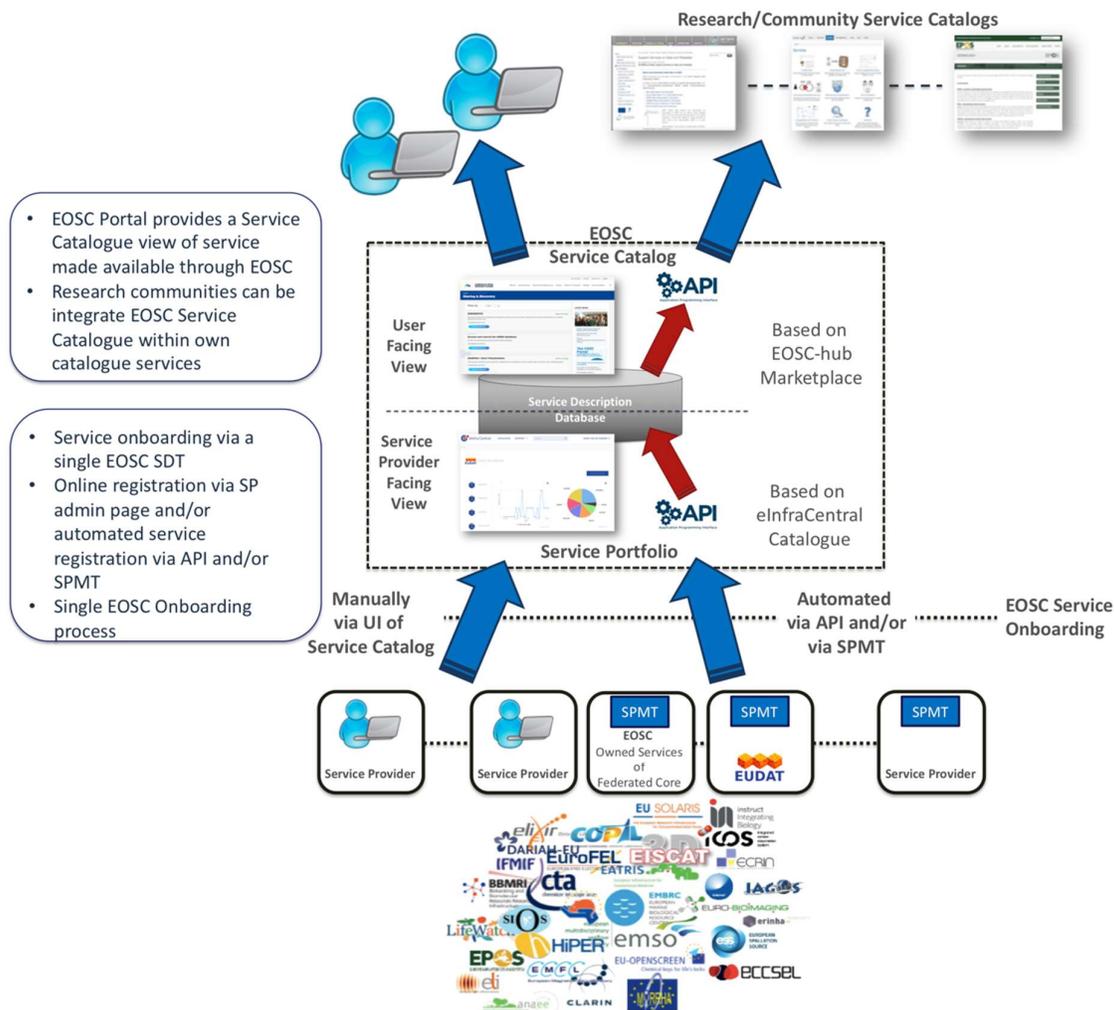


Figure 4 The EOSC Portal Architecture as proposed by the Joint Agreement of EOSC-HUB, eInfraCentral and Openaire

3.3.1 EOSC Service Catalogue Interoperability Framework

In order to harmonize the description of the services throughout the EOSC ecosystem, with NI4OS-Europe being integral part of it, an EOSC Service Catalogue Interoperability Framework is devised that comprises of:

- the EOSC Service Catalogue Template Specification (SCTS), accompanied by a structured classification of services-resources for the harmonized description of various SCTS attributes, in the form of a Classification Appendix;
- the EOSC Service Catalogue Model Specification;
- the EOSC Service Catalogue Interface Specification;

- the EOSC Service Catalogue Vocabulary.

