

D3.2 First report on mapping of EOSC prospective service providers and candidate services

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Abstract

This deliverable describes results of the initial mapping of EOSC prospective service providers and candidate services coming from the Nordic and Baltic countries. Services are analysed using the compliance checklist and maturity model developed in EOSC-Nordic and summarised in Deliverable 3.1. Aggregated results are presented in this deliverable.



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Executive summary

This deliverable describes results of the initial mapping of EOSC prospective service providers and candidate services coming from the Nordic and Baltic countries. At first, in order to do an initial discovery of services offered by national research infrastructure providers that participate in EOSC-nordic project, a service template to capture basic information about services was developed. 49 services from 18 providers and 8 countries were captured. This was a sample set of services from the interviewed providers that mostly covered compute, data storage and data analysis type of services.

With this initial information, we were able to take this work one step further and to develop a maturity model in order to further assess the services' maturity and underpin the future work of Task 3.1 of EOSC-nordic to support services to reach the requirements of joining EOSC.

Services were analysed using the compliance checklist and maturity model developed in EOSC-Nordic and summarised in Deliverable 3.1. In total, the initial mapping covered 36 services and provided feedback for improving the maturity assessment model. The improved maturity model was then used to map services that have been analysed for maturity in terms of service management, data management and service quality, accessibility and legal requirements, sustainability and financial aspects as well as EOSC architecture compatibility. Furthermore, results of the assessment were summarised and analysed, allowing to improve the service mapping process in the future and these findings are summarized in this deliverable. The outcomes of this deliverable are intended to be disseminated to a wider audience via EOSC-Nordic web site.

I. Introduction

This deliverable is intended to provide a summary of the mapping as well as initial analysis of the results for the discovered services. Note that the concrete steps for supporting maturity level of services is outside the scope of this document. The document is intended to serve as a reference for T3.1.3 Support to the integration of mature services into EOSC portal and T3.1.4 Support to aligning with EOSC service management & operational environment.

The outcomes of this deliverable also are planned to be integrated into the Knowledge base built in collaboration with WP6 and aimed at assisting service providers among others. The Knowledge base would constitute part of the WP6 Knowledge Hub.

This document is structured in the following manner:

- **Service inventory** describes the approach to the performed mapping as well as summarises the coverage of the identified services;
- **Service maturity** presents the checklist and maturity model that was applied to the identified services, describes the assessment process and provides aggregated analysis of the outcome. The purpose of the maturity model is to help service providers achieve better alignment with the EOSC requirements. For the sake of brevity as well as privacy considerations, this deliverable does not include analysis results for the individual services. More information on the selection of services can

be found at the EOSC-Nordic blog entry¹, which includes that information about a selection of services.

- **Conclusions and next steps** describe how we plan to use the outcome of this deliverable.

Annex 1 presents the service inventory template, while the service maturity template is presented in Annex 2. Finally, the glossary of used expressions is presented in Annex 3.

2. Service Inventory

One of the objectives of the WP3 is to identify services offered to researchers by service providers in Nordic and Baltic regions, in order to support services' integration via EOSC portal and other relevant catalogues. This initial effort of doing the **service discovery** is of importance for further work, that is to assess these services according to the defined maturity model and to identify organisational, semantic and technical interoperability of services. Another important anticipated outcome of the service discovery is to create a service inventory and to analyze it to reveal baseline, differences and overlaps of the national service portfolios offered to researchers. This can be further used to identify opportunities for experience and knowledge sharing, interoperability of services in international service provision scenarios and collaboration in order to tackle common issues and challenges.

2.1 Service Inventory Template

A major objective of Task 3.1 for this deliverable was to gather an **initial sample** of candidate services offered by Nordic and Baltic providers. Therefore, it was important to balance the need for gathering sufficient information with the goal to receive responses from as many service providers as possible by employing a lightweight process. To achieve this, a template for the service inventory was created reusing - to a large extent - terminology and vocabulary of the EOSC catalogue. Thus, a minimal set of somewhat familiar information could be used, which would enable the identification of services and its basic characteristics in a way that is meaningful for future work on including such services into the EOSC catalogue.

A finding of the EOSC eInfraCentral project was that the community recognised early that a common approach to both describing and exchanging service-related information is the way forward to enhance discoverability and thus potential uptake. The approach taken by eInfraCentral was to promote and extend best practices followed independently by some of infrastructures and to enable the harmonisation of service descriptions in a single, common catalogue. This work has been extended within the EOSC Portal Collaboration Agreement of eInfraCentral, EOSC-hub and OpenAIRE-Advance. As the result, eInfraCentral developed the Service/Resource Description Template (SDT)² that addresses one of the goals and it is now widely adopted as the standard scheme for the representation of service-related information in the EOSC Catalogue. The Service Description Template defines attributes, their potential values and format (if any) as well as whether the attribute is mandatory or optional for the implementation of a number of features in a common catalogue.

¹ <https://eosc-nordic.eu/new-assessment-tool-developed-and-ready/>

² <https://github.com/eInfraCentral/docs>

In the context of the EOSC-Nordic project, populating comprehensive inventories is at a risk of becoming time consuming and needs involvement by multiple parties, so it was decided to take a staged approach. The goal of the initial exercise to list services was to create a lightweight inventory with basic information about services in order to motivate service providers to populate it by a representative sample that can be used to validate the template's usability, and show basic overview of the services and trends. This approach gave the input to further develop and populate the service inventory in the most effective way and to give direction for creation of the services maturity assessment.

