CatRIS

Catalogue of Research Infrastructures Services

Horizon 2020 CSA

WP3 User needs and requirement elicitation
Deliverable 3.4 "Concept note for CatRIS"

Main Authors:

Vladimir Cvijanović, EFIS

Giorgos Giannopoulos, NKUA

Anna Kamenskaya, CTLS

Alasdair Reid, EFIS

Jorge-A. Sanchez-P., JNP

Due date of deliverable: 30 June 2019

Actual submission date: 2 August 2019

Dissemination level: PU

List of Contributors

Partner	Acronym	Partner name	Name of Contributor
2	EFIS Centre	European Future Innovation System Centre (EFIS)	Vladimir Cvijanović Alasdair Reid
3	JNP	JNP Strategy & Management Consulting	Jorge Sanchez Panos Spyrou Nikos Vogiatzis
4	EUROCEAN	Fundacao EurOcean	Margherita Zorgno
5	CTLS	Core technologies for life sciences	Anna Kamenskaya Patrick England
6	NKUA	National Kapodistrian University of Athens	Giorgos Giannopoulos George Papastefanatos

Document Revision History

Date	Version	Author/Reviewer	Summary of changes
09.05.2019	0.1	Vladimir Cvijanović	Draft structure of the deliverable done.
27.05.2019	0.2	Jorge-A. Sanchez-P.	Chapter 2 drafted.
05.06.2019	0.3	Giorgos Giannopoulos George Papastefanatos	Chapters 3 and 4 drafted.
07.06.2019	0.4	Vladimir Cvijanović	Chapter 1 drafted; review of the document.
08.06.2019 - 19.06.2019	0.5	Jorge-A. Sanchez-P., Vladimir Cvijanović, Giorgos Giannopoulos, Panos Spyrou	Review and modifications of the document
20.06.2010	0.6	Vladimir Cvijanović and Panos Spyrou	Formatting and review of the document.
01.07.2019	0.7	Vladimir Cvijanović	Revising basis of comments by partners and the 1st focus group.
11.07.2019	0.8	Vladimir Cvijanović	Integration of the findings from the 2nd and the 3rd focus groups; revising the document; Summary and Conclusion written.
15.07.2019	1.0	Alasdair Reid	Final review
25.07.2019	1.1	Vladimir Cvijanović	Final revision based on comments by partners.

TABLE OF CONTENTS

List of Annexes

Annex 1: Questions for the focus groups

List of Tables

List of Figures

Definitions

Short name	Definition
Core Facility (CF)	Core Facilities are shared and typically physical resource infrastructures for scientific research of a smaller scale than Research Infrastructures.
E-infrastructure	'e-Infrastructures address the needs of European researchers for digital services in terms of networking, computing and data management' (https://ec.europa.eu/digital-single-market/en/e-infrastructures)
Research Infrastructure (RI)	'Research Infrastructures are facilities that provide resources and services for research communities to conduct research and foster innovation. They can be used beyond research e.g. for education or public services and they may be single-sited, distributed, or virtual' (https://ec.europa.eu/info/research-and-innovation/strategy/european-research-infrastructures_en).

Acronyms

Abbreviation	Meaning
CF	Core Facility
DOI	Digital object identifier
EOSC	European Open Science Cloud
ESFRI	European Strategy Forum on Research Infrastructures
RI	Research Infrastructure
SDT	Service description template
SLA	Service-level agreement
SSRs	Shared Scientific Resources

TRL	Technology readiness level
UI	User interface

Summary

D3.4 provides support for the development of the CatRIS Portal, the core of which is the catalogue of research infrastructures' (RIs') services and resources. An open, trusted and user-friendly portal will support a harmonised and aggregated catalogue of RI services and resources that span both national and European levels. In addition, the catalogue should support and be interoperable with the European Open Science Cloud (EOSC) Catalogue. The deliverable addresses the suggested typology of RI services, the service catalogue content and its main functionalities.

The CatRIS Portal and catalogue concept presented is based on background research done by the CatRIS consortium. The main building blocks have undergone an additional verification in the focus groups sessions with members of the RI community: policy makers/funders, RI users and RI managers. The feedback has addressed the typology of RI services, service catalogue content and its main functionalities.

The service catalogue content will be produced on the basis of the suggested EOSC-compatible service description template that is revised on a rolling basis. It comprises the following information: basic information, classification information, maturity information, contractual information, support information, contact information as well as service level targets and performance information. The way this information will be organised on the gateway follows best practices and is well illustrated in preliminary mockups. The main functionalities for the CatRIS Portal will be implemented in three phases, each implementing one of the following blocks of functionalities: 1) service registration, searching and browsing functionality, 2) visualisation and analytics facilities, as well as interoperability mechanisms, and 3) rating, recommendation, comparison, favourites creation and extended searching and visualisation facilities.

The focus groups provided an overall positive feedback for the CatRIS concept. In addition, there were several helpful suggestions towards designing a user-friendly catalogue tailored to the needs of each of the above mentioned groups. While the typology/classification of services and resources was not contested as such, there were nevertheless suggestions for clarifications for two categories and improvements at the third level of classification. This important feedback has been taken into account in the development of the Portal and the Catalogue.

Introduction

This deliverable provides support for the development of the CatRIS gateway, the core of which is the catalogue of research infrastructures' (RIs') services and resources. An open, trusted and user-friendly portal will support a harmonised and aggregated catalogue of RI services and resources that exist at both national and European levels. In addition, the catalogue should support and be interoperable with the European Open Science Cloud (EOSC) catalogue. The deliverable addresses the suggested typology of RI services and the service catalogue content and its main functionalities.

The EOSC, an initiative of the European Commission, aims to provide European researchers with seamless access to a wide range of open science services across disciplines by mitigating technical and policy fragmentation in service access and provisioning. In this context, the EOSC seeks to provide a 'federated, globally accessible environment where researchers, innovators, companies and citizens can publish, find and re-use each other's data and tools for research, innovation and educational purposes' that 'operates under well-defined and trusted conditions, supported by a sustainable and just value for money model' (Ayris et al. 2016: 8).

Following the publication of the Commission Staff Working Document (SWD) of March 2018 on the Implementation of the EOSC, a joint effort by the European Commission, the Member States and four projects (EOSCPilot, eoscpilot.eu; eInfraCentral, www.einfracentral.eu; OpenAIRE-Advance, www.openaire.eu/advance; EOSC-Hub, www.eosc-hub.eu) led to the successful development of the first version of the EOSC Portal for the EOSC launch in November 2018. This first version of the EOSC Portal included the EOSC catalogue (built on the basis of the eInfraCentral project's catalogue technology) including the main EOSC contributors, i.e., aggregators of thematic and regional initiatives and clusters, e-Infrastructures service and data resource providers (SPs) offering more than 300 services and resources to European researchers, with more to come.

From 2019, a suite of additional projects has been launched including: OCRE, EOSC-Life, PaNOSC, ESCAPE, ENVRI-FAIR, SSHOC, BE OPEN, and EOSC-Nordic, NI4OS-Europe, EOSC-Pillar, ExPaNDS, EOSC-synergy, etc. It is expected that the services and resources from these projects will be included over time in the EOSC catalogue and marketplace.

