



D15.1 Service integration plans of the Data Spaces and EOOSC Nodes

31/07/2024

Abstract

EOOSC Beyond builds on Pilot Nodes activities to enhance and validate the EOOSC Core functionalities and evolve the EOOSC Federation model. This deliverable presents the outcomes of the interviews and workshops carried out with the Pilot Nodes during the early phase of the project to deliver a service integration plan driven by real, science-based user stories.



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Executive Summary

The European Open Science Cloud (EOSC) is not a platform or a monolithic system. Instead, it has redesigned itself as Federation of Nodes. EOSC Beyond will pilot this concept focusing on pragmatic steps necessary while observing how governance and sustainability developed outside of the project may influence any of the technical approaches.

A successful EOSC Federation hinges on its ability to deliver value for research communities, to help them deliver open science supported by robust federated capabilities at infrastructure, data and services level. The EOSC vision to deliver the “web of FAIR data” aligns better with a “web of nodes” interconnected in meaningful ways, delivering services jointly to enhance the overall capability. Open Science is an essential asset and core value of European research and as such, it should be a core activity for research organisations and alike to contribute to the success of the EOSC Federation.

The first steps to understand how to contribute to the Network of Pilot Nodes are proposed in this document. EOSC Federation is a breakthrough from previous understandings of what EOSC is. This new landscape needs to be assessed and collectively understood to be able to converge towards a common goal. Since Research Infrastructures, e-infrastructures are inherently federated, adopting a federated approach for the provision of services and FAIR data is a logical evolution. If these are jointly delivered according to interoperability frameworks, researchers will significantly benefit from open science frameworks instead of siloed access to individual organisations that require customised technical and domain specific knowledge.

A critical activity for establishing the Federation is defining a comprehensive process for interactions among EOSC Beyond Pilot Nodes to drive the formation of a Network of Pilot Nodes based on real scientific needs. Pilot Nodes representing different types of research activities, from different scopes including Thematic, National, e-Infrastructures and science clusters will work closely with service owners of the EOSC core layer to evolve the services and reflect on the needs of current scientific challenges. The EOSC Core services are not centralised in one single node; federated core services can be delivered by any participating node of the EOSC Federation.

Understanding the new scope of federating capabilities is also key for the Pilot Nodes to achieve meaningful integrations and node to node connectivity. While EOSC Beyond core service offer will be developed in other work streams, it will be crucial that the Pilot Nodes understand core service definitions and the different types of service consumption models. The process proposed in this document will be tested, adjusted and refined according to the evolution of the services and feedback loops from the key players ensuring continuous improvements and handling of risks associated with every innovative process.

1. Introduction

This document outlines a plan for initiating integration work between the EOSC Beyond Pilot Nodes and EOSC Beyond Core Services. These integrations will be facilitated through an innovation service released early in the project, the EOSC Core Innovation sandbox acting as a test environment for the piloting activities in the integration process with the EOSC Platform.

Emphasising a user-driven focus, understanding the needs of all Pilot Nodes stakeholders is crucial for driving technological integrations and service evolution, while also contributing to the design of the new core innovation services in Beyond.

Chapter 2 introduces the methodological approach proposed to establish a requirement gathering process that will feed into the general technical roadmap of the project and enable further integrations of the services within the federation.

Chapter 3 reflects on preliminary dialogues carried out with the Pilot Nodes and service owners to unify the understanding of the current status quo of the EOSC Federation and identify the relevant activities and stakeholders involved in the formalisation of the EOSC Federation. These were contextualised to define what are the initial activities that a Pilot Node should concentrate on in this project.

Chapter 4 provides a Pilot Nodes classification, a general description of the piloting activities and a template proposal co-designed with Pilot Nodes owners to gather the information needed to formalise the Pilot Nodes concept.

Chapter 5 presents the key user stories identified by the Pilot Nodes, highlighting what would be the user journey and the Services involved in the journey. These will be formalised later into requirements that will be handed over to service owners.

Chapter 6 provides a baseline with definitions of EOSC Beyond Core services as they currently are, e.g. from the outcomes of the project EOSC Future. These definitions may undergo revisions and reformulation as the service evolves to fulfil the needs of the Federation.

Chapter 7 presents an integration plan of the Pilot Nodes with the Core services of the EOSC Beyond Sandbox and preliminary intentions of integrating with the EU Node. These plans are presented on an individual basis per Pilot Nodes as well as in an overall summary table.

Chapter 8 presents first results on potential interactions between the nodes following a “match making” exercise between service needs and offers from each of the Pilot Nodes.

Chapter 9 finalises with conclusions and next steps going forwards.

This document is intended to aid EOSC Beyond Pilot Node owners in establishing an iterative process to guide them through the initiation of the Pilot Nodes activities and subsequent steps in the Pilot Nodes lifecycle. It is also intended for service owners and technical architects involved in the EOSC Beyond project to outline a technical roadmap that will

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support the evolution of the EOSC Beyond Core services as well as the design and implementation of new services such as the Execution Framework and Integration Suite and the establishment of the Network of Pilot Nodes. Finally, this document is also open to further stakeholders from outside the project who may want to express interest in piloting activities that will contribute to the overall development of the new EOSC landscape.

2. Methodology

The establishment of an integrated federation of independently operated EOSC Pilot Nodes is at the core of the activities planned for EOSC Beyond. Careful considerations on how to achieve this objective have been put in place since the project inception. EOSC Federation Pilot Nodes activities span across a variety of service needs and offers from Pilot Nodes of different typologies representing different types of interactions, integration needs and exchanges.

The Pilot Nodes are entry points in the Federation representing real life needs of stakeholders in their different roles to address complex scientific challenges. To formulate these needs, one to one interviews were conducted with each of the Pilot Nodes. The interviews were the first step towards developing an understanding of what are the scientific drivers behind each Pilot Node, the communities involved, the stakeholders and finally their service offerings and needs to enhance or federate their capabilities with other nodes. The interviews gathered documented material and first impressions on how each of the Pilot Nodes could contribute to the EOSC Pilot Nodes Federation.

To harmonise these impressions in a collective manner an in-person workshop was organised in Krakow, July 2024, for all Pilot Nodes from EOSC Beyond. The invitation was extended to other EOSC related projects and external guests representing some of the cluster projects and RIs were welcomed into the workshop. Many of the findings of these interviews and the workshop are presented throughout this document.

The workshop objectives were focused on the collection of information needed to:

- elaborate on real life user stories that will drive the creation of the EOSC Federation
- start identification of requirements that will feed the EOSC Beyond technical roadmap
- formulate the plans for integration with the EOSC Core Innovation Sandbox
- understand preliminary connections between nodes

EOSC Beyond adopts an agile methodology ([Fig. 1](#)) to elaborate the integration plans. Each of the Pilot Nodes will span a set of User stories that lead to a set of user journeys. These will help to identify the service offering for each of the nodes as well as the needs from other nodes in the federation. Requirements will drive the service implementation plans which will be fed as an input to the general technical roadmap of the project to evolve further Core Services, identify GAPS and feed into the new Integration Suite and Execution Framework.

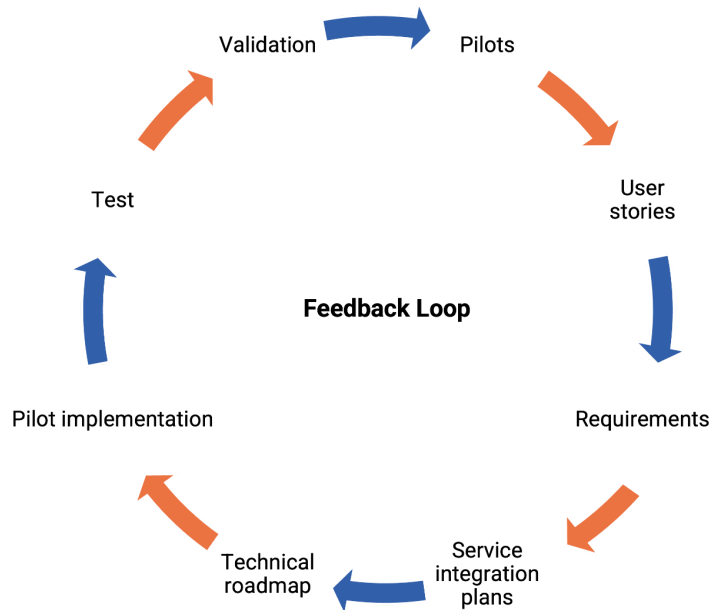


Figure 1 - Pilots implementation feedback loop

Nodes will establish service to consumer (B2C) and service to service (B2B) relationships which will need dedicated agreements to define the scope and terms under which they operate from the technical and the legal point of view. The work envisaged during WP15 and WP16 will concentrate on the technical arrangements needed to fulfil the Pilot Nodes objectives. Understanding how the Pilot Nodes will interact with the EOSC Core services, the innovation services such as the Execution Framework or the Integration Suite as well as the needs from the EOSC Exchange layer is key to formulate the plans to deliver the EOSC Pilot Nodes Federation. Pilot Nodes will be able to test different levels of integration with the Core services via EOSC Core Innovation Sandbox, that is a pre-production environment of the EOSC Platform that acts as a testing and staging environment for EOSC Core service providers, EOSC Exchange service providers and EOSC Nodes in the integration process with EOSC. Testing and validation procedures against acceptance criteria will bring the capabilities of the Nodes to the EOSC Federation into a production stage.

3. First discussions on the EOSC Node and Network of Pilot Nodes concepts

EOSC Beyond will concentrate on the practical steps needed at the technical level to implement a Network of Pilot Nodes. In doing so, it will be able to report from hands-on experience on good approaches, successful practices and challenges or obstacles. The EOSC Association and EOSC Tripartite will separately develop consensus around the mission and objectives of the EOSC Federation, the role of EOSC Nodes, and scope and operation of the EOSC Federation itself. These topics are outside the scope of EOSC Beyond.

During the one-to-one interviews Pilot Nodes were asked what a Node should be based on the activity they wanted to pilot. The answers differed depending on the nature of each of the Pilot Nodes. From this perspective a Node classification depending on the type may be able to help in the formation of a Federation to identify patterns of connections that apply to a certain type of Nodes. These reflections are reported further in section 4 where the Pilot Nodes are introduced.

During the Pilot Nodes workshop in Krakow, participants were introduced to some of the forming Node requirements and characteristics¹. It was acknowledged that the EOSC Tripartite Group² has endorsed the EOSC Association to lead a Community co-creation of the EOSC Federation Handbook³. EOSC Beyond Pilot Nodes technical activity initiation does not depend on the delivery of such Handbook. However, the Handbook will be followed closely once delivered to align as closely as possible with the concept co-developed with the Community. The group highlighted the importance of establishing a clear value proposition of the EOSC Federation aligned with the activities of participating organisations.

Several participants expressed what these values meant for their organisations:

- Extend the scope of users within a community that can make use of services
- Extend the usage of data and services by adjacent science communities
- Establish basic interoperability at the infrastructure level to start with followed by interoperability of community services at the scientific level at a later stage
- Increase the knowledge base for the communities in terms of data and services, avoid duplication of efforts for integration with common and core services.
- Enhance the usability of third-party services by providing beneficial core services, incentivise the service providers to join the federation.

General questions were formulated from the workshop participants. These are not meant to be answered in the context of Beyond but to be discussed with the broader EOSC community:

- What are the benefits of the federation?
- How do we attract those building the federation?

¹<https://eosc.eu/wp-content/uploads/2024/03/EOSC-A-Board-Position-Paper-on-the-EOSC-Federation-version-20231112.pdf>

² <https://eosc.eu/tripartite-collaboration/>

³ <https://eosc.eu/eosc-federation-handbook/>

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- What is the mission and vision of the federation?
- Should the nodes be self-sustainable?

In the scope of EOSC Beyond, the project needs to formulate **What is a Pilot Node?** to start the technical activities to be implemented during the project. First findings suggest that the minimum set of requirements needed to set up a Pilot Node are:

- federated services to be offered in the federation for other nodes to consume
- federated services to be connected to in the federation either as a consumer or in peer-to-peer mode
- services and other resources to be published in the EOSC Exchange
- use cases to be implemented by the Node including their technical and scientific description. For each use case user stories need to be broken down into requirements and an implementation plan for each of them.

The follow up sections expand further on each of these items.

