



**EUROPEAN OPEN
SCIENCE CLOUD**

EOSC

Implementing an inclusive
European Open Science Cloud

**SYMPOSIUM
2021**

15-18 June 2021

#EOSCSymposium2021

The EOSC Symposium 2021 Programme Committee

The EOSC Symposium Programme Committee is made up of representatives from across the EOSC landscape and communities, as well as representatives of the EOSC Association



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Disclaimer

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August 2021

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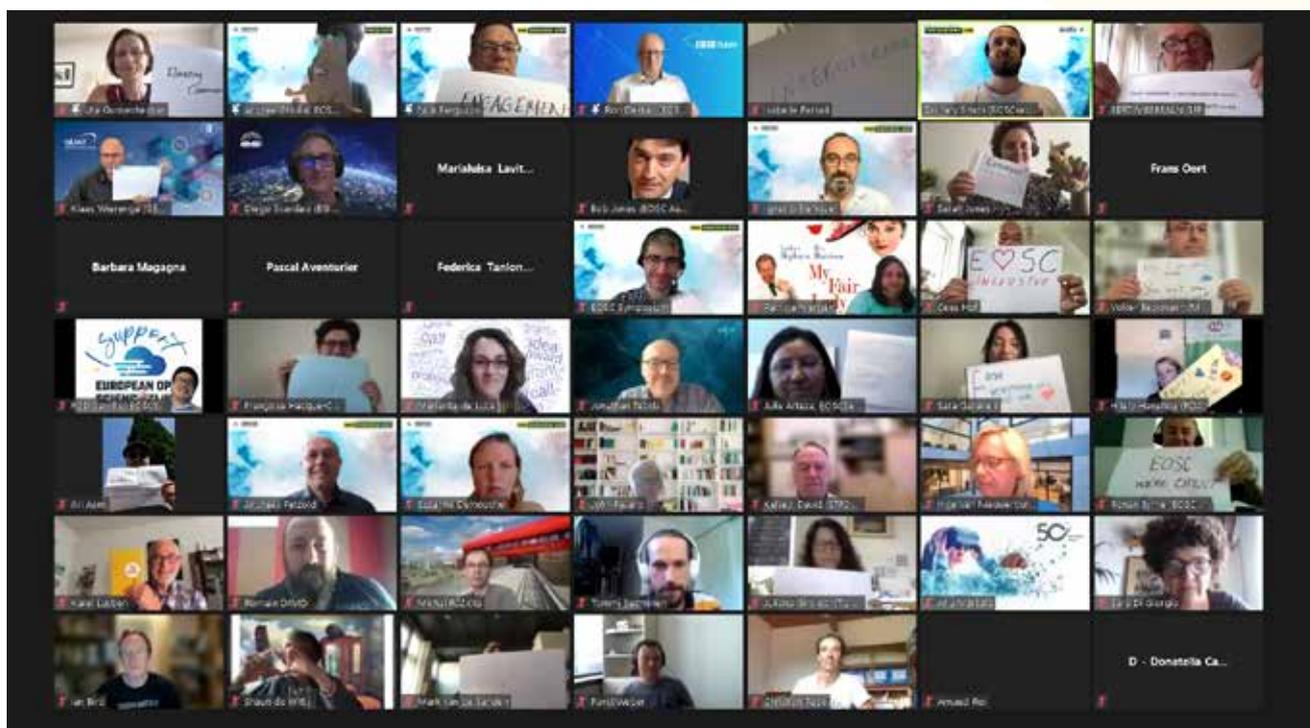
Programme

Follow the link below for the detailed programme including session recordings and presentations.

www.eoscsecretariat.eu/eosc-symposium-2021-programme

From Brussels to Budapest, we'd like to thank you, the EOSC stakeholders who have contributed to the EOSC Symposium events that have been delivered by EOSCsecretariat.eu. Together we are implementing an Inclusive European Open Science Cloud.

Here's to the future, the next Symposium and seeing and meeting each other again soon.



Introduction

The EOSC Symposium 2021 provided a key engagement opportunity for the EOSC community after the European Open Science Cloud finally entered its highly-anticipated implementation phase in 2021. Delivered online to just under 1,000 EOSC stakeholders from over 63 different countries, this was not only the largest EOSC Symposium yet, but it was also an essential opportunity for convergence and alignment on principles and priorities.

The [EOSC Association](#) will play an important role in this phase. With already over 210 member and observer organisations from across Europe, the Association represents a single voice for the advocacy and representation of the broader EOSC Stakeholder community in Europe, promoting alignment of EU research policy and priorities.

The Association will continuously develop the [EOSC Strategic Research and Innovation Agenda \(SRIA\)](#) which will influence future EOSC activities at institutional, national and EU level (including the EOSC-related work programmes in Horizon Europe). This living document will adapt to the changing EOSC ecosystem and the needs of EOSC stakeholders. The Association is setting up a series of Advisory Groups (AG) with Task Forces (TF) to engage with the EOSC community around priority areas, namely: **Implementation of EOSC, Technical Challenges on EOSC, Metadata and Data Quality, Research Careers and Curricula, and Sustainability of EOSC.** The symposium was the first opportunity for the Association to present the draft charters of the Task Forces. A key objective of the event was also for the Association to understand what work has been carried out, is in progress, or is planned on the topics of the AGs and TFs. A call for contributions ran throughout May 2021, with a total of 137 applications received. Through presentations, lightning talks, and panels, over 70 community members were able to highlight key findings and recommendations for the AGs and TFs to take into consideration for their work.

The Symposium took place just weeks before the European Open Science Cloud (EOSC) was granted special status as a co-programmed European Partnership. This new European Partnership status will fortify EOSC with almost €500 million of European funding and an in-kind contribution from the partners of another €500 million. Indeed, the first day of the event was dedicated to the EOSC Ecosystem featuring keynotes from the European Commission, the EU Portuguese Presidency, and the EOSC Association. This was followed by an overview of the future EOSC calls in the Horizon Europe Programme.

Day two really kicked off the theme of the rest of the Symposium, delving deep into the real priorities for the implementation of EOSC. The EOSC AG and TF structure was presented, and information was given on how to become part of the Task Forces. The AGs and TFs formed the backbone of the Symposium with dedicated sessions running throughout where the draft charters were shared and other contributions from the stakeholder community were presented.

The first of these focussed on Research Careers and Curricula highlighting the key role that EOSC can play in the cultural change required to make Open Science and FAIR data better known and ultimately the norm for the research community, and in providing the necessary infrastructure to modernise the academic reward system.

The Sustainability of EOSC AG session focussed on the two main TF topics: financial sustainability and the sustainable long-term preservation of data and other research relevant digital objects. The session highlighted

the importance of long-term sustainability of services that looks beyond project-based funding, as well as the important role of commercial providers and their services which should be free at the point of use.

Technical challenges on EOSC was the highest subscribed session with just under 40 applicants to the call for contributions. It was split into break-out sessions covering the three TFs: Infrastructure for quality research software, AAI architecture, and Technical interoperability of data and services. Inputs and activities from a broad range of initiatives and EC-funded projects were presented.

Similarly, the Implementation of EOSC session saw just under 40 applicants with break-out sessions taking place. The Implementation of EOSC AG focusses on how to roll out EOSC's recommendations and test their applicability together with research communities and service providers. The AG also seeks to promote broader adoption of EOSC, specifically amongst the research community.

Finally, the Metadata and data quality session focused on addressing semantic interoperability to ensure data can be discovered and reused, as well as aspects of data quality and metrics to promote high-quality resources in EOSC.

In order to further facilitate engagement between the Association and the community, EOSC-Clinics ran throughout lunch breaks at the event. These open Q&A sessions were hosted by members of the EOSC Association Board of Directors who fielded questions from the audience in a nice informal setting.

The symposium also saw additional sessions on other key topics of the implementation phase. The first of these focused on challenges and best practices around EOSC engagement and coordination mechanisms at national levels.

The second focussed on Open Science Policies and the identification and alleviation of policy barriers. The session highlighted the incentivisation of researchers and future EOSC stakeholders/communities to adopt national, European and institutional policies that will assist the harmonisation of different initiatives towards an Open Science future.

The third was about the importance of user-centric and co-creation aspects of EOSC to foster closer engagement. It suggested the onboarding of Research Infrastructures and their thematic communities as a way to address and prioritise current research community requirements and provide added value for their end users.

Finally, the key role of the EOSCsecretariat.eu project was highlighted, firstly, in supporting the EOSC governance in setting up the EOSC Executive Board, its six working Groups, and supporting the production of 20 reports which led to the establishment of the EOSC Association, and secondly, in instituting the EOSC Symposium as a key EOSC stakeholder event which will be sustained by the newly-funded EOSC Future project. EOSC Future featured in a number of sessions throughout the Symposium as many of the activities relating to the creation of the Minimal Viable EOSC described in the SRIA will be undertaken by the project. EOSC Future will implement an operational EOSC-Core, a system of systems, that acts as the "glue-layer" combining resources across infrastructures, and it will work to populate the EOSC-Exchange.