The CatRIS project aims to extend the EOSC catalogue by focusing on physical RIs, Core Facilities (CFs) and Shared Scientific Resources (SSRs) at European and national levels (all hereinafter referred to as RIs).

Currently, RIs provide information about their services/resources mostly in free formats via their individual websites with varying degrees of completeness and detail; the implementation of service management and processes for service portfolio management, service level management, etc. as provided by standards and frameworks are at different levels of maturity. Many RIs have no descriptions of their services and do not make them publicly available; many have no link to services in their websites, no service catalogue and for many the service descriptions are at an early or evolving stage.

At the current time, there is no unified online service catalogue that potential users of RIs could explore. The MERIL (portal.meril.eu/meril) and RICH (www.rich2020.eu) portals have been gathering information on RI services/resources and some preliminary work has been done already in terms of exploring ways to display this information in a structured way. Several initiatives at national level and within certain thematic areas have also established portals where information about services/resources is reported in some form. CatRIS is working on closing this gap.

To inform the CatRIS concept, the following evidence has been collected via a multidimensional research process:

- Ideas and opinions were gathered from potential users/customers of research infrastructure (RI) services, RI (service) managers/providers and policy makers and funders, through a Survey (D3.2). The survey, where a first set of user requirements and functionalities were listed, was constructed based on past experience of the consortium from other similar activities (i.e. EOSC Portal, eInfraCentral, MERIL). In particular it was based on eInfraCentral project's survey. Full Survey results are reported in D3.3 Report on the results of the survey on requirement elicitation.

- A total of 29 interviews were done with RI (service) managers, representatives of cross-border, regional networks of RIs, RI users and policy makers/funders. The interviews helped prioritise and enhance the set of user needs (implicit or explicit) and to record the preliminary perspective of the community in relation to the CatRIS objectives. This led to a first draft working list of requirements that was subsequently refined, and which was an early guide on the functional specifications process and the portal design. The full analysis of the interviews is presented in D3.1 Working note on typology of research infrastructure services.

- The preliminary results of the survey and the interviews were discussed in a validation workshop held in Brussels on 15 May 2019 with the participation of RI managers, users and policy makers (funders). Moreover, additional important feedback from the RI community was gathered and taken into account for the CatRIS concept. The validation

workshop results are reported in D3.1 Working note on typology of research infrastructure services.

- A state-of-play desk research was performed that compiled in a structured way existing catalogues, derived observations and gaps of European top level aggregators, thematic aggregators that focus in one or more scientific disciplines, regional aggregators that cover specific geographic areas, key European RIs and best practice catalogues at global level (reported in D4.1 Mapping and gap analysis of service catalogues/portfolios). Consortium partners have contributed towards identifying the existing and developing catalogues of RIs and RI aggregators.

- A detailed desk research was accomplished in D4.4 (Functional and non-functional requirements) that assessed a list of selected catalogues to derive functional and non-functional requirements of similar portals/systems. In this step the project partners identified additional repositories, catalogues and marketplaces and specific features that could be also applied on the CatRIS platform.

Finally, conclusions from above mentioned background research have been presented to three focus groups in the form of a draft concept note. The three focus groups brought together, respectively, RI policy makers/funders, RI users and RI managers. The aim was to collect additional feedback on the catalogue design and development. A first focus group, with policy makers/funders, was organised in Brussels on 27 June 2019, the second and the third were organised in Paris on 2 July 2019 and comprised RI managers and RI users, respectively.

This concept note presents the main conclusions and is structured as follows: Chapter 1 discusses the proposed typology/classification of RI services/resources. Chapter 2 presents the core information that is to be included in the CatRIS catalogue. Chapter 3 presents examples of how this information will be (re)presented online. Chapter 4 addresses the functional and non-functional requirements that will drive the CatRIS Portal development efforts. Chapter 5 presents an analysis of the focus groups' findings. The concluding section summarises the findings underlining the most important takeaways.

1 The proposed typology/classification of RI services/resources

The aim of the typology is to fit for the needs of specific RIs while facilitating a harmonisation with the EOSC catalogue (https://catalogue.eosc-portal.eu). To an extent, 'physical' RIs have different needs for the classification of services in comparison to e-infrastructures. We examine how the existing typology can be improved, starting from a two-level classification. We do so by considering ideas from the survey[1], interviews and the validation workshop[2].

The EOSC services classification has been modified and adapted on the basis of the results not only from CatRIS but also from other projects. As the basis for a discussion we consider an initial two-level version of the EOSC services classification for physical RIs and CFs (see Table 1). This typology concerns the first and the second level of RI and CF services and is therefore not scientific area-specific. A third-level classification is currently being developed in EOSC (see CatRIS D4.3[3]).

---

[1] The survey was done in the period 18 March – 10 May 2019 and gathered 207 responses. The classification of services included in the survey was the following one: 1) Access to facilities / instruments, 2) Access to data, 3) Access to samples, 4) Analysis service, 5) Material processing service, 6) Data management, 7) Software and applications, 8) Storage service, 9) Support service, 10) Training and education service, 11) Expertise (consultancy) service, advice, 12) Infrastructure management service and 13) Transport service and 14) Other (the category that respondents themselves could suggest).

[2] There were 29 interviews done in the period March – May 2019 with the following groups of professionals in the RI and CF community: users (8 interviews), managers/service providers (15), representatives of RI networks (4 interviews), and RI policy makers and funders (2 interviews). The validation workshop on 15 May 2019 in Brussels gathered 16 external participants comprising a mixed group of RI users, RI managers and RI policy makers/funders that discussed CatRIS concept and typology of RI services.

[3] CatRIS deliverable D4.3 Service description template.

Table 1: EOSC classification of services of physical RIs and CFs

1)	Access physical & e-Infrastructures
a)	Facility
b)	Instrument & equipment
c)	Material storage
d)	Data storage
2)	Sharing & discovery services
a)	Data
b)	Samples
c)	Software
d)	Applications
3)	Aggregators & integrators
4)	Processing & analysis
a)	Data management
b)	Data analysis
c)	Material analysis and processing
5)	Security & operations
a)	Operations & infrastructure management services
6)	Training and support
a)	Training
b)	Consultancy and support

Source: authors, based on initial CatRIS findings.

Based on the survey, interviews and the validation workshop, the RI typology that has emerged complements and/or modifies the aforementioned typology. The full analysis of the applicable findings forms part of CatRIS D3.1[4] and is presented here in a short and an adapted form. Survey respondents picked all of the aforementioned categories of services also suggesting some additional services, like 'statistics about RI usage', 'certification – benchmarking', 'e-infrastructure' (all of these have already been identified by EOSC, albeit at the third level of classification – see CatRIS D4.3[5]).