4. Introduction of the Pilot Nodes activities

EOSC Beyond features 10 Pilot Nodes, each one focused on building and integrating into the European Open Science Cloud. These nodes are categorised into national, regional, and thematic groups along with an e-Infrastructure node. The project also involves three Data Spaces, which focus on adopting advanced capabilities for service orchestration and workflow execution via EOSC. The following list categorises the different types of Pilot Nodes:

National Nodes:

- Germany (NFDI)
- Czech Republic (e-Infra CZ)

Regional Node:

- Southeast Europe (NI4OS): Including GRNET, IPB, and UKIM

Thematic Nodes:

- Environmental Sciences (LifeWatch)
- Health and Food Sciences (METROFOOD-RI)
- Structural Biology (Instruct-ERIC)

e-Infrastructure Node:

- EGI

Data Spaces:

- Life Sciences (CNB-CSIC),
- Climate Science (ENES)
- Social Sciences (CESSDA)

There is ongoing work to identify more pilot opportunities and engage various stakeholders including OSCARs and Research Infrastructures (RIs). Four additional pilots have been invited to provide input into the initiative: SSHOC, ENVRI, DARIAH, and CLARIN. These communities attended Nodes Workshops in Krakow, where they provided valuable input in creating integration plans and developing the idea of federated capabilities within the EOSC Federation.

During the Krakow workshop, the participants developed a template and defined detailed descriptions of the Pilot Nodes. This work helped outline the technical efforts required to implement the scientific and technical use cases that the Pilot Nodes aim to achieve within the Network of Pilot Nodes.

The factsheet for each Pilot Node includes generic information such as name, legal entity, type, scope, and more. It also covers supported scientific and technical use cases, and the services, research products, and other resources offered to the Network of Pilot Nodes.

On top of that, the factsheet outlines the federating capabilities of each node, categorising them as:

1. **Supplier** - nodes that enable capabilities within the Network of Pilot Nodes for other nodes. e.g. a supplier may offer a monitoring service for other nodes to consume.
2. **Consumer** - nodes that do not have certain capabilities and instead leverage them from the Network. e.g. a consumer will consume monitoring service from a supplier.
3. **Peer-to-peer (P2P)** - nodes that federate their services within the EOSC. e.g. a node with a monitoring service may decide to synchronise its monitoring data with another node under established agreements.

EOSC Pilot Node Template	
Node Name	
Node legal entity name	
Node legal representative/signing person	
Entity type	<i>i.e. Research Infrastructure, National infrastructure, e-Infrastructure, Data Space, etc</i>
Countries building/delivering in the pilot Node	<i>List the countries only</i>
Entities participating in the EOSC Node - Institutional level	<i>List of Institutional entities (legal or non-legal)</i>
Node type	<i>i.e. Thematic, National, Regional, e-infra</i>
Scope of the Node	<i>Provide a solid description</i>
Scientific disciplines supported by the Node	https://confluence.egi.eu/display/EGIG/Scientific+Disciplines <i>Please use appropriate values from the standard above. In addition, list any other scientific discipline, if it's not included in the standard.</i>
Node representative contact	
Support/Technical contact	
Benefits/resources wished from the EOSC Federation	<i>i.e. what the Node needs Be precise. Try to include the technologies and capacities in the description Examples: e.g access to generic (e.g. PID) services benefits from pooling resources (with other services or nodes) What are the challenges that you are seeking solutions for via establishing a node</i>
Benefits/resources could be offered to the EOSC Federation	<i>i.e. what the Node can offer to others Be precise. In addition to high-level benefits, skills brought to the table, try also to include the technologies and capacities in the description. Focus on the benefits. Examples: physical infra but there are terms of providing the services (cost, in-kind)</i>

EOSC Pilot Node Template	
Stakeholders	<p>Please provide both 1- type, 2- role/needs</p> <ul style="list-style-type: none"> ● Stakeholder roles: ● consumer, ● provider (service/data/other resource), ● funder, ● governance <p>Examples: researcher/consumer research institution/consumer node/consumer university/data provider university/data provider researcher/provider computing centre/service provider</p>
Communities to be served	<i>i.e. PAN community, national (which country) researchers, etc</i>
Scientific use cases	<p><i>Ideally, enabled in the EOSC Federation.</i> Please mark, if a given scientific use case is possible to be fulfilled already within your Node only, or does it require resources from “the outside”.</p>
Technical use cases	<p><i>Ideally, enabled in the EOSC Federation.</i> Please mark, if a given technical use case is possible to be fulfilled already within your Node only, or does it require resources from “the outside”.</p> <p>Please try to derive the technical use case from the scientific use cases.</p>
Resources to be offered (via EOSC Exchange)	<p>Please specify the following information below</p> <p>EOSC Exchange user types:</p> <ul style="list-style-type: none"> ● researchers ● students ● data managers ● data stewards ● service developers ● service providers ● citizens ● citizen scientists ● policymakers ● public administration ● business ● other (please specify) <p>EOSC Exchange client types (how do you grant the access, on what level):</p> <ul style="list-style-type: none"> ● single user ● scientific community ● scientific institution ● country ● scientific project ● other EOSC Node ● research infrastructure <p>List of resources of a given type</p>

EOSC Pilot Node Template	
	<p>Services for providers and developers</p> <ul style="list-style-type: none"> ● Service name ● target audience (Exchange user types) ● supported client types: list the possible clients of your service ● is the service offered differently depending on the client type ● EOSC Access and Use policy (available to all EOSC users, accessible in the federation under specific conditions. List relevant policies and rules). <p>Services for end-users</p> <ul style="list-style-type: none"> ● Service name ● service type (data source/computing/storage / generic data processing service/data transfer service/data management service / thematic service/training service / other (please specify)) ● target audience (Exchange user types) ● supported client types: list the possible clients of your service ● is the service offered differently depending on the client type ● EOSC Access and Use policy (available to all EOSC users, accessible in the federation under specific conditions. List relevant policies and rules). <p>Research Products</p> <ul style="list-style-type: none"> ● Publications (Y/N) estimated number, if possible ● Data (Y/N) estimated number, if possible ● Software (Y/N) estimated number, if possible ● Other (Y/N) *Please specify what kind of other Research Products your Node brings to the federation ● Training Materials (Y/N) <p><i>Disclaimer: if you claim to offer research products in the EOSC Exchange, it would imply that the records of the research products will be available in the EOSC Federated Catalogue. Enabling merely a data source in EOSC Exchange that hosts these research products does not equal to publishing these research products in EOSC Federation</i></p> <p>What aspects do you consider, when deciding on access to your Node's resources?</p> <ul style="list-style-type: none"> ● user type (Y/N) - you will grant the researcher access differently (also capacity-wise) than to the citizen scientist. Please provide the details if possible ● user nationality (Y/N) ● user affiliation - you will grant for accepted institutions communities

EOSC Pilot Node Template	
Federated capabilities (EOSC Core)	<p>Please specify the mode in which you are offering the capability</p> <p><i>Supplier - enabling the capability to the others</i> <i>Consumer - not having that capability, taking it from the federation (one of the givers)</i> <i>P2P - connecting your core service to the federation</i></p> <ul style="list-style-type: none"> ● <i>Resource Catalogue</i> ● <i>AAI</i> ● <i>Monitoring</i> ● <i>Accounting</i> ● <i>Helpdesk</i> ● <i>Order/Access Management</i> ● <i>Messaging system</i> <p><i>Other possible federating capabilities:</i> <i>What other federated capabilities can your node offer to other nodes</i></p> <p><i>Examples:</i> <i>PID service</i> <i>orchestration service</i> <i>conversion/transformation service (for units or metadata schemata)</i> <i>hub for controlled vocabularies</i> <i>metadata schema registry</i> <i>software/data quality control</i> <i>thematic catalogue</i></p> <p><i>Try to be as descriptive as possible</i></p>
Supported standards	<i>What does the standard apply to?</i>
Supported APIs and protocols	<i>Please attach the capability/service connected to a given API/protocol. Try to attach the standard to the API if applicable</i>
Sustainability Statement	<i>Minimum - 3 years of the project. What happens after? Relate to the sustainability of the underlying infrastructure/community. State what it would take to make the Pilot Node sustainable longer. If possible, refer to the node life cycle (sustainability) but also to services provided by it (exchange, federating)</i>
Who can onboard resources to this Pilot Node?	<p><i>Would service and data providers have to be a "member" of the Node to have the right to onboard their services?</i> <i>The onboarding process should probably include various agreements:</i> <i>The onboard has the right to offer the resource</i> <i>transparent and complete disclosure of visibility/access/use policies, as well as specific SLAs for services</i> <i>If the service is a federating service, what is required?</i> <i>Onboarder allows Node to act as its representative in any discussions about the Node's collective set of services and data – e.g. joining the Federation, sharing resource metadata with other nodes, etc.</i> <i>Practical info about contacts, escalation, issue management, etc.</i></p>

Table 1 - Co-designed Pilot template

The basic information on the Pilot Nodes is presented below. Complete definitions and descriptions of each use case, along with all additional materials from the pilot nodes, are available in the [Complementary Annex](#) to this deliverable.

4.1. E-INFRA CZ

The e-INFRA CZ pilot node is part of a consortium comprising CESNET, IT4Innovations VSB, and CERIT-SC MUNI. It is an e-infrastructure for research and development in the Czech Republic, which provides complex capacities and resources for the transmission, storage, and processing of scientific data to all entities engaged in research and development.

The legal representative for the node is likely CESNET, though this is still under consideration. The Pilot Node serves researchers in the Czech Republic and their European collaboration partners. Participants include the e-INFRA CZ consortium, several universities involved in the EOSC CZ NDI project, potential ELIXIR CZ partners, and potentially other universities and institutes from the Academy of Science.

It is a national node covering scientific disciplines such as information sciences, biology, physics, and chemistry.

At present focused on current users of computing services, it aims to expand to all disciplines by providing generic data repositories for all Czech scientists.

4.2. EGI Pilot Node

The EGI Node, legally represented by the EGI Foundation, is an e-Infrastructure. It includes 27 members of the EGI Federation, comprising organisations from 27 countries, such as Gauss Allianz, France Grilles, CSIC, and CERN representing 1) National compute-storage providers, 2) providers of generic computational platforms or 3) providers of thematic applications that rely on the infrastructure and/or platform capabilities. As an e-Infrastructure Node, the EGI Federation aims to integrate into the EOSC Federation, contributing EOSC-dedicated capacity for transnational access to services and tools operated within other EOSC Nodes, as well as to international use cases directly served by the EGI EOSC Node. This capacity will be provided by selected compute-data centres of the EGI Federation. The EGI Node supports all scientific disciplines, offering "horizontal" services, potentially useful across any field.

4.3. Instruct ERIC - Integrated Structural Biology Infrastructure

Instruct-ERIC is a pan-European research infrastructure focused on providing high-end technologies and methods in structural biology to users. The node includes 17 member countries such as Belgium, the Czech Republic, Finland, France, Germany, Greece, Israel, Italy, Latvia, Lithuania, Netherlands, Portugal, Slovakia, Slovenia, Spain, and the United Kingdom. It involves various entities at the institutional level, including researchers, Instruct facilities, and Instruct member countries and institutions.

As a thematic node, Instruct-ERIC aims to support the structural biology community and its member countries by promoting innovation in biomedical science. It operates on a non-economic basis within the scope of the ERIC regulation. The scientific discipline supported by the node is primarily structural biology.

4.4. LifeWatch ERIC

The LifeWatch ERIC Node is a European Research Infrastructure Consortium providing e-science research facilities to scientists investigating biodiversity and ecosystem functions and services. It aims to support society in addressing key planetary challenges by creating a unique access point for scientists to discover, collect, manage, and analyse data within the VR environment. The node focuses on sharing and expanding the availability of resources to support biodiversity and ecosystem research. The legal representative of the node is LifeWatch ERIC, with participating countries including Spain, Italy, The Netherlands, Belgium, Greece, Portugal, Slovenia, and Bulgaria. The entities involved at the institutional level are the three LifeWatch ERIC Common Facilities based in Spain, Italy, and The Netherlands:

- LW ERIC ICT-CORE,
- LW ERIC SERVICE CENTRE, and
- LW ERIC VLIC.

The LifeWatch ERIC is a thematic node covering scientific disciplines such as biology, botany, ecology, genetics and heredity, mycology, structural biology, taxonomy, zoology, and more.

4.5. METROFOOD-RI - Infrastructure for promoting Metrology in Food and Nutrition

METROFOOD-RI is a research infrastructure built by several countries, including Italy, Belgium, Czechia, Germany, Spain, Greece, Slovenia, Poland, Portugal, Romania, North Macedonia, Turkey, and Switzerland, with the possibility of more joining as the ERIC evolves. The institutions participating in the EOSC Node comprises ENEA, SCIENSANO, CZU, TUM, EUT, AUTH, IJZRSM, PMT PL, INSA, IBA, JSI, TUBITAK, and PREMOTEC GMBH.