Tuesday, 15 June 2021 - EOSC Ecosystem



Tuesday, 15 June 2021 EOSC Ecosystem

9:00-10:30 Opening Keynote Session



Chair **Marialuisa Lavitrano**

University Milano-Bicocca & Director,
EOSC Association

Main takeaways

- The EOSC Symposium comes at a strategically important time as the implementation phase begins and the EOSC Association and its Advisory Groups and Task Forces take shape.
- The [EOSC Association](#) was established in July 2020 as a non-for-profit international association (AISBL) in Belgium. With already more than 210 member and observer organisations from across Europe, the Association represents a single voice for the advocacy and representation of the broader EOSC Stakeholder community in Europe, promoting alignment of EU research policy and priorities. An essential role of the Association is to continuously develop the [EOSC Strategic Research and Innovation Agenda \(SRIA\)](#) which will influence future EOSC activities at institutional, national and EU level (including the EOSC-related work programmes in Horizon Europe). To support this, the Association is setting up a series of Advisory Groups with Task Forces (TFs) to engage with the EOSC community around priority areas namely: **Implementation** of EOSC, **Technical challenges** on EOSC, **Metadata and data quality**, **Research careers and curricula**, and **Sustainability** of EOSC.
- The Association will play a key role in the new EU Partnership which represents a new Governance model for EOSC, placing stakeholders across Europe firmly in the driving seat. The Partnership represents a new Governance for EOSC as the first implementation phase of the EOSC begins. The partnership is made up, on the one hand of the European Commission and on the other hand the newly formed EOSC Association. The Partnership Board invites representatives of the MSs and ACs organised in the commission's Expert Group "EOSC Steering Board".
- Leveraging the [EOSC Strategic Research and Innovation Agenda \(SRIA\)](#) v1.0, the partnership has several key objectives to ensure that standards are defined, and that services and tools are developed. It will enable a step change across scientific communities and research infrastructures towards seamless access and reliable re-use of data, methods, software and publications. Not only within, but also across disciplines and borders.
- The ambition is to develop an inclusive, open and dynamic ecosystem where Open Science practices and skills are rewarded and taught; an ecosystem where FAIR data management becomes the norm, with operating conditions that safeguard trust and public interest. Supporting the EU's [Open Science policy](#) and [European Data Strategy](#), EOSC intends to help European scientists reap the full benefits of data-driven science and give Europe a global lead in research data management.

Introduction

The EOSC Symposium was opened by the EOSC Association Board member Marialuisa Lavitrano (University Milano-Bicocca & Director, EOSC Association) who gave an overview of the establishment of EOSC Association and the key role it will play in the implementation phase of EOSC. The EC's perspective was presented by Kostas Glinos (Head of Unit Open Science, European Commission) and Liina Munari (Deputy Head of Unit, Open Science and Digital Modelling, DG CONNECT, European Commission). The EC supports an Open Science policy that builds trust in a digitally enabled and more open and robust research process not only for scientists, but also for society at large. EOSC provides the enabling infrastructure for this to happen and seeks to transform European Science.

Ute Gunsenheimer (Designated Secretary General, EOSC Association) provided an overview of the main objectives of the Association and Paulo Quaresma (Board of Directors of FCT & EOSC Steering Board) highlighted the role of the Association in terms of establishing the EU Partnership with the EC and setting up Task Forces which will guide the policy agenda for the future. The partnership will pave the way for deepening Open Science practices in the new European Research Area and for contributing to the Digital Agenda for Europe. EOSC shall be seen as the research foundation of all sectoral Data Spaces defined in the European strategy for data.

João Moreira (FCT/FCCN & EOSC Association) presented EOSC from the perspective of the Portuguese EU Presidency highlighting the role that EOSC can take in developing innovative services and products which can increase collaboration, facilitate faster delivery and reuse of results, and to foster the development of value-added services.

[Watch the full session](#)

Future steps

- A Memorandum of Understanding for the EOSC Partnership in Horizon Europe has been signed on 23 June 2021. The first meetings of the Steering Board will also take place during June 2021.
- Member States and Associated Countries and their national funding organisations play a key role in the partnership as they will directly finance research infrastructure developments which are to be compliant with EOSC standards and should be easily integrated into EOSC. They will also develop policies that stimulate and support existing organisations in their countries to be as compliant as possible with EOSC and work towards sharing their research assets through EOSC.
- One of the key roles of the Association is the continued realisation of the SRIA (currently v1.0). This is envisioned as a living document that will adapt to the changing EOSC ecosystem and the needs of EOSC stakeholders in future versions that will be updated by the EOSC Association with input from the European Commission. Timings of future iterations will be defined by the Association.
- The TFs are an essential element of this work. The Symposium is a key event to firstly present the draft charters of the 13 TFs (which were being finalised at the time of the event) and to understand current work already underway or planned from the EOSC community. A call for members for the TFs will run throughout July 2021, with setup to follow through to September.



Tuesday, 15 June 2021 EOSC Ecosystem

11:00-12:30 Future EOSC calls in Horizon Europe



Chair

Liina Munari

DG CONNECT, European Commission

Michel Schouppe

DG RTD, European Commission

Main takeaways

The following summary¹ includes information presented at the Symposium as well as at the [Research Infrastructures Info Days](#).

- The INFRAEOSC destination of the Research Infrastructures part of the Horizon Europe Work Programme for 2021-2022 was developed following the input received in the context of the European Co-Programmed Partnership for the European Open Science Cloud through its Strategic Research and Innovation Agenda, which set the high-level priorities to be tackled through European funding.
- The [EOSC Strategic Research and Innovation Agenda \(SRIA\)](#) contains a detailed roadmap for the next two years, including both priority activities and expected outcomes. The SRIA was widely consulted across the relevant stakeholders and proposes a breakdown of the three general objectives to be attained by the EOSC Partnership (around people, data, and infrastructure) into a list of fourteen concrete action areas divided into seven areas related to implementation challenges (e.g. identifiers, metadata, FAIR metrics and certification, etc.) and seven areas related to boundary conditions (skills and training, communication, funding models, rewards and recognition, etc.).
- The INFRAEOSC destination foresees an estimated budget of almost 90 M€ to fund ten topics under the WP 2021-2022, respectively six topics in the call for proposals 2021 and four topics in the 2022 call. Additional EOSC-related EU investment will also be made in 2021-2022 for a public procurement supporting the EOSC-Core (about €35M) and for a grant for FAIR and open data sharing in support of European preparedness for COVID-19 and other infectious diseases (about €12M) under the separate call: HORIZON-INFRA-2021-EMERGENCY-01.
- The topics proposed under the INFRAEOSC destination relate to the fourteen action areas presented in the EOSC SRIA.
- Projects funded under the INFRAEOSC destination will drive the implementation and the operationalisation of the EOSC ecosystem to attain the vision of a Web of FAIR data and services for science.
- Through the funded projects, progress will be attained along the dimensions of the general objectives set forth in the SRIA:
 - Projects will contribute to the mainstreaming of Open Science as the new norm;
 - Projects will contribute to an increased federation of research infrastructures;
 - Projects will contribute to the promotion of the FAIR principles and open data, in line with the logic that data should be as open as possible and as closed as necessary.

¹ All information and more can be found https://ec.europa.eu/info/news/horizon-europe-info-days-eosc-symposium-presenting-infraeosc-destination-2021-and-2022-2021-jun-15_en

Introduction

The session *Future EOSC calls in Horizon Europe* gave an overview of the work that has been conducted within the last few years, especially on the SRIA with its identified Action Areas. The overall aim of the new Horizon Europe program was presented. In addition to that, the future INFRAEOSC calls, which are based on the challenges identified in the SRIA, were introduced including objectives, activities and possible synergies with existing projects.

[Watch the full session](#)

Future steps

Full details on the EOSC-related Horizon Europe Calls [can be found here](#).



Tuesday, 15 June 2021 EOSC Ecosystem

13:45-15:15 EOSC engagement mechanisms at national level



Chair Sara Garavelli
CSC & EOSCsecretariat.eu

Main takeaways

- The main objectives of the EOSCsecretariat.eu study on EOSC engagement and coordination mechanisms at a national level includes the mapping of existing and emerging EOSC coordination & engagement mechanisms at national levels, the description of best practices, main challenges and benefits of such national mechanisms, the positioning of national coordination and engagement mechanisms in the EOSC ecosystem, and recommendations on how to improve the EOSC engagement at a national and EU level. It is meant to support three key purposes:
 - First, it serves as input for the future work of the EOSC Governance.
 - Second, it can be used as a blueprint for all EU countries willing to set up EOSC national coordination and engagement mechanisms.
 - Third, it is a reference document for all the EOSC stakeholders to better understand the EOSC national actors.
- Currently, 11 countries have already contributed to the study, while 20 other countries are being targeted, of which all intend to set up mechanisms to coordinate EOSC activities. Early results show that such mechanisms are likely to differ greatly between countries as their needs vary.
- Success factors at a national level include, for example, a strong commitment at all levels (including the political level), the involvement of key players (especially universities), low entry barriers, and good communication channels. At a more general level, such factors include a clear value proposition of EOSC, a sustainability plan, quality of data and services and their interoperability, as well as the development of competencies and skills to guarantee FAIR-by-design processes and to support EOSC-related actions.
- **NI4OS**, National Initiatives for Open Science, aims to be a core contributor to EOSC, all while ensuring inclusiveness on the European level for Open Science (OS). Currently, 15 member states and associated countries are participating. Against this background, setting up national OS initiatives faces several challenges. Firstly, 14 different languages are spoken in the targeted region and the countries differ greatly in terms of maturity of OS policies and initiatives, as well as infrastructures and education policies. In addition, political instability affects both the introduction and the implementation of OS policies. The need therefore arises for a modular solution that can be further customised to fit specific requirements of each state.
- The panel discussion presented an opportunity for 8 countries (namely, Austria, the Czech Republic, Italy, Finland, France, Germany, Spain and Sweden) to share their experiences and approaches to setting up national mechanisms meant to coordinate EOSC-activities. Even though their approaches differ greatly in terms of, for example, the extent to which governments and ministries are involved, or whether bottom-up, or top-down approaches were chosen, one common theme was identified: the need to make all stakeholders' voices heard.