Potentially divergent opinions collected from the interviews and the validation workshop suggested that the future catalogue could include the following services:

1) a 'full service' (a service including several individual services);
2) provision of standards, common vocabularies, formats and software;
3) guesthouse and canteen;
4) logistics services and financial services;
5) 'knowledge transfer' (named as a horizontal service, i.e. that can be used across scientific disciplines)

The above-mentioned options were considered on the basis of the existing classification of services (see CatRIS D4.3 for a somewhat more advanced version). Starting from the top of the list, a 'full service' should not be understood as a separate service in the typology as it represents several services offered to a user. Rather, the functionality of the catalogue should allow a user to bundle together various services. The 'Provision of standards, common

---

[4] CatRIS deliverable D3.1 Working note on typology of research infrastructure services.
[5] CatRIS deliverable D4.3 Service description template.

vocabularies, formats and software' is a service that EOSC already partially considers as part of the (super)categories 2/6 and 2/8 ('Sharing and discovery' / 'data' and 'software'). However, it may be a good idea to explicitly mention these services at the third level of services' classification. As to 'guesthouse and canteen' and 'logistics services and financial services', these services had not been explicitly included as services although they are implied in the (super)category 4 Security & Operations / 16 Operations & Infrastructure Management Services. 'Knowledge transfer' should be introduced as a new type of service, as CatRIS currently only names 'technology transfer' under the (super)category 5 ('Training & Support' / 18 Consultancy & Support'). Namely, while technology transfer is typically limited to the intellectual property rights (IPR), knowledge transfer is broader, and it includes all forms of learning (between organisations).

To conclude, the current EOSC typology (applied to physical RIs and CFs) has proven to be quite comprehensive, especially at the first and second level of categorisation. Potential changes to the typology suggested could be introduced at the third level. The CatRIS Portal should consider them in the future implementation of the typology. This forms a separate part of work, laid out under CatRIS D4.3.

## 2   The core information to be included in the CatRIS Catalogue

A *Services and Resources Catalogue* aims to present in a well-organised manner the available services and resources that are on offer to a user/customer by a provider. It is the customer-facing list of all services and resources offered. Similarly to labels on goods or products, containing information on the good as well as pricing, services/resources and their attributes should be explained in a clear and structured manner to guide the user to find the right service.

The development and implementation of a catalogue is an essential step towards the transformation from a *technology-oriented* organisation into a *service-oriented* organisation. It is a means to communicate and provide clarity to users and customers (the main category being researchers) about the services available to them, to help improve customer relations by sharing information and managing customer expectations.

CatRIS aims to develop an open, trusted and user-friendly portal providing access to a harmonised and aggregated catalogue of RI services and resources offered at European and national levels. The CatRIS catalogue will be interoperable with the EOSC catalogue by employing formal processes; service registration and harvesting methods; single sign-on and seamless transitions to service/resource providers; rich browsing and visualisation functionality; user evaluation modules; and guided support towards effective and efficient use of RI services/resources.

The EOSC community recognised that a common approach to describing (goal-1) and exchanging (goal-2) service-related information is the way forward to enhance discoverability and thus potential uptake of services. The eInfraCentral project worked initially on harmonisation in partnership with five key e-infrastructures: GÉANT, OpenAIRE, PRACE, EGI and EUDAT. The approach was to promote and extend best practices followed independently by some of infrastructures and to enable the harmonisation of service descriptions in a single, common catalogue. This work has been extended within the EOSC Portal Collaboration Agreement of eInfraCentral, EOSC-hub and OpenAIRE-Advance and now the CatRIS project.

Figure 1: The EOSC Ecosystem
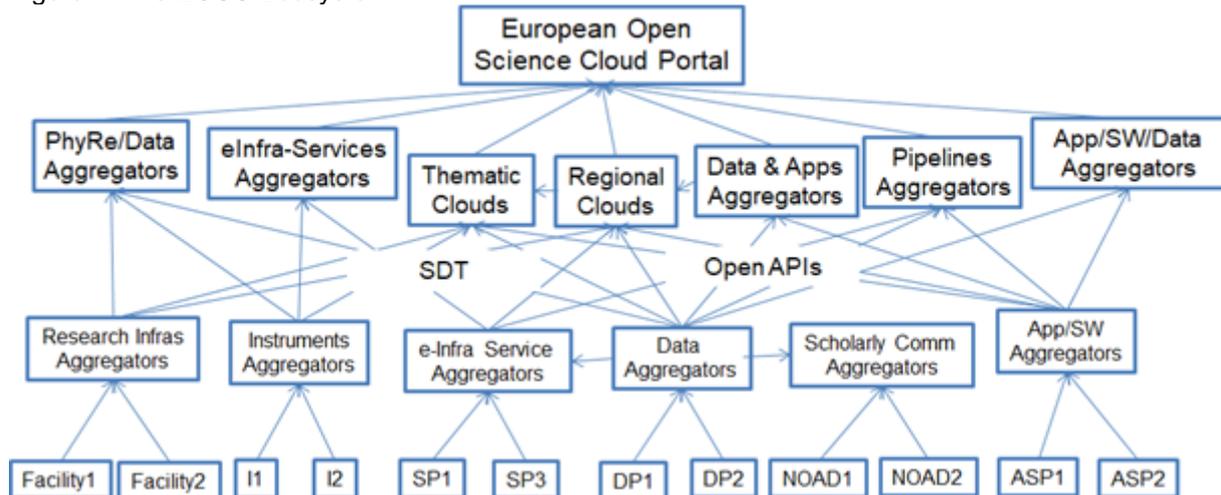
Note: PhyRe = Physical Resource; App/SW/Data = Applications/Software/Data; App/SW = Applications/Software; I1, I2 = Instrument 1, 2; SP1, SP2 = Service Provider 1, 2; DP1, DP2 = Data Provider 1, 2; NOAD 1, NOAD 2 = National Open Access Desk 1, 2; ASP1, ASP2 = Application Software Provider 1, 2.
Source: JNP, eInfraCentral project.

Goal-1 is addressed by the Service/Resource Description Template (SDT) and it is now widely adopted as the standard scheme for the representation of service-related information in the EOSC Catalogue. Goal-2 is addressed by a rich set of Open REST API methods for the exchange of information from service and resource providers that complements the SDT as depicted in Figure 1. The open APIs include methods and mechanisms for data acquisition (resource metadata, indicators, usage, etc.) from federated catalogues, in order to enable a seamless synchronisation of content. Thus, as depicted in Figure 1, the EOSC ecosystem's service-specific aggregators (Data, Apps, Instruments, etc) will feed more generic aggregators (Thematic, regional clouds, Physical or Digital RIs), all of which will in turn feed the aggregated European Open Science Cloud Portal.

As the standard scheme in the EOSC for the service-related information, the SDT is adopted in all EOSC related portals. Consequently, the SDT developed is applicable for all kinds of services, physical and digital alike. Incorporating the needs of physical services under the CatRIS project, the EOSC SDT organises service and resources-related information into blocks to allow service providers to conceptualise the service/resource management processes and move progressively from basic to more complex functions:

● **Basic Information**: basic information about a service/resource such as the unique service/resource identifier in the catalogue, the name, the description, the logo, the link to further information at the SP site, etc.

- **Classification Information**: information about the classification of the service/resource, such as the target users, category, scientific domain, language, places offered, tags, etc.
- **Maturity Information**: information about the maturity of the service/resource, such as the phase, technology readiness level (TRL), certifications, etc.
- **Contractual Information**: information about the contractual aspects of a service/resource, such as order type, service-level agreement (SLA), terms of use, privacy policy, access policy, pricing, etc.
- **Support Information**: support information for users, such as links to the service/resource manual, related training, helpdesk, etc.
- **Contact information**: names, emails of key contacts at the provider that can support users with the service/resource.
- **Service Level Targets and Performance Information**: indicators relevant to the service/resource, as reported by the provider, including its availability (e.g. uptime), usage (e.g. number of users) or delivery time.

