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Collaboration Activities and Opportunity Areas

Ilire Hasani-Mavriqi, EOSC Focus, and
Wolmar Nyberg Åkerström, EOSC-A

2024 Coordination meeting of EOSC-related projects funded under Horizon Europe
June 20-21, 2024

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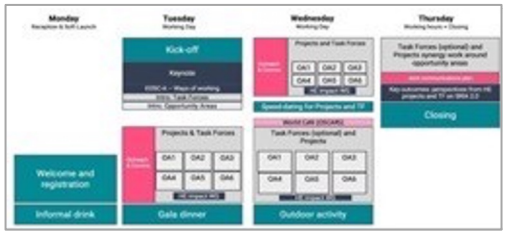
Evolution of HE EOSC –Related Projects Collaboration

Opportunity Areas
OA1: PIDs
OA2: Metadata, Ontologies & Interoperability
OA3: FAIR Assessment & Alignment
OA4: User & Resource Environments
OA5: Skills, Training, Rewards, Recognition & Upscaling
OA6: Open Scholarly Communication



2023

June

2023 Coordination Meeting
Birth of Winter School idea

September

EOSC Symposium 2023
Launching the EOSC Macro-Roadmap & scoping Opportunity Areas

October - December

Establishment of OA Organising Committees (Project + TF) and Winter School preparations

2024

January

EOSC Winter School in Thessaloniki

April - June

OA individual meetings and collaboration schemes
Onboarding 7 new projects
2024 Coordination Meeting

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EOSC Winter School 2024

- Provide an environment where well-defined technical topics can be discussed in detail
- Establish collaborations among projects to accelerate progress towards creating “one EOSC”
- Increase the potential of the HE EOSC-related projects to deliver sustainable results that benefit the ESOC deployment, thereby maximize project impact
- Integrate the outputs of EOSC-A TFs into HE EOSC-related projects

Organised by the EOSC Association with the support of the EOSC Focus project, the Horizon Europe (HE) EOSC-related projects, and local organisers from the RAISE project consortium

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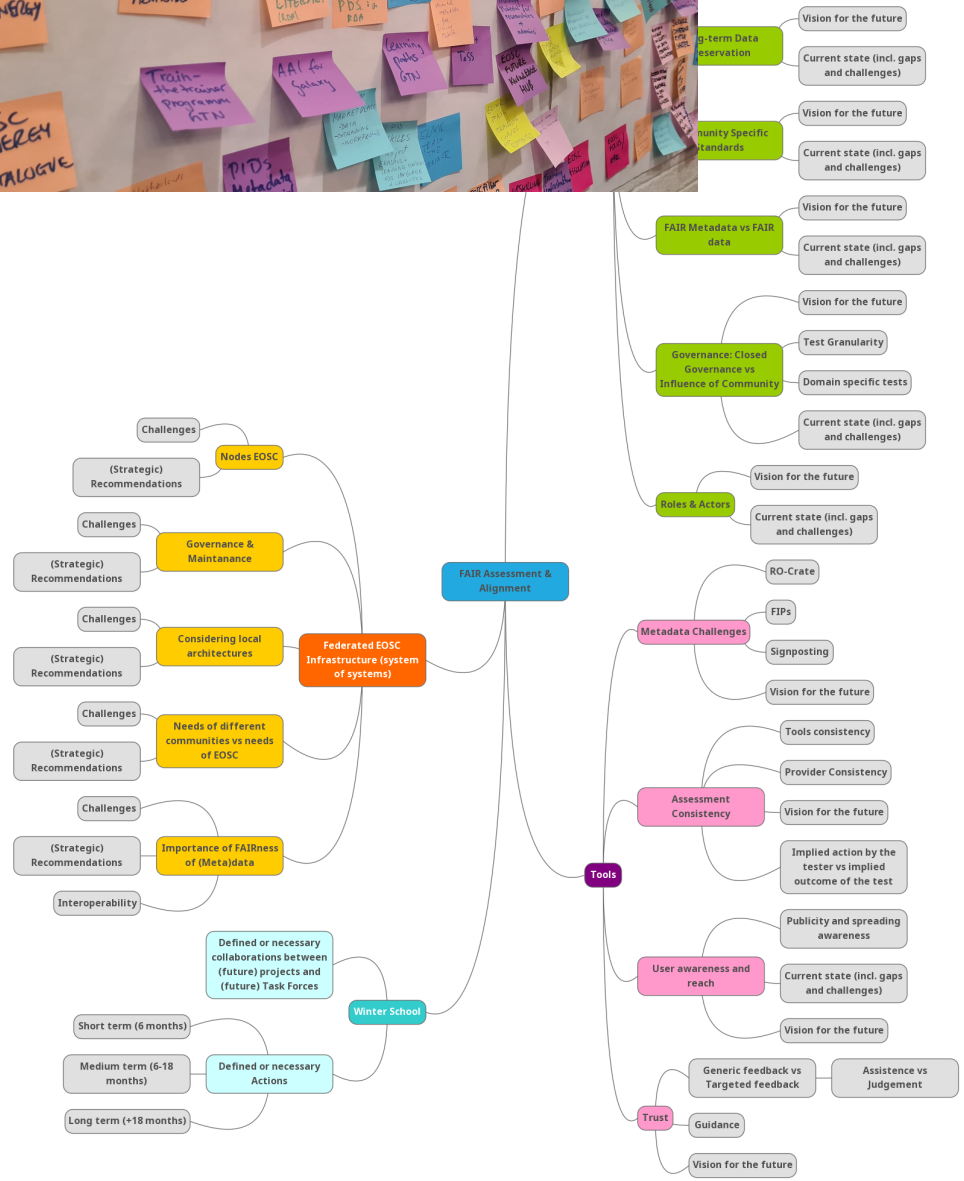
EOSC Winter School 2024