Introduction

User engagement and uptake are considered essential factors for the success of EOSC. This session explored how European countries are contributing to this activity highlighting best practices and current challenges. The session presented the early results of an EOSCsecretariat.eu study on EOSC engagement and coordination mechanisms at national levels, as well as introducing national initiatives for Open Science such as NI4OS. The session concluded with a panel discussion focusing on national initiatives and mechanisms to coordinate EOSC-activities in a number of countries.

[Watch the full session](#)

Future steps

- The EOSCsecretariat study on EOSC engagement and coordination mechanisms at a national level will provide useful input in terms of the future work of the EOSC governance. It can serve as a blueprint for countries wanting to set up national mechanisms to support EOSC activities and it provides insight into the status quo of national actors. Additionally, it lists several factors crucial for setting up national initiatives.
- NI4OS is experienced in terms of setting up national OS policies and initiatives. It is well acquainted with the challenges related to that line of work, specifically in participating countries, and will be a valuable partner in order to strengthen OS and make it become the norm.
- During the Panel Discussion, many aspects essential for the successful implementation of national initiatives were identified by the panelists and the audience. Two crucial points however were mentioned again and again: the necessity to support exchange of knowledge and learn from each other's experiences and the need to find ways of involving all stakeholders and making their voices heard.



Tuesday, 15 June 2021 EOSC Ecosystem

11:00-12:30 Policies round table. A lively discussion on Open Science Policies practice in regional projects



Chair **Jos van Wezel**

KIT & EOSCsecretariat.eu

Introduction

A multitude of projects operating around the sphere of EOSC are undertaking a consultation process leading to the exchange of ideas and recommendations on how to seamlessly facilitate the federation under EOSC. In this context, the identification and alleviation of policy barriers is highly emphasised, along with the incentivisation of researchers and future EOSC stakeholders/communities to adopt indicated national, European, and institutional policies that will assist the harmonisation of different initiatives towards an Open Science future.

[Watch the full session](#)

Main takeaways

- A lot of organic growth can be observed in policies across Europe, as EOSC is developing joint approaches in policy development that should be enforced.
- Clarity is important to define FAIR and communicate to researchers feasible ways to harmonise their work in terms of data management.
- Open Science is currently held back by legal barriers. Priority should be given to reducing complexity and defining the exceptions. Moreover, the EU should give emphasis to the compatibility of users and interoperability of data in a horizontal manner when shaping the legal landscape.
- The legal framework as a whole is becoming more solid. However, the implementation of the legal framework by researchers is becoming an increasingly challenging task.
- Policies adopted by big institutions are being upscaled to national level policies. Smaller organisations are usually more flexible to adopt policies that fit their purpose. A coordinated approach to include a multitude of actors in common forums is important to ensure horizontal implementation and harmonisation.

Future steps

- The effort in the provision and development of tools must not be limited, but expanded to also reflect a bottom up approach of harmonisation-standardisation that should be taken into consideration in EU laws.
- Clarifications should be provided on the coverage of future policy aspects coming from a national-European-institutional level and consequently the type of support and actions that need to be taken should be identified in order to assist the research communities to adopt and comply with these policies.
- The institutions, funders and policy makers should be brought to the same table to initiate discussions on policy development while also trying to find a joint approach to track progress, sharing best practices and incentives, and the policy implementation tools that have been developed.

The image features a hand in the lower-left foreground, reaching towards a digital map of Europe. The map is rendered as a white wireframe mesh, overlaid on a background of a network of white nodes and connecting lines. The entire scene is set against a vibrant blue background with a bokeh effect of light spots. A white horizontal bar is positioned across the middle of the image, containing the text.

Wednesday, 16 June 2021 - EOSC Governance and Association



Wednesday,
16 June 2021

EOSC Governance and Association

9:00-10:45 Priorities for the EOSC Implementation phase - Topics and charters for the EOSC Association Advisory Groups and Task Forces



Chair

Karel Luyben

CESAER & President, EOSC Association

Introduction

This session introduced the EOSC Advisory Groups (AG), their Task Forces (TF), and their charters. They will form an important element of the EOSC implementation phase. Additionally, the next steps related to the membership of AGs, such as the application process, selection criteria and the choice of Chairs, were described. The session ended with a Q&A Session.

[Watch the full session](#)

Main takeaways

- There are five AGs, namely *Implementation of EOSC*, *Technical Challenges on EOSC*, *Metadata and Data Quality*, *Research Careers and Curricula* and *Sustaining EOSC*. Each of them consists of different TFs.
- The TFs *Rules of Participation*, *Compliance Monitoring*, *PID Policy and Implementation* and *Researcher Engagement and Adoption* belong to *AG Implementation of EOSC*. The TFs *Technical Interoperability of Data and Services*, *Infrastructure for Quality Research Software* and *AAI Architecture* are assigned to the *AG Technical Challenges on EOSC*. The *AG Metadata and Data Quality* consists of *Semantic Interoperability* and *FAIR Metrics and Data Quality*. Three further TFs - *Data Stewardship*, *Curricula and Career Paths*, *Upskilling Countries to Engage in EOSC* and *Research Careers, Recognition and Credit* - belong to the *AG Research Careers and Curricula*, while the last two TFs *Defining Funding Models for EOSC* and *Long-term Data Preservation* belong to *AG Sustaining EOSC* (FAQs on the TFs [are answered here](#)).
- The TFs are set up in two stages. The first stage lasted until June 2021 in which draft charters defining the scope and activities of each charter were drafted. The second is to recruit members from the community to implement the activities suggested in the charters (more information on the charters [can be found here](#)).
- TF membership is yet to be defined. The selection criteria will come into play, if necessary. Each charter gives an outline of competencies and skills needed in the context of their specific objectives and activities. A call for membership will be opened in mid-June and closed in mid-July.
- In some cases, it was suggested for pragmatic reasons to limit the number of members of TFs to a certain number. This idea, however, was not very well received as it carries the risk of not being inclusive, while supporting closed clubs instead.

Future steps

- To move forward, membership has to be defined. In addition, TF members have to be recruited so that the TFs can start their activities.
- As the idea of limiting the number of TF members has raised concerns that future work might not be inclusive, transparent and open, it may be reasonable to (a) develop counter strategies in order to avoid the danger of closed clubs, and (b) communicate clearly that the numbers have been limited due to pragmatic reasons. The intention is - as always - to be as open, transparent and inclusive as possible.
- Some examples of suggested counter strategies included distinguishing between voting/active members and externals contributing to the activities, considering review boards from experts beyond the TF members, and sending updates on a regular basis. Such updates would need to be "digestible" and offer opportunities to participate as well as clear descriptions and useful links. Against this background, TFs could come up with quarterly summaries for distribution as well as to find mechanisms in order to synchronise/harmonise all TFs and AGs to get the bigger picture.



**Wednesday,
16 June 2021**

EOSC Governance and Association

11:15-13:00 Priorities, projects and partnerships - Identifying and addressing challenges for the EOSC Implementation phase



Chair

Sarah Jones

GÉANT & Director, EOSC Association

Introduction

This interactive session focussed on the various challenges that projects implementing the EOSC are facing. First, Sarah shared her personal views on why achieving EOSC in reality is difficult. She underlined the immense complexity of EOSC and reminded us that we are still in the build phase. The EOSC Association should collaborate with service providers and research communities to make the EOSC-Core run smoothly as utility services so that users can focus on the science. A panel composed of Owen Appleton, EGI Foundation; Ingrid Dillo, DANS; Rudolf Dimper, The European Synchrotron (ESRF); Shalini Kurapati, Clearbox AI, Politecnico di Torino; Hilary Hanahoe, RDA; reflected on the challenges and key actions necessary in order to tackle them. The audience was engaged in the panel through live event polls. Overall, many of the challenges are more on the social and policy side than on the technical side. Amongst those raised were awareness creation, researcher engagement, and ensuring inclusiveness in a multinational context where many languages are spoken. On the technical side, the most pressing challenges are interoperability, standards, and creating a seamless and easy to use EOSC. The panelists and the audience named, as the most important actions to focus on, researcher engagement, studying user needs, tailoring communications for different groups, and making FAIR data a norm in Europe.

[Watch the full session](#)

Main takeaways

- EOSC as a core utility needs to run so smoothly that the user doesn't even think about it, but rather can focus on the ecosystem built on top of it and what it has to offer them.
- Making this happen is hard but through collaboration, it can be done. Collaboration between the EOSC association, service providers and research communities is crucial.
- Key challenges facing EOSC are: awareness creation and user (especially researcher) engagement, increasing complexity of EOSC, variety of languages and ensuring inclusiveness, payments on the provider side, and keeping the interest and confidence of the wider audience alive while tackling these challenges, and on the technical side the challenges are ensuring an effective identity management, building a Google-like search engine so that people can find the data, interoperability, and standards.
- Key priorities for the EOSC Association to focus on are: awareness creation, researcher engagement, investing more resources in studying users' needs, tailored communication to different groups, knowledge management (i.e. who does what, where to find what etc.), making FAIR data a norm in Europe, resolving the financial question on the provider side, and how to glue services and data together (EOSC-Exchange isn't as clear as EOSC-Core).