The SDT provides for each service/resource attribute definitions, potential values and formats as well as whether the attribute is mandatory or optional for the implementation of a number of features/functionalities in the CatRIS platform. It is an evolving standard, which will incorporate new features from incoming e-infrastructures and research infrastructures in the EOSC ecosystem as they emerge.

3 The online (re)presentation of services and resources

The user interface for the services and resources in the CatRIS Portal has been based on extensive research and on the best practices of functional platforms. A mapping exercise took place in early 2019, with the aim to analyse the gaps and identify good examples and the functional requirements for the development of the CatRIS Portal. EU-funded Service Catalogues like EOSC, MERIL, RICH2020, EUROCEAN, CERIC, etc but also international private ventures like ScienceExchange and Labs Explorer, were assessed. The main conclusions of this exercise led to the development of a number of mockups of the online (re)presentation of services and resources (see CatRIS D5.1[6]).

The user-friendly environment is a first characteristic of utmost importance and was also identified in the assessed catalogues. Simple, easily-readable content and a good navigation environment play an important role in meeting this goal. Modern and tasteful graphics and images allow users to deal with the big amount of information available on the platforms. Different interfaces according to the different user groups have also been adopted widely by many platforms, with various implementation approaches. The representation of services with various entry points according to their scientific discipline has also been adopted by inter-disciplinary platforms.

The following general characteristics have been found as the basis of the services and resources representation of the CatRIS Portal:

- Minimalist design with the use of images and shapes and redirection links in the landing page, in order to create a user friendly and easily navigated environment for the user
- Logos and images used in order to easily distinguish between different Service Providers and Services/Resources;
- Graphics widely used to make evident the use and rating of registered services/resources;
- Different views of services for different user groups according to the authenticated user profile;
- Flexible catalogue interface with an extensive filter function that will allow the user to adjust the services offered according to the different categories, scientific disciplines, language, etc.;
- Visualisations of the services in bar graphs, charts and maps.

---

[6] CatRIS deliverable D5.1 Gateway functional specifications.

4   The main functionalities to be developed for the CatRIS Portal

The CatRIS Portal will serve as the main entry point to all available RI services across Europe. It will allow service providers to register their RI services, following a well-structured, detailed SDT, that facilitates the thorough organisation of services' categories and attributes. Based on this structured and harmonised storage, indexing and management of services, the portal will provide an extended set of facilities to RI users, for searching, filtering, browsing, viewing, visualizing, comparing and rating RI services.

Harmonising the description of RI services and providing a single catalogue for registering and searching for them, as well as interoperability mechanisms to facilitate the population of the catalogue with existing or new services, will significantly increase the discoverability of services, the collaboration and feedback exchange between service providers and users.

To achieve the above goals, the CatRIS Portal development will be guided by (a) experience and insights gained from past or existing cataloguing efforts in adjacent fields such as the eInfraCentral Portal (www.einfracentral.eu) and the Catalogue of Services of the European Open Science Cloud (catalogue.eosc-portal.eu) and (b) direct feedback from RI stakeholders (users, providers, policy makers), obtained by thorough requirement elicitation processes, as described above (interviews, surveys and a validation workshop). These ongoing processes have already provided an initial set of core user requirements to be implemented in the CatRIS Portal and derived a prioritisation of the functionality and user needs, regarding their phased implementation within the catalogue. The user requirements are included in CatRIS D4.4[7]. Likewise, development of the CatRIS Portal shall also take into account findings and conclusions from the focus groups, as laid out in Chapter 5.

The development of the Portal will be implemented in three phases, with each phase resulting in a new release of the Portal, building on and extending the functionality of the previous release. The first phase of the CatRIS Portal will implement the core **service registration, searching and browsing functionality (see section 4.1)**. The second phase will extend and enhance the initial browsing and searching functionality and will incorporate **visualisation and analytics facilities, as well as interoperability mechanisms (section 4.2)**. The final release of the Portal will fully implement the prescribed functionalities for the Portal, including **rating, recommendation, comparison, favourites creation and extended searching and visualisation facilities (section 4.3)**. In more detail, the intended functionalities are described in the following sections.

---

[7] CatRIS deliverable D4.4 Functional and non-functional requirements.

4.1   Service registration, searching and browsing functionality

The Portal framework will comprise three core layers: (i) the Storage layer for storing and indexing data and metadata on users, services and resources, (ii) the Business layer for implementing the core functionality of the Portal regarding registering, organising, indexing, searching, filtering, recommending, rating and aggregating statistics functionality and (c) the User Interface (UI) layer, for exposing the aforementioned functionality to the end users.

In the first phase, we will implement the initial functionality, which will include facilities for service, RI provider and RI user registration and for service searching and browsing. The design of the service presentation pages will comply with the aforementioned SDT in order to model the resources that need to be stored and the actions/functionalities that need to be performed on them. Furthermore, the CatRIS Portal will be designed and implemented with the goal to be extensible (to the extent this is possible) with respect to the evolution of the SDT versions; for start, studying and consulting the schema, semantics and rationale of the current SDT (v2.00 – under approval) for the design and development of the framework will ensure its modularity and extensibility and, thus, its adaptability to potential changes in the SDT or the required functionalities, in the upcoming development phases.

The emphasis in this release will be put on the development of the registration process, regarding services and different types of users, as well as on the development of the initial functionality and UIs for searching, filtering and browsing services. Specifically, the following functionalities will be implemented:

1. **Service provider registration**. The portal will provide the interface for an RI service provider to register by filling in information about the service providing organisation/company. The provider registration process includes the registration of an initial service that will be offered by the service provider.
2. **Service registration**. A registered service provider will be able to register individual services in the CatRIS Portal. The registration form will contain all service attributes (mandatory and optional) derived from the adopted SDT, while an underlying validation mechanism will verify the inserted data w.r.t (a) whether all mandatory attributes of the service have been inserted and (b) whether the inserted service complies with the schema of the SDT (e.g. whether the value for a specific attribute complies with the data type prescribed in the SDT for the specific attribute).
3. **Service search**. A user will be able to search for services using keywords and, optionally, specifying their search on certain attributes of the service (e.g. Name, Description, User Value). The search results will comprise ranked lists of services, with

each service represented by a summary of its most important attributes. Additionally, the user will be able to search for services by exploiting their categorisations and performing faceted filtering on them.

4. **Service browsing**. The user will be able to select a service and view its detailed attributes, categorization, metadata and additional material. Additionally, it will be possible to select a list of services and view an overview of them. The UI for displaying the services will facilitate the user into selecting the attributes of the services she considers most important for viewing single services or overviews of services.

4.2   Visualisation and analytics facilities and interoperability mechanisms

In the next phase, the visualisation and analytics dashboard and the interoperability mechanisms of the CatRIS Portal will be delivered. In parallel, new extensions and adjustments in the core functionality (e.g. enriching the search/filtering mechanisms, optimizing the efficiency of the system), as well as improvements and adaptations on the UIs according to the continuous feedback from stakeholder groups and the user assessment reports will be performed. Selected advanced functionality (indicatively – rating, commenting, favourites, recommendation, comparison facilities) will be considered for development in this iteration. The goal of this release will be to produce a stable, efficient RI service catalogue, that will support a rich set of facilities, regarding service registration, management and searching. In more detail, the main functionalities that will be implemented in this phase will be the following:

1. **Visualisation**. Mechanisms and UIs for the visualisation of aggregate statistics and analytics on the services will be developed. The users will be able to inspect, in tables, map graphs (when applicable) and bar graphs, aggregate statistics on different aspects of the available services. Indicatively, the user will be able to view the geographical distribution of services, their distribution per discipline/scientific domain/category, as well as statistics on services' ratings and visitation counts.