As a thematic node, METROFOOD-RI focuses on promoting metrology in food and nutrition, providing high-level metrology services to enhance food quality and safety. The primary goals of the METROFOOD-RI node include implementing FoodCASE as a pilot data space for the food domain, connecting with EOSC Data Spaces, integrating METROFOOD-RI AAI with EOSC AAI and METROFOOD-RI data catalogues with EOSC, and establishing an EOSC node for the food domain. The scientific disciplines supported by the node are chemical sciences, biological sciences, agricultural sciences, nanotechnology, and environmental biotechnology.

4.6. NFDI - German National Research Data Infrastructure

NFDI is a national infrastructure based in Germany, built by various German entities. The participating entities at the institutional level include NFDI consortia such as DAPHNE4NFDI, PUNCH4NFDI, Text+, NFDI4ING, and Jupyter4NFDI, with Helmholtz Federated IT Services (HIFIS) as the base infrastructure provider. This national node serves as a common entry point for scientists in the German NFDI consortia, offering a range of scientific and collaborative services. This non-profit association coordinates these activities, supported by over 270 member institutions, including science organisations, universities, higher education institutions, non-university research institutions, scientific societies, and associations.

The node supports scientific disciplines such as information sciences, biology sciences, physics sciences, chemical sciences, and engineering and technology.

4.7. NI4OS - National Initiatives for Open Science in Europe

NI4OS-Europe, represented by GRNET, is a consortium of national and institutional e-Infrastructures from Albania, Armenia, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Georgia, Hungary, Moldova, Montenegro, North Macedonia, Romania, Slovenia, and Serbia. At the institutional level, GRNET, IPB, and UKIM participate in the EOSC Node. As a regional node, NI4OS-Europe aims to play a role in the EOSC service portfolio, contributing to the governance of EOSC and promoting inclusiveness at the European level to foster global open science. It supports the development and integration of national open science cloud initiatives in 15 member states and associated countries within the EOSC governance framework. NI4OS-Europe promotes the adoption of the EOSC philosophy and FAIR principles within the regional community, offering technical and policy support to service providers joining EOSC. This includes generic services such as computing, data storage, and data management, as well as thematic services, repositories, and data sets.

The node supports all scientific disciplines with a special focus on climate, digital cultural heritage, life science, and computational physics.

4.8. CESSDA - Consortium of European Social Science Data Archives

CESSDA is an international service provider for research, offering data services to the social sciences. By uniting social science data archives across Europe, CESSDA promotes the results of social science research and supports international research and cooperation. CESSDA supports continuous learning and training for its Service Provider staff, the social science user community, and partners, focusing on research data management, data discovery and reuse, digital preservation, data archiving, and CESSDA tools and services. Its technical infrastructure ensures a stable, up-to-date foundation for user-friendly tools and services, facilitating easy data deposit and access.

CESSDA (potential SSHOC Node) is a thematic data space based in Norway, France, and the Netherlands, focusing on providing services and capabilities for the social sciences. It cooperates closely with DARIAH and CLARIN within the SSHOC initiative. The node offers discovery services, standardised workflows, training, and support for SSHOC members as well as the social science and humanities community. Additionally, it provides tools and services supporting researchers and institutions in data management, discovery, reuse, digital preservation, and archiving.

By uniting social science data archives across Europe, SSHOC contributes significantly to the advancement and dissemination of social science research. The node's technical infrastructure ensures a stable, up-to-date foundation for user-friendly tools and services, facilitating easy data deposit and access.

4.9. CNB-CSIC - National Biotechnology Center | CSIC

The CNB-CSIC Data Space, a thematic node from Spain, is part of the INSTRUCT-ERIC EOSC Pilot Node, focusing on the structural biology community with a specific emphasis on cryo-EM data validation. Together with INSTRUCT-ERIC EOSC Pilot Node, they represent the entire cryo-EM data cycle, from sample preparation and acquisition to the reconstruction of volume maps and atomic models.

A key feature of the CNB-CSIC Data Space is the cryo-EM Validation Report Service (VRS), which allows users to validate their cryo-EM data through an open-access website. This service ensures that cryo-EM data meet high-quality standards, supporting reliable research and data integrity. The node also validates existing structures in major repositories like the Electron Microscopy Data Bank (EMDB) and the Protein Data Bank (PDB), making this information accessible through a public repository.

The CNB-CSIC Data Space contributes to the INSTRUCT-ERIC Pilot Node and the broader EOSC community by offering validation services that enhance the quality and reliability of cryo-EM data, fostering better research and collaboration in structural biology.

The primary scientific discipline supported by this data space is structural biology

4.10. ENES - The European Network for Earth System Modelling

The ENES Data Space, a thematic node from Italy, focuses on providing core services and capabilities for the climate community. It involves key entities like the CMCC Foundation and the University of Trento. The node offers a comprehensive range of resources including data, storage and compute resources, and infrastructural components for service deployment and orchestration. Additionally, it provides software solutions supporting researchers and institutions in realistic scenarios.

The ENES Data Space is specifically designed to address needs from the climate community and, in particular, the ENES community. ENES, the European Network for Earth System modelling, aims to accelerate progress in Earth's climate system modelling, contributing to the assessments of the Intergovernmental Panel on Climate Change (IPCC) and informing EU mitigation and adaptation policies. Managed by IS-ENES, the portal offers access to crucial model data and software, supplemented by ESiWACE projects for enhanced performance on high-performance computers.

The ENES Data Space supports the scientific discipline of Climate Research within the broader category of natural sciences -> earth sciences.

5. Pilot Nodes user stories and journeys: initial requirements

One of the stages in progressing towards integration plans was the development of user stories and use cases, where each Pilot Node identified a set of use stories to be implemented, including detailed steps and the necessary services for integration. This process helped identify the preliminary requirements for the Pilot Nodes, forming a roadmap that outlines all necessary integrations and additional development needed for the core or the Pilot Nodes themselves. User stories, specify clearly the personas involved in the user journey. The user journey needs to identify the services involved behind the scenes in order for the user to be able to complete the journey. An assessment of these services will lead to an understanding of the integration plans needed with the core services and other potential services from nodes at the Network of Pilot Nodes. User stories represent all the relevant stakeholders that interact with a Pilot Node. We present in this deliverable the first priority user story to reflect on the methodology that will be followed.

Further user stories were gathered during the workshop, they will be added and implemented incrementally throughout the project lifetime and followed up in the JIRA environment. Requirements derived from these stories will be fed to the technical roadmap to be able to evolve the core services and provide input to the new services. Core service owners will work in conjunction with the Pilot Nodes to support the integration plans. These requirements will be further elaborated in the deliverable focused on requirements.

5.1. E-INFRA CZ

User Story:

As a user with an account in Czech AAI, I want to invite colleagues from other countries and give them access to my project, so that we can collaborate effectively within the e-INFRA CZ Node.

User Journey:

1. Local node accounts and projects are already in place.
2. AAI integration - the node must be integrated with EOSC AAI.
3. Authorization and access management for international colleagues.

Core Services Involved:

- AAI

Integration Summary:

The e-INFRA CZ Node needs to integrate its AAI with the EOSC AAI to enable collaboration and access management. This includes providing access to local projects and ensuring

proper authorization for international coworkers. The node will utilise the AAI service offered by the Network to manage user authentication and authorization.

5.2. EGI Pilot Node

User Story:

As a researcher, I want to access computing resources to run molecular dynamic simulations to characterise perovskite materials. My research group at the university would also need access to the model and the ability to evaluate the results.

User Journey:

1. The research scientist needs to register in the EGI node with an EGI-recognised identity provider. (EGI NODE: Service Check-in)
2. The researcher needs to request and order the type of computational and storage resources from the service catalogue using order management system. (EU Node: Service Order Management)
3. The order will be processed, and a cloud/HPC/storage provider (or set of providers) will be identified with the capacity requested by the user. (EU Node/EGI Node: Cloud and storage federated service)
4. A Virtual Organisation is created, and members of the research scientist's team are added to manage access to resources. (EGI Node: Check-in AAI service)
5. An orchestration service deploys and configures all the resources needed for the researcher at the specified nodes and the researcher can start running his/her simulations on the cloud environment. (EOSC AAI Federation, Execution Framework)

Core Services Involved:

- AAI
- Order Management
- Execution Framework

Exchange Services Involved:

- Storage
- Compute

Integration Summary:

The core service of AAI will be integrated into the Network of Pilot Nodes, allowing researchers to request and access computing resources. The Order Management system will be provided by an EU node. This integration involves using the federated authentication mechanisms and resource management protocols. The EGI node will offer AAI services to the Network and requires integration with the identity management and resource allocation systems, leveraging the order management service provided by the EU node and the Execution Framework service in EOSC sandbox.

5.3. Instruct ERIC

User Story:

As a small facility manager, I would like to store my user's data for a long time, so that I can make it available to other researchers.

User Journey:

1. During my visit, I need to have access to one or more storage options
2. I need to understand and agree to the Terms and Conditions and also the costs
3. Once agreed I need to have storage provisioned and made accessible via a unique upload URL.
4. This URL and metadata need to be associated with the visit record.

Core Services Involved:

- AAI
- Order Management
- Marketplace

Exchange Services Involved:

- Storage

Integration Summary:

The core services, including AAI, Order Management, and Marketplace, need to be integrated within the Network of Pilot Nodes to ensure long-term storage and accessibility for researchers. Instruct ERIC would need to integrate with services provided by the Network of Pilot Nodes to manage user authentication and authorization, handle the storage provisioning process, and agree on the costs through Order Management and Marketplace services. Compliance with common standards and terms is essential for utilising these services.

5.4. LifeWatch ERIC

User Story:

As a Researcher, I need to evaluate the quality of a specific aquatic ecosystem by studying phytoplankton species. To do this, I need access to all available datasets in the selected area, including abiotic and biotic data. Additionally, I need information on available services or VREs to help calculate ecological indicators of the ecosystem's quality.

User Journey:

1. The LifeWatch ERIC Metadata Catalogue federates resources coming from the EOSC Resource Catalogue and vice versa exposes its own resources to the EOSC

2. The LifeWatch ERIC Metadata Catalogue (based on GeoNetwork) should harvest metadata related to datasets, services, and VREs from the EOSC Resource Catalogue
3. The Researcher doesn't need to be registered to use the LifeWatch ERIC Metadata Catalogue search.
4. The Researcher can search different types of digital objects (datasets, services, VREs, research sites, workflows, training objects, etc.) in the LifeWatch ERIC Metadata Catalogue.

Core Services Involved:

- Resource Catalogue
- IF Registry

Exchange Services Involved:

- Data sources

Integration Summary:

LifeWatch ERIC would need to integrate its metadata catalogue with the EOSC Interoperability Framework Registry and Resource Catalogue to provide researchers with comprehensive access to datasets and services. This integration involves federating the LifeWatch ERIC Metadata Catalogue to the EOSC Resource Catalogue and ensuring metadata harvesting and search functionalities.

5.5. METROFOOD-RI

User Story: As a researcher I want to access all EOSC services with one login so that I don't have to remember multiple logins

User Journey:

1. The researcher uses METROFOOD AAI with EOSC AAI to login (implementing Keycloak).
2. A connection is established between AAI used by EOSC and METROFOOD.

Core Services Involved:

- AAI

Integration Summary:

The core service is the AAI, which must be integrated with the EOSC AAI to enable single sign-on capabilities. This integration requires implementing Keycloak to bridge the METROFOOD and EOSC authentication systems, allowing access to EOSC services with a single login credential.

5.6. NFDI

User Story:

As a user, I want to log into any service offered by the node using either my institutional identity or a social login.

User Journey:

1. Login should be provided by an AAI proxy chain handling user accounts and mapping.
2. All services in the node will need to be registered against one of the proxies.

Core Services Involved:

- AAI

Integration Summary:

NFDI needs to integrate its services with the EOSC AAI proxy chain. It would handle authentication and authorisation, allowing users to log in using either their institutional identity or social login. Each service would need to be registered with the AAI proxy, ensuring unified access control and user account management across the node's services within the Network of Pilot Nodes.

5.7. NI4OS

User Story:

As a regional LifeScience user, I would like to use the drug discovery and molecular dynamics services from the NI4OS Europe catalogue to perform simulations using the offered cloud resources.

User Journey:

1. Login through the AAI service to the Jupyter Notebook.
2. Access the data on the shared storage.
3. Call the thematic services APIs.
4. Deposit the results in the repository.