Future steps

- Instead of aiming for full functionality straight away, the implementation of EOSC should be iterative in nature responding to user feedback and should include a lot of testing.
- Collaboration between the EOSC Association, service providers, and research communities is crucial.
- The EOSC Association should run an effective stakeholder forum to represent all interests including those of the European Commission, Member States, funders, Research Performing Organisations, industry etc., and make use of it.
- Without FAIR data, there is no EOSC.



**Wednesday,
16 June 2021**

EOSC Governance and Association

13:00-14:00 Lunch & the EOSC clinic: Open questions session



Chair

Karel Luyben

CESAER & President, EOSC Association

Sarah Jones

GÉANT & Director, EOSC Association

Klaus Tochtermann

ZBW & Director, EOSC Association

Introduction

The EOSC Clinic was a valuable chance for the audience to ask questions to the Board of Directors during the lunch break and to discuss EOSC developments. The discussions touched upon EOSC alignment and training requirements as well as the collaboration globally and with GAIA-X.

Main takeaways

- EOSC Infrastructure has good collaboration with universities already. The need to understand the difference with other infrastructures that have fostered EOSC's popularity was emphasised during the discussions. A further aim should be to see whether other legal entities are interested in collaboration with EOSC.
- EOSC's implementation is based on trust building within the community.
- The value of the collaboration possibilities globally and with GAIA-X was emphasised during the discussion.
- It was mentioned that "EOSC is not a house" that is being built but rather EOSC should be considered more like a WWW development; a web of data which would be as FAIR as possible.

Future steps

- The next pragmatic steps for EOSC are to align all parties already involved in EOSC and to engage more parties, to onboard, and to leverage on EOSC's similarities with activities in other areas.
- One of the key engagement activities is setting up an effective stakeholder forum (such as the EOSC Future User Registry), since a mechanism is needed to enable all stakeholders to be involved in the co-design of EOSC.
- The next definition for "what is EOSC" must be foreseen.
- In the long run, EOSC users need to be educated.
- The need for infrastructures was mentioned to store, compute, and connect.



**Wednesday,
16 June 2021**

EOSC Governance and Association

14:00-16:00 Research careers and curricula



Chair

Marialuisa Lavitrano

University Milano-Bicocca & Director, EOSC
Association

Introduction

In this session the three Task Forces (TFs) of the Researchers Careers and Curricula Advisory Group (AG) presented their draft charters; TF Data Stewardship Curricula and Career Paths, TF Research Careers, Recognition and Credit, and TF Upskilling Countries to Engage in EOSC. Together these TFs address the operational goals 003 and 008 of the SRIA, which are (003) Increasingly mainstream Open Science skills in European research-performing organisations, including through the uptake of curricula and training frameworks related to data stewardship through the lifespan of the Partnership, and (008) Co-design and adopt a rewards and recognition framework for FAIR and open data practices in research during the lifespan of the Partnership.

[Watch the full session](#)

Main takeaways

- The reproducibility crisis of scientific research undermines trust in science. A big cultural change including ORDM and FAIR policies is needed, and work is on-going to change this.
- Open Science can be encouraged and rewarded by developing FAIReR academic assessments that are rooted in both the FAIR guidelines for data management and policies for the responsible assessment of research (FAIReR = FAIR + Responsible). Both a cultural change and a technical infrastructure are needed for this. EOSC could play an important role here.
- There is a growing need for RDM and FAIR competencies in science but currently, there are too few data stewards available.
- Open Science training coordinators are doing an important job, on a practical level, to upskill countries to engage in EOSC, and in making Open Science training as widely available as possible (e.g., in local language, via online platforms, collaboration and best practice sharing etc.).

Future steps

- Both quantitative and qualitative data are needed to assess the quality of research outputs.
- The academic reward system should acknowledge Open Science practices.
- EOSC can play an important role in the cultural change of making Open Science and FAIR data more known and ultimately the norm as well as in providing the necessary infrastructure to modernise the academic reward system.
- Open Science training, and improving RDM and FAIR competencies, are of strategic importance for EOSC. The EOSC Association should link the TFs of the Research Careers and Curricula AG with the many initiatives and networks that are already existent.



Thursday, 17 June 2021 - Implementation priorities



Thursday, 17 June
2021

Implementation priorities

9:00-10:45 Engagement and cross-fertilisation between Research Infrastructures and the EOSC ecosystem



Chairs Suzanne Dumouchel

Huma-Num (CNRS) & Director, EOSC Association

Mirjam van Daalen

Paul Scherrer Institute & Chair, ESFRI Task Force on EOSC

Introduction

The Research Infrastructures (RIs) and their thematic communities are key stakeholders for EOSC, both as providers of thematic quality data and services, and as users of EOSC's generic data and services. RI communities are also leading the data culture change, driving data "FAIRness" and quality, as well as open access to data. This session tackled the user-centric and co-creation aspects of EOSC in its second phase post 2020, highlighting the need for closer engagement and onboarding of the RIs and other thematic communities in EOSC, in order to address and prioritise the actual research community requirements and provide added value for their end users.

[Watch the full session](#)

Main takeaways

- The thematic RIs and their communities are key stakeholders for EOSC, its uptake and sustainability (RIs are providers of thematic quality data and services and are users of EOSC's horizontal data and services). The broader the federation of thematic RIs in EOSC and the uptake of horizontal services, the better the chances for EOSC to become sustainable.
- While the clouds form the technical foundation that makes EOSC possible, the ESFRIs and science clusters are the guarantors of the scientific part of EOSC and together form the overall framework in which EOSC evolves.
- Science Clusters:
 - act as the key interfaces between the scientific communities, their infrastructures, and the EOSC;
 - provide FAIR data and build and maintain key community services;
 - make cluster community services available to the scientific community at large;
 - apply community services across clusters for novel research and important societal challenges;
 - provide platforms for scientific interoperability in EOSC;
 - assist researchers in their exercise of Open Science in/with EOSC.
- The ESFRI Science Clusters will be connected through the EOSC Future project. There:
 - scientific areas range from the impacts of climate change on biodiversity, environment, and societies to an improved understanding of our universe, and finally to all aspects of COVID-19 research;
 - scientific added value is provided by new interdisciplinary analyses coming from complementary RIs which beforehand was not possible;
 - innovative algorithms and methods will be shared with other scientific communities and society within the EOSC platform: innovative access management, novel approaches for sharing, analysing and reusing imaging data, and machine learning.
- What the ESFRI Science Clusters need from EOSC:
 - an open ear listening to ESFRI communities in order to make EOSC usable and useful for researchers;
 - reliable and user-friendly basic services such as AAI, data search, data transfer, access to storage and compute, which work seamlessly across disciplines;
 - a sustainable platform which researchers can trust and rely on for investing time (and money) to build their workflows.

Future steps

- *Blue-Cloud and FNS-Cloud: a synergy to strengthen open research in the fisheries field:*
 - Blue-Cloud has been cooperating with the FNS-Cloud project since April 2020, due to the commonalities shared by the initiatives in integrating data on the thematic European Open Science Cloud (EOSC) and fostering methods to make data more FAIR (Findable, Accessible, Interoperable, and Reusable).
 - The collaboration has brought important results in a relatively short period of time. BlueCloud and FNS-Cloud support the development of the new FAO uFish dataset, a widely used and cited reference table of food composition values of aquatic products. The data is taken from selected publications and undergoes a thorough review and validation process that must be replicated in the application.
- *SSHOC: Social Science and Humanities Open Cloud:*
 - SSHOC builds the SSH Cloud: creating the social sciences and humanities (SSH) part of European Open Science Cloud (EOSC) in order to maximise data re-use: maximising re-use through Open Science and FAIR principles (standards, common catalogue, access control, semantic techniques, training). It interconnects RIs: interconnecting existing and new infrastructures (clustered cloud infrastructure). It also sets up governance: establishing an appropriate governance model for SSH-EOSC.
 - SSHOC offers on- and offline trainings and training materials and an international cross-disciplinary trainer network to support communities. It offers an EU-wide easy-to-use SSH Open Marketplace, where tools and data are openly accessible. These tools are high-quality and 'cloud ready,' and the data is high quality SSH data with the availability of trusted and secure access mechanisms for SSH data, conforming to EU legal and national/institutional requirements.
- *EOSC-Life: EOSC Services for Life Science Cross-cutting services:*
 - The need from users, developers and infrastructure administrators drive the ELIXIR & EOSC-Life Tools ecosystems. It is co-designed with EOSC-Life users and includes cross-cutting, horizontal services and technologies serving non-bio stakeholders, Thematic data, tools, ontologies, and digital object outputs. Practical and real use case driven RO-based services can help to connect resources available via other EOSC services and related RIs.



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Implementation priorities

9:00-10:45 Engagement and cross-fertilisation between Research Infrastructures and the EOSC ecosystem



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Future steps

- *ESCAPE - Expanding EOSC participation by a factor of a thousand: citizen science in the EOSC:*
- The science-inclined public is both the largest and most overlooked group of EOSC stakeholders. Making data FAIR is easy compared to making FAIR data useful. Citizen scientists need to get involved too. Thus a realistic plan for genuinely two-way benefits for citizen scientists and EOSC needs to be made.
- *Researcher Engagement: Visions, needs and requirements for (future) research environments:*
- Challenges in Researcher Engagement in EOSC are saturation, the Emperor's New Clothes metaphor, information overflow, and it being seen as "not my business." Thus several lessons learned have been derived from the activities carried out: Researchers want information on concrete services and benefits for every day research; ways of clearly communicating what the EOSC is or what it may offer must be found; information should be prepared in a way that researchers know where to find it and can make use of it; what does not yet exist cannot be easily sold to a critical audience; and in general the genuine approach, to ask what researchers need and want, was very well received.