2. **Interoperability**. The APIs for the automatic population and synchronisation of services from individual RIs as well as APIs to export data to third-party stakeholders are to be developed. The APIs will offer the functionality a) for an RI to connect to the Portal and programmatically populate the catalogue with new services or update existing services, b) to ingest/exchange data with the eInfraCentral Portal and the Catalogue of Services of the European Open Science Cloud (catalogue.eosc-portal.eu), c) to ingest/exchange data with the MERIL Portal (portal.meril.eu/meril), d) to expose service information from the CatRIS Portal to external third-party applications.

4.3 Personalised features of the CatRIS Portal

At the final phase of the development, further improvements and extensions of the Portal will be implemented, based on stakeholder groups and user assessment reports, as well as on our empirical findings on testing and assessing the catalogue. In this frame, the added functionality will offer personalised features to the end user such as rating, adding a service in a list of favourites, recommendations and comparison facilities.

5 Lessons from the focus groups

5.1 Focus groups' design and methodological notes

With the aim of testing and validating the original catalogue and gateway concept for CatRIS as well as of providing feedback regarding the needs of the RI community, the consortium organised three focus groups. The first one with policy makers/funders, was organised on 27 June 2019, 8:30h – 13h in Brussels (with six external participants); the second and the third ones were organised on 2 July 2019 in Paris, with the RI managers' group (ten external participants) taking place in the morning hours (9h – 13h) and the RI users' group (seven external participants) in the afternoon of the same day (14h – 18h). In the discussions that took place during the focus groups, the physical RIs, CFs and Shared Scientific Resources (SSRs) are all referred to as RIs.

The focus group design reflected a preference for smaller groups so that in-depth discussions could be developed. Facilitators ensured a balance between posing questions and letting the discussion flow. The minutes of focus groups' consultations were taken by the organisers and were circulated to focus groups' participants for an additional feedback and/or verification. As such they serve as direct input for the analysis of the findings below.

Key questions for the participants focused on five different topics (see Annex 1: Questions for the focus groups): 1) CatRIS vision, mission and definitions, 2) typology/classification of services and resources, 3) services and resources description template, 4) online (re)presentation of services and resources, and 5) functional and non-functional requirements of a portal serving a catalogue.

In order to prepare for the discussion, the participants were invited to read the draft Concept Paper for CatRIS that was circulated before the workshop, and that contained extracts of relevant project deliverables. The analysis part below, section 5.2, is clearly divided by target group.

5.2 Focus groups' findings

5.2.1 CatRIS vision, mission and definitions

RI policy makers/funders

Policy makers/funders welcomed the CatRIS mission and the effort to expand the mapping of RI services towards physical RIs. One participant underlined that CFs are currently poorly mapped but also have limited resources to describe their services, hence, it is important that

CatRIS reaches out and supports such facilities. Participants would like to have long-run sustainability of the CatRIS catalogue. In that regard, self-financing after the end of the project was mentioned. Another request was to ensure a balanced thematic coverage of the different scientific fields. Participants underlined the challenge faced by the project given that the number and heterogeneity of physical RIs is several orders of magnitude greater as compared to the eInfraCentral (EOSC) catalogue. Hence, CatRIS should seek to develop the catalogue in a phased manner building on/linking to national or thematic aggregators wherever possible.

Participants doubted whether most RI managers or users would understand or see the need to make a distinction between the definitions of service and resource. A key issue is to be clear on who the catalogue is targeting – whether it is individual researchers, purchasing managers at research institutes/universities, businesses, or other stakeholders.

At the same time, CatRIS has to avoid duplicating MERIL or similar catalogues of infrastructures/resources and ensure that the level of granularity is correct. It was pointed out that the advanced imaging and microscopy example (see mockups in CatRIS D5.1) was not clearly a service and more a description of an overall core facility/equipment. CatRIS should focus clearly on cataloguing services. Interoperability with other catalogues (thematic, etc.) should be a clear priority.

The participants did not see the reason to distinguish between: *RI Service/Resource* and *Physical RI Service/Resource*. It was pointed out that the distinction between different types of RIs was becoming blurred – e.g. physical RIs were increasingly producing and managing data. CatRIS should not over-define or 'put in boxes' different types of RI services and resources as there is a risk this will limit the use of the Portal.

In terms of the definitions of a *catalogue* (the customer-facing list of all live Services and Resources that can be requested by users/customers along with relevant information about these Services/Resources) and a *portfolio* (an internal list that details all the Services and Resources offered by a Service/Resource Provider, including those in preparation, live and discontinued), the difference was not clear at first. After some discussion participants accepted the need to distinguish between the user-facing services and the 'back-office' portfolio. However, again, it was stressed that such distinctions will confuse users and will appear to be 'semantics' for RI managers who have not yet developed service descriptions or structured a portfolio of services.

RI users

Users questioned why CatRIS is not focusing on the large European RIs and obtaining information directly from them. It was stressed that CatRIS will support the RIs to adopt the proposed Service Definition Template (SDT) and APIs. This adoption will help to channel the already existing information into CatRIS. Furthermore, the users underlined the bottom-up and inclusive approach of CatRIS which is in contrast with the earlier attempts (MERIL, etc.) at creating catalogues of RIs. A user argued that the APIs proposed by CatRIS to link RIs to CatRIS in a bottom-up approach, would be useful and relatively easy to be adopted.

As regards maintaining the catalogue up to date, it was explained as imperative to make sure that people populating the catalogue see a clear benefit of doing this work. A gamification scenario could be envisaged, e.g. a label (silver, gold, platinum…), methods and tools for automating the maintenance work.

RI managers

Participants raised issues concerning and expressed their interest in understanding the process of quality check for the information provided. All participants considered a quality check really important for having a trusted catalogue. Participants found the definitions of service and resource, portfolio and catalogue clear.

Furthermore, the importance of the common nomenclature to properly describe an RI was stressed. A member of the consortium underlined that common nomenclature will be used and the other various levels nomenclatures will be open to consultation. Moreover, the name *aggregator* will not be used for the user, since it can create misunderstandings.

5.2.2 Typology/classification of services and resources

RI policy makers/funders

The policy makers/funders welcomed the attempt to ensure coherence with the EOSC typology and adjust it and expand it for physical RIs. There was a feeling that the third level of services labels were not yet clear or well defined and probably needed more work and refinement based on the experience of onboarding the first services. There was a discussion on the need to clearly define expertise as a service – this could be captured under processing and analysis but also under consultancy and support. More basic services provided to users of RIs (e.g. local transport, accommodation, etc.) should not be a separate category but included as information in a more visual way (e.g. icons that show users at a glance without giving details, a bit like WIFI or 'no animals' symbols for hotels on booking.com). The use of float-over with a pop-up explanation of definitions should be considered.