The developed service inventory includes a subset of EOSC-HUB SDT 1.3³ and eInfraCentral SDT v2.0⁴ attributes in order to capture basic service related information. Below, we list the attributes of the service inventory and provide provenance information for their origin (in parentheses):

- Service provider name (EOSC-HUB SDT v1.3, ID: SP1)
- Service provider abbreviation (defined in context of this service inventory)
- Service name (EOSC-HUB SDT v1.3, ID: SD.BSD.1)
- Service description (EOSC-HUB SDT v1.3, ID: SD.BSD.2)
- Service URL (EOSC-HUB SDT v1.3, ID: SD.BSD.3)
- Service category (EOSC-HUB SDT v1.3, ID: SD.SCM.1)
- Service owner name (EOSC-HUB SDT v1.3, ID: SM.2)
- Service owner contact (EOSC-HUB SDT v1.3, ID: SM.3)
- Target users (EOSC-HUB SDT v1.3, ID: SD.SCU.1)
- User base (e-infcentral SDT v2.0)
- Service access policy description (SDT v2.0 ID: AO.AP.2)
- Access policies in use (SDT v2.0 ID: AO.AP.3)

2.2 Results of the First Round of Service Inventory

The goal of this task is to discover prospective service providers and services that could be offered across the border using the EOSC platform. As such, our main target were the services that are currently offered on a national level. While the question of motivation and/or mandate to offer services across the border is important, this goes beyond the scope of this survey and can be considered for the second iteration of the deliverable when the EOSC provides more clear rules for the sustainability of EOSC services.

Because WP3 participants represent different service providers from all of the Nordic and Baltic countries, we were able to get a representative sample for populating this service inventory. A selection of mature services already in production offered by WP3 participants' organisations as well as communities and other prominent research service providers were mapped. Regarding the reliability of data, the input was provided by service providers themselves in what can be considered a self assessment manner. As a result, the initial inventory includes:

- 49 services,
- from 18 different service providers,
- from 8 countries: Norway, Estonia, Latvia, Lithuania, Sweden, Iceland, Finland and Denmark.

³

<https://docs.google.com/spreadsheets/d/1zeUShdnFQU5fTeKSyOcvICCKeGMA6sbnp7bUkXaa97k/edit#gid=1115091576>

⁴ <https://github.com/eInfraCentral/docs/blob/master/eInfraCentral-SDTv2.0.xlsx>

Most of the service providers that provided input to the service inventory are bounded by national funding and are providing services in context of national research and education. Some services, though, are available to the research project that gets national funding, and as such the project can be international, indirectly services can be of international, cross border use although this is not a primary target.

Figure 1 shows the distribution of service categories among the participating 49 services. With about 30 %, compute services make up the single most frequent category. All services related to data, data management, data storage and data analysis together account for about 45 % of all services in the inventory. Development resources and software services account for almost 10 % of all services. The remaining 15 % of services are in the categories of consultancy & support, network, other and security & identity. Several categories were not present in the initial inventory, namely aggregators & integrators, applications, education & training, instrument & equipment, material storage, measurement & materials analysis, operations & infrastructure management services and scholarly communication (see Appendix A, Table 1 for a definition of the service categories).

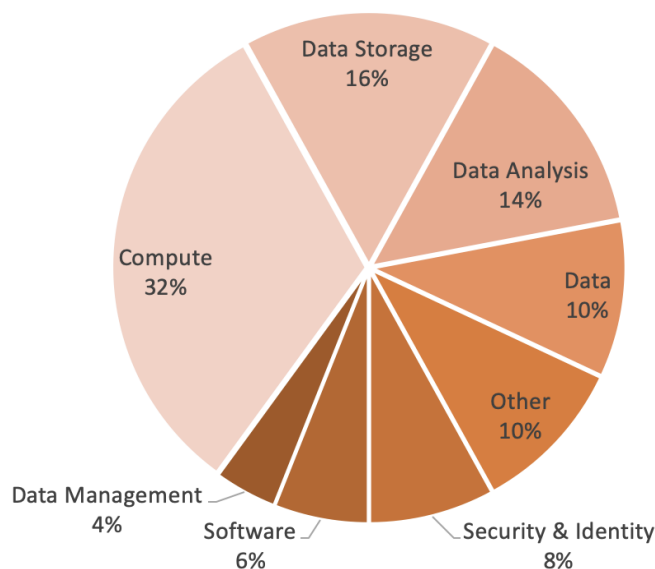


Figure 1: Distribution of service categories in the initial service inventory

Figure 2 breaks down the services' categories with respect to the country offering the services. The breakdown illustrates what kind of services are commonly provided by all/most countries: *compute* and *data** services, while the other service categories are only present in a few countries. Furthermore, the breakdown shows that for some countries only a small subset of service categories were included in the initial inventory: Iceland (*compute* service only), Finland & Norway (*compute* and *data** services).

In the future, this information may be exploited in several ways:

- for every country, services in categories which were not present in the initial inventory could be identified,
- if a country does not provide a service in a specific category, but its researchers need that kind of service, the information about existing services could be used to provision such a service nationally or enable the use of existing services provided elsewhere,
- experiences made for discovering, mapping and onboarding services in the initial inventory could be used to complement a country's service portfolio,

- knowing which country provides what kind of specialised service(s) could be exploited to agree on sharing these services for all users and benefiting from the possible expert competence of a provider, instead of every country re-implementing their own service instance(s).