Thursday, 17 June
2021

Implementation priorities

11:15-13:00 Sustaining EOSC



Chair

Bob Jones

CERN & Director, EOSC Association

Introduction

Sustainability is key to the long-term success of the EOSC. Sustainability covers many aspects, however, two major areas are financial sustainability and the sustainable long-term preservation of data and other research relevant digital objects. The work of the EOSC Association task forces on Funding Models and on Long-term Data Preservation will be central to this. EOSC projects are developing a range of services, however, for these to be sustainable in the longer-term they need to move beyond project based funding. Commercial providers will have a key role in providing EOSC services, and the sustainability of these will be central to any commercial business planning process.

Watch the full session

Main takeaways

- The definition of sustainability needs to cover both financial and other aspects, for example, long-term digital preservation. The EOSC Association Task Forces (TFs) under the Sustainability Advisory Group (AG) will need to have a cross-cutting role with the other task forces.
- Reliance on short-term, project based funding is not compatible with the longer-term sustainability of EOSC. EOSC projects are developing a range of examples of how sustainability can be achieved.
- EOSC services should be 'free at the point of use', however, this will require there to be a range of mechanisms to cover the cost of developing and maintaining these services sustainable in the long-term.
- A crucial component of EOSC will be services provided by commercial organisations, such as commercial cloud services. One mechanism for delivering these free at the point of use is the 'service voucher' provided to individual researchers for purchase of such services. However, there are significant issues affecting the cross-border flow of financial resources to cover such costs.

Future steps

- The work of the EOSC Association task forces on Funding Models and on Long-term Data Preservation will be central to ensuring the long-term sustainability of the EOSC.
- EOSC projects are developing a range of services, however, for these to be sustainable in the longer-term they need to move beyond project based funding. There are a number of examples, from projects such as [EOSC Enhance](#), [DICE](#) and [CS3MESH4EOSC](#) which help show how sustainability can be achieved.
- Commercial providers will have a key role in providing EOSC services, and the sustainability of these will be central to any commercial business planning process. Projects such as [Archiver](#), [OCRE](#) and [CloudBank](#) are exploring how to provide commercial services on a sustainable basis, which are 'free at the point of use'.
- Work is ongoing looking at potential business models to support sustainability, and [EOSC Hub](#) has identified a range of business models covering procurement, virtual access, in kind and/or cash resources and public-to-public cooperation. The [OntoCommons.eu](#) project has identified that the FAIRification of data is a 'paid for' service that EOSC may be able to offer to commercial data producers to help add-value to commercial data.



Thursday, 17 June
2021

Implementation priorities

13:30-14:00 Lunch & EOSC clinic: Open questions session



Chairs Ronan Byrne

HEAnet & Director, EOSC Association

Suzanne Dumouchel

Huma-Num (CNRS) & Director, EOSC Association

Introduction

The EOSC clinic was an essential part of the EOSC Symposium, enabling the participants to ask open questions via sli.do and interact with members of the EOSC Board of Directors. Participants in the session had the opportunity to reflect on EOSC sustainability, which was discussed in the previous session, and its marketing relevance for the future. It also tackled the next steps in relation to GAIA-X, data management plans that will be established within Horizon Europe and EOSC, and the FAIR forever initiative.

[Watch the full session](#)

Main takeaways

- Commercial providers are a good addition to the services provisioning mix of EOSC if adopted wisely and for certain services.
- Marketing is needed to convey the message about EOSC before EOSC is able to market itself.
- Business models may include provisioning based on exchange with existing providers and negotiation, and not just money. The marketplace does not bring everything.
- The more data saved, the higher the risk that data becomes unusable. Long-term data management has to be taken care of in planning and audits.

Future steps

- More marketing of EOSC is required.
- Long term data management must not only be about saving data (long term) but also about finding data (long term).



Thursday, 17 June
2021

Implementation priorities

14:00-16:00 Technical challenges on EOSC



Chair

Klaus Tochtermann

ZBW & Director, EOSC Association

Breakout: AAI architecture



Chair

Marina Adomeit

SUNET

- The breakout started by 'looking back' at the main outputs of the EOSC-hub project and finished by 'looking forward' to the aspirations and main work to be done in EOSC Future.
- The [EOSC-hub](#) (Nicolas Liampotis, GRNET & EOSC-Hub/EOSC Future) project took requirements from both end users and resource providers to ensure that the AAI would be as transparent as possible. They demonstrated a working system across research communities and the delivery of a white labeled AAI service for EOSC Portal. However there are some clear gaps in the work which will hopefully be taken up by the EOSC Future project.
- **Umbrella Project** (Jean-François Perrin, ESRF & PaNOSC) created a diverse and large community of 50k users with very limited IT knowledge. UmbrellaID has been the AAI of the Photon and Neutron community since 2012. At the heart of this was a single, common and persistent unique ID.
- **ENVRI FAIR** (Keith Jeffery, ENVRI & EPOS-ERIC) set up an AAA task force (authentication, authorisation, accounting) to carry out AAAI implementation within the sub-domain RIs and the ENVRI-Hub although they are not aiming to build a centralised identity provider. The development of EPOS policies is fundamental even if it is a huge undertaking.
- **EOSC Future** (Christos Kanellopoulos, GÉANT & EOSC Future) picks up on where EOSC-hub left off and focuses on integrating community AAIs, identity providers, and services. By Month 30 (2023) a researcher should be able to undertake the full research life cycle i.e., Community AAI seamless integration with EOSC AAI federation through self service onboarding and cross sector access to the EOSC Federation. EOSC AAI will bring together all the entities and components for seamless access.

Introduction

In this session, the draft Task Force (TF) charters for the Technical Challenges on EOSC Advisory Group (AG) were presented by members of the writing groups, namely Infrastructure for Quality Research Software (Presented by **Cerlane Leong**, CSCS), AAI Architecture (presented by **Christos Kanellopoulos**, GÉANT), and Technical Interoperability of Data and Services (presented by **Joan Masó**, UAB). Technical Challenges on EOSC is one of the EOSC Association AGs. The TFs within this AG focus on implementing the technical architecture and interoperability in EOSC. The AG will also give indications of strategic areas for future work.

The following high-level priorities were highlighted for the Task Forces and break-out sessions which followed.

- **TF AAI Architecture** will build on a lot of good work which has already been done. It will develop the next version of the EOSC AAI Architecture, engage with stakeholders to identify new use cases and requirements, and analyse governance models for EOSC AAI
- **TF Infrastructure for Quality Research Software** will be exploring the community software landscape, defining what is quality software for EOSC, implementing Scholarly Infrastructure for Research Software in EOSC, and ensuring the sustainability of software when funding runs dry.
- **TF Technical Interoperability of Data and Services** will build upon the EOSC Interoperability Framework (EIF). It will finalise the guiding principles for interoperability, analyse existing interoperability systems and standards, promote alignment between EOSC standards and industry-related major activities, classify categories of services including the perspectives of various stakeholders, identify and specify a minimal set of functionalities, and promote consumption of EOSC interoperability standards and services.

Watch the full session

Breakout: Infrastructure for quality research software



Chair **Cerlane Leong**

CSCS

- **The SQaaS Platform** (Pablo Orviz, Spanish National Research Council (CSIC) & EOSC-Synergy), developed within EOSC Synergy, is used by thematic services in order to compose ad hoc items depending on the requirements and covers different services. The library is the core component. It implements the quality criteria, is user-friendly, and does not require technical knowledge.
- **Towards Reusable Research Software** (Daniel Garijo, Universidad Politécnica de Madrid): Software metadata is abundant but generally not machine readable. Knowledge graphs can be used to link the research software and its components. Research software should be actionable and useful to understand differences, authorship, portability, comparison, and reduce time needed for adoption. It is therefore very important to make research software metadata machine-actionable.
- **NI4OS-Europe Pre-Production Environment** (Dusan Vudragovic & Sonja Filiposka FCSE, UKIM & NI4OS-Europe): NI4OS-Europe is developing a pre-production environment to ensure a minimum set of federating services, to verify the quality of services before EOSC onboarding, and to support the service providers regionally. It has all the essential building blocks that enable the integration of generic and thematic services into the EOSC ecosystem.
- **OSF and improving the researcher experience** (Nici Pfeiffer & Eric Olson, Center for Open Science): The mission of this tool is to increase the openness, integrity, and reproducibility of research thereby changing the research culture. The environment allows research developers to test the integration of their resources. It helps them to avoid reproducing already existing features and tools. They instead are able to renovate them, bring innovation and to share software amongst their peers and with researchers.
- **EGI ACE/EGI Application Database** (William Karageorgos, IASA, EGI-ACE) is a central service for the storage of information about software solutions, involving programmers and scientists, and publications. As a software catalogue, it is a classification system, provides information about supported sites, and contains versioning information on software and author information on publications as well as cross-references between entries.