Core Services Involved:

- AAI
- Resource Catalogue
- Integration suite Community APIs

Exchange Services Involved:

- Data access and sharing

- Simulation services
- Storage

Integration Summary:

The NI4OS node will integrate its services by utilising the AAI service to ensure secure and federated authentication and authorization for users across the network. The drug discovery and molecular dynamics services will be registered and discoverable through the EOSC Resource Catalogue. Results and data produced will be deposited into the shared repository, ensuring compliance with EOSC standards, and facilitating collaborative research across Network of Pilot Nodes. This integration supports the harmonised provision of services and resources within the EOSC ecosystem.

5.8. CESSDA

User Story:

As a service provider, I want to track the usage of my resources, calculate associated costs, and eventually charge commercial users.

User Journey:

1. The service provider registers their service at the EOSC Accounting Platform.
2. The service provider configures the exchange of access and usage data between their service and the EOSC Accounting Platform.
3. The service provider accesses dashboards with statistical reports on the usage of each resource/service to monitor and manage usage and costs.

Core Services Involved:

- Service Accounting
- Research Products Accounting

Integration Summary:

The core services, Service Accounting and Research Products Accounting, should be integrated into the service provider's infrastructure to enable the tracking of usage and calculation of costs. The node will utilise these services offered by the Network of Pilot Nodes. Requirements include configuring data exchange protocols and setting up dashboards for reporting.

5.9. CNB-CSIC

User Story:

As a structural biology researcher, I want to submit a proposal to ARIA (INSTRUCT-ERIC use case) to analyse the structure of my target macromolecule. After the facility processes the

acquired data and I obtain a cryo-EM map along with an atomic model, I want to validate the data to assess its quality and optimize my data processing. Finally, I want to view the results in a report and interactively within a 3D viewer such as 3DBionotes-WS.

User Journey:

1. Log in to ARIA (INSTRUCT-ERIC use case), submit a proposal to study my macromolecule target, and get it approved.
2. Acquire data from the cryo-EM facility and start processing it.
3. Obtain a cryo-EM volume map and an atomic model of the target.
4. Search for validation software in the Marketplace or Resource Catalogue and find the Validation Report Service (CNB-CSIC use case).
5. Possibly, log in to the Validation Report Service web page using the AAI.
6. Deploy VRS on the cloud through the Order Management and Execution Framework to validate the quality of the cryo-EM volume map and atomic model, utilising resources, and storage from other nodes in the background.
7. Obtain PIDs for the results through the PID Service.
8. View the results in the output report and in a 3D viewer such as 3DBionotes-WS.
9. Optimise my data processing workflow based on the VRS results.

Core Services Involved:

- AAI
- Marketplace
- Order Management:
- PID Service:

Exchange Services Involved:

- Compute
- Containers
- Marketplace

Integration Summary:

Core services such as AAI, Marketplace, Order Management, and PID Service would be integrated to support the researcher's workflow. The node will use these services offered by the Network of Pilot Nodes to facilitate secure login, resource management, and PID assignment for results. Requirements include setting up secure access protocols (AAI), integrating the Marketplace for service discovery, utilising the Order Management for deploying VRS, and ensuring the PID Service is used for result identification. Compute and storage resources from other nodes are leveraged as part of the network's infrastructure.

5.10. ENES

User Story:

As a scientist, I want to get access to computing resources so that I can perform interactive analysis and visualisation on climate data.

User Journey:

1. Scientist registers to the ENES node and joins the ENES VO (AAI Checkin service).
2. The scientist logs in to the science gateway and selects the desired computational and software profiles (Orchestration service from EGI).
3. A ready-to-use environment is created allowing the scientist to run big data processing, data analysis, and viz, AI/ML applications.

Core Services Involved:

- AAI

Exchange Services Involved:

- Compute resources
- Storage
- Containers
- Notebooks
- Orchestration service from EGI

Integration Summary:

The core service involved in this use case is the AAI service which facilitates the scientist's registration and login to the ENES VO. This service will be integrated into the Network of Pilot Nodes by ensuring that the ENES node offers AAI as a federated service. The orchestration service from EGI would be used to provide the necessary computational environment. For this integration, the node needs to support federated identity management and orchestration capabilities compliant with EOSC standards.

6. Introduction of the core services of EOSC Beyond for EOSC Pilot Nodes.

This section presents a summary of the services to be offered to the Pilots as part of the integration plans with the EOSC Sandbox environment. The services as they are described at the time of writing represent the definitions elaborated in previous projects such as EOSC Future and FAIRCORE4EOSC project. EOSC Beyond WP7 and WP10 will evolve these definitions and design new services such as the Execution Framework and Integration Suite. New core services definitions have not been added to this description as they will be proposed in WP10 and evolved according to the needs of the Pilots. Different type of service integration modes will also be described in deliverable D7.1 EOSC Core Gap Analysis and Requirements Report and D10.1 Report in EOSC IS and EF Requirements and GAP Analysis (M6) for the Pilots to evolve their understanding on best integration scenarios.

6.1. EB⁴ Interoperability Framework Registry

The EOSC Interoperability Framework Registry is a database designed to contain Interoperability Guideline profiles. This registry enables providers to align their services and products with specific guidelines, thereby indicating compatibility and composability features with other EOSC resources or core components. By recording these guidelines, the registry enhances the overall interoperability within the EOSC ecosystem.

Providers can onboard new guidelines into the registry or assign existing guidelines to their service resources. The registry is equipped with an API that supports CRUD (Create, Read, Update, Delete) operations on Interoperability Framework Database records, facilitating the management of relations between Interoperability Guideline entries and EOSC Service Catalogue entries.

ATHENA RC manages the Interoperability Framework Registry. This framework includes various features tailored to different user groups:

Providers can:

- Onboard their guidelines that other users can utilise to interoperate with their resources.
- Manage the interoperability guidelines that have already been onboarded.
- Link a resource with an onboarded interoperability guideline using a UI integration in the Providers' Portal.
- Use a REST API that supports all these operations.
- Define configuration templates to create "configurations" of interoperability guidelines for resources, a feature that is set to be released.

⁴ Core Services in EOSC Beyond are named with the "EB" prefix to distinguish them from possibly different services provided from the EU Node.

Capabilities for the EPOT team members:

- Initial onboarding approval or rejection of interoperability guidelines.
- Auditing and curating entries of the interoperability guidelines.

Capabilities for other core components :

- Vice: Providing listings of interoperability guidelines adhered to by a resource.
- Versa: Providing listings of resources that have stated compatibility with a specific interoperability guideline.

6.2. EB Messaging Service

The ARGO Messaging Service (AMS) is a Publish/Subscribe service implementing the Google PubSub protocol. This service is designed to create nodes of Publishers and Subscribers, enabling message-oriented services using the Publish/Subscribe model over plain HTTP. It provides an HTTP API that facilitates this model, allowing users and systems to send and receive messages between independent applications.

In the Publish/Subscribe paradigm, Publishers are users or systems that send messages to named channels called Topics. Subscribers, on the other hand, are users or systems that create Subscriptions to these Topics to receive messages. This setup allows for efficient communication and message distribution across different applications and systems.

The AMS offers following features:

- Ease of use - it supports an HTTP API and a Python library, simplifying integration with AMS.
- Push Delivery - AMS instantly pushes asynchronous event notifications to subscribers when messages are published to a message topic.
- Replay Messages - users can replay messages that have been acknowledged by seeking a specific timestamp.
- Schema Support - includes defining the expected payload schema, expected set of attributes and values, and validating each message against these requirements, with immediate client notification if criteria are not met.
- Replicate Messages on Multiple Topics - a republish script consumes and publishes messages for specific topics, allowing message replication.

GRNET manages the Messaging Service. The value of EOSC Messaging lies in its asynchronous messaging capabilities based on open specifications. By facilitating end-to-end interconnection between services, supporting technical interoperability, and enforcing the adoption of common standards, Messaging Service serves as the main transport layer within the EOSC infrastructure.

6.3. EB AAI

The Authentication and Authorization Infrastructure (AAI) Service enables authenticated and authorised access to resources. This service, managed by GRNET provides mechanisms for authentication, authorization, and access control.

Key features of the service include:

- Unified authentication and authorization - the EOSC AAI provides a federated identity management system that allows users to access multiple services using a single set of credentials. This system supports interoperability with various identity providers, ensuring access across different research infrastructures and scientific communities.
- Comprehensive access control - the service includes advanced authorization mechanisms to control access to resources based on user roles and permissions.
- Interoperability and integration - the service supports integration with other AAI systems, enabling the harmonisation of access control policies across diverse platforms.
- User and resource management - AAI provides tools for managing user identities, groups, and resource access policies. This includes capabilities for dynamic group management, role assignment, and the delegation of administrative tasks.
- Scalability and customization - the AAI Service is designed to scale with the growing needs of the community. It supports multiple configurations and customizations to meet the specific requirements of different research infrastructures and service providers.

6.4. EB Resource Catalogue

The EOSC Resource Catalogue provides data and functionality to register, maintain, administer, and share resources onboarded by various providers. It also serves as the point of reference for all EOSC Core components that add value to this information, making the data and services searchable and accessible through various tools for both researchers and end users.

The EOSC Resource Catalogue consists of the following:

EOSC Providers Portal:

The portal enables front-end functionality for registering EOSC Providers (organisations entitled to publish their resources via the EOSC Catalogue) and offers capabilities to onboard and manage EOSC resources. It also provides a Provider dashboard, where representatives from provider organisations can view detailed information about their offerings, as well as various usage statistics on their resources. Finally, it offers members of the EOSC portal onboarding team the functionality to manage the EOSC portal catalogue entries, including managing the onboarding process for providers applying to list their resources in the portal, auditing onboarded resources, and more.

EOSC Service Catalogue:

This component offers the underlying storage functionality and interoperability tools for the programmatic access, registration, and management (CRUD) of providers, services, and catalogues. It also provides the necessary API functionality for the interoperability of service catalogues from individual providers or aggregators (e.g., thematic, or regional catalogues) with the EOSC portal. Modifications to the entities maintained in the Service Catalogue are synchronised with the EOSC Research Graph, which aggregates the complete set of entities and their relationships in the platform.

EOSC Research Product Catalogue:

This component offers capabilities to populate and access a Knowledge Graph, where (i) nodes represent instances of different EOSC resource types (e.g., services and products), the EOSC Resource Providers, and contain information about the EOSC Interoperability Frameworks (to which EOSC Interoperability Frameworks the resources are compliant), and (ii) relationships represent the semantic associations between them.

6.5. EB Order Management

EB Order Management System is a set of services, processes, and guidelines designed to facilitate a unified ordering process for resources, providing an experience for users and enabling efficient resource management for providers. It provides a coherent user journey from resource discovery to acquisition in the EB Marketplace, enhancing the user experience and supporting inter-provider communications to improve resource composability and outreach.

It integrates various order management systems through a flexible API, allowing easy communication between the EB Marketplace and provider-specific OMS. This integration supports a wide range of provider use cases and enables efficient resource provisioning and order management.

Order Management System offering:

Unified Ordering Process:

- Users can discover, order, and procure resources through a single portal.
- Providers can efficiently manage resource orders using the interface that best suits their needs.
- Interoperability:
- Supports integration with various OMS (Order Management System), including a reference implementation for Jira.
- Flexible API allows for different levels of integration, accommodating diverse provider needs.

Support and Guidance:

- Support for both users and providers.
- Comprehensive documentation and guidelines are available for seamless integration.

EB Order Management System can be offered in three modes:

- EOSC Order Management as a dedicated service for the provider
- Dedicated deployment: utilise OMS exclusively for the provider's internal operations.
- Integrate with EOSC Beyond's Order Management
- Federated integration: integrate with EOSC Beyond's OMS and federate its output within EOSC Nodes Federation to enable data exchange and sharing with other nodes.
- Integrate Node's Order Management with EOSC Beyond's Order Management
- Federated integration: integrate Node's OMS with EOSC Beyond's OMS, enabling data exchange and sharing with other nodes

6.6. EB Service Accounting

The EOSC Accounting service is a platform managed by GRNET.

The Accounting System is a platform that is responsible for collecting, aggregating, and exchanging the metrics between different infrastructures, providers, and projects.

Essentially, the main functions of the platform are expressed by a REST API. Therefore, the primary duties of the API are the following:

- Accepting input from several different resources.
- Storing the input into a database.
- Aggregating the incoming input.
- Offering the aggregated input to several different clients.
- Request accounting data for a specific time period.

Access to the API resources is restricted to authenticated clients, ensuring that only authorised users can retrieve the necessary data. Authentication is required for any client wishing to access the API resources.