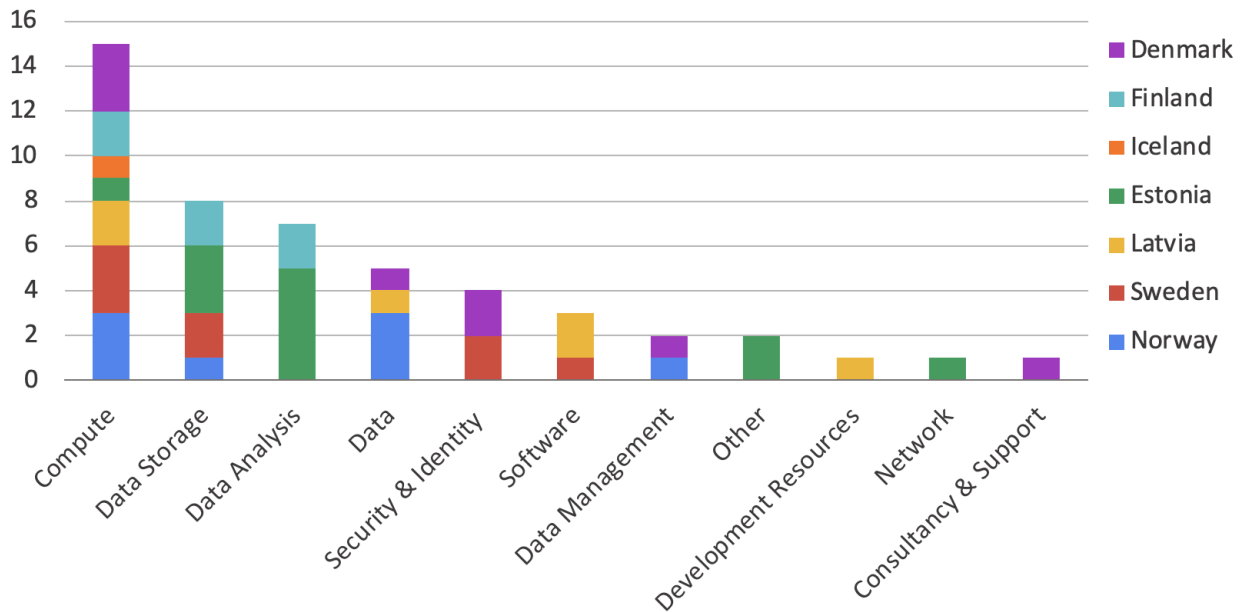


Figure 2: Distribution of service categories versus participating country

Figure 3 shows what kind of users a service is provided for. Clearly, most services in the initial inventory were recorded for the context of EOSC and are targeted at researchers. Note, based on the definition of *researchers*, *research organisations* and *research projects* (see Appendix A, Table 2), research could be conducted in the academic sector as well as in the commercial sector. Often, there are some limitations on what kind of fraction a publicly funded service may be sold/offered to commercial users, and thus, we assume, that services are often primarily targeted at academic users. In future work on identifying service candidates and revisiting existing services, this information about the target users could be explicitly surveyed.

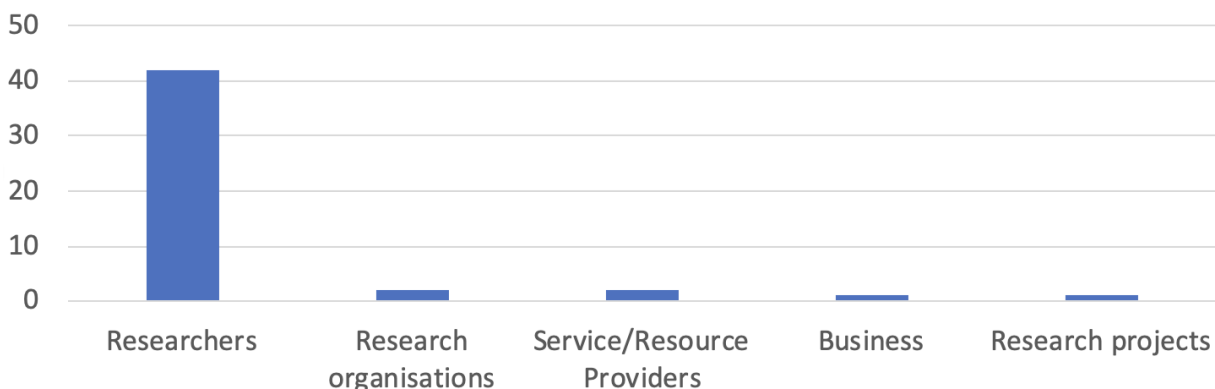


Figure 3: Distribution of target audiences for the services in the initial service inventory

3. Service Maturity

3.1 Service Maturity Template

To maximise benefits for researchers, we developed a simple model to assess the maturity of services targeting researchers. As described in the preceding deliverable⁵, we adopt the FitSM⁶ definition of a maturity level i.e. the achieved overall effectiveness of a service management system, based on a combination of the capability levels of its processes and general aspects of management - and extend this to actual services. Hence, we include additional service-centric measures that enable us to define the maturity of the service as a whole (and not only service management aspects). The maturity model provides a tool for describing the maturity of services based on different characteristics spread across five categories and is meant to evaluate the readiness of a service for inclusion into the EOSC Catalogue.

To encourage providers to advance services' capabilities and compliance with EOSC inclusion criteria (EOSC Rules of Participation), the model distinguishes three maturity levels: minimum, intermediate and high. Each criteria is marked with a specific maturity level. If a service is able to fulfill minimum requirements, it could be accepted to the EOSC Catalogue. The intermediate level is considered to be a recommended level for community-maintained services. We expect only a few services to be able to fulfill all the highest level requirements. These requirements should be considered case by case by service providers considering how valuable these are for end users and how much resources are needed to fulfill them.

Although the goal was to formulate a generic maturity model, it should be noted that one should not simply compare "scores" between services without taking into account that services are different. In addition, service providers should always take into account available resources and adapt them to optimally fulfill the end user needs.

The first version of the maturity model was presented in Deliverable 3.1 and it contained 24 questions classified in five sections:

1. Service management (13 questions)
2. Data management and service quality (4 questions)
3. Accessibility and legal requirements (5 questions)
4. Sustainability and Financial (1 question)
5. EOSC architecture compatibility (1 question)

After defining the first version of the maturity model, service providers that participated in the initial service discovery were invited to populate the assessment template for their respective services. This was used as an opportunity to assess the template, collect the feedback and use it to produce the next, improved version.

The *Service management* section is composed of questions that are inspired by FitSM. During the first round of assessment, most of the questions were found to be clear and sound. Some questions were additionally clarified or broken into multiple questions so that each question's intention would be clear and could be answered with a simple yes/no answer.