The scientific domain classification did not raise any remarks. The classification of services and resources based on access type was discussed with participants asking whether one service could be categorised as being accessible via various types and whether access to mobile RIs was covered.

The access mode distinction was considered useful, but participants questioned the definition of the policy-based category and asked for a clearer definition of what this means in practice. The term market-driven was also queried and it was suggested that fee based or another term indicating direct payment could be used. The access mode and order type classification could be possibly merged.

Some participants doubted the relevance of using TRL levels and certainly did not consider the catalogue should contain services below TRL 7. It was not clear to the participants how TRL could be applied to RI services. There was also a worry that users might understand it to mean the TRL level their research was operating at rather than the TRL of the service.

All participants considered the list of potential users/customers as over complicated and too long – a much simpler approach is required in their view, perhaps 3-4 categories distinguishing between scientific researchers, businesses, service providers (research infrastructure managers) and funders/policy makers.

RI managers

There was a discussion on whether users and providers could suggest a different classification of domains and subdomains. A member of the consortium explained that inputs from researchers are needed and that users' attributes may be added to the classification list. However, some participants had received feedback from users that their catalogue was too granular, which could make the catalogue less user-friendly. This is something to pay attention to in the CatRIS catalogue. One suggestion from a participant was that users could decide if they can search starting from scientific domain or scientific technique.

With regard to typology, a participant pointed out that *material analysis* and *instrument and equipment* categories are not obvious and clear to be understood, so users might be confused.

As regards the search function and organising information in the catalogue there were two suggestions by the participants. In order to avoid a huge list of results in a query, a participant suggested to follow the Twitter example: a way to highlight the entry point (like tagging on

Twitter), in order not to provide all the information but only the requested one. Another participant suggested including information already collected by ESFRI.

Participants suggested that other information about associated services should be included (canteen, internal guesthouse, opening hours of the lab etc.) as users often ask for this kind of information. Another participant pointed out that at least 30% of requests they receive from users are open questions and requests to help. The questions were raised as to how CatRIS can deal with these open questions as well as who is going to deal with them.

Regarding the category training, there is a need to differentiate two types of trainings: required ones and related/additional ones (for example someone that would like to know how to use a different tool). A member of the consortium summarised that having two different sub-categories with specific attribute in the SDT (one of required training and the other to related training) will be needed.

A participant pointed that it is important to set a quality threshold for allowing people to list their service in the catalogue.

A debate took place about the access mode, namely about the *type of access* of the user (see mockups in CatRIS D5.1): The concept *wide access* mode is misleading and gives the perception that users can access immediately, which is never the case. The category *market-driven* means that user has to pay; since also in other type of access a fee can be applied, in all access types an option of specification if fees are applied or not should be added (like a sub-category that describes if the access requires paying a fee or not). Another participant pointed out that *excellence-driven* is misleading and suggested to change *excellence-driven* to *peer-reviewed*. Another participant suggested to add the information on whether the access is autonomous or assisted.

5.2.3   Services and resources description template

RI policy makers/funders

The main comment on the SDT concerned the need to keep the number of mandatory fields limited (at least initially) to encourage RIs to begin the work on describing their core services. Participants felt the balance was broadly correct.

A key issue will be to ensure that RIs providing similar services/resources describe the same type of service in a homogenous way – both in terms of content and length of text. Equally, the question was posed as to whether, for example, the catalogue will present a specific beam line

configured for specific experiments (e.g. life science analysis) as a service or present a 'generic' service provided via all beam lines and types of experiments (scientific fields).

Participants welcomed the idea of collecting some KPIs while noting that what users or policy makers might want to see and what RIs can provide may not always coincide.

RI managers
One participant pointed out that TRL cannot define all the infrastructures; some research does not necessarily have a TRL. If we give ratings according to TRL this could be misleading for some RI services (also this might differ depending on whether one is talking about physical or digital services).

A participant asked if it would be possible to hide information (for example TRL). However, another participant suggested that if a field is mandatory it should not be hidden, but rather become optional (being mandatory but not showing in certain cases). One of the participants suggested hiding some parameters in order to have them and expose only if and when needed. There was a suggestion that a TRL and *phase* should be optional (see CatRIS D4.3).

Concerns were raised as to how CatRIS is going to manage the updating of the information in the catalogue. There were suggestions from the participants to impose the rule that the services are deleted if information is not renewed or updated or to send reminders to users to validate the information.

5.2.4   Online (re)presentation of services and resources

RI policy makers/funders
The participants felt that the mock-ups presented struck the right balance in terms of content (text/images, etc.). Again, the idea of helping users to quickly get an idea of how to access a service and how much a service costs are viewed as critical elements on the service description page. The time to access (waiting time to run an experiment, etc.) was underlined as a factor that researchers would want to have information on up-front.

When viewing the results of the search mockup, the participants stressed that the option to compare similar services is important and should offer an easy and an immediate summary of key characteristics – the mockup presented of the results of a search was considered to be appropriate.

RI users

Participants voiced significant concern over the rating system, asking how stars were attributed or even that they would prefer not to see the ratings by other users of the catalogue. They objected to CatRIS turning into a social networking system and argued that rating should be done on the basis of objective criteria but that it should not be publicly available. Furthermore, a user argued that it should be for internal use by RI managers. A member of the consortium proposed a user satisfaction survey instead, to which some users agreed.

A discussion among users focused on the search function in the light of a claim by a participant that users' needs are very specific. Consequently, it was claimed that CatRIS should recognise those needs. Hence, the search function has a major importance.

The mockups (see CatRIS D5.1) were found to contain an excessive number of words and categories irrelevant to a user (though potentially relevant to the European Commission). Users could be assisted if the same technology would be shown as available at different geographical locations. In that context price and capacity are important as well. Recommendations are as follows: the order of categories in *Usage* should be rearranged in that the most relevant categories are put on top. Furthermore, use cases should be renamed into *examples of use* and that should go on top. The access mode is relevant.

A map (see mockups in CatRIS D5.1) may offer some interesting functionalities that users were interested in. When it comes to the origin of users, a participant claimed that this should not be visible to everyone. A consortium member clarified that there would be a dashboard for a user and a dashboard for a service provider. Recommendations are that *service homepage* and *service order* buttons should be moved to the right. Moreover, *service order* button should be renamed to *service request form* or similar. *Service order* button should be a Request Form which could be replicated and sent out to multiple service providers.

A participant inquired whether users could have favourites that they could share and whether there can be some kind of interaction among users. A member of the consortium answered that a user can create a profile with such functionalities. Nevertheless, the social media type of interaction is currently not foreseen.

A participant mentioned an example of a use case of a specialised scanner for an experiment in linguistics underlining the need to know where to find the equipment and where it is available. This led to a consensus that having a list of use cases was an important recommendation and that there should be at least one per major field of science.

As to the cost structure, a participant underlined the need for it to be transparent as this information could convince a principal investigator to pay for a service. Consequently, an agreed recommendation would be to ensure transparency of the information on cost structures. A service inquiry form might be the way to do it.

To conclude, the information in the catalogue should be presented in a more user-friendly way. Furthermore, a number of beta testers will be defined, with a number of involved users.