6.7. EB Research Product Accounting

Accounting for Research Products is a component of the EOSC Accounting system. This service is designed to collect, process, and publish usage statistics for research products that can be shared across the Network of Pilot Nodes. Leveraging automated and standardised scientific methods, it ensures proper integration and accurate reporting of data. The service is built upon the UsageCounts service provided by OpenAIRE AMKE, in turn based on the COUNTER standard.

The services' main value lies in its ability to offer additional metrics that can supplement traditional impact measures such as citation counts. This is achieved by providing detailed statistics on metadata views and item downloads.

Accounting for Research Products service:

- Provides metrics, activity, views, downloads of data sources and research products.

- Produces evidence based analytical metrics of views and downloads, trends, aggregated from all over the world, and helps spot retention of data.
- Produces accurate and objective performance measures monitoring of repository content.
- Enables the view of research uptake, identify science trends, examine the engagement and evolution of research popularity.
- Information is automatically updated with real time data.
- Metrics for Open Access repositories are combined per country.

6.8. EB Service Monitoring

The EOSC Monitoring Service ensures continuous and on-demand monitoring to quickly detect and analyse data, addressing issues before they impact users and productivity. This service helps management teams monitor service availability and reliability from a broad view down to specific system metrics and checks compliance with multiple Service Level Agreements (SLAs). It combines EOSC-CORE Monitoring for EOSC-Core services and EOSC-Exchange Monitoring for services in the EB Service Catalogue.

Managed by GRNET., the service offers functionalities such as monitoring EOSC-Core and EOSC-Exchange services, reporting on availability and reliability, visualising service status, and providing dashboards for both providers and users like researchers. It sends real-time alerts to service operators and the EOSC Provider Onboarding Team to address issues promptly.

Key features include support for multiple entry points, interoperability with other monitoring systems, high availability, and support for multiple tenants, configurations, metrics, and profiles for flexibility and customization. The service supports several integration options:

- Monitor an Onboarded Service: For services onboarded to the EOSC platform.
- Monitor an Infrastructure: For entire infrastructures.
- Integrate External Monitoring Service: For external monitoring services.
- Combine Results of Existing ARGO Tenants: For combining results from existing ARGO tenants.
- Third-party Services Using EOSC Monitoring Data: For third-party services using monitoring data.

6.9. EB Helpdesk

The EB Helpdesk, managed by KIT, serves as the support hub for all EOSC Beyond users. It handles requests related to EOSC services, resources, and projects, ensuring prompt assistance.

Built on open-source technology, the helpdesk offers transparency and flexibility, benefiting from continuous community improvements. Its user-friendly interface enhances navigation and user interaction, simplifying access to support.

Key features include:

- Smart Search - the helpdesk is equipped with search functionality that allows users to quickly find relevant solutions, knowledge articles, and other resources to resolve their queries efficiently.
- Knowledge Base - the helpdesk incorporates a comprehensive knowledge base that can contain a repository of valuable information, such as FAQs, troubleshooting guides, and best practices.
- Custom workflows - the helpdesk enables the creation of custom workflows tailored to specific EOSC community requirements. This includes filters, automatic ticket assignment, escalation procedures, and notifications.
- Multiple access channels - the helpdesk provides users with various channels to access support. Whether it's through a web portal, email, webform, messenger or other communication channels, users can choose the most convenient way to interact with the helpdesk and receive timely assistance.
- Easy integration with other services - the EOSC Helpdesk is a scalable solution which can be easily integrated with other community helpdesks, messengers like SLACK, rocket chat etc.

6.10. EB PID Service

The EB PID Service is a service for storing, managing and accessing persistent identifiers (PIDs) and essential metadata (PID records) as well as managing PID namespaces. The service aims at improving the management and interoperability of Persistent Identifiers (PIDs) across various research domains. This service is critical for ensuring that research data, outputs, and resources are uniquely and persistently identified, making them easily accessible and reusable.

Led by the GRNET, in cooperation with GWDG the implementation of the service relies on the DONA/Handle solution.

Key features and functionalities:

- Persistent identification - the service ensures that all research outputs, including data, publications, software, and other resources, are assigned unique and persistent identifiers. At the same time the service ensures the use of Persistent Identifiers for providers/resources onboarded into Resource Catalogue.
- Easy integration with other services - Support of an EOSC Core adapter for the PID Service
- Alignment with FDO concept and model - Align PIDs with the FDO concept and model . The idea of FDOs is to provide a framework that helps to optimise the conditions of digital research data management on a global scale by finding a way to apply the FAIR principles to digital objects such as research data and all components that are involved in their production, storage and distribution.
- Support for globally unique identification of measuring instruments operated in the sciences - PIDs for instruments based on standards agreed by the research community
- Support of data type descriptions - Creation of machine-readable type descriptions for supported resources

- Check and improve the Quality of Prefixes and PIDs used.

Last but not least, the EB PID Service will investigate the use of the services developed in the FAIRCORE4EOSC project in order to advance and improve the discoverability and interoperability of an increased amount of research outputs.

6.11. EB Marketplace

The Marketplace is designed to help researchers discover, order, and access services, analytical tools, data management tools, storage, and computing resources. This integrated platform provides access to numerous services across various research domains, along with integrated data analytics tools. It allows local, national, and international providers, including European e-Infrastructures and Research Infrastructures, to showcase their services and resources, promoting access to a broader user group. The platform enables scientists to access technologies that might not be easily available otherwise, optimising their ability to use existing European solutions.

Thanks to the Marketplace, researchers, the public sector, and private companies can introduce cross-country and cross-domain collaborations.

Besides the opportunity to onboard and promote services it also enables providers to obtain statistics on access requests and customer feedback, manage service requests, interact with users, and provide support through a free online platform. Additionally, the Marketplace increases the utility of providers' services by linking them with compatible services or products through the EOSC Interoperability Framework and allows users to authenticate with their credentials.

The EB Marketplace is managed by ACC Cyfronet AGH.

The core functionalities of the Marketplace include:

EB Marketplace Backoffice:

- Service offering management - a user interface for providers to manage their offerings.
- Service access management - a user interface for providers to control access to services.

EB Marketplace Resource Discovery:

- Searching and filtering - advanced options to help users find the appropriate services.
- Recommendations and comparison - configurable service recommender and offering comparison tools.

EB Service Access and Requests Management:

- Status following - allows users to track the status of their requests.
- Message exchange - facilitates communication regarding requests.

EB User's Projects:

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

- Marketplace projects - a space for users' scientific activities to organize services and support requests
- RAiD projects - integration with RAiD projects for comprehensive project management.

7. Integration Matrix: scope of integrations and timeline

The integration matrix for the EOSC Beyond project outlines the scope and timeline of integrations for the Pilot Nodes. This section consolidates the information provided by them. Each pilot node has detailed its integration plans with the EOSC Core Innovation Sandbox, addressing several key questions.

1. **Type of Integration** - Pilot Nodes have specified their intended use of the Innovation Sandbox capability to prototype and validate their services within a structured environment.
2. **Scope of Integration** - each Pilot Node has described which Exchange resources are in the scope of integration and foresee results from the user perspective.
3. **Use Case** - the Pilot Nodes provided examples of how specific users or groups will interact with the integrated systems to achieve particular goals, such as enhancing accessibility, tracking resource usage, and ensuring high-quality service delivery.
4. **Timeline** - each Pilot Node has outlined the projected timeline for achieving integration, identifying specific months when integration is expected to become feasible within the Beyond project.
5. **Integration with EU Node Core Service** - finally, the Pilot Nodes have indicated their plans for further integrations with the EU Node Core services following successful integration within the EOSC Beyond pre-production environment.

The EOSC Core Innovation Sandbox serves as the main solution for performing integrations within EOSC Beyond. It is a pre-production environment of the EOSC Platform that acts as a testing and staging environment for EOSC Core service providers, EOSC Exchange service providers, and EOSC Nodes in the integration process with EOSC.

The Sandbox offers integrations with federating capabilities that will ultimately create interoperable interfaces with EOSC EU Node.

The Sandbox will be used to deploy and validate the network of EOSC Pilot Nodes the project has planned to create, showcase, and demonstrate the new capabilities that will be implemented.

As the EOSC Federation continues to develop, the EU Node will act as a pioneering production Node to support multi-disciplinary and multi-national research across Europe.

Integrating services within the Innovation Sandbox will ensure production ready status to establish connections with the EU Node, hence in easy access and interoperability within the EOSC ecosystem.

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

CORE SERVICE	PILOT NODE									
	EGI Pilot Node	Instruct-ERIC	LifeWatch	NI4OS	e-INFRA CZ	NFDI	METROFOOD-RI	CESSDA	CNB-CSIC	ENES
AAI	Pre-Integrated	Pre-Integrated	Planned	Pre-Integrated	Planned	Planned	Planned	Planned	Possibly	Planned
Service Accounting	Planned	Not applicable	Not applicable	Planned	Planned	Planned	Not applicable	Not applicable	Possibly	Planned
Service Monitoring	Pre-Integrated	Pre-Integrated	Planned	Planned	Pre-Integrated	Planned	Possibly	Planned	Pre-Integrated	Planned
Research Product Accounting	Planned	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Possibly	Not applicable
Resource Catalogue	Planned	Planned	Planned	Planned	Planned	Planned	Planned	Planned	Planned	Planned
Order Management	Planned	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Possibly	Not applicable	Not applicable	Not applicable
Helpdesk	Planned	Planned	Planned	Planned	Pre-Integrated	Planned	Possibly	Planned	Pre-Integrated	Not applicable
PID Service	Planned	Planned	Not applicable	Planned	No idea	Not applicable	Possibly	Planned	Planned	Planned
Marketplace	Not applicable	Planned	Planned	Planned	No idea	Planned	Possibly	Pre-Integrated	Planned	Not applicable
Interoperability Framework Registry	Pre-Integrated	Not applicable	Pre-Integrated		No idea	Planned	Possibly	Planned		Not applicable
Messaging System	Pre-Integrated		Pre-Integrated	Pre-Integrated	Not applicable	Planned		Not applicable		Not applicable

Table 2 - Pilot Nodes Integration plans overall summary

The most frequently planned core services are the AAI, Resource Catalogue, Helpdesk, and Service Monitoring, which are either pre-integrated or planned by most nodes. On the other hand, the Interoperability Framework Registry, Order Management, and Messaging System have received significantly less interest, with several nodes indicating these services are not applicable.

Among the Pilot Nodes, EGI Pilot Node, NFDI, and NI4OS are planning to integrate the most services. The EGI Pilot Node, in particular, demonstrates a high level of integration across nearly all core services.

Given the variations between node types, future project implementation will involve meetings to establish the technical details for each integration.

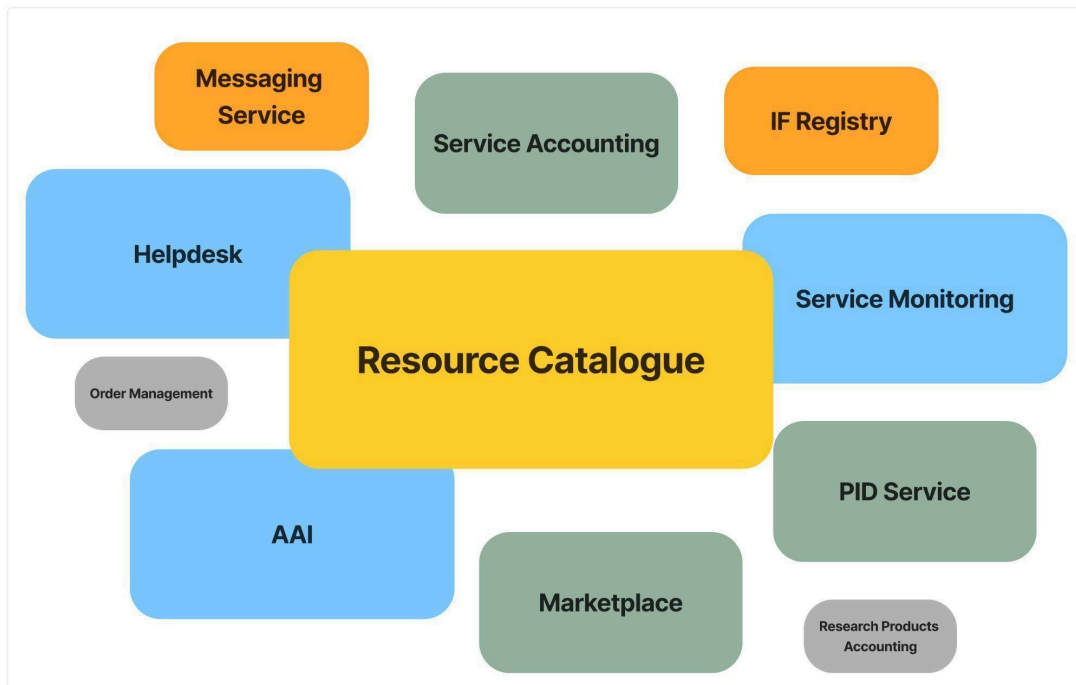


Figure 2 - Services integrations popularity

The following sections include integration matrixes for each Pilot Node. Tables 3 - 12 provide details about the type, scope of integration, timeline, and other relevant information.