The *Data management and quality* section focuses on FAIR data aspects, disaster recovery, data lifecycle and service quality issues. We intentionally left out the more fine-grained FAIR data aspects because they

⁵ D3.1 Service compliance checklist and maturity model (under review by the European Commission)

⁶ <https://www.fitsm.eu/fitsm-standard/>

were being addressed within WP4 of the EOSC-Nordic project. After collecting feedback from the first assessment efforts, we added two specific questions that were considered important for end users. We added the question: “*Research data lifecycle is clearly defined?*” to understand whether research data management is transparent for end users. The goal of the second question: “*Service quality plan exists?*” was to gather a better understanding of a service provider's capability to deliver at the expected level. This level was dependent on particular service categories. For example, for storage-oriented services, the focus should most likely be in e.g. the capability to store research datasets exactly as they were when they were stored. On the other hand, for analysis-based services, a quality plan should perhaps concentrate on tools and practices that are used to ensure that the analysis produces reliable results after all changes made to an existing service.

The section *Accessibility and legal requirements* covers questions about the possible user base, terms of use, licences, and GDPR. Although this section contained only five questions they were found to require further refinement, as they were somewhat difficult to answer. The questions were improved by using simplified terms to make the questions more clear and understandable, and by including explanations about individual questions for reference, if needed by assessors/service providers during the assessment process. In the questionnaire, this section contained a question about Limitation of liability in contracts and contract chains. On service providers point of view, all the contracts have to have clearly defined and agreed limitation of liability, because otherwise the liability is unlimited. On risk management point of view, such a situation is intolerable. The problem becomes considerably more complicated, if a service provider uses subcontractors or even a chain of subcontractors. In such a case, each party has to be very careful with liability issues, because otherwise they could face unlimited liability due to the issues caused by some other service provider. Although this liability issue is important, we decided that in future it will be not included into maturity model. It is not an easy issue to be evaluated and it is slightly out of the scope of this maturity model. It is a contract or business issue that a service provider has to take into account.

The *Sustainability and financial* section contains only one question aiming to give information for end users about what kind of lifespan the service most likely will have. This was found to be a difficult question to answer as many organisations are operating on an annual budget or services are funded by different funding mechanisms such as EC funded projects etc. Considering only secured funding, however, could give the false impression that a service's future is unknown while in reality there are mechanisms by which time-limited funding sources get renewed or new sources of funding may be used, e.g., when a service gets adopted by a wider community. We decided to drop this question due to its complexity, and hence reducing the risk of misinterpreting what had been anticipated to be a simple yes/no answer. Instead, a question about the public status of the service was devised for this section. The intention was the same as in the previous question - to help potential service users to select more mature services if considered relevant for their research case.

The last section was meant to assess a service for *EOSC architecture compatibility*. Unfortunately, at the time of writing the maturity model, no finalized EOSC architecture documents were available.

In summary, the first version of the maturity model was found to be very condensed, with some questions considered too complex to answer in a simple yes/no matrix. Taking the received feedback, a new version of the maturity model was defined, clarifying the questions and keeping them simple and focused on a specific issue.

The sections of the maturity model version 2 were as follows:

1. Service management (17 questions)
2. Data management and quality (2 questions) - section specific for data repositories
3. Accessibility and legal requirements (6 questions)
4. Sustainability (1 question)
5. EOSC architecture compatibility (6 questions)

The Maturity model version 2 is presented in Annex B. The service providers were asked to update their answers based on the new template and the feedback was that questions were found to be easier to understand and answer.

3.2 Service Maturity Initial Results

Service providers that participated in the initial service inventory were asked to assess the services they had proposed in the initial mapping using the service maturity model. This was an iterative approach - the first version of the service maturity template was used to assess a subset of services. Based on the feedback, a new improved version of the service maturity was developed and was used to update the answers and assess the services. This section presents the findings of the service maturity assessment, using version 2 of the service maturity assessment template. In general, we adopted a self-assessment approach, whereby the assessors evaluated services provided by their own organisations. In some cases, the assessors sought clarifications from the service owners if certain questions required internal service knowledge that was not made publicly available. This proved to be useful because some information might have been available, but only known to the team responsible for a particular service.

Service management

The Service Management section contains 17 questions (numbered S-1 to S-17). 15 services fulfilled the minimum criteria by answering 'Yes' or 'N/A' to the questions: Web address with service info (S-1), End-user contact (S-2), End-user documentation (S-4), Security contact (S-3) and Disaster recovery for research data (S-5), i.e the first five. The medium criteria was fulfilled by 10 services, which answered 'Yes' or 'N/A' to the intermediate criteria questions and in addition to: Service installation manuals (S-6), Proactive software updates (S-7) and Service availability public (S-8). 4 services fulfilled the maximum criteria by affirming all 17 questions. The selection of requirements for each level i.e. five (minimum), eight (medium) and seventeen (maximum) gave a reasonable comparison between the minimum and medium levels, but set the bar high for the maximum criteria. This helped in minimising the risk for overly positive results that can sometimes be achieved when performing self-assessments.