Approach

- Presentations, group work, mapping exercises, demonstrators and hackathons
- Topics were decided by the technical coordinators of the projects and Task Force co-chairs, ensuring relevance to current technical challenges faced by EOSC

Main results

- Translation of the “Opportunity Areas for technical collaboration” into concrete actions to be implemented by the projects collaboratively
- The positive experience is expected to be repeated in future editions



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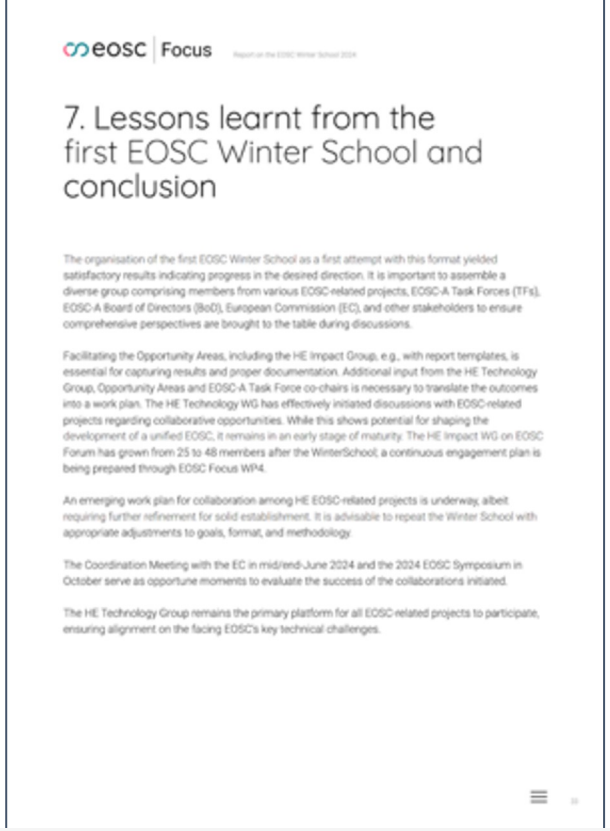
Report on the EOSC Winter School

2024

29 January -
1 February 2024

Thessaloniki, Greece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7. Lessons learnt from the first EOSC Winter School and conclusion

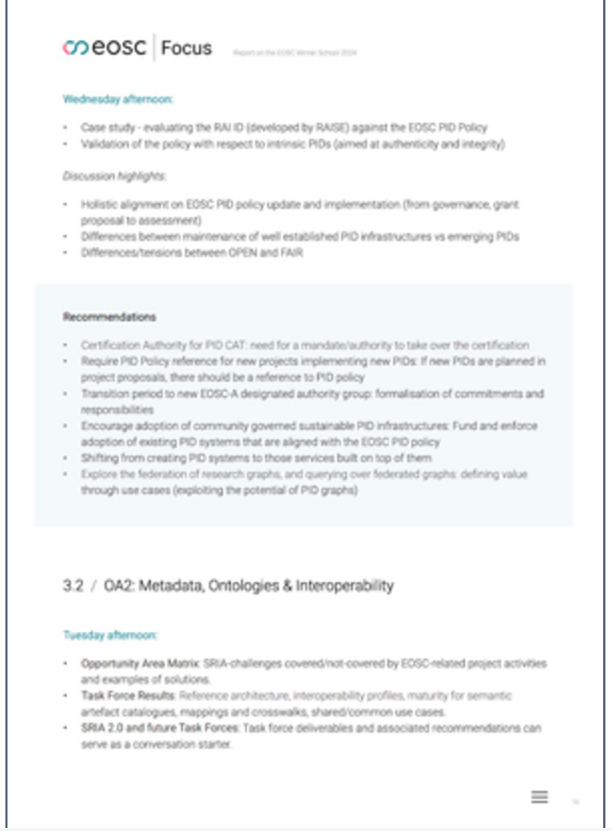
The organisation of the first EOSC Winter School as a first attempt with this format yielded satisfactory results indicating progress in the desired direction. It is important to assemble a diverse group comprising members from various EOSC-related projects, EOSC-A Task Forces (TFs), EOSC-A Board of Directors (BoD), European Commission (EC), and other stakeholders to ensure comprehensive perspectives are brought to the table during discussions.

Facilitating the Opportunity Areas, including the HE Impact Group, e.g., with report templates, is essential for capturing results and proper documentation. Additional input from the HE Technology Group, Opportunity Areas and EOSC-A Task Force co-chairs is necessary to translate the outcomes into a work plan. The HE Technology WG has effectively initiated discussions with EOSC-related projects regarding collaborative opportunities. While this shows potential for shaping the development of a unified EOSC, it remains in an early stage of maturity. The HE Impact WG on EOSC Forum has grown from 25 to 48 members after the WinterSchool; a continuous engagement plan is being prepared through EOSC Focus WP4.

An emerging work plan for collaboration among HE EOSC-related projects is underway, albeit requiring further refinement for solid establishment. It is advisable to repeat the Winter School with appropriate adjustments to goals, format, and methodology.

The Coordination Meeting with the EC in mid/end-June 2024 and the 2024 EOSC Symposium in October serve as opportune moments to evaluate the success of the collaborations initiated.

The HE Technology Group remains the primary platform for all EOSC-related projects to participate, ensuring alignment on the facing EOSC's key technical challenges.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Wednesday afternoon:

- Case study - evaluating the RAI ID (developed by RAISE) against the EOSC PID Policy
- Validation of the policy with respect to intrinsic PIDs (aimed at authenticity and integrity)

Discussion highlights:

- Holistic alignment on EOSC PID policy update and implementation (from governance, grant proposal to assessment)
- Differences between maintenance of well established PID infrastructures vs emerging PIDs
- Differences/tensions between OPEN and FAIR

Recommendations

- Certification Authority for PID CAT: need for a mandate/authority to take over the certification
- Require PID Policy reference for new projects implementing new PIDs: if new PIDs are planned in project proposals, there should be a reference to PID policy
- Transition period to new EOSC-A designated authority group: formalisation of commitments and responsibilities
- Encourage adoption of community governed sustainable PID infrastructures: Fund and enforce adoption of existing PID systems that are aligned with the EOSC PID policy
- Shifting from creating PID systems to those services built on top of them
- Explore the federation of research graphs, and querying over federated graphs: defining value through use cases (exploiting the potential of PID graphs)

3.2 / OA2: Metadata, Ontologies & Interoperability

Tuesday afternoon:

- **Opportunity Area Matrix**: SRIA-challenges covered/not-covered by EOSC-related project activities and examples of solutions.
- **Task Force Results**: Reference architecture, interoperability profiles, maturity for semantic artefact catalogues, mappings and crosswalks, shared/common use cases.
- **SRIA 2.0 and future Task Forces**: Task force deliverables and associated recommendations can serve as a conversation starter.

Rey Mazón, M., & Hasani-Mavriqi, I. (2024). Report on the EOSC Winter School 2024. EOSC Association. https://doi.org/10.5281/zenodo.11165100

Opportunity Area Expert Groups

- Commitment: WS participants
- Facilitation: EOSC Focus & EOSC-A
  - Individual OA meetings, EOSC Forum groups, collaboration schemes
  - Identify topics where concrete collaboration opportunities can be established and develop them into a realistic work plan
- Work plans
  - Dynamic - continuously adapted to the influx of new projects and members to meet the evolving needs of the EOSC community
  - Short-term: to be accomplished in less than 6 months from WS, i.e. around summer 2024
  - Medium-term: to be accomplished in between 6 and 18 months from WS, i.e. around summer 2025
  - Long-term: to be accomplished beyond summer 2025

OA4: User & Resource Environments (2/2)

Action	Role of OA	Others involved (required/desired)	Activities + outcome
Better integration of data discovery across EOSC projects	Lead	EOSC Beyond	Creation of handbook to integrate DD in projects and align with EOSC-A TF semantic interoperability

OA5: Skills, Training, Rewards, Recognition & Upscaling (1/3)

Action	Role of OA	Others involved (required/desired)	Activities + outcome	Timescale
Theme Training material, Learning Paths, Curriculum Define approaches to harmonise existing learning paths and methodologies	Facilitate discussion	Training community, Skil-l4EOSC Competence Centre Network	Mapping workshop, Collect information about existing methodologies (e.g. Skills4EOSC's MVS and FAIR by Design Methodology, ELIXIR Learning Paths); analysis and formulation of next steps	Short-term

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Opportunity Area Expert Groups

By facilitating collaboration between and outside the projects, which each have their individual objectives, Opportunity Area Expert Groups generate significant added value. They enhance the broader community's ability to solve specific challenges in the development of EOSC, making EU-funded projects more impactful

The six EOSC Opportunity Area Expert Groups are designed to maximise the impact of the HE EOSC-related projects through strategic collaboration and co-creation of outputs with experts from the EOSC-A Task Forces.

- OA Expert Group 1 **Persistent Identifiers**
- OA Expert Group 2 **Metadata, Ontologies and Interoperability**
- OA Expert Group 3 **FAIR Assessment and Alignment**
- OA Expert Group 4 **User and Resource Environments**
- OA Expert Group 5 **Skills, Training, Rewards, Recognition & Upscaling**
- OA Expert Group 6 **Open Scholarly Communication**

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https://eosc.eu/eosc-opportunity-area-expert-groups/

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Joining Opportunity Area Expert Groups

Membership and organisation

OA Expert Groups foster collaboration among experts both within and beyond the project boundaries.

Practically, the OA Expert Groups are tied to HE EOSC-related projects, consisting mainly of technical project coordinators and other project representatives. Project participation, which is facilitated by EOSC Focus, is voluntary. OA Expert Groups may include additional experts not directly involved in the projects but with relevant expertise, such as former and current members of the EOSC-A Task Forces. To ensure collaboration between the EOSC-related projects, each OA Expert Group is expected to appoint two co-chairs to help contextualise project deliverables and support projects in finding synergies.

Expression of Interest to join an EOSC Opportunity Area Expert Group

https://eosc.eu/eosc-opportunity-area-expert-groups/#interest

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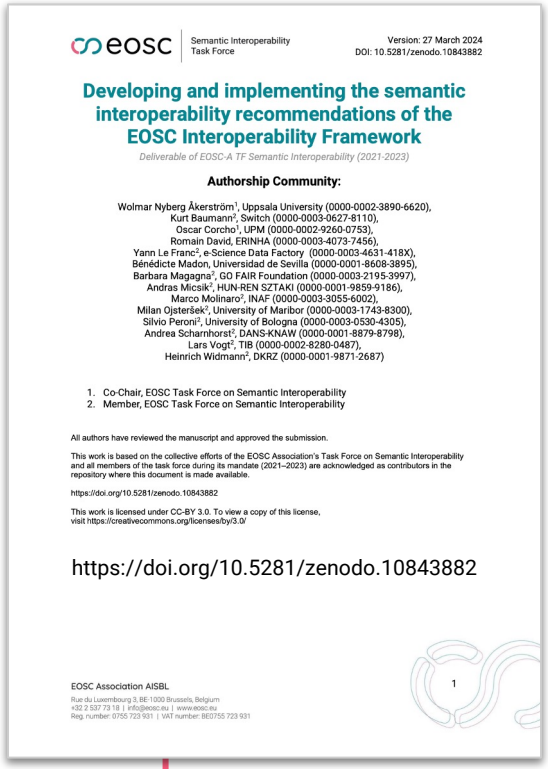
Evolution of on an Opportunity Area Expert Group



eosc | Semantic Interoperability Task Force

Version: 27 March 2024
DOI: 10.5281/zenodo.10843882

Developing and implementing the semantic interoperability recommendations of the EOSC Interoperability Framework

Deliverable of EOSC-A TF Semantic Interoperability (2021-2023)

Authorship Community:

Wolmar Nyberg Åkerström[1], Uppsala University (0000-0002-3890-6620),
Kurt Baumann[2], Switch (0000-0003-0627-8110),
Oscar Corcho[1], UPM (0000-0002-9260-0753),
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2. Member, EOSC Task Force on Semantic Interoperability

All authors have reviewed the manuscript and approved the submission.

This work is based on the collective efforts of the EOSC Association's Task Force on Semantic Interoperability and all members of the task force during its mandate (2021–2023) are acknowledged as contributors in the repository where this document is made available.

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Semantic interoperability Task Force (2021-2023)

Further develop and implement the semantic interoperability recommendations of the 2021 report *EOSC Interoperability Framework*, https://doi.org/10.2777/620649

Guide current and future actions

5 recommendations
4 explorations as context

2023 — **June** — **September** — **2024** — **January** — **June**

Task force activities	EOSC Symposium	Pre-Winter School	Winter School	Post-Winter School

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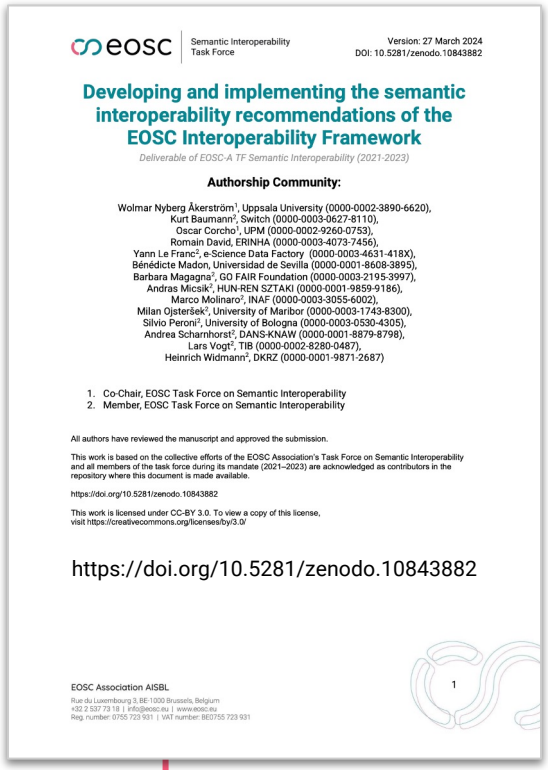
Evolution of on an Opportunity Area Expert Group



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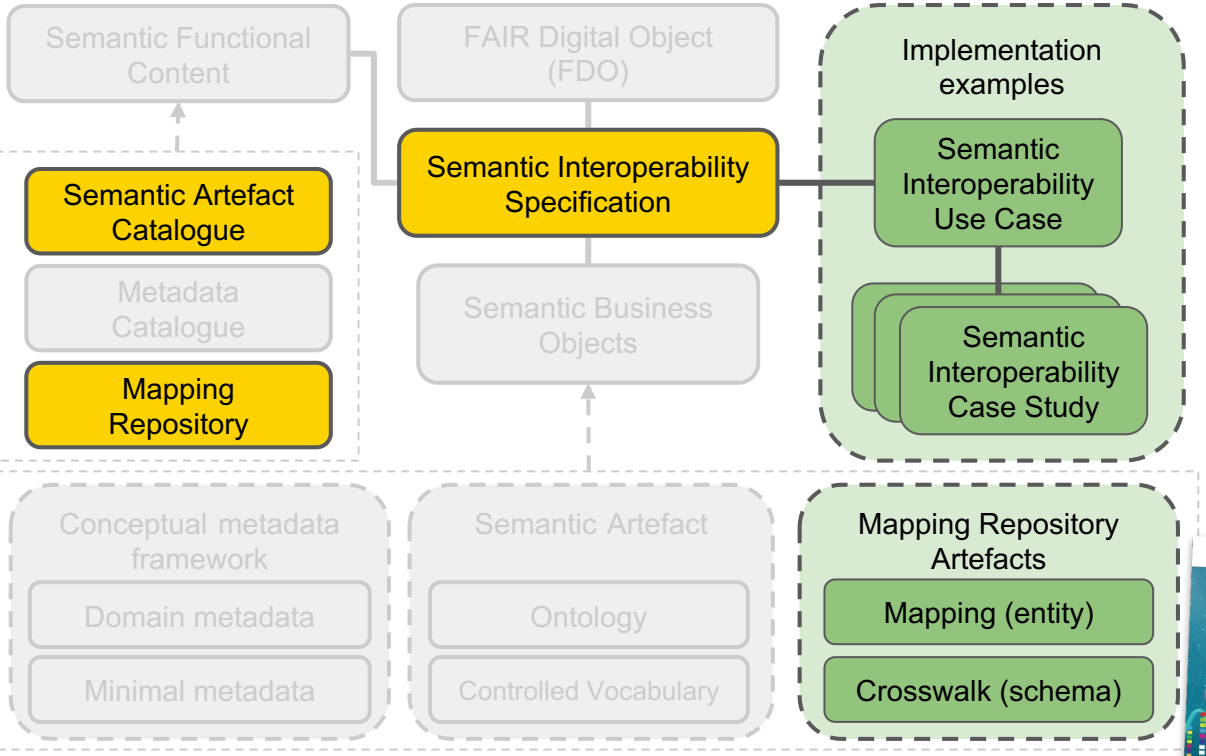

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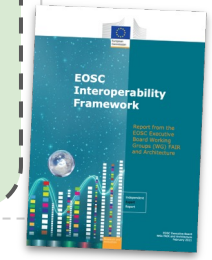

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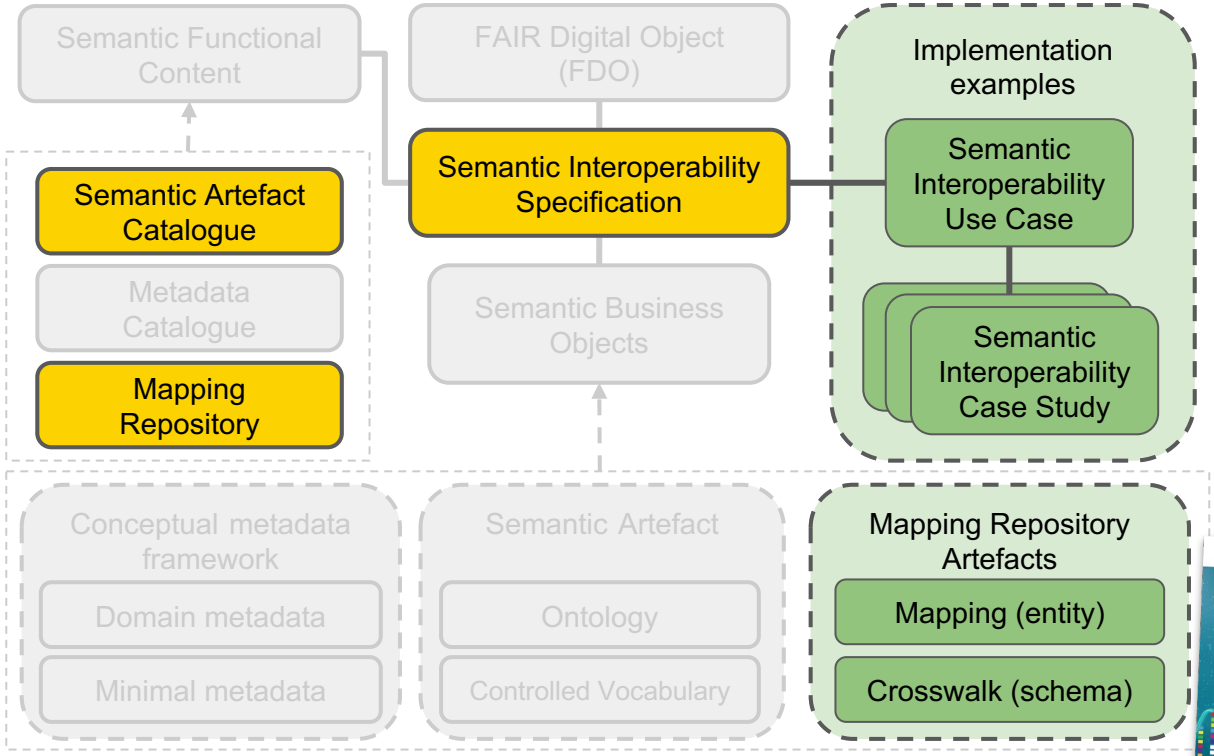

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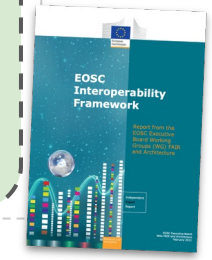

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Evolution of on an Opportunity Area Expert Group

- Semantic artefacts and their representations
- Catalogues of semantic artefacts and their governance
- Mappings, crosswalks and alignment
- Implementation examples
- 8 organisers; ~100 seats; references to specifications, papers, repositories, EOSC projects, Task Forces, …

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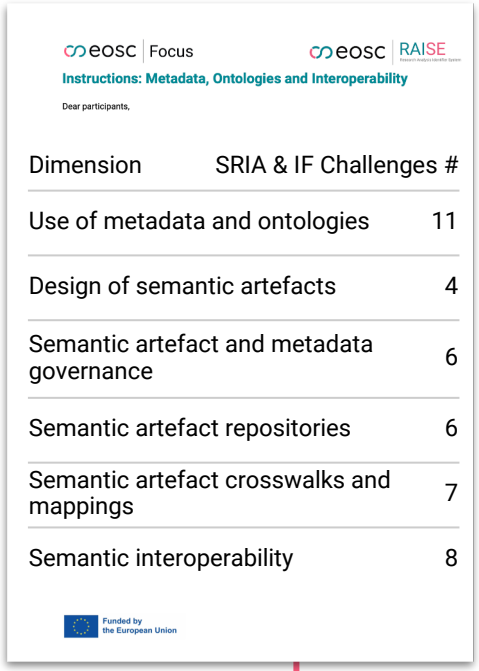

Dimension	SRIA & IF Challenges #
Use of metadata and ontologies	11
Design of semantic artefacts	4
Semantic artefact and metadata governance	6
Semantic artefact repositories	6
Semantic artefact crosswalks and mappings	7
Semantic interoperability	8

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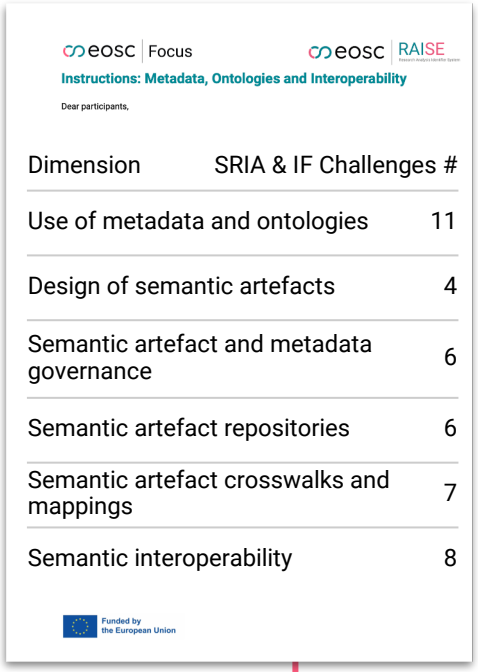

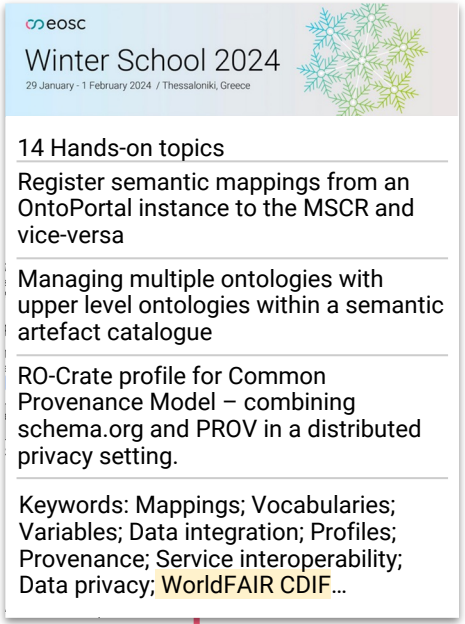

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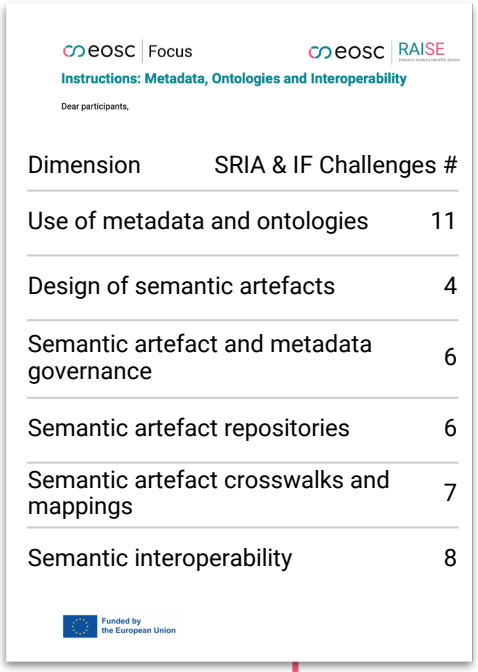

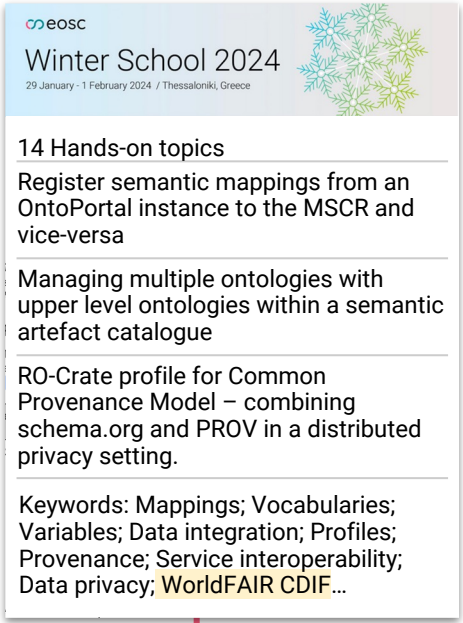

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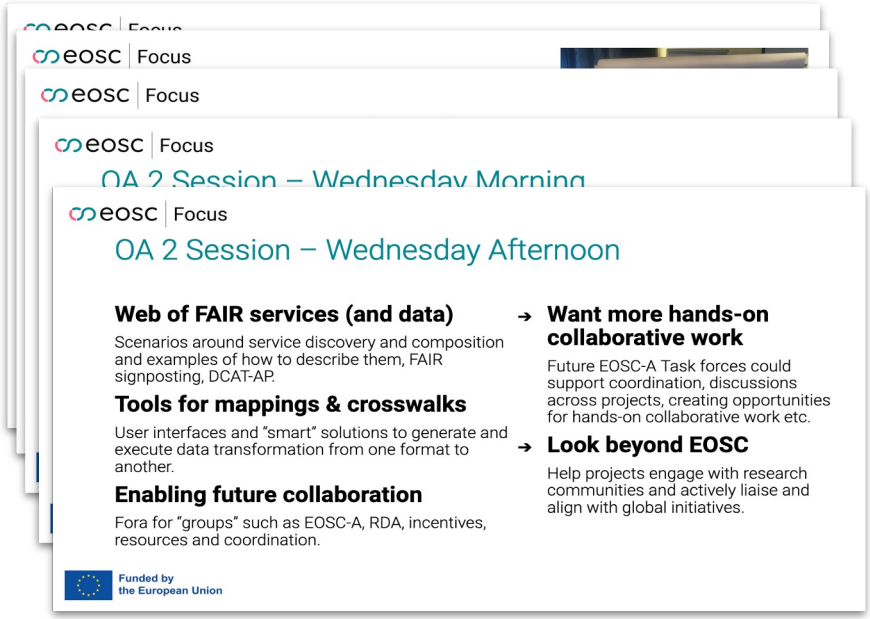
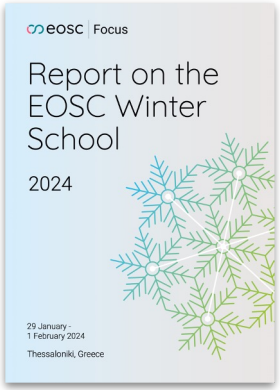
Post-Winter School activities (April)





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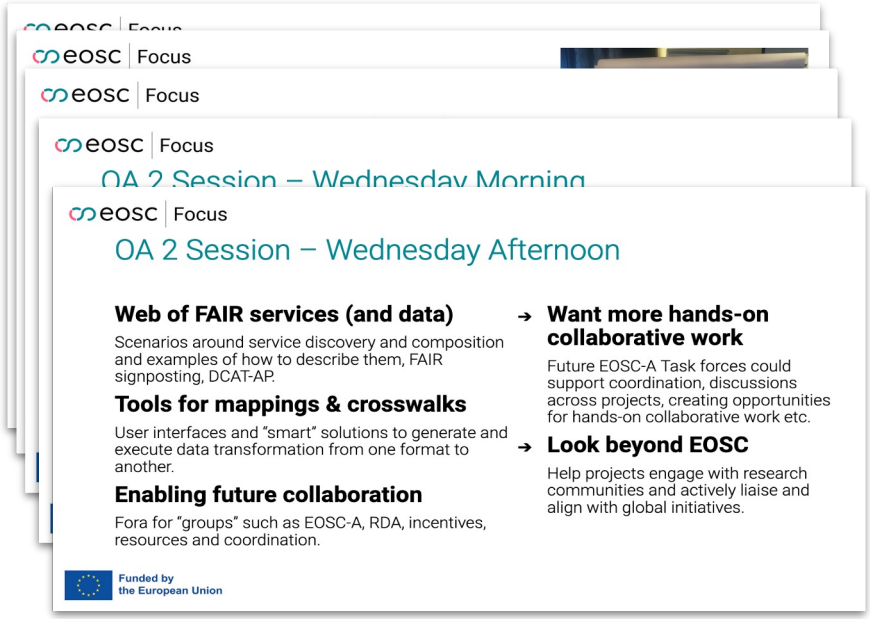

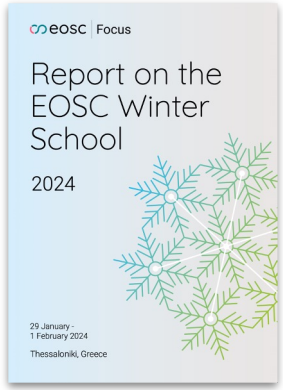

Support hands-on collaborative work across EOSC projects Establish effective channels for cross-project collaboration and to explore how different tools and solutions from EOSC-related projects can be integrated, reused and aligned.	❑Connecting OA2 stakeholders ❑Matchmaking for Opportunities, events and learnings ❑Peer-to-peer interactions between EOSC- related projects
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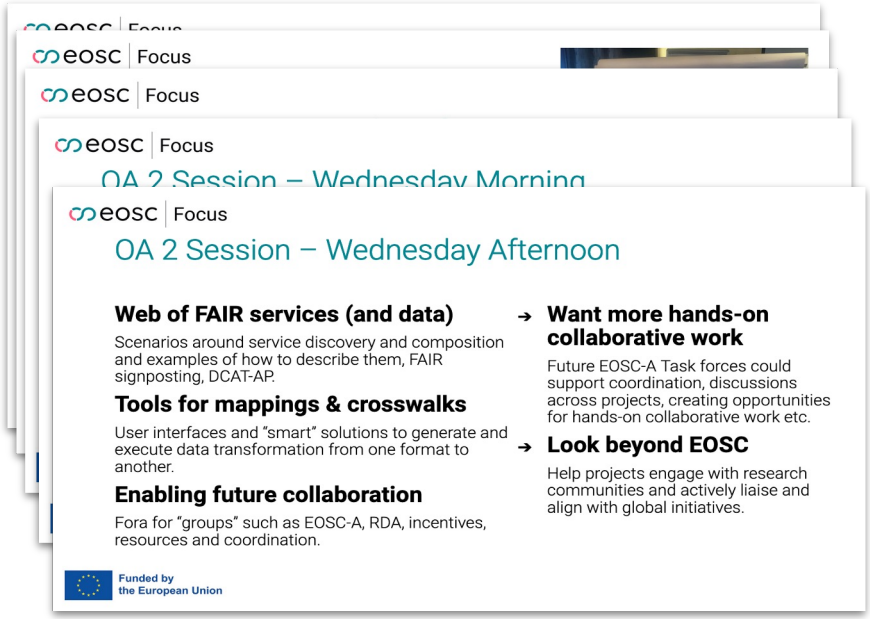

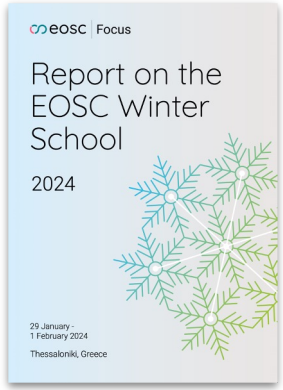

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