Breakout: Interoperability challenges for thematic communities



Chair **Joan Masó**

UAB

- **ENVRI-hub** (Andreas Petzold, Institute of Energy and Climate Research & ENVRI-FAIR) is the platform of the environmental sciences community in EOSC. Researchers are already working individually via Direct Access through Research Infrastructure portals, soon Subdomain Access as a service will be added, with future plans to integrate and coordinate the access for all researchers to ENVRI assets, via the ENVRI-Hub. It can serve as a MODEL for EOSC architecture.
- **NEANIAS Ecosystem** (Georgios Kakaletis, CITE & NEANIAS) presented the design principles, architecture and infrastructure resources of the platform. NEANIAS faces two major interoperability challenges: End-to-end service interoperability (Authentication, Authorisation, and Delegation, and cross domain trust) and single point, machine-actionable, resolution and access of data (PID service and multi-protocol support would be required).
- **CoVis: a curated knowledge map of seminal works on COVID-19** (Peter Kraker, Open Knowledge Maps) uses Knowledge Maps to structure the overwhelming quantities of COVID-19 data (200,000 papers in the last year) helping scientists achieve better research outcomes and save time for scientific discoveries. The project started with help from the EOSCsecretariat.eu co-creation funding and collaborates with OpenAIRE and TRIPLE.
- **ESCAPE** (Mark Allen, CNRS & ESCAPE) is a partnership in Astronomy and Particle Physics Research for Open Science. It has an architecture with a Virtual Observatory, a Data Lake (although more of a federated structure than a data-warehouse), and a Science Platform with a focus on Citizen Science. Connection to EOSC is a work in progress.
- **WfExS: a software component to enable the use of RO-Crate in the EOSC-Life tools collaboratory** (Laura Rodríguez-Navas, BSC & EOSC-Life) is a high-level workflow execution service backend, developed as part of an EOSC life Demonstrator (D7), useful for managing workflows across different domains. It is designed to facilitate sensitive data analysis using existing infrastructures and has a strong focus on reproducible and replicable analysis by using digital objects like RO-Crate, using a single linked-data metadata document to describe the digital object. It can be applied to manage the lifecycle of researching and could serve as a model for EOSC.

Breakout: Cross-cutting interoperability challenges

 **Chair** **Juan Bicarregui**
STFC & UKRI

- **Fenix: A template for future e-infrastructure services layers involving HPC (Dirk Pleiter, KTH / Forschungszentrum Juelich)** provides federated infrastructure services to support community specific platform services. It is a long-term effort of supercomputing centres to provide a variety of e-infrastructure services and aims at supporting diverse science and engineering communities in deploying domain-specific platform services.
- **Enabling Resource Composability in EOSC (Diego Scardaci, EGI Foundation & EOSC Future)** is an essential role that [EOSC Future](#) will deliver to allow the composition of resources across infrastructures by providing APIs and metadata, interoperability frameworks, and portal capabilities. By the end of the project, 'composability indicators' will be associated with EOSC resources, researchers will be able to access fully integrated/end-to-end workflows for various research topics, and there will be an execution framework.
- **EOSC-hub Interoperability guidelines (Giacinto Donvito, INFN & EOSC-hub):** The project produced interoperability guidelines for EOSC using a reference technical architecture. Six guidelines are for Federation of Services (EOSC-Core) and twelve are for common/horizontal services (EOSC Exchange). The multiple examples of composed services resulting from EOSC-hub interoperability guidelines are an important input for EOSC Future's work on the interoperability framework.
- **Service Interoperability Framework (Leah Riungu-Kalliosaari, CSC - IT Center for Science & EOSC-Nordic):** EOSC-Nordic considered the European Interoperability framework (more concerned with public services, not interoperable IT services) and EOSC Interoperability Framework (more concerned with data) to find recommendations that would improve service interoperability across services providers, considering diversity of providers and services themselves. Using use-cases from different research communities, EOSC-Nordic surveyed service providers and produced a 18 page report available via their website.
- **ScienceMesh (Hugo Labrador, CERN & CS3MESH4EOSC)** aims to build a distributed interoperable mesh of sites leveraging existing file sync and sharing services. It already has 400K users, 16PB of data, 130+ organisations across 25 countries. It has decentralised operation and site sovereignty. ScienceMesh provides an IOP (Interoperability Platform) to quickly establish communication and immediately join the ScienceMesh ecosystem.

Breakout: Interoperability challenges to increase the services offer of the EOSC

 **Chair** **Anastas Mishev**
UKIM

- **DICE (Nadia Tonello, Barcelona Supercomputing Center & DICE)** operates use cases of integration of generic services into community platforms, aiming to attract new users, create data service composability, and enhance interdisciplinary use of data.
- **OpenAIRE CONNECT Research Community Dashboard (Alessia Bardi, CNR - ISTI / OpenAIRE & OpenAIRE Nexus)** delivers configurable Open Research Gateways and lowers the barriers to the adoption of Open Science publishing practices in the research community.
- **EGI-ACE (Mark Dietrich, EGI Foundation & EGI-ACE)** Integrates data spaces, data ecosystem, and data initiatives from a variety of communities through harmonising their models and enabling interoperability governance and standards across the communities. It creates a common framework, with plans to expand collaboration and refine the framework by finding commonalities with more communities.
- **OpenAIRE (Andrea Mannocci, ISTI - CNR & OpenAIRE-Nexus)** aims to build an open science graph (OSG) interoperability framework, where the EOSC resource catalogue seamlessly flows with information from across the relevant stakeholders. EOSC can capitalise on synergies. OpenAIRE plans to launch an RDA interest group on "OSGs for FAIR data" and related Working Groups.
- **RELIANCE (Raul Palma, Poznan Supercomputing and Networking Center & RELIANCE)** aims to extend EOSC's capabilities with an enhanced support for research activities and interconnected services, in alignment with the EOSC Interoperability Framework by using the Research Objects as the key enablers that will support and bring systematic change to open science practices within EOSC. RELIANCE plans to demonstrate its services via three Earth Science communities and plans to engage more communities through an Open Call.



Friday, 18 June 2021 - Implementation priorities





Friday, 18 June 2021

Implementation priorities

09:00-10:45 Implementation of EOSC



Chair Suzanne Dumouchel

Huma-Num (CNRS) & Director, EOSC Association

Introduction

The Advisory Group (AG) and Task Forces (TFs) on the Implementation of EOSC focus on how to roll out EOSC recommendations and test their applicability with research communities and service providers. They also seek to promote broader adoption of EOSC, specifically amongst the research community. This session focused on current activities in these areas with contributions from the community through the open call for contributions. A lively response from the community brought the Programme Committee to organise four breakout sessions.

[Watch the full session](#)

Main Session

- Three TFs have been established in the Implementation of EOSC AG. Their diversity must be the priority principle. In a bottom-up approach EOSC needs to move from the recommendations that were produced previously to the implementation phase.
- **TF Researcher Engagement and Adoption**'s main goals are to identify researchers' needs and to allow researchers to take a degree of ownership of EOSC. The core activities in this TF are communication and training.
- **TF PID Policy and Implementation**'s main aims are to contribute to the next version of the EOSC SRIA regarding PID infrastructures, machine-actionable PIDs, meta resolver, PID graph, PIDs and FAIR data management, quality of service for PIDs, and new PID technologies. It will then provide community feedback and make recommendations for the integration of PID services in the EOSC ecosystem, covering all EOSC resource types, draft a recommendation about global PID resolution including existing and emerging instances of meta-resolvers, issue a report on data formats and their definitions, produce a report about EOSC PID graph, define the criteria to assess PIDs' quality and have them listed on EOSC MarketPlace, and collect best practice PID use cases exemplifying FAIR data management and describe them in a report..
- **TF Rules of Participation compliance monitoring** must ensure that the entry requirements of EOSC move from the current high-level EOSC Rules of Participation (RoP) to practical criteria for implementation in EOSC, define at what level RoP can be reasonably monitored, and set in place a framework to enable such monitoring alongside other key stakeholders, and involve the community in setting the RoP. Core activities feature three phases: RoP Architecture (structure of the rules), an expanded RoP which provides more specific criteria or requirements for providers and resources and a monitoring plan, an initial 'EOSC Appeal' group, and a proposal for the setup of a RoP Board to the AG and EOSC Association.

Breakout: Rules of Participation & PID policy



Chair **Juan Bicarregui**

STFC & UKRI

- **Rules of Participation for EOSC in the NI4OS-Europe context (Dusan Vudragovic, Belgrade Institute of Physics & NI4OS-Europe):** FAIR principles and EOSC architecture will impose constraints on the RoP. NI4OS identified a minimal integration level between EOSC Core and Exchange. Three areas in particular were identified concerning the level of implementation: technology readiness level, EOSC core integration level, and management integration level; each of these features nine levels of resource categorisation. When combined together, they produce an indicator of the cumulative level of integration of a service within EOSC. It is crucial to ensure resources are aligned to the quality of the research undertaken.
- **RoLECT: a self-assessment tool against EOSC RoP Legal & Ethics Compliance (Marianna Katrakazi, ATHENA RC & NI4OS Europe)** focuses on the legal and ethical aspects of compliance with EOSC RoP, and is designed to promote compliance and identify non-compliance. There are many challenges with respect to implementing RoPs and the aim is to help resource providers. The tool aims to support resource providers who do not have the necessary legal/ethics expertise to assess their own compliance independently through a structured flow of questions, categorised into three levels of importance. The tool is dynamic and questions asked depend on previous answers. It can be explored as a guest user¹ and includes [a licence clearance tool](#) for checking compatibility between different open licences.
- **EOSC PID policy and implementation (Mark van de Sanden, EUDAT)** examined the interaction of EOSC PID policy with [EUDAT](#) services being impacted: B2HANDLE, B2SAFE, B2SHARE, B2FIND, as well as how key principles of the PID policy can be applied at a practical level. PIDs should be globally unique, persistent and resolvable. Persistency can mean different things for different communities. Six roles are defined within the PID policy - however, roles may rely on multiple partners to deliver, e.g., the PID Service Provider. Main challenges include translation of policy to criteria against which compliance can be assessed, technical interoperability, and long-term sustainability of PID service providers.
- **What does the P in PID stand for? Persistence or Persistable? (Jonathan Clark, The DOI Foundation):** Persistence tends to be taken for granted. Persistable - that can be made to persist - be permanent. However, persistence is not an inherent property of the system. Persistable needs to be built into the design. Two persistencies represent a particular challenge: Persistence of the service to resolve from the identifier to the object, Persistence of a service to allow for updating of the binding between identifier and object. Disaster recovery and business continuity are two key issues, as well as the definition of what needs to be done to ensure persistence.
- **Openly reproducible PIDs as a factor of FAIRness in data sharing practices (Andrey Vukolov, ELETTRA Sincrotrone Trieste & ExPaNDS):** The access model is not defined explicitly. In the current model the existing data representing a given object are stored separately. Each node in the PID administration workflow is a separate point of failure, because any technical failure leads to data loss. In terms of FAIR, PID provides only one address endpoint to access a digital object, and the RI is separated from the PID namespace authority. Consideration of how to define a reproducible PID: The reproducible PID's prefix/namespace is defined by a known algorithm, the PID is reproducible from the data/metadata themselves by an open algorithm, a workflow is proposed for openly reproducible PIDs.
- **Beyond PIDs: global open scholarly infrastructure (Edward Pentz, Crossref; Matt Buys, DataCite)** - Although important, PIDs don't have 'magical properties.' The focus should be on the services and infrastructure they connect with. What are the principles that will underpin a global open scholarly infrastructure? There needs to be a focus on open, community-governed initiatives, also referring to the [Principles of Open Scholarly Infrastructure \(POSI\)](#), towards a rich and reusable open network of relationships to support open research and researchers. There are 16 balanced principles covering the areas of Governance, Sustainability, and Insurance that organisations need to commit to. EOSC PID policy implementation activities should consider alignment with the POSI principles.