7.1. E-INFRA CZ

EOSC BEYOND INTEGRATION SANDBOX						
Service/Capability	Node name	Type of integration	Scope of integration	Comment	Timeline	Integration with EU Node Core service
	e-INFRA CZ	Please choose how do you wish to leverage Innovation Sandbox capability	Describe what part of the node Exchange resources are in the scope of chosen status and foresee results from the user perspective*	A short explanation why the service will not be integrated (complete only if applicable)	Point out the month of the BEYOND project when integration becomes achievable	Do you plan to integrate with the EU Node Core service, after integrating with the EOSC Beyond pre-production environment?
AAI	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	No clear plan, EGI Check-In and EOSC EU Node solution are different	Not sure what EU Node solution is		yes
Service Accounting	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	compute services already integrated with EGI solution	it's not clear whether integration with EU Node is expected, on which level		no
Service Monitoring	Pre-Integrated	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)	compute services already integrated	it's not clear whether integration with EU Node is expected, on which level		yes
Research Product Accounting	Not applicable			currently included in service accounting		no
Resource Catalogue	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)	subset (compute services) quickly, the remaining services later			yes
Order Management	Not applicable			No experience, no idea what it provides		no
Helpdesk	Pre-Integrated	I run my own core service for this capability in my node and would like it to federate it with other nodes	national RT integrated			yes
PID Service	No idea			No experience, no idea what it		

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

				provides		
Marketplace	No idea			No experience, no idea what it provides		
Interoperability Framework Registry	No idea			No experience, no idea what it provides		
Messaging System	Not applicable			No idea why national EOSC should be integrated		no

Table 3 - e-INFRA CZ service integration plan

7.2. EGI Pilot Node

EOSC BEYOND INTEGRATION SANDBOX					
Service/Capability	Node name	Type of integration	Scope of integration	Timeline	Integration with EU Node Core service
	EGI Pilot Node	Please choose how do you wish to leverage Innovation Sandbox capability	Describe what part of the node Exchange resources are in the scope of chosen status and foreseen results from the user perspective	Point out the month of the BEYOND project when integration becomes achievable	Do you plan to integrate with the EU Node Core service, after integrating with the EOSC Beyond pre-production environment?
AAI	Pre-Integrated		EGI Check-in already integrated with EOSC AAI	NA	NA
Service Accounting	Planned		useful for tracking usage of consumable services	M12	M18
Service Monitoring	Pre-Integrated		useful for ensuring high-quality service delivery and high quality user experience	NA	NA
Research Product Accounting	Planned		understand relative levels of interest by other users in particular items of data		
Resource Catalogue	Planned		expose EGI Node resources to EU Node, vice versa	M12	M18
Order Management	Planned		trigger access to services or data after selection.	M12	M18
Helpdesk	Planned		support users	M12	M18
PID Service	Planned		uniquely reference new services. Not likely to be used for data, since data in EGI Node would come from other sources	M12	M18
Marketplace	Not applicable		Implement front-end based on resource catalogue. Beneficial to provide high quality user experience, but user's data cannot be federated across different front-ends in different nodes		
Interoperability Framework Registry	Planned		manage interoperability of resources – data to services, service-to-service	M12	M18

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

Messaging System	Pre-Integrated		support exchange of non-accounting data provided by different services (e.g. event and transaction logging for compliance purposes)	NA	NA
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Table 4 - EGI service integration plan

7.3. Instruct ERIC

EOSC BEYOND INTEGRATION SANDBOX						
	Node name	Type of integration	Scope of integration	Comment	Timeline	Integration with EU Node Core service
Service/Capability	Instruct-ERIC	Please choose how do you wish to leverage Innovation Sandbox capability	<i>Describe what part of the node Exchange resources are in the scope of chosen status and foresee results from the user perspective*</i>	<i>A short explanation why the service will not be integrated (complete only if applicable)</i>	<i>Point out the month of the BEYOND project when integration becomes achievable</i>	<i>Do you plan to integrate with the EU Node Core service, after integrating with the EOSC Beyond pre-production environment?</i>
AAI	Pre-Integrated	I run my own core service for this capability in my node and would like it to federate it with other nodes	LS AAI already integrated		6 months	yes
Service Accounting	Not applicable			Not clear if this is needed		
Service Monitoring	Pre-Integrated	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)	Service monitoring used to monitor uptime of public facing platform services and provide a user facing dashboard	Integrated as part of the EOSC-Future project	8 months	yes
Research Product Accounting	Not applicable			Not clear if this is needed		
Resource Catalogue	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	Instruct already maintains a catalogue which can be syndicated to a wider audience		12 months	yes
Order Management	Not applicable			Instruct ARIA platform already handles this		
Helpdesk	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	Receive helpdesk messages into Instruct's helpdesk platform		6 months	yes
PID Service	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	Minting PID from within the Instruct node and (potentially) federate those with the wider network		12 months	yes
Marketplace	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer	As part of onboarding of resource catalogue		18 months	yes

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

		data sharing matrix)				
Interoperability Framework Registry	Not applicable					
Messaging System						

Table 5 - INSTRUCT-ERIC service integration plan

7.4. LifeWatch ERIC

EOSC BEYOND INTEGRATION SANDBOX						
Service/ Capability	Node name	Type of integration	Scope of integration	Use case	Timeline	Integration with EU Node Core service
	LifeWatch	Please choose how do you wish to leverage Innovation Sandbox capability	<i>Describe what part of the node Exchange resources are in the scope of chosen status and foresee results from the user perspective*</i>	<i>Describe how a specific user or group of users will interact with a system or service to achieve a particular goal</i>	<i>Point out the month of the BEYOND project when integration becomes achievable</i>	<i>Do you plan to integrate with the EU Node Core service, after integrating with the EOSC Beyond pre-production environment?</i>
AAI	Planned	I want to use EOSC Beyond's Core service only for my node's operation.	Integration with: - the LifeWatch ERIC Metadata Catalogue, for the section related to the editor of the resources - LifeBlock, to allow users to access the service - helpdesk, to allow users to create tickets	- a user that would like to add a resource to the LifeWatch ERIC Metadata Catalogue will login using her/his EOSC account - a registered user will access the LifeBlock environment using er/his EOSC account - helpdesk users can open a ticket using their EOSC account	4 months after the deploy of EOSC pre-production	
Service Accounting	Not applicable					
Service Monitoring	Planned	I want to use EOSC Beyond's Core service only for my node's operation.	Services in the scope: - LifeWatch ERIC Metadata Catalogue and atalogue entries (where applicable) - LifeBlock - Helpdesk	The e-infrastructure technicians will have a dashboard to monitor the state of the services and alerts via e-mail could be sent in case of alarms	6 months after the deploy of EOSC pre-production	
Research Product Accounting	Not applicable					
Resource Catalogue	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	Services in the scope: - the LifeWatch ERIC Metadata Catalogue will federate resources coming from the EOSC Resource Catalogue and vice versa will expose its own resources to the EOSC - LifeBlock will harvest data from the EOSC nodes, secure them and make it interoperable with the LW VREs	- a user can search resources in the LifeWatch ERIC Metadata Catalogue or in the EOSC resource Catalogue finding the same results - a registered user can access the LifeBlock system and manage also the data coming from the other EOSC nodes	12 months after the deploy of EOSC pre-production	
Order Management	Not applicable					

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

Helpdesk	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	Service in the scope: - Helpdesk, a user can open a ticket related to the EOSC network on the LifeWatch ERIC Helpdesk	- users can open a ticket on the LifeWatch ERIC Helpdesk related to EOSC issues, the ticket will be forwarded by the system to the EOSC Helpdesk, the user can follow the state of the ticket until it will not be solved.	6 months after the deploy of EOSC pre-production	
PID Service	Not applicable					
Marketplace	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)	Services in the scope: - the LifeWatch ERIC Metadata Catalogue will federate resources coming from the EOSC Resource Catalogue and vice versa will expose its own resources to the EOSC - LifeBlock will harvest data from the EOSC nodes, secure them and make it interoperable with the LW VREs	TBD	18 months after the deploy of EOSC pre-production	
Interoperability Framework Registry	Pre-Integrated		All LifeWatch ERIC services are available through APIs, so we are interested in expanding our interoperability framework in both directions. Not sure if it is under scope of this point.			
Messaging System	Pre-Integrated		Not sure what it is. Interested and ready for interoperability between our systems and EOSC central/federated services.			

Table 6 - LifeWatch ERIC service integration plan

7.5. METROFOOD-RI

EOSC BEYOND INTEGRATION SANDBOX							
	Node name	Type of integration	Scope of integration	Use case	Comment	Timeline	Integration with EU Node Core service
Service/ Capability	METROFOOD-RI	Please choose how do you wish to leverage Innovation Sandbox capability	Describe what part of the node Exchange resources are in the scope of chosen status and forseen results from the user perspective*	Describe how a specific user or group of users will interact with a system or service to achieve a particular goal	A short explanation why the service will not be integrated (complete only if applicable)	Point out the month of the BEYOND project when integration becomes achievable	Do you plan to integrate with the EU Node Core service, after integrating with the EOSC Beyond pre-production environment?

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

AAI	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	METROFOOD-RI currently has its own AAI. Connection to EOSC AAI is planned, so that users use one login	Users will use only one login.	-	Cannot define timeline until the scope of work is known	yes
Service Accounting	Not applicable				METROFOOD-RI is doing this on its own		
Service Monitoring			METROFOOD-RI currently has its own monitoring (Nagios, with active development of Kubernetes), but would like to consider connecting to EOSC monitoring	METROFOOD will be able to monitor the services provided	-	Not part of EOSC Beyond but open to check	
Research Product Accounting	Not applicable				METROFOOD-RI is doing this on its own		
Resource Catalogue	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	METROFOOD-RI's catalogues would be connected to the EOSC Catalogue	METROFOOD will be able to include their resources in the bigger EOSC Catalogue	-	Cannot define timeline until the scope of work is known	yes
Order Management			Order management may be a part of the catalogues, especially if Marketplace is really the "User view"	Users will browse service catalogues and order		Not part of EOSC Beyond but open to check	
Helpdesk	Planned	I want to use EOSC Beyond's Core service only for my node's operation.	METROFOOD-RI's is interested in a helpdesk and would like to discuss the one developed by KIT	Users will be able to provide issues experienced when using services		Not part of EOSC Beyond but open to check	
PID Service			METROFOOD does not have PID service and would like to find out what is available and how can it be used	If user uploads a new research outcome to a repository, PID is automatically assigned		Not part of EOSC Beyond but open to check	
Marketplace			If Marketplace is the "User view" of the resource catalogue, it may be interesting				

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

Interoperability Framework Registry			Would be interesting for METROFOOD to register APIs in a central registry but need more explanations. Does that mean that there can be support in integration among data obtained by different facilities or services?				
Messaging System			Not sure what this is				

Table 7 - METROFOOD RI service integration plan

7.6. NFDI

EOSC BEYOND INTEGRATION SANDBOX						
Service/ Capability	Node name	Type of integration	Scope of integration	Comment	Timeline	Integration with EU Node Core service
	NFDI	Please choose how do you wish to leverage Innovation Sandbox capability	Describe what part of the node Exchange resources are in the scope of chosen status and foresee results from the user perspective*	A short explanation why the service will not be integrated (complete only if applicable)	Point out the month of the BEYOND project when integration becomes achievable	Do you plan to integrate with the EU Node Core service, after integrating with the EOSC Beyond pre-production environment?
AAI	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	Access to services via AAI proxies (AuthN via IdPs, AuthZ via VOs)		16	yes
Service Accounting	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	Forwarding of aggregated accounting values		24	yes
Service Monitoring	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	Forwarding of service status planned: up, down, maintenance		24	yes
Research Product Accounting	Not applicable			currently included in service accounting		
Resource Catalogue	Planned	I want to use EOSC Beyond's Core service only for my node's operation.	Offers a machine-actionable endpoint for listing resources/services for harvesting by other		20	

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

			catalogues			
Order Management	Not applicable			Users wishing to get access to a restricted resource need to submit a ticket to the helpdesk for ordering (possibly restricted to VOs)	-	
Helpdesk	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes				20 yes
PID Service	Not applicable			We are planning to use separate PID services (per institution, no further plans for federation at the moment)	-	
Marketplace	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	forward resource catalogue in a technical manner to other EOSC nodes and forward users to the already existing cloud portal			22 maybe
Interoperability Framework Registry	Planned	I want to use EOSC Beyond's Core service only for my node's operation.	Developed adapters will be available for everyone			24
Messaging System	Planned	I want to use EOSC Beyond's Core service only for my node's operation.	Data exchange (service listings, monitoring/accounting data) with other nodes			24

Table 8 - NFDI service integration plan

7.7. NI4OS

EOSC BEYOND INTEGRATION SANDBOX						
	Node name	Type of integration	Scope of integration	Use case	Timeline	Integration with EU Node Core service
Service/ Capability	NI4OS	Please choose how do you wish to leverage Innovation Sandbox capability	Describe what part of the node Exchange resources are in the scope of chosen status and forseen results from the user perspective*	Describe how a specific user or group of users will interact with a system or service to achieve a particular goal	Point out the month of the BEYOND project when integration becomes achievable	Do you plan to integrate with the EU Node Core service, after integrating with the EOSC Beyond pre-production environment?