The SCTS includes four different Description Templates (DTs). The templates describe different phases of the on-boarding, update, maintenance and monitoring processes of services by the provider:

- the Provider Description Template is used during the first step of the registration process;
- the Service Description Template is used during the second step of the registration process;
- the Option Description Template is used to describe the available different options (instantiations) offered for a specific service/resource registered;
- the Service Level Target (SLT) Description Template is used for the provider to report performance-level indicators relevant to the service/resource, and it is not mandatory.

The work on this template is still in progress and advances and changes are expected.

4 Levels of integration and readiness

Based on the current activities in the EOSC ecosystem, as well as on the previous regional experience, the NI4OS-Europe project outlines several different perspectives by which services can be viewed and classified. Each of these perspectives can be combined with each other to provide better positioning of the services and their providers within the landscape. Also, these perspectives offer benchmarking yardsticks to evaluate and improve the quality of the offered services and the organizational and technical readiness of their respective providers. Before describing the NI4OS-Europe perspective and service positioning, we will look at the current efforts in defining levels of integration in EOSC.

4.1 Current state of play

The current EOSC integration classification is based on the guidelines described for the level of integration of services [16] into EOSC.

EOSC-Hub project defines three levels of operational integration with the Hub depending on the maturity level of the Service Management Framework in place:

- 1) **High**: the service is operated according to the EOSC service management system. The service provider actively participates to the Hub Operations Coordination.
- 2) **Medium**: aimed at services run with a more mature Service Management Framework.
- 3) **Low**: aimed at services run with a less mature Service Management Framework.

Each level of integration will have its own set of proposed operation requirements.

Two main types of services, which will be integrated into EOSC and consequently NI4OS-Europe, have been identified. The first type (of services) are services which will enable access to EOSC itself. In other words, these are access enabling services. The second type of services are research enabling services. These are services which will be offered to users and/or research communities through the EOSC marketplace. The research enabling services can be further divided into common services (e.g., EGI Cloud Compute for EOSC) which can be reused by other services, and other research enabling services (e.g., scientific applications offered by a research organization).

Each category of services must comply with a minimum level of integration as described below:

- **Federation and access enabling services** must satisfy the set of requirements described for the high level of integration (of services).
- **Research enabling services** must satisfy a medium level of integration if they are **common services** and a low level of integration if they belong to the category of **other research enabling services**.

4.2 Functional perspective

As described in Section 2.1, NI4OS-Europe services are classified into:

- Federating or access enabling services;

- generic services;
- thematic services;
- repositories.

This perspective is considered to be orthogonal to the later ones. For each of the categories in this perspective there will be mapping toward the other ones, as shown in Figure 5.

All NI4OS-Europe services, regardless of their function, will be part of the NI4OS-Europe service portfolio.

4.3 IT service management perspective

The ITSM perspective is more related to the service providers of the services under consideration. Depending on the functional category of the services, as described in Section 4.2, different ITSM processes and procedures will be recommended to be adopted by the offering service providers.

Service providers offering service from the federating core will have to adopt larger set of ITSM processes, because the availability and reliability of these services will directly imply all other NI4OS-Europe services. For example, the ticketing help desk system, as one of the key components that enables quality service offering, will have to be maintained using a set of operational processes that will support its high availability and reliability. The same ITSM rigor should be applied for the common services, being the resources foundation on which thematic service and repositories will rely upon.

From the operational point of view, each of these services will have a nominated service owner. The owner will be nominated by the institution offering the service and will be a part of the **operational on-boarding team**.

For the **service level management**, the providers of these services will be encouraged to have operational level agreement (OLA) to ensure their delivery.

Pre-production env.	Generic services	Thematic services	Repositories	
High	High	Medium	Low	ITSM perspective
High	Medium	Medium	Low	Integration level persp.
Higher	High	Medium	Lower	Technology read. persp.