Horizontal Priorities

- Methodologies and assessment tools exist to help understand the level of integration of a service within EOSC, and the legal and ethical compliance of a service. These can be further built on.
- Ensure clear definitions of roles and responsibilities.
- Open research needs to be supported by a global open scholarly infrastructure.
- Provision of sustainable, persistent and reproducible PIDs and PID services is a core element of such an infrastructure.
- Consider the long-term persistence of metadata even if the data they relate to are no longer available.

¹ <https://rolect.ni4os.eu/rolect/auth/login>

Breakout: Community engagement & data types



Chair **Anastas Mishev**

UKIM

- **EOSC-SYNERGY Thematic Services: Contribution to the EOSC Ecosystem (Ignacio Blanquer, UPV)** gave an introduction to EOSC-Synergy Thematic services and how they contribute to the EOSC ecosystem. The thematic services of four big research areas (Earth observation, Environment studies, Biomedicines, Astrophysics) have been analysed through certain technical aspects resulting in a virtuous cycle of services that increase their capacity, performance, reliability and quality.
- **EXPANDS and the neutron and synchrotron light source science community (Isabelle Boascaro-Clarke, Diamond Light Source)** presented an overview of the neutron and synchrotron light source science community that encompasses 25,000 photon facility users and encourages them to publish research data at the same time as their research articles.
- **Fostering Researcher Engagement by Providing Open Research Knowledge Graph (Sören Auer, TIB Leibniz Information Center for Science and Technology)** is the concept of a knowledge graph that links the various pieces of information related to a document to each other in a graphical format. Knowledge graphs can be extended with bibliography information.
- **NFDI4Culture: 3D Heritage Data Interaction and Enrichment (Ina Blümel, German National Library of Science and Technology)**, is a consortium for research data on material and immaterial cultural heritage. They explained the challenge of visualisation tools in this sphere and demoed a 3D heritage data interaction and enrichment tool that can be used both by researchers and experts working in culture.
- **FiglinQ: a platform enabling data-connected, interactive, smart manuscripts (Przemek Krawczyk, Amsterdam UMC)** is a platform where one can produce interactive charts that include and display the data that they are based on. These charts (including data) can be embedded directly in manuscripts allowing the readers to click and dig into the data behind a graph. These are called smart manuscripts.

Horizontal Priorities

- There is a need for alignment and cross-fertilisation for the services that these organisations and initiatives provide and that could be added to EOSC.
- The EOSC Association was seen as a very good channel to get greater visibility for their services and tools, some which are quite new and not so well-known yet (e.g. FiglinQ)
- Small national RIs should be connected to the bigger European vision through EOSC
- It's the right time to move from static images in research articles to truly digital science, and electronic and interactive charts are definitely steps in that direction.
- Entrepreneurial approach to EOSC and digital science is needed, moving from high-level discussions and standardisation processes to testing and learning.
- Sharing information on services from one research community to another might bring up positive surprises that didn't seem relevant at first but were then adopted / sparked new ideas etc. in other scientific communities (multidisciplinarity).
- Increased visibility through EOSC might bring new users for services. In addition, interoperability is crucial for user engagement (e.g. single sign-on) and that added-value of EOSC for researchers should be crystallized to get them interested.
- EOSC should try to look into the future and try to think of what researchers want to use. E.g. Tomography is becoming very data-heavy.

Breakout: Community engagement



Chair **Donatella Castelli**

CNR-ISTI & EOSCsecretariat.eu

- **Implementing an Open Science Future: Adoption of new practices, incentives, policies, and tools (David Mellor, Center for Open Science):** There is a collective action problem on how science should be done. Study has been done on the behaviour of researchers in relation to the norms of practicing science: Most of the individuals surveyed agree on the importance of open sharing; skepticism and focus on quality should be the norms of science as opposed to secretive, dogmatic and focused on quantity. But most of the researchers interviewed believed that other researchers don't follow open science norms. A number of recommendations were given for reducing the perceived risk of adopting the Open Science practices covered by EOSC: the practices should be possible, easy, normative, rewarding, and required.
- **Connecting EOSC with Local Open Science Communities (Loek Brinkman, Open Science Community Utrecht):** Three challenges were identified for EOSC: Creating awareness, reaching users, and obtaining user feedback. Researchers are the engines of cultural change, forming grassroots communities and networks (such as INOSC), where researchers share experiences, and learn how to incorporate Open Science in their practices. Utrecht University is encouraging such local communities in other universities in the Netherlands and other EU countries. They have created a starter kit for forming and launching Open Science communities.
- **The EOSC Early Adopter Programme and Competence Centres: relevance, impact and lesson learnt (Gergely Sipos, EGI Foundation):** The Early Adopter Program (providers) and Competence Centers (supported users and providers) worked closely together as instruments of engagement with research communities, and were similar in many aspects. The competence centers were mini-projects selected based on scientific communities who expressed interest in collaborating, whereas early adopter programs were set up through 2 open calls during the project. Open calls are extremely useful instruments to engage with European scientific communities. The biggest benefit for the communities was the advisory network to find the most suitable combination of services/resources and then to help them integrate those into their own workflows.
- **Supporting disciplinary engagement with EOSC (Timea Biro, RDA4EOSC):** A study mapping the state of awareness and readiness of domains / disciplinary research communities, identifying the underrepresented and providing recommendations for future engagement. Most of the communities assessed find themselves as either aware but not (fully) ready or ready but not aware of EOSC nor the benefits of engaging with the wider cross-disciplinary community and joining the effort.
- **EOSC DIH: Bridging industry and EOSC (Sy Holsinger, EGI Foundation)** - EOSC Digital Innovation Hub (DIH) Supports innovation within private enterprises using the EOSC services, data and expertise. There were 18 business pilots during the EOSC-Hub project which will be continued by EOSC Future. It partners with key infrastructure projects, startups, spinoffs from universities, EOSC regional projects, SME associations, data spaces, and data providers. DIH set up persistent websites to inform about business pilots, partnerships established, and additional funding opportunities around the community.

Horizontal priorities

- Many scientific communities are not EOSC-ready and are not fully aware of the benefit of multidisciplinary science.
- A culture shift in how researchers approach scientific research is required in order to reduce perceptions of risk associated with sharing data. Rewards and incentives are essential for this.
- Open calls can become an essential instrument to engage with European scientific communities. These should be supported by coordinated support networks and advice. DIH is an example of this for the SME community.
- Local networks of Open Science practitioners can help to cultivate this culture shift. A grassroots approach can foster greater trust in using FAIR data principles.

Breakout: Panel discussions - Readiness indicators & data and services.

Two panels were held in this breakout session, one on Readiness Indicators, and the other on Data and Services.

A dashboard approach to EOSC readiness indicators: co-designing the way forward (INFRAEOSC-5 Landscaping Task Force)



Chair Federica Tanlongo

GARR & EOSC-Pillar

- Starting from an initial proposal, a set of indicators and methodologies was designed in a validation workshop and further revised in consultations with key stakeholders.
- 18 indicators in 5 key macro areas were identified, and analysed via a dashboard. The countries analysed were Italy, Portugal, Serbia and Slovenia.
- The dashboards main functionalities are:
 - harvesting information from trusted open data sources automatically
 - the possibility to upload data manually
 - transparency
 - a European overview contextualised with country specific statistics
 - a dedicated country page with quantitative and qualitative information

NEANIAS, Cos4Cloud, TRIPLE, INODE: 4 EOSC-Projects Join Forces to Shape Europe's Data and Services World (INFRAEOSC-2)



Chair Eleni Petra

Athena RC & NEANIAS

- [NEANIAS](#) addresses community-specific needs for underwater, atmosphere, and space research sectors in order to onboard the community to Open Science, nurture new business opportunities, and power up EOSC.
- [Cos4Cloud](#) is linking Citizen Science to the EOSC by connecting different infrastructures of Citizen Science, known as Citizen Observatories (CO), through integrative codesigned services. COs can provide complementary data for research on a wide range of topics, such as biodiversity or environmental quality.
- [TRIPLE](#) provides a multilingual discovery solution for Social Sciences and Humanities through a single access point that allows users to explore, find, access, and reuse publications and data, projects, and researcher profiles at a European scale.
- [INODE](#) helps users from the astrophysics, cancer biomarker research, and Research and Innovation policy making domains to link and leverage multiple datasets, access and search data using natural language, and leverage examples and analytics, as well as get guidance from the system in understanding the data and formulating queries, exploring data, and discovering new insights through visualisations.