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

AAI	Pre-Integrated	I run my own core service for this capability in my node and would like it to federate it with other nodes	Primarily web-based service will be integrated with the AAI, but we would like to achieve such integration for other types of services as well.	Users will utilize the provided API for authentication and authorization purposes.	For demonstration purposes, we will integrate one NI4OS-Europe service once the corresponding API is provided.	Only if it becomes mandatory.
Service Accounting	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	It is necessary for all resources at the exchange layer to integrate with the accounting system.	Users will use the API provided to gather information about service usage.	For demonstration purposes, we will integrate one NI4OS-Europe service once the corresponding API is provided.	Only if it becomes mandatory.
Service Monitoring	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	It is necessary for all resources at the exchange layer to integrate with the monitoring system.	Users will need to prepare service-specific probes for integration into the monitoring system.	For demonstration purposes, we will prepare a set of probes for one NI4OS-Europe service.	Only if it becomes mandatory.
Research Product Accounting	Planned	I want to use EOSC Beyond's Core service only for my node's operation.	It is necessary for all repositories at the exchange layer to integrate with this system.	We anticipate that this will be carried out automatically by the OpenAIRE services.		yes
Resource Catalogue	Planned	I want to use EOSC Beyond's Core service only for my node's operation.	This is mandatory for all resources.	All resources within NI4OS-Europe will be registered manually or semi-automatically if possible, in the catalogue.	Once the resource catalogue becomes available, we will begin the registration process.	Yes
Order Management	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)	We anticipate this to happen automatically once the resource is added to the catalogue.	Providers will receive notifications about orders based on the information provided in the catalogue.		yes
Helpdesk	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	This is mandatory for all resources.	Users will need to provide a support email address.	This will be completed as part of the registration process.	Only if it becomes mandatory.
PID Service	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	This is mandatory for all resources.	We anticipate that this will be carried out automatically.		Only if it becomes mandatory.
Marketplace	Planned	I run my own core service for this capability in my node and would like it to federate it with other nodes	We anticipate this to happen automatically once the resource is added to the catalogue.			Only if it becomes mandatory.
Interoperability Framework Registry						

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

Messaging System						
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Table 9 NI4OS service integration plan

7.8. CESSDA

EOSC BEYOND INTEGRATION SANDBOX						
Service/ Capability	Node name	Type of integration	Scope of integration	Comment	Timeline	Integration with EU Node Core service
	CESSDA	Please choose how do you wish to leverage Innovation Sandbox capability	<i>Describe what part of the node Exchange resources are in the scope of chosen status and foreseen results from the user perspective*</i>	<i>A short explanation why the service will not be integrated (complete only if applicable)</i>	<i>Point out the month of the BEYOND project when integration becomes achievable</i>	<i>Do you plan to integrate with the EU Node Core service, after integrating with the EOSC Beyond pre-production environment?</i>
AAI	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)				YES
Service Accounting	Not applicable					
Service Monitoring	Planned					YES
Research Product Accounting	Not applicable					
Resource Catalogue	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)				YES
Order Management	Not applicable					
Helpdesk	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)				YES
PID Service	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)				YES
Marketplace	Pre-Integrated	I run my own core service for this capability in my node and would like it to federate it with other nodes				YES

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

Interoperability Framework Registry	Planned					YES
Messaging System	Not applicable					

Table 10 - CESSDA service integration plan

7.9. CNB-CSIC

EOSC BEYOND INTEGRATION SANDBOX						
Service/ Capability	Node name	Type of integration	Scope of integration	Comment	Timeline	Integration with EU Node Core service
	CNB-CSIC	Please choose how do you wish to leverage Innovation Sandbox capability	<i>Describe what part of the node Exchange resources are in the scope of chosen status and foreseen results from the user perspective*</i>	<i>A short explanation why the service will not be integrated (complete only if applicable)</i>	<i>Point out the month of the BEYOND project when integration becomes achievable</i>	<i>Do you plan to integrate with the EU Node Core service, after integrating with the EOSC Beyond pre-production environment?</i>
AAI	Possibly	I want to use EOSC Beyond's Core service only for my node's operation.	We will consider using to facilitate users retrieve their private outputs after executing our services	It depends on the level of detail provided for user data.	Month 35	
Service Accounting	Possibly	I want to use EOSC Beyond's Core service only for my node's operation.	We will use it to collect usage info for our online resources	It depends on what info will be recorded from users (e.g. location)	Month 35	
Service Monitoring	Pre-Integrated	I want to use EOSC Beyond's Core service only for my node's operation.	We will use it to collect stability and availability statistics for our online resources	Pre-Integrated = As part of EOSC Future, we have experience to integrate the Service Monitoring with other of our services (3DBionotes-WS)	Month 17	
Research Product Accounting	Possibly	I want to use EOSC Beyond's Core service only for my node's operation.	We will use it to collect usage info for our data	It depends on what info will be recorded from users (e.g. location)	Month 35	
Resource Catalogue	Planned	I want to use EOSC Beyond's Core service only for my node's operation.	We will use it to ensure findability and accessibility for our services and data to the community		Month 17	
Order Management	Not applicable			Our services do not require Order Management. However, we will use Order Management as consumers to ask for computing and storage resources to		

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

				launch VRS.		
Helpdesk	Pre-Integrated	I want to use EOSC Beyond's Core service only for my node's operation.	We will use it to manage issues or feedback from our users	Pre-Integrated = As part of EOSC Future, we have experience to integrate the Helpdesk with other of our services (3DBionotes-WS)	Month 17	
PID Service	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)	We will use it to create PID for our validation data after executing VRS on EMDB and PDB entries		Month 17	
Marketplace	Planned	I want to use EOSC Beyond's Core service only for my node's operation.	We will use it to ensure findability and accessibility for our services and data to the community		Month 17	
Interoperability Framework Registry			no data	no data	no data	no data
Messaging System			no data	no data	no data	no data

Table 11- CNB-CSIC service integration plan

7.10. ENES

EOSC BEYOND INTEGRATION SANDBOX						
Service/ Capability	Node name	Type of integration	Scope of integration	Comment	Timeline	Integration with EU Node Core service
	ENES	Please choose how do you wish to leverage Innovation Sandbox capability	<i>Describe what part of the node Exchange resources are in the scope of chosen status and forseen results from the user perspective*</i>	<i>A short explanation why the service will not be integrated (complete only if applicable)</i>	<i>Point out the month of the BEYOND project when integration becomes achievable</i>	<i>Do you plan to integrate with the EU Node Core service, after integrating with the EOSC Beyond pre-production environment?</i>
AAI	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)	Access to services via AAI proxy (AuthN via IdPs, AuthZ via VOs)		No defined timeline yet (tentatively, by M12)	perhaps, currently under evaluation
Service Accounting	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)	Tracking usage of consumable services		No defined timeline yet (tentatively, by M12)	perhaps, currently under evaluation
Service Monitoring	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)	Monitoring of service performance (availability, reliability)		No defined timeline yet (tentatively, by M12)	perhaps, currently under evaluation

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Research Product Accounting	Not applicable			Not relevant at this moment		
Resource Catalogue	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)	ENES resources could be exposed to the EOSC Catalogue		No defined timeline yet (tentatively, by M12)	perhaps, currently under evaluation
Order Management	Not applicable			Not interested		
Helpdesk	Not applicable			Not relevant at this moment		
PID Service	Planned	I want to use EOSC Beyond's capability and federate its output data with other nodes (refer data sharing matrix)	Assignment of PIDs to provenance products to enhance findability and citability.		No defined timeline yet (tentatively, by M12)	perhaps, currently under evaluation
Marketplace	Not applicable			Is there a difference with resource catalogue? Planned, if it is the UI for the Resource Catalogue		
Interoperability Framework Registry	Not applicable			Not interested		
Messaging System	Not applicable			Not interested		

Table 12 - ENES service integration plan

8. Further integrations - exploration of node-to-node connectivity in the Network of Pilot Nodes

EOSC Federation emerges as a new landscape of interconnected nodes. Understanding what the relations between nodes are should be derived from real life scenarios and emerging needs that foster open science, collaborative environments, and excellent science.

Expanding on the user stories, EOSC Beyond Pilot Nodes explored how services could be exploited across the Network of Pilot Nodes leading to node-to-node connectivity in ways that would support the implementation of the Pilot Nodes. Understanding these types of relationships and whether there are existing or emerging patterns would help in the formation and evolution of the Network itself.

E.g. Research Infrastructures are in many cases federated and they also collaborate on higher aggregates e.g. like the science clusters on specific domains such as environmental, social science and humanities etc. Building on existing network would accelerate the establishment and evolution of such connections.

Nodes can establish provider to consumer relationships as well as agreements on how to operate a specific service in a joint manner a.k.a. federated capabilities, in compliance with a set of well-defined interfaces made available through the EOSC Interoperability Framework.

Finally, although not in the scope of this WP or EOSC Beyond, some of the contributing entities to the Network have already existing legal establishments that could potentially act as the legal authority needed to represent a Node. E.g. Many RIs are established as an ERIC⁵.

The Pilot Nodes explored how the consumption of services and federated capabilities from other Nodes through a “shopping mall” exercise where service offer from each of the Nodes was represented in collaborative panels. Equally service needs for each of the Nodes were represented on a separate panel and a potential match was identified from the service offer panel of a given node. While many of the matches were done with the EU Node, there were emerging matches based on consumption needs and federating capabilities.

e.g. The offering/need of a federated storage service, a provenance service for the Network, e-infrastructures services to scale up EU Node offering. For those groups of Nodes with similar interests dedicated streams of work will be created to understand how federated capabilities among Nodes can emerge from all the Pilot Nodes in addition to those offered by the EU Node.