Figure 5: NI4OS-Europe perspectives

The service providers for thematic services and repositories can on-board their services with lower ITSM procedures in place, but will be encouraged on increasing the usage of ITSM best practices and standards, enabling them to increase the quality of their service offering. This will be achieved through trainings and collaboration, as described in the NI4OS-Europe training plan. These services will also have to have respective owners and/or contact points through which the operational on-boarding team will coordinate the on-boarding process and validation.

4.4 Integration level perspective

Integration level perspective will be also dependent on the functional perspective classification.

High level of integration will be a mandatory requirement for the services of the NI4OS-Europe pre-production environment. These services will have to have high level of stability, reliability and availability, since the whole NI4OS-Europe on-boarding process will be highly dependent on them. For example, the ticketing services will have to be highly integrated with the monitoring system, enabling the operational monitoring team to have a full view of the availability of this service.

Common services are also required to have high level of integration, especially with services such as AAI, monitoring, ticketing and accounting. These services will provide resources to many thematic services and repositories, making their operations very important.

Thematic services and repositories integration will depend on the service itself and on the ITSM best practices and standards adoption of their providers. The detailed on-boarding timeline described in D5.1 will give the details of integration for each of them.

4.5 Technology readiness perspective

NI4OS-Europe will provide support to a number of services which have already been identified, as well as, to new services which will be identified later for on-boarding to the European Open Science Cloud, meaning being included in the associated catalogue of services. Of course, NI4OS-Europe consortium, should enable the on-boarding of services which are mature enough so that they can be in an operational mode once they get on-boarded.

To achieve that, NI4OS-Europe needs to use a metric to judge whether a service is ready to on-board or not. Hence, for this purpose, a readiness level metric will be used.

Guidelines for the readiness level of services, which will be on-boarded to NI4OS-Europe, have been already described for the EOSC-Hub in [16].

“Technology Readiness Level” (TRL) [17] is a gauge for the maturity of a technology. Originally developed for the space industry by NASA, it became later adopted by various departments of defense around the world and by others. Its use within the EU was first recommended by the High-Level Group of Key Enabling Technologies (HLG-KET) final report in 2011 and it was subsequently used in H2020 funding programs.

For use within the context of operational service delivery, TRL has its limitations as it is usually used to describe the maturity of underlying technologies rather than the delivery of them in the form of a service to end users. In addition to this, an end service may be the union of multiple sub-components, each based on various technologies with differing levels of maturity. Nevertheless, TRL is a widely used and easily understandable method that was included in the EOSC-Hub project proposal.

The basic explanations of TRL may be seen from the definitions from the European Commission in preparation for its WP2014-2015 program, shown in Table 1.

TRL 1	Basic principles observed
TRL 2	Technology concept formulated
TRL 3	Experimental proof of concept
TRL 4	Technology validated in lab
TRL 5	Technology validated in relevant environment
TRL 6	Technology demonstrated in relevant environment
TRL 7	System prototype demonstration in operational environment
TRL 8	System complete and qualified
TRL 9	Actual system proven in operational environment

Table 1: Readiness levels

We recommend that in EOSC TRL8 remains the minimal requirement to include new services in the catalogue. The service assessment will include the evaluation of both operational and technical aspects. Technical requirements have been defined by the EOSC-Hub deliverable D10.3 [18] released in September 2018. Once both operational and technical requirements will be defined, a formal procedure to assess the service TRL will be defined as part of the process to on-board services in the catalogue.

NI4OS-Europe operational management team, consisting with experts on technical aspects, will be judging whether a service belongs to TRL8 or TRL9. The criteria will be based on proving that the services belong to a particular TRL by providing evidence.

For instance, if a service is either in TRL 8 or in TRL 9, the service should be active and running in a full operational mode. Therefore, the system should be online and running without any issue.

Furthermore, if the system is fully operational under a different infrastructure project this should be clearly stated and would immediately qualify the service in TRL >7.

If scientific publications have resulted by scientific teams using the particular service, then the service would qualify to TRL 9. In this case, representative peer reviewed publications should be given as reference.

4.6 *Minimum Viable EOSC – MVE*

Having in mind the previously discussed perspectives and categorizations, it is important to define the minimum set of federating services that will be deployed to support integration of the initial set of the regional service into the EOSC. This minimal set, referred to as the Minimal Viable EOSC or MVE will contain essential building blocks that will enable the integration of all the other service in the EOSC ecosystem. Starting from such MVE, our pre-production environment will iteratively expand to include other service performance measurement tools. Expansion will follow both desired and achieved levels of integration of regional services.