Future steps

- Researcher Engagement and Adoption:
 - Clarify questions about the scope of the Task Force on Researcher Engagement and Adoption and about resources available
 - Analyse and understand how researchers are engaged on national and institutional levels, which engagement-measures have been undertaken already and what are the effects and results
 - Set up a Communication Plan / Strategy
 - Set up an activity plan taking into account the available resources
- PID Policy & Implementation:
 - Identification of past and current European research projects dealing with PIDs
 - Cooperation with research project leads to assess and select EOSC compatible outcomes
 - Interview European data repository managers to identify PID best practices and produce a SWOT analysis
- Rules of Participation compliance monitoring:
 - Regular meetings
 - Workshops with catalogue owners and providers
 - Workshops with providers and research communities together with projects
- EOSC readiness indicators:
 - Many of the indicators identified are not accomplished as ready to use datasets
 - Some datasets are available at the European level, but they are not exactly linked with the defined indicators, the proxies using them need to be defined
 - In parallel, some analysis of data availability at country level is taking place
 - The integration of selected datasets into the dashboard as well as the publication of a final report is going to be finalised in the summer of 2021



Friday,
18 June 2021

Implementation priorities

11:15-13:00 Metadata and data quality



Chair

Sarah Jones

GÉANT & Director, EOSC Association

Introduction

The session *Metadata and data quality*, chaired by Sarah Jones (GÉANT & Director, EOSC Association), focused on addressing semantic interoperability to ensure data can be discovered and reused, as well as aspects of data quality and metrics to promote high-quality resources in EOSC. It started with brief introductions to the Semantic interoperability Task Force (TF) charter as well as to the FAIR metrics and data quality TF charter. Contributions from the community to both topics followed. Discussions on Potential Solutions ended the session.

Watch the full session

Main Takeaways

- The Semantic Interoperability TF already identified several problems and needs that will have to be addressed in order to advance interoperability solutions. The problems that the TF will have to deal with include the lack and/or overabundance of explicit definitions, common semantics/general ontologies, reference repositories, common metadata schemes across communities, and metadata models. Principle approaches for ontology and metadata schemes, harmonisation across disciplines, harmonising data of the same type as well as federated access to existing research data repositories are therefore needed.
- In the context of EOSC, FAIR metrics have been considered already to quite some extent, all while data quality hasn't yet been explored sufficiently. The TF FAIR Metrics and data quality thus aims at overseeing the implementation of FAIR metrics through testing FAIR metrics with research communities and considering more general aspects of data quality.
- Communities contributing to the Semantic interoperability session included the [International Union of Crystallography \(IUCr\)](#) trying to harmonise Crystallographic Information Files and Crystallographic Information Frameworks (CIF), [ExPaNDS](#) presenting [Ontologies for Photon and Neuron Science](#), the [Jülich Forschungszentrum](#) introducing the [TOAR database](#), [eLTER](#) applying the [RDA I-Adopt Framework](#), and [Reliance](#) presenting metadata models and research objects for Earth Observation Data Cubes.
- The FAIR metrics and data quality session saw a contribution from [FAIRsFAIR](#) presenting [FAIR-Aware](#), a tool used to evaluate people's awareness of FAIR principles. Two other speakers gave an insight into the current FAIR status in Cryo-Electron Microscopy data analysis, and insight into standardised provenance information for biological specimens respectively. The latter faces challenges such as the fact that specimens and data are often disconnected, or that the retracing of analysed data back to raw data or of data generations to specimens is often impossible.
- Eventually, potential solutions were presented. Among them [The Role of DDI-CDI in EOSC: Possible Uses and Applications](#), the [Helmholtz Metadata Collaboration \(HMC\) Platform](#) as well as the [TIB Terminology Service](#) as a core service for research data infrastructures.

Future steps

- The presentations led to lively discussions in the chats. Links as well as contact requests were exchanged in order to deepen specific discussions and exchange knowledge as well as experiences. This organic knowledge exchange should be encouraged and continued.
- DDI-CDI (Cross-Domain Integration) was developed by members of the Data Documentation Initiative (DDI) serving SBE research projects using data from other domains. Three key features to facilitate data combination and machine actionability were embraced: structure (describing the roles played by datums in various data structures), provenance (describing provenance and processing of data) and variable descriptions (concepts, variables, classifications, coding, etc.). Based on their experiences, examples, and use cases the following recommendations and activities are suggested: enhance support for data integration, automate metadata capture, develop crosswalks to domain standards, link DDI-CDI to other Metadata Standards within the EOSC Metadata Infrastructure, establish guidelines for metadata provision, support technology-neutral solutions, align with international metadata initiatives, and align with relevant implementation technologies and platforms.
- The HMC platform supports researchers in (automatically) describing their data by means of a suitable, standard compliant description with metadata. It also allows them to reuse Helmholtz research data for advanced methods of data processing and analysis. It does so by bringing together Metadata Hubs (community expertise, training, and technologies), FAIR Data Commons (technical services and FAIRification), HMC projects (community and use cases), and the HMC Office (management and control).
- TIB hopes to leverage their services - among them technical support, training and consultation, vocabulary services and curation, and legal issues and licensing/licenses - in EOSC. Future steps include the implementation of Terminology Service (TS) in further TIB projects, quality checks and pipelines for incorporation of third party ontologies, the extension of APIs for retrieving machine-readable ontology data, the development of domain-specific ontologies for NFDI projects, domain-specific frontends for NFDI projects, the implementation of modules for curation and editing into TS, as well as establishing a notification service about published ontologies, changes, and updates.



Friday, 18 June 2021

Implementation priorities

13:00-14:00 Lunch & EOSC clinic: Open questions session



Chairs **Bob Jones**

CERN & Director, EOSC Association

Ignacio Blanquer

UPV & Director, EOSC Association

Introduction

During this session participants had an opportunity to discuss the views and attitudes of commercial providers towards the EOSC initiative. They also touched upon the dissemination and engagement plan of the EOSC Association in the national and international arena.

Main Takeaways

- The Advisory Groups (AGs) and Task Forces (TFs) should work together in addressing the technical challenges in order to understand the respective TF needs, specifically in terms of the level of data integrations.
- Champions are key for approaches to the community and they can form a bridge between research and technical areas. High-profile scientists are good enablers for their respective disciplines and they have good connections.
- The EOSC Association needs to set the future dissemination plan/strategy, and to showcase the main take-aways from the EOSC Symposiums and success stories from their members.
- Engagement with and enthusiasm for EOSC is seen in many areas.
- EOSC is a worldwide leader with its multi-country, multi-disciplinary concept.

Future steps

- The AGs and TFs should work together.
- The EOSC Association needs to set the future dissemination plan/strategy.
- It is important to share the EOSC visions, tools and services with the smaller countries, encouraging them to be part of the EOSC community.



Friday, 18 June 2021

Implementation priorities

14:00-15:45 The EOSC Symposium and beyond



Chair **Nicholas Ferguson**

Trust-IT Services & EOSCsecretariat.eu & EOSC Future

Introduction

The EOSC Symposium and beyond, chaired by **Nicholas Ferguson** (Trust-IT Services & EOSCsecretariat.eu), was the last session of the EOSC Symposium 2021. It took a retrospective look at the achievements of the EOSCsecretariat.eu project which has supported the EOSC governance 2019-2021 and also presented the plans of the recently funded EOSC Future project that aims to demonstrate an operational EOSC Platform. The session was closed by the EOSC Association President Karel Luyben who thanked everyone who had been involved in bringing the European Open Science Cloud to where it is today and looked ahead with a positive spirit noting that we, the whole EOSC Community, are the true EOSC ecosystem.

[Watch the full session](#)

Main Takeaways

- EOSCsecretariat.eu paved the way for the set-up of the EOSC Association, acted as an aggregator for the growing EOSC community by collaborating with ESFRIs, the HPC community, Call5b projects, and initiatives such as GAIA-X, all the while supporting the co-creation of EOSC through a dedicated co-creation budget.
- EOSCsecretariat.eu's Covid-19 fast-track funding demonstrated very concretely the added value of Open Science.
- The objective of EOSC Future is to implement an operational EOSC-Core, a system of systems, that acts as the "glue-layer" combining resources across infrastructures, and to populate the EOSC-Exchange.
- EOSC is more than the portal. It is not just about machines, it is about people. "We" are the EOSC ecosystem.
- The EOSC Association will collaborate with the community and strive towards linking the diverse contributions better, but at the same time, the Association has to balance moving forward with consulting the community as widely as possible.

Future steps

- EOSC should rely on what has already been done in terms of engagement and continue the cooperation with the whole EOSC community. However, more attention should be directed to the researcher community.
- EOSC marketing is needed. The EOSC Association will have to communicate actively to different groups making clear the added value of EOSC for each of them.
- Not much can be achieved alone. The EOSC Association will have an active and collaborative role in the EOSC implementation phase.

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