RI managers

The stars rating system again created a debate. All participants felt uncomfortable with the idea of stars ratings and questioned if user feedback is included. A member of the consortium stated that only registered users can give ratings in order to control the relevance, but participants were not convinced about the outcomes, considering the rating potentially 'dangerous'. If the users that give ratings are identified, they would be likely to be more 'objective' in giving comments. Participant suggested counting the number of visitors of the service instead, even if difficult (because clicking on a service to discover and using the service are two different things).

Regarding the visual design of the catalogue there was a suggestion from a participant to wait to see how users will use the catalogue in order to develop it further afterwards. Another participant pointed out that having personalised search is a useful attribute. As to the comparison, one participant suggested that it would be important to be able to compare services with specific attributes (for example geographically).

To conclude, participants suggested that a user check of a beta version for feedback would be useful. People who participated in the different focus groups and interviews, as well as people that were in MERIL project, could give feedback and be beta testers.

5.2.5   Portal's functional and non-functional requirements

RI policy makers/funders

It was underlined that the use of persistent identifiers (PIDs) should be privileged, so that services are clearly linked to the host RI/CF. CatRIS could provide such PIDs to RIs (this topic is also being discussed at the level of the MERIL project) and/or could link to PIDs provided by other platforms (ORCID, etc) in the future.

In terms of the functionalities, the possibility to search and compare services in an easy manner is critical. Participants welcomed the filtering possibilities presented. It was stressed that

compared to e-infrastructures, the geographic location of physical RIs is more important. In some cases, users will be keen to use services of a relatively standard type as close as possible to their 'home base', while for services or resources of a more 'exceptional' nature, they will be willing to travel or source services at a greater distance. A map-based view of the search results (similar to that proposed say by booking.com) after the user has performed a filtered search could therefore be useful.

The possibility for CatRIS to offer users a tailored view of services based on their profile or past searches was considered useful but in a first instance users should not be confused by being asked too many details or having to fill in complicated registration forms. Similarly, it was considered interesting if the Portal can point users toward similar services to those they traditionally use or toward those located in geographic proximity to the user's 'home base'.

A discussion took place on the rating option which was considered an interesting function but raised the question of how CatRIS could control for users having actually used a service. This needs to be clarified and a solution found if the rating system is to be credible.

When it comes to functions providing visualisation (dashboards) for users or service providers, participants stressed that while the catalogue could also provide input for policy making/funders analysis, this should not be a short-term focus or priority.

In terms of inter-operability, the participants stressed that links to thematic (e.g. WayForLight) or national catalogues should not require significant manual reworking of information to upload to the CatRIS. Hence, the importance of APIs, etc. is confirmed. However, as participants pointed out, the frequency of updating may vary significantly.

Overall, there is an opportunity to promote the CatRIS catalogue and technology as a means for national or thematic RIs (service providers) to describe and promote their services. Significant investments in RIs at national level (e.g. Slovak case was mentioned) means that there is interest in attracting new users now. Dedicated events or webinars to explain the CatRIS approach to RI communities should be foreseen once the first prototype is up and running.

5.3   Main takeaways from the focus groups

The participants of the three focus groups expressed a clear interest in the project and willingness to participate in the discussions to further develop the catalogue. Policy makers/funders especially welcomed the CatRIS mission. On the other hand, they are aware

of the challenges it faces with regard to being inter-operable with other catalogues and as inclusive as possible. In that context, RI managers raised the issue of the quality check needed for the catalogue to be reliable.

On typology/classification of services and resources, RI policy makers/funders and RI managers mentioned a need for clarifications for two categories and improvements at the third level of classification. Other issues raised concerned clarifications and/or refinement of certain categories of the catalogue keeping in mind its user-friendliness.

As to services and resources description template, RI policy makers/funders mentioned the need to use a limited number of mandatory fields in order to incentivise RIs to start describing their core services. They were also concerned with a homogenous description of similar services/resources among RIs. On a more granular level, RI managers wondered whether TRL and phase/lifecycle status should be optional and how CatRIS was going to ensure the updating of information.

Regarding online (re)presentation of services and resources none of the target groups found that there was a lack of information as it is currently presented. Nevertheless, user-friendliness was effectively underlined as criterion to be followed by all of them. In that sense RI users stressed the need to improve certain aspects of the catalogue, most notably the search function as well as to reorganise information that users could see. Use cases and transparency of the cost structure were also stressed as important. That the rating system should be improved was an issue raised by all three groups. Both RI users and managers also discussed the importance of having beta testers for the catalogue.

Last but not least, the group of RI policy makers/funders discussed some functional and non-functional requirements of a portal serving a catalogue. To an extent there were similar issues raised as with some of the previous topics. This concerns in particular the search and comparison possibilities as well as overall user-friendliness. In a similar vein to RI managers, there were questions raised as to the rating system and its credibility.

Conclusion

Following multiple lines of research CatRIS produced a number of findings serving as a basis for the building of the CatRIS gateway and the Catalogue. The Concept note presents their main building blocks that have undergone an additional verification in the focus groups sessions with members of RI community. This concerns the typology of RI services, service catalogue content and the main functionalities.

The service catalogue content will be produced on the basis of the suggested EOSC-compatible service description template that will be revised on a rolling basis. It comprises the following information: basic information, classification information, maturity information, contractual information, support information, contact information as well as service level targets and performance information. The way this information will be organised on the actual platform follows best practices and is demonstrated in the mockups in CatRIS D5.1.

The main functionalities for the CatRIS Portal are to be implemented in three subsequent phases, each implementing one of the following blocks of functionalities: 1) service registration, searching and browsing functionality, 2) visualisation and analytics facilities, as well as interoperability mechanisms, and 3) rating, recommendation, comparison, favourites creation and extended searching and visualisation facilities.

The three focus groups, comprising RI policy makers/funders, RI users or RI managers, broadly approved the typology/classification of services and resources. There were nevertheless suggestions for clarifications for two categories and for improvements at the third level of classification. Overall the CatRIS concept received positive feedback and there were suggestions for designing an even more user-friendly catalogue suited for needs of each of the above-mentioned groups. This important feedback will be taken into account in the development of the catalogue.

References

1. P. Ayris, J.-Y. Berthou, R. Bruce, S. Lindstaedt, A. Monreale, B. Mons, Y. Murayama, C. Sodergard, K. Tochtermann, R. Wilkinson (2016), Realising *the European Open Science Cloud*, Brussels: European Commission.

Annex 1: Questions for the focus groups

Goals of the focus group

The focus groups gather RI Managers, Service Providers and RI Users (Researchers, Innovators, etc). It serves the purpose of testing and validating the CatRIS Catalogue and Portal concept and providing feedback on specific results that will be leading the CatRIS specifications. The topics for discussion at the focus groups will focus on the type, structure and representation of information to be included in the CatRIS Catalogue and the main functionalities of the CatRIS Portal that are under development. The participants at the focus groups are invited to read the CatRIS Concept Paper that has been circulated before the workshop.

Working rules

A Concept note with background information is prepared in advance of the event. Everybody is free to express their opinion on the topic discussions. Responses will be treated anonymously in the focus group report.

Topic 1 – CatRIS Vision, Mission and Definitions

CatRIS aims to develop an open, trusted and user-friendly Portal to a harmonised and aggregated Catalogue of Research Infrastructure Services and Resources offered at European and National levels, supporting and interoperable with the European Open Science Cloud (EOSC) catalogue, focusing on physical Research Infrastructures (RIs), Core Facilities (CFs) and Shared Scientific Resources (SSRs) (all hereinafter referred to as RIs) and making those findable and accessible by researchers, research groups, communities, projects, organisations, innovators and businesses, funders and policy makers.