The services of the MVE should include:

- Service catalogue management system. Discovering services in a one-stop-shop manner is essential for EOSC to achieve wide outreach and broad userbase.
- The user support channel in the form of a helpdesk ticketing system. The user support is the first prerequisite for each of the services that are to be on-boarded to EOSC, since it will enable communication between the service providers and the potential user communities.
- User guidelines – technical wiki that enables NI4OS-Europe infrastructure, service administrators, thematic service developers to document relevant procedures and integration guidelines.

Other services can extend the MVE, such as:

- Monitoring system. Monitoring availability of each of the EOSC enabling infrastructure elements is crucial to maintain user satisfaction and increased usage of the offered services.
- Accounting system. Having in mind different options for sustainability of such a complex infrastructure, an accounting system is necessary to determine its degree of usage, as well as to support the planning of future infrastructure developments.
- Endpoint database. Endpoint or topology database is an integral part of the infrastructure that will enable the proper operations of the monitoring and the accounting systems.
- Authentication and Authorization Infrastructure. Many of the services will require personalization, as well as data and services isolation, which can be easily achieved by employing AAI mechanism. Using a proxy AAI service will enable easy integration of on-boarded services with national or project AAls.
- Software Repository – system that provides NI4OS-Europe infrastructure and service administrators storage for software code and packages.
- Training Portal – system for supporting training activities and publishing webinars.
- Events Scheduler – system for supporting networking activities within NI4OS-Europe infrastructure.

5 Technical architecture

NI4OS-Europe will provide a set of service integration, operation and federation tools necessary for implementation of services on-boarding and day-to-day operation of the whole infrastructure, based on the MVE defined in the Section 4.6. Tools will be selected among those developed or used by large-scale infrastructures such as EGI, EUDAT or EOSC-Hub. NI4OS-Europe infrastructure will be as much as possible compatible with EOSC technologies and protocols. In cases where tools provide multitenancy feature (e.g. ARGO Monitoring and Messaging Service) NI4OS-Europe will rely on existing infrastructure. In other cases, regional instances will be deployed at partner institutions. This way infrastructure will be kept compatible, but will allow NI4OS-Europe operators to gather relevant know-how on running the tools themselves. The short depiction of each of these services is given below, while the more in-depth description will be presented in D3.2.

5.1 Topology database

Grid Configuration Database (GOCDDB) [20] provides a central registry for e-Infrastructure topology. GOCDDB enables detailed describing of service endpoints with custom attributes, tagging and additional sub-endpoints. Services are assigned to resources centres, which are grouped in operations centres. Besides service endpoints, GOCDDB enables definition of contact points and declaration of downtimes for individual services endpoints or resource centres.

GOCDDB is provided by UKIM.

5.2 Service catalogue

AGORA will be used for providing Service Catalogue. Detailed description is given in Section 3.3.

AGORA is developed and provided by GRNET.

5.3 Helpdesk

Request Tracker [21] (RT) will be used as a helpdesk platform. RT is an open source solution that enables advanced ticket management via web interface, email, command line interface or REST-API. Furthermore, it allows high level of ticket attribute customization and fine-grained authorization, which is required for large scale infrastructures.

Service is provided by IPB and UoBL.

5.4 AAI

NI4OS-Europe Login similar to EGI AAI Proxy [22] will be provided for NI4OS-Europe infrastructure. AAI Proxy enables access to services and resources using federated authentication mechanisms. Users can authenticate with the credentials provided by their

home organization (through eduGAIN [23]) as well as social identity providers (e.g. Google or Facebook) or other external identity providers (e.g. random project AAI). AAI Proxy supports SAML, OpenID Connect and OAuth2 providers.

Service is provided by GRNET.

5.5 Monitoring

The ARGO Monitoring Service [23] provides a flexible and scalable framework for monitoring status, availability and reliability of a wide range of services provided by infrastructures with medium to high complexity. It can generate multiple reports using customer defined profiles (e.g. for SLA management, operations) and has built-in multi-tenant support in the core framework. ARGO supports flexible deployment models and its modular design enables ARGO to integrate with external systems (e.g. Topology Databases, Service Catalogs). During the report generation, ARGO can take into account custom factors that define importance of a specific service endpoint and scheduled or unscheduled downtimes.