5

https://research-and-innovation.ec.europa.eu/strategy/strategy-2020-2024/our-digital-future/european-research-infrastructures/eric_en

D15.1 Service integration plans of the Data Spaces and EOSC Pilot Nodes

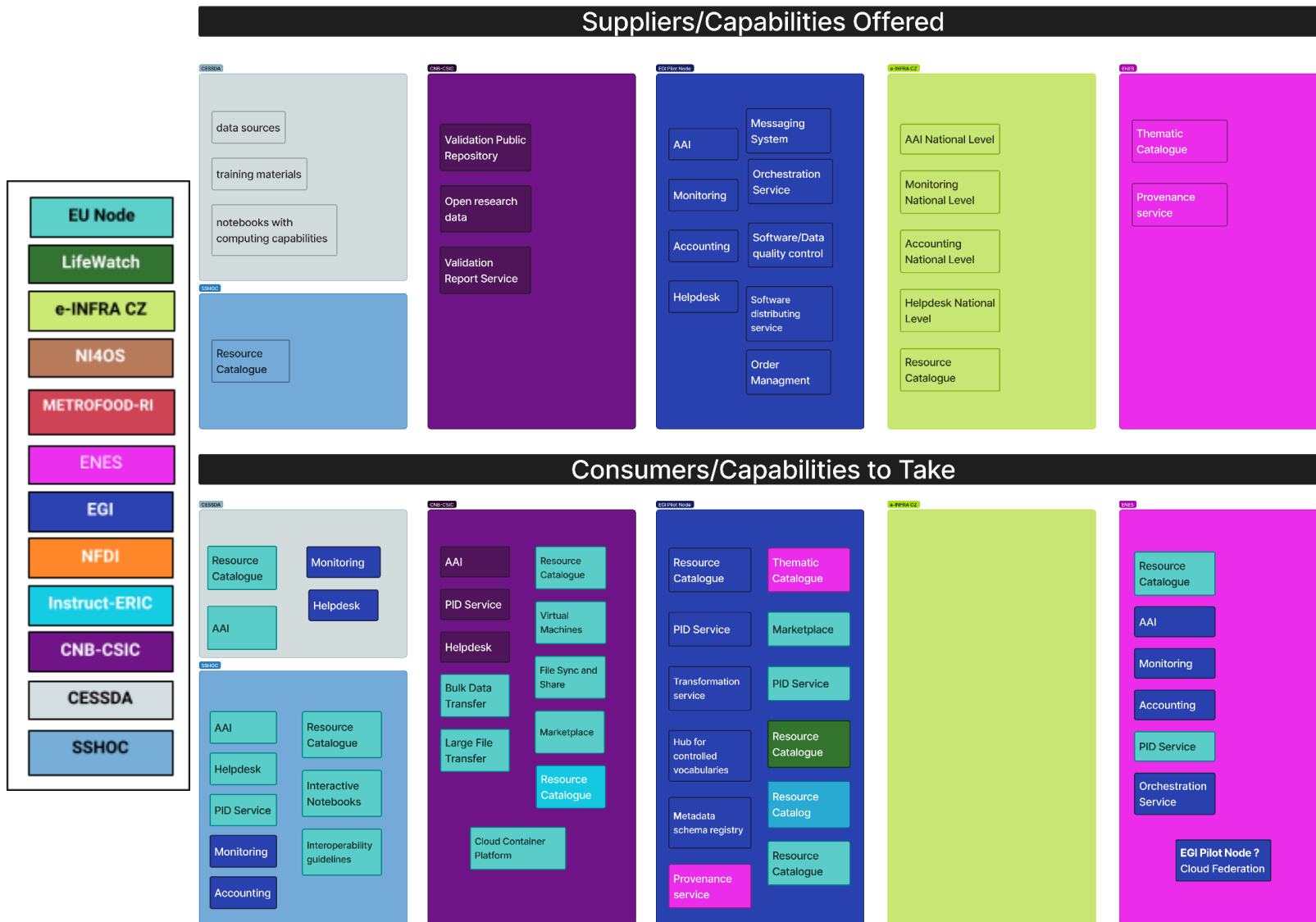


Figure 3 - shopping mall - nodes interconnections - Part 1

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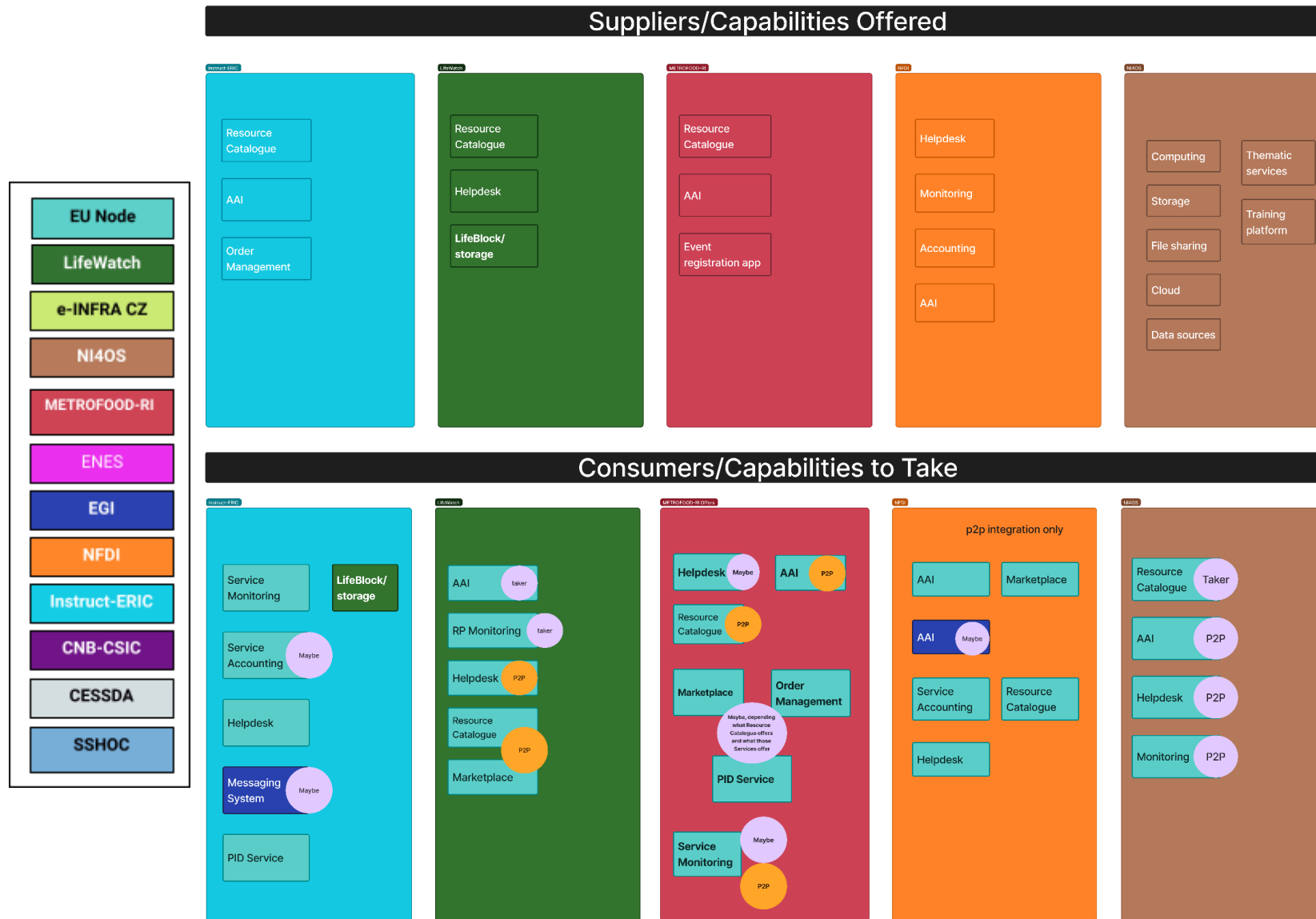


Figure 4 - Shopping mall - nodes interconnections - Part 2

A preliminary map was established based on the input provided by the contributing Pilots.

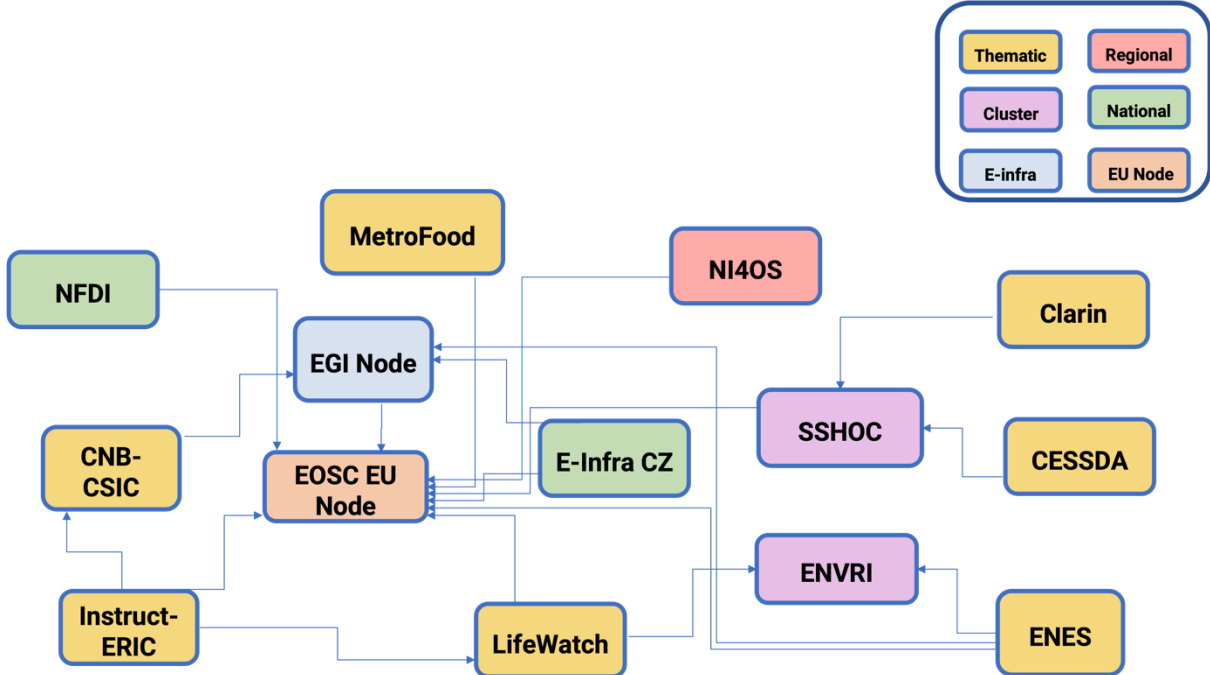


Figure 5 - Preliminary connections between Pilot activities

Connections presented in Figure 5 are envisioned and may not all become part of the integration plans within the scope of EOSC beyond. e.g. those established with the science clusters.

9. Summary and next steps

The findings presented in this document summarise the start phase of the Pilot Nodes activities. During this early phase (M1-M4), WP15 has focused on the gathering of information to categorise Pilot Nodes and identify first user-driven stories and user journeys that will drive the next steps of the implementation plans.

Pilot Nodes and Service owners will work closely in the integration of services with the EOSC Platform through the EOSC Innovation Sandbox. Next steps will formalise user driven journeys into requirements feeding into the Design phase of the Next Generation of EOSC Core Services (WP7), the EOSC Integration Suite (IS) and Execution framework (WP10).

The close collaborations established with the EU Node contractors as presented in EOSC Beyond deliverable D5.1 will ensure that interfaces between the Sandbox and the EU Node are interoperable. Integrations with the Sandbox environment will allow the Pilot Nodes to test and validate their services with the EOSC Platform and move their solutions towards production ready environments such as the EU Node expanding the overall capabilities of the EOSC Federation.

The methodology presented in the document is meant to provide an agile process to frame the technological roadmap of EOSC Beyond driven by real user needs in the context of the EOSC Federation.

Pilot Nodes participants of EOSC Beyond collectively discussed the evolution of the EOSC landscape into a Network of Pilot Nodes and will follow closely the activity developing to formalise the landscape such as the EOSC Handbook to be presented in Q3 at the EOSC Symposium.

The methodology presented therefore provides an iterative process to accommodate new potential requirements emerging from the EOSC landscape. Pilot Nodes activities will be key to test and validate the EOSC Core Platform delivered in EOSC Beyond ensuring that innovation services are always delivering user driven requirements. The innovations derived from these requirements will pave the next generation of the ECP feeding potentially into current developments of the EU Node when applicable or into future roadmaps for its evolution.

10. Acronyms

Term	Definition
AAI	Authentication and Authorization Infrastructure
AMS	ARGO Messaging Service
API	Application Programming Interface
ARIA	Cloud platform for Access and Facility management
B2B	Business to Business
B2C	Business to Consumer
CESSDA	Consortium of European Social Science Data Archives
CERN	European Organization for Nuclear Research
CLARIN	Common Language Resources and Technology Infrastructure
CMCC	Euro-Mediterranean Center on Climate Change
CNB-CSIC	National Biotechnology Center Spanish National Research Council
CYFRONET	Academic Computer Centre Cyfronet AGH
DARIAH	Digital Research Infrastructure for the Arts and Humanities
DOI	Digital Object Identifier
EB	EOSC Beyond
ENES	European Network for Earth System Modelling
ENVRI	Environmental Research Infrastructures
EOSC	European Open Science Cloud
ERIC	European Research Infrastructure Consortium
FAIR	Findable, Accessible, Interoperable, Reusable
GRNET	Greek Research and Technology Network
KIT	Karlsruhe Institute of Technology
LW	LifeWatch
METROFOOD-RI	Infrastructure for promoting Metrology in Food and Nutrition
NFDI	German National Research Data Infrastructure
NI4OS	National Initiatives for Open Science in Europe
OSCARs	Open Science Clusters' Action for Research and Society
PID	Persistent Identifier

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Term	Definition
RI	Research Infrastructure
SSHOC	Social Sciences and Humanities Open Cloud
SLA	Service Level Agreement
TCB	Technical Coordination Board
VRE	Virtual Research Environments
VR	Virtual Reality