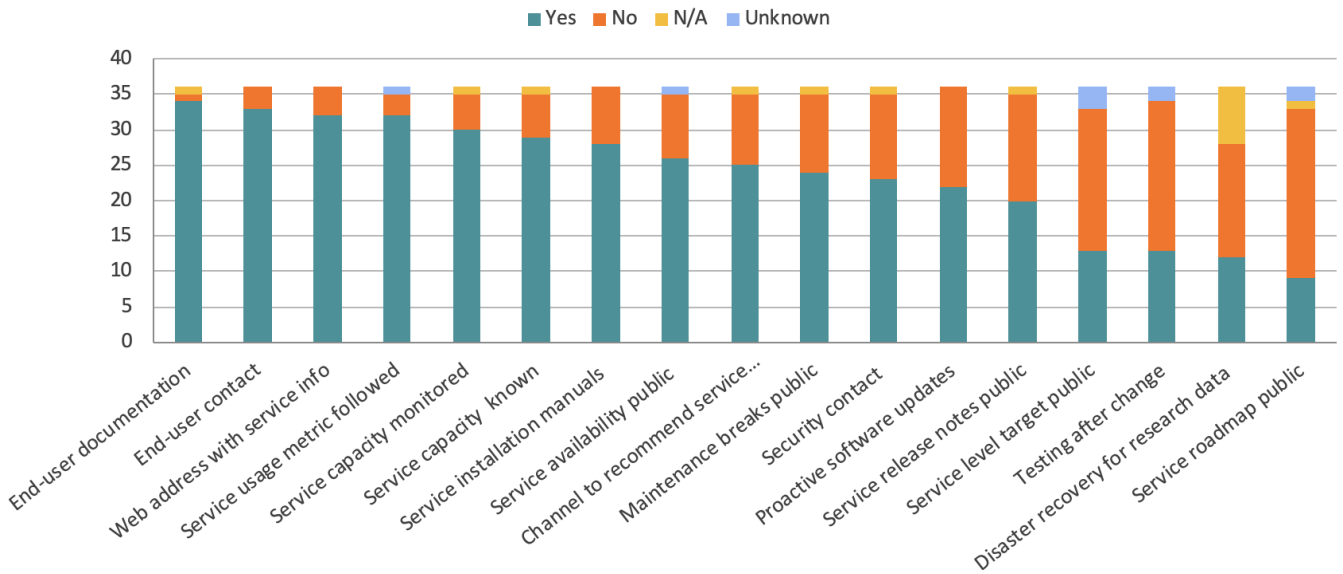


Figure 4: Service Management assessment results - ordered according to descending numbers of 'Yes' answers.

Data management and FAIR data requirements (research data repositories only)

This section mainly assessed research data repositories, hence the high number of 'N/A' answers. While some services were not data repositories, they processed research data and could provide information about the data lifecycle. This attributes to the double number of 'Yes' responses (6) about the research data lifecycle in comparison to that of analysing the 'FAIRness' of the service (3).

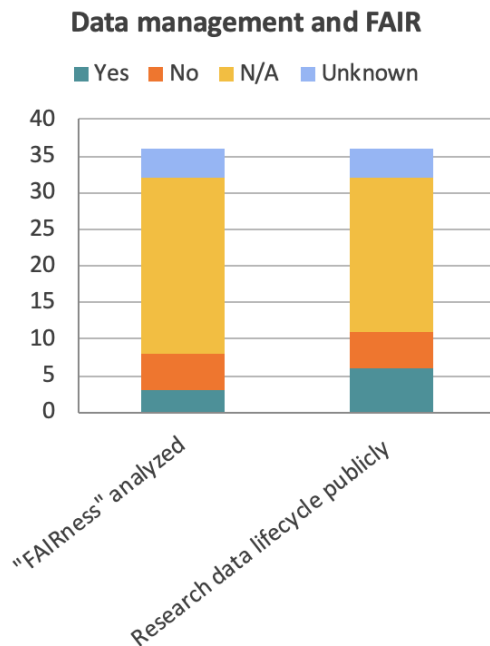


Figure 5: Data management and FAIR data requirements results

Accessibility and legal requirements

This section covered aspects related to the user base and requirements for privacy, confidentiality and copyrights. A majority of the services (32/36) provided access to a wide range of users under specific conditions although several (7/36) did not have well articulated terms of use. All the five questions were considered to be important and therefore covered the three maturity levels in equal measure. The questions related to IPR, copyrights and liabilities were problematic. This might be due to difficulties in understanding the question, lack of IPR knowledge among scientists and service providers and lack of interest in IPR matters. Evidently, there is a need for guidelines with concrete explanations and good examples to raise awareness about IPR matters. WP2 within the EOSC-Nordic project is addressing the legal issues related to the implementation of EOSC standards and policies in the Nordics. The upcoming deliverable (D2.3: Open Science in the Nordics: Legal Insights) identifies the (legal) barriers to participation in EOSC and recognises the lack of expertise in IP-rights as one of them. Further work will provide recommendations that the service providers may apply to overcome these legal-related challenges.

Accessibility and legal requirements

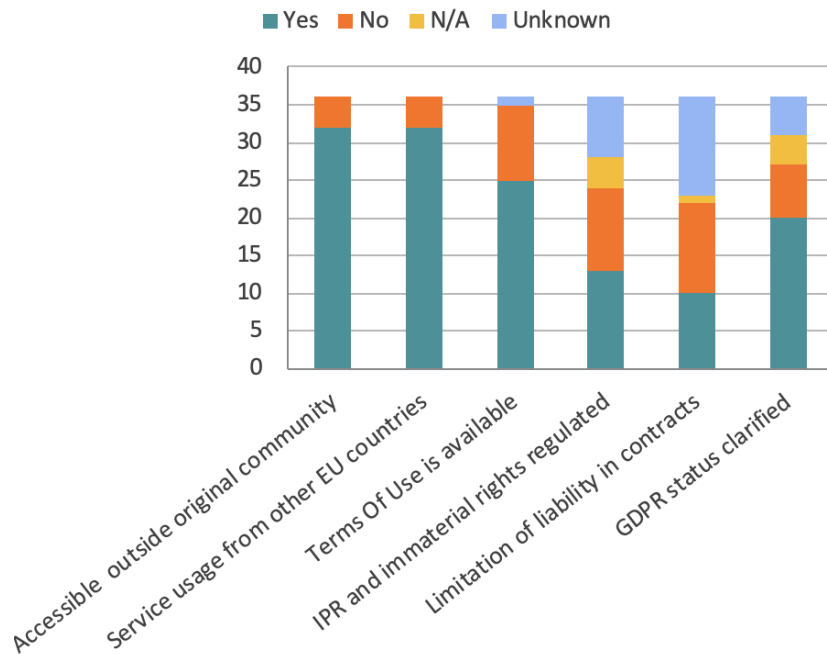


Figure 6: Accessibility and legal requirements results

Sustainability

Planning and maintaining the lifespan of a service helps both the service provider and users to manage expectations and prepare for any anticipated changes. A significant number of service providers (24/36) had this information readily available.

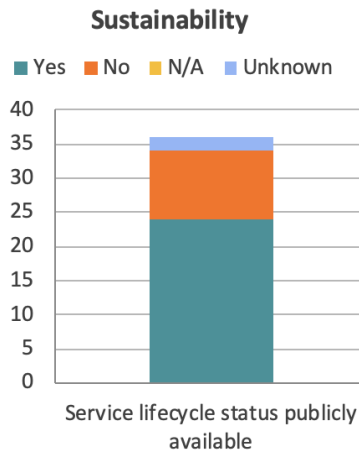


Figure 7: Sustainability results

EOSC architecture compatibility

At the time of conducting the assessments, the EOSC information and services relevant for this section were not yet available. As expected, all answers (except one) were either no, unknown or N/A. The exception was a service that is using B2SHARE to securely handle PIDs for metadata.

This section will be revisited when the appropriate information and services become available in the future.

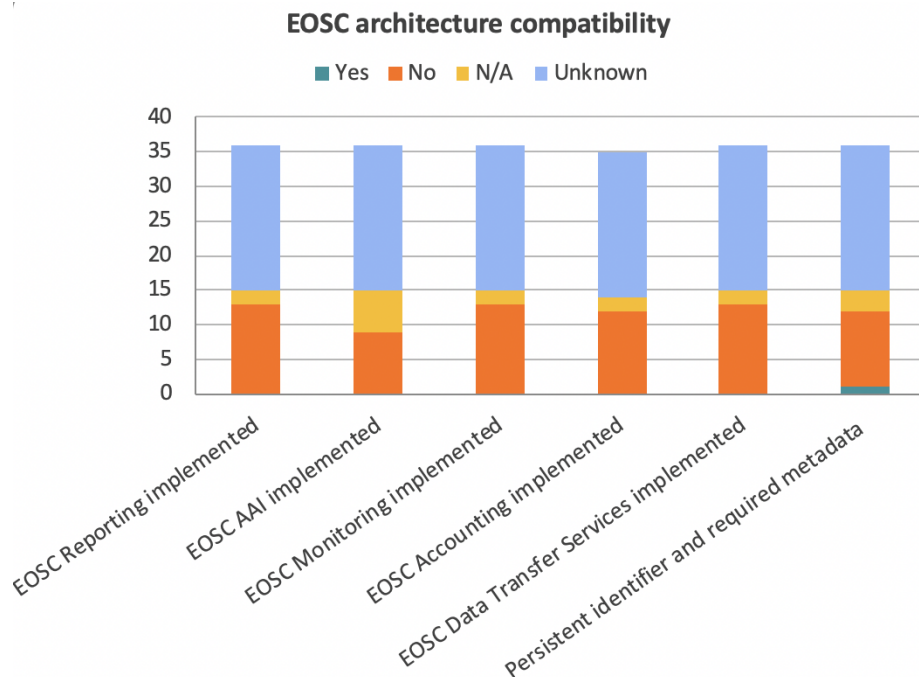


Figure 8: EOSC architecture compatibility results

Lessons learned

The purpose of the maturity model is to help service providers achieve better alignment with the EOSC requirements. The first round of assessments helped to validate and improve the maturity model. The second round provided an initial trustworthy data set for further decision making.

The assessment has shown that there are a number of already mature services that could relatively be easily added to the EOSC catalogue from the technical point of view, if the service owners decide to do so. However, it is worth noting that despite the technical compatibility with EOSC, there might be other reasons that could prevent a mature service from being added to the EOSC catalogue, such as governance and funding.

The more problematic areas of services have also been identified and serve as input to EOSC-Nordic WP2 for analysis. In particular, Intellectual property rights (IPR) and GDPR status. These aspects were either not available, missing or not known also for services that were generally considered mature. This means that either the requirements from EOSC are too strong or that legal requirements are unclear. In reality, it should be noted that with proper help and guidance minimum requirements should be achievable with reasonable amounts of work.

4. Conclusions and next steps

The initial mapping of the Nordic and Baltic services allowed to create a solid basis for analysis of services. The maturity model derived in D3.1 allowed us to perform assessments, which were both relatively lightweight⁷ and useful for understanding the compatibility of the service landscape to the current EOSC requirements. This initial service mapping and analysis experience will contribute to the second iteration of service discovery and alignment with EOSC rules.

The analysis has further provided basic evidence that there are a number of very similar services, especially for computations, that are offered across countries. This opens possibilities for collaboration that can benefit in improving services, saving cost and time by sharing experiences and even creating synergies in providing services crossborder. To make sure that there is the correct motivation, for the next steps we would need to clarify EOSC Sustainability plans.

One of the aspects of mature services - sustainability - has turned out to be hard to assess due to the complexity of answers. For example, a lack of secured funding does not always mean that a service's future is unclear but can be caused by the time-limited funding sources supporting the service.

Another important aspect - IPR - was badly addressed by a number of services. We attribute that to the lack of IPR knowledge among scientists and service providers as well as lack of interest in IPR matters. As the importance of legal compliance is growing, there might be a need for guidelines with concrete explanations and good examples to raise awareness about IPR matters.

We intend to disseminate results of the initial analysis through the EOSC Nordic webpage. Furthermore, the outcome of the analysis is going to be used by WP3 tasks that deal with supporting of services and their

⁷ Our initial goal was to have an even smaller set of questions, however during the first evaluation round it became clear that we need to expand some of the questions to be able to use answers for comparison and analysis.

integration into EOSC Portal - T3.1.3 “Support to the integration of mature services into EOSC portal” and T3.1.4 “Support to aligning with EOSC service management & operational environment”.

Appendix A: Definition of Service Inventory

Vocabularies

Table A.1 provides a definition of the vocabularies we have used for the *service categories* to create a first service inventory.

Table A.1: Service category vocabularies

Service Category	
Value	Description
Aggregators & Integrators	Thematic, Regional and other Aggregators & Integrators
Applications	End-user applications (apps) offered-as-a-service or deployed-on-demand
Compute	High-performance computing resources and scalable cloud compute capacity for demanding job processes
Consultancy & Support	Dedicated support, expertise, consultancy for a wide range of scientific disciplines and research activities
Data	Vast range of data, datasets etc to facilitate research and scientific activities
Data Analysis	Processes for data with the goal of discovering useful information, informing conclusions, and supporting decision-making
Data Management	Robust, feature-rich and user-friendly data management services
Data Storage	Reliable, secure and scalable cloud storage for scientific data, apps and workloads
Development Resources	Developer tools, development kits, libraries, APIs
Education & Training	Highly-specialized seminars and courses to help advance research knowledge and sharpen scientific skills
Instrument & Equipment	Access to instruments and equipment
Material Storage	Access to biological, chemical, historical, archeological, cultural, etc. storage. Includes the acquisition, preparation and processing of samples and materials in view of their preservation.
Measurement & Materials Analysis	Processes and techniques for material analysis, characterisation and monitoring
Network	Ultra-fast connectivity and access to eInfrastructures' resources and services
Operations & Infrastructure Management Services	Services for monitoring, scaling, creating, tracking and automating operations on [your] infrastructures and services.
Scholarly Communication	Collection, preparation and delivery of biological, chemical, environmental or

	other samples.
	Research findings available to the wider academic community and beyond
Security & Identity	Protect [your] infrastructure and manage user identities and access against advanced threats across devices, data, apps, etc
Software	Software, platforms and tools offered-as-a-service or deployed-on-demand
Other	

Table A.2 provides a definition of the vocabularies we have used for the *target users* to create a first service inventory.

Table A.2: Target user vocabulary

Target Users	
Value	Description
Researchers	Someone who conducts scientific research, i.e., an organized and systematic investigation into something.
Research groups	A research group is a group of researchers working together on a particular issue or topic. Research groups may be composed of researchers all from the same subject/discipline or from different subjects/disciplines.
Research communities	Research communities provide an infrastructure through which scientists of discipline-specific scientific areas are able to advance their research goals, reaching out to other researchers.
Research projects	A privately or publicly funded project on a research topic.
Research networks	Research networks aim to stimulate interaction between researchers and promote information exchange.
Research managers	Someone in an organization whose job is to manage a research initiative aiming to the development of new scientific results, products or ideas.
Research organisations	A public or private legal entity (e.g. academia, business, industry, public services, etc.) representing the User.
Innovators	The group, which is the first to try new ideas, processes, goods and services. Innovators are followed by early adopters, early majority, late majority, and laggards, in that order.
Businesses	An organization or economic system where goods and services are exchanged for one another or for money. Businesses can be privately owned, not-for-profit or state-owned.
Service/Resource Providers	A service provider is an organisation that provides different kind of solutions and/or services/resources to end users and other organizations. This broad term incorporates all businesses and organisations that provide products and solutions through services that are offered for free, on-demand, pay per use or a hybrid delivery model.
Funders	Individual or organization financing a part or all of a project's cost as a grant,

	investment, or loan.
Policy Makers	Individuals (usually members of the board of directors) who have the authority to set the policy framework of an organization.
Research Infrastructure Managers	An RI Manager is a type of Project Coordinator who specializes in research infrastructures. They are responsible for things like managing researchers, making sure costs are on budget and serving as a liaison between research staff and project stakeholders.
Service/Resource Provider Managers	A service/resource provider manager is an individual within an organisation that is responsible for the quality of the services/resources provided and monitors the delivery of the service.
Service/Resource Managers	Service Managers are typically responsible for managing service level agreements with customers and external service providers.
Other	

Table A.3 provides a definition of the vocabularies we have used for the *access policies in use* to create a first service inventory.

Table A.3: Access policies in use vocabulary

Access Policies in use	
Value	Description
Remote	Services and Resources are delivered remotely with the use of a physical infrastructure. The user is able to remotely work with the physical RI without the need of physical presence.
Physical	Services and resources require a physical presence of the user. The user can only access the RI if he is physically present in the specific location that the RI is offered.
Virtual	The service/resource is delivered through a virtual infrastructure that the user may access virtually through the web or an intranet.
Mail-in	Samples are sent in to for e.g. analysis and the results are returned to the user without the user actually accessing the RI

Appendix B: Service Maturity Model

Service name:							
Assessor:							
Date:							
		Mini mum	Inter medi ate	High	Question	Result	Source
1. Service management							
	S-1	X	X	X	Web address where more information about the service can be found is publicly available	Yes, No, Unknown or N/A	FitSM: Service Portfolio Management Process
	S-2	X	X	X	Contact address for end-users is publicly available	Yes, No, Unknown or N/A	FitSM: Incident & Service Request Management Process EOSC portal service requirements for providers
	S-3	X	X	X	Contact address for security issues is publicly available	Yes, No, Unknown or N/A	FitSM: Incident & Service Request Management Process
	S-4	X	X	X	Service documentation for end users is publicly available	Yes, No, Unknown or N/A	FitSM: Service Portfolio Management Process, EOSC portal service requirements for providers
	S-5	X	X	X	Disaster recovery possibilities for research data are publicly described	Yes, No, Unknown or N/A	FitSM: Incident & Service Request Management Process
	S-6		X	X	Detailed service installation documentation exist.	Yes, No, Unknown or N/A	
	S-7		X	X	Automatic software upgrades have been implemented or there is an alternative policy/practice enabling rapid responses to software vulnerabilities	Yes, No, Unknown or N/A	FitSM: Information Security Management
	S-8		X	X	Service availability is monitored and availability information is publicly available for service users	Yes, No, Unknown or N/A	FitSM: Service Level Management, FitSM: Service Availability & Continuity Management
	S-9			X	Service level target is defined and it is publicly available	Yes, No, Unknown or N/A	FitSM: Service Level Management
	S-10			X	Service capacity is monitored	Yes, No, Unknown or N/A	FitSM: Capacity Management
	S-11			X	Service capacity limits are known	Yes, No,	FitSM: Capacity Management

						Unknown or N/A	
	S-12			X	Service usage metric is defined and followed	Yes, No, Unknown or N/A	
	S-13			X	Information about maintenance breaks is publicly available	Yes, No, Unknown or N/A	FitSM: Service Level Management
	S-14			X	There is a document, that is used to ensure that the service behaves normally after implemented changes	Yes, No, Unknown or N/A	FitSM: Release & Deployment Management
	S-15			X	Service release notes or similar documentation describing changes in service is publicly available	Yes, No, Unknown or N/A	FitSM: Service Portfolio Management Process, EOSC portal service requirements for providers
	S-16			X	Channel to recommend service enhancements exists	Yes, No, Unknown or N/A	FitSM: Continual Service Improvement Management
	S-17			X	Service roadmap exist and it is public	Yes, No, Unknown or N/A	

2. Data management and FAIR data requirements (research data repositories only)

	D-1	X	X	X	Service provider has analyzed "FAIRness" of the service.	Yes, No, Unknown or N/A	FAIR data principles EOSC portal service requirements for providers EOSC: Rules of Participation draft
	D-2			X	Research data lifecycle is clearly publicly defined	Yes, No, Unknown or N/A	

3. Accessibility and legal requirements

	L-1	X	X	X	The service is accessible by users outside its original community	Yes, No, Unknown or N/A	EOSC portal service requirements for providers
	L-2	X	X	X	Service usage form other EU countries is possible	Yes, No, Unknown or N/A	
	L-3	X	X	X	Terms Of Use is available	Yes, No, Unknown or N/A	
	L-4	X	X	X	IPR (immaterial rights) : * Licences, non-disclosure agreements, copyrights, database rights, are clear	Yes, No, Unknown or N/A	FAIR data principles EOSC: Rules of Participation draft

	L-5	X	X	X	Limitation of liability in contracts and contract chains: * Damages has to be limited	Yes, No, Unknown or N/A	
	L-6	X	X	X	GDPR * GDPR status of a service has been clarified * If the service contains or processes personal data, GDPR implications have been identified * If the service contains or processes personal data, service fulfills GDPR requirements	Yes, No, Unknown or N/A	GDPR
4. Sustainability							
	F-1		X	X	Status in terms of service lifecycle is publicly available (e.g. pilot, in production, to be deprecated soon)	Yes, No, Unknown or N/A	
5. EOSC architecture compatibility (to be included when documents and services become available)							
	A-1				EOSC Monitoring and reporting implemented	Yes, No, Unknown or N/A	TBC when description is available
	A-2				EOSC AAI implemented	Yes, No, Unknown or N/A	TBC when description is available
	A-3				EOSC monitoring implemented	Yes, No, Unknown or N/A	TBC when description is available
	A-4				EOSC accounting implemented	Yes, No, Unknown or N/A	TBC when description is available
	A-5				EOSC Data Transfer Services implemented	Yes, No, Unknown or N/A	TBC when description is available
	A-6				Persistent identifier with required metadata for services	Yes, No, Unknown or N/A	TBC when description is available

Appendix C: Glossary

This section contains the definitions of the key terms used in this deliverable of EOSC-Nordic WP3. In order to keep an alignment to the EOSC Portal, we adopt existing definitions from the EOSC portal⁸ and FitSM

⁸ <https://www.eosc-portal.eu/glossary>

glossaries⁹. EOSC will use FitSM, standards for lightweight IT service management, during service validation in the process of adding service to its service catalogue.

Definitions from additional sources may be adopted if considered necessary. We recognise that EOSC is undergoing stabilization of understanding, in particular with respect to EOSC Architecture and Rules of Participation, so that exact interpretations might need updating once output of these EOSC working groups is mature.

EOSC

According to EOSC glossary: “the European Open Science Cloud promoted by the European Commission to provide all researchers, innovators, companies and citizens with seamless access to an open-by-default, efficient and cross-disciplinary environment for storing, accessing, reusing data, tools, publications and any EOSC Resource for research, innovation and educational purposes.”

Service

At this point in time, we are using a service model in the context of the FitSM standard series.

According to FitSM glossary: “A way to provide value to customers through bringing about results that they want to achieve.”

Please note that when referring to services, usually IT services are meant.

EOSC Service

According to EOSC glossary: “An EOSC Resource implemented by the EOSC System to provide EOSC System Users with ready-to-use facilities. EOSC Services are supplied by an EOSC Service Provider in accordance with the EOSC Rules of Participation for EOSC Service Providers. EOSC Services are approved by the EOSC Service Portfolio Management Committee and populate the EOSC Service Portfolio and the EOSC Service Catalogue.”

In writing this document we will assume that EOSC service is an IT service¹⁰ that provides value to EOSC.

EOSC Service Catalogue

According to EOSC glossary: “the list of all live EOSC Services that can be requested by EOSC System Users. It is a subset of the EOSC Service Portfolio and it populates the EOSC Service Registry.”

EOSC Service Portfolio

According to EOSC glossary: “the internal list of EOSC Services including those in preparation, live and discontinued. The development of this list is controlled by the EOSC Service Portfolio Management Committee.”

EOSC Service Registry

⁹ <https://www.fitsm.eu/download/280>

¹⁰ Other possible types of EOSC Services, like ones offering access to specialised equipment, biological material, fabrics, fossils, ... etc. are not taken into consideration.

According to EOSC glossary: “an EOSC Service providing EOSC System Users with a list of live / ready-to-use descriptions of EOSC Services offered by the EOSC System. The list includes (a subset of) the entries in the EOSC Service Catalogue as well as any other service worth being discoverable via the service instance. “

Service portfolio

Internal list that details all the services offered by a service provider, including those in preparation, live and discontinued.

EOSC service portfolio

The internal list of EOSC Services including those in preparation, live and discontinued. The development of this list is controlled by the EOSC Service Portfolio Management Committee.