CatRIS being one of the building blocks of the EOSC Initiative of the European Commission abides to its vision to provide all researchers, innovators, companies and citizens with seamless access to an open-by-default, efficient and cross-disciplinary environment for producing, storing, accessing, publishing, and reusing data, tools, publications and any EOSC Resource for research, innovation and educational purposes.

- ***Is the CatRIS focus clear? Is something critical missing?***

Service: One of the working definitions of a service that we have used is "The means or a process that organisations use to deliver results that Users/Customers value and wish to

achieve". These results are usually intangible although they may also include tangible elements. Services require instantiation by a Service Provider.

- ***Do you agree with this definition?***

Resource: We also must make evident the difference between a service and a resource. One of the working definitions of a resource is 'Any physical or digital asset or infrastructure made available to Users/Customers'. Resources include facilities, instruments, data(sets), software, applications, samples, etc. Resources are generally tangible elements and most of the times do not require an instantiation.

- ***Do you agree with this definition? Is the difference from a service clear?***

RI Service/Resource: Services and Resources provided by Research Infrastructures. This Includes among others access to and use of facilities and instruments, users support and training and other activities and resources that the RIs deliver to Users/Customers.

Physical RI Service/Resource: RI Services and Resources that rely on the access to or use of a physical facility or instrument.

- ***Are these definitions clear?***

Catalogue: The customer-facing list of all live Services and Resources that can be requested by users/customers along with relevant information about these Services/Resources. It is a subset of the Portfolio.

Portfolio: An internal list that details all the Services and Resources offered by a Service/Resource Provider, including those in preparation, live and discontinued.

- ***Is the difference of a Catalogue and a Portfolio clear? And why CatRIS is focusing on the catalogue?***

Service/Resource Provider: An organisation, a part of an organisation or a federation that manages and delivers Services and Resources to Users/Customers.

CatRIS Portal: A Portal providing information about Physical Research Infrastructure Services and Resources in Europe.

CatRIS Service: The CatRIS Portal will be offering services among which lists and classifications of RI Services and Resources, the relevant Service/Resource Providers, advanced search options, filtering and visualisation functionalities, etc.

CatRIS is also a SRP offering a number of cataloguing services and other related functionality.

A short presentation of the most significant results of the survey (…), interviews and the validation workshop to be presented as an intro to the following topics.

Topic 2: Typology/Classification of Services and Resources

(…)

- ***We are starting from the EOSC typology for physical RIs, as in the table below (from the Concept note). In addition, small changes to the typology (at the third level of services) have been suggested. Do you agree with such typology?***

Table: EOSC classification of services of physical RIs and CFs

7)	Access physical & e-Infrastructures
a)	Facility
b)	Instrument & equipment
c)	Material storage
d)	Data storage
8)	Sharing & discovery services
a)	Data
b)	Samples
c)	Software
d)	Applications
9)	Aggregators & integrators
10)	Processing & analysis
a)	Data management
b)	Data analysis
c)	Material analysis and processing
11)	Security & operations
a)	Operations & infrastructure management services
12)	Training and support
a)	Training
b)	Consultancy and support

Source: CatRIS Concept note

- *Based on the EOSC Classification, a standard list has been created for many attributes of the SDT, some of which will be used as a base to structure the Catalogue (e.g. Scientific Domain, Categorization, etc) Firstly do you agree with the classification suggested? Secondly, which are the most important attributes that the catalogue should base its structure and layout on?*

- *More specifically, concerning the Instruments and equipment, do you think that another approach might be needed, since this category can include too many subcategories? Which alternative would you suggest?*

- *Would it make sense to merge the Categories "Material Storage" and "Data Storage", or to create a new super-category "Storage"?*

- *Should the subcategory of Consultancy and Support, "Testing", become its own category? What should it include?*

- *Would you agree with the descriptions provided for the different Target Users?*

- *Should the Phase List of values diversify according to the category of the service or one common list should be applicable to all, with the appropriate wording?*

Topic 3: Services and Resources Description Template

(…)

- *According to the SDT which at are the most important attributes you are ready to share with (FOR POLICY MAKERS/FUNDERS: THAT MAY BE RELEVANT FOR) the users? Which are the ones you will have issues sharing (FOR POLICY MAKERS/FUNDERS: THAT YOU FEEL ARE CRITICAL)? Are there any others that are missing?*

- *Are all the definitions of attributes easily understandable? Is there any clarification you deem necessary?*

- *Would you share any service performance indicators with the users (FOR POLICY MAKERS/FUNDERS: ARE YOU INTERESTED IN ANY ADDITIONAL SERVICE PERFORMANCE INDICATORS)?*

- *Do you agree with the necessity characterisation (mandatory/optional) given to each attribute? Are there attributes you believe there should be mandatory and are currently optional or vice versa?*

- *Is there any attribute without a developed list of values that you believe it would be optimised through one?*

Topic 4: Online (Re)presentation of Services and Resources

(…)

- **What would be the structure of an ideal layout for presenting a service to you?**

- **What are the most important attributes of a service, that you would like to see and where?**

- **When viewing the results of a service search, what are the service attributes you would like to be visible In the catalogue, before clicking on a service, as the most important ones? What attributes of a service are the most important for you when viewing the results of a service search?**

Topic 5: Functional and non-functional requirements of a Portal serving a Catalogue

(…)

Catalogue browsing and searching

- **How do you usually search for a service or a resource? Which keywords or tags do you use? e.g. do you use keywords related to: category? scientific domain? service provider? related instruments? samples or the results of an experiment?**

- **What aspects of a service would you use to filter the results of a search, upon which you can review a more focused search on a smaller set of services? e.g. scientific discipline (e.g. life sciences), availability (e.g. available), geographic proximity (e.g. up to 200 kilometres from your location)?**

- **When comparing services/resources, which aspects are you interested in the most? e.g. description (instruments & equipment), user base, use cases, place, target users, price, etc?**

End-User Interaction

- **Are you interested in viewing the services/resources based on your profile? e.g. different views would be offered to different user groups based on scientific domain as reflected in the authenticated user profile.**

- **Are you interested in rating specific aspects of a service, or just the service as a whole? e.g. rate its availability, reliability, others….**

- **Would it make sense/be useful to you if you are recommended with also slightly different (but related to your field) services than you usually use? Or are your**

experimental needs and the respective RIs you use in your field quite fixed and rarely change?

Visualisation and analytics

- ***What types of aggregated statistics are you interested in exploring? e.g.: distribution of services per category, distribution of services per discipline/scientific domain, geographical distribution of services, grouping of services per pricing, grouping of services per TRL/maturity, grouping of services per user rating, other?***

Service/Resource Provider Interaction

- ***What are the most important statistics you would like to know about your services/resources? Views, Number of users registered it as favourites, Number of users redirected to your website, other?***

Catalogue Interoperability

- ***Would you use an Application Programming Interface (API) in order to upload or update a service/resource in the catalogue?***

Non-Functional Requirements

- ***Any other non-functional requirement that you see missing from the current list?***