The ARGO Messaging Service (AMS) is a messaging service that allows you to send and receive messages between independent applications. It is implemented as a Publish/Subscribe (pub/sub) Service. AMS is used internally by ARGO Monitoring Service, but it can also be used by any other NI4OS-Europe infrastructure tool or even on-boarded services.

ARGO Monitoring and Messaging Service is provided by GRNET, SRCE and CNRS.

5.6 Accounting

Accounting Service developed by VI-SEEM project [25] will be used in NI4OS-Europe infrastructure. The accounting system accumulates and reports utilization of the different types of resources in the infrastructure using standard metrics. The information that is relevant to the resources usage is gathered and organized in one central database. Accounting will be expanded to support new types of services (e.g. data repository) as needed. Additionally, integration with existing systems such as APEL [26] will be investigated.

Service is provided by IICT.

5.7 Technical wiki

Open source software MediaWiki [27] will be used for providing Technical Wiki. MediaWiki powers Wikipedia and tens of thousands other web sites. It is well supported and most of the technical personnel is familiar with it. MediaWiki will be used for technical documentation of NI4OS-Europe infrastructure and also by service providers.

Service is provided by IPB.

5.8 Software repository

Open source software GitLab [28] will be used for providing Software Repository. Besides for providing Git for software repository, GitLab contains set of programs that enables portfolio planning and management. It enables fine-grained authorization, issue tracking, delivery organization and other features required for software management.

Service is provided by IPB and UoBL.

5.9 Training portal

Open source software Moodle [29] will be used for providing Training Portal. Moodle is well known e-Learning platform that enables educators, administrators and learners with a single robust, secure and integrated system to create personalized learning environments.

Additionally, open source system BigBlueButton[30] will be used for organizing webinars. BigBlueButton fully supports integration with Moodle system.

Both services are provided by UKIM.

5.10 Events scheduler

Open source software Indico [31] will be used as Events Scheduler. Indico provides all the features needed for organization of various events, from simple team meetings to large conferences. It enables fine grained authorization and integration with AAI proxies. Various types of documents can be uploaded and archived by using Indico.

Service is provided by GRNET.

6 Conclusions

Defining a clear and sound set of policies is a key element toward wider EOSC adoption as the single place of reference for scientific services and data. Rules of participation and on-boarding are one of the most important such policies. The biggest challenge that EOSC is facing is the heterogeneity and the wide spectrum of potential service providers in terms of maturity, both organizational and technical, that will contribute their services.

This deliverable addresses the regional specific rules of participation for the service providers, as well as the customized on-boarding procedure. Building upon the results of other EOSC related projects, we have devised a NI4OS-Europe specific on-boarding procedure. The procedure distinguishes the specifics of different types of services, such as pre-production environment services, generic and thematic services as well as repositories. The proposed hierarchical organization model helps the service providers to better understand the process of different service types.

Following the on-boarding procedure, the deliverable focuses on the rules of participation, both from organizational and technical perspective. The importance of IT service management adoption by the service providers has been identified as an important factor that will influence the quality of the offered services. To follow the rules of participation and the on-boarding process, the AGORA service catalogue management system is introduced, along with the currently supported data models defined in the EOSC Service Catalogue Interoperability Framework.

NI4OS-Europe project identified several different perspectives by which services can be viewed and classified. These perspectives are compatible with the current classifications used in EOSC related projects and are based on the regional experience of the NI4OS-Europe project consortium. Aside from the functional perspective, the deliverable introduces the ITSM and the technology readiness perspective. All these perspectives allows better and finer service classification, enabling the on-boarding process to be more adapted and easily implemented. They also help us identify what we believe the Minimum Viable EOSC or MVE should contain. The elements of this MVE, in the form of the NI4OS-Europe technical architecture, is presented next. Each identified element is shortly described, along with the used tools and software, as well as the hosting partner.

This deliverable describes quite on-going and dynamically changing topics, such as the on-boarding and the rules of participation. An improved, second version will be produced as D3.2 in M19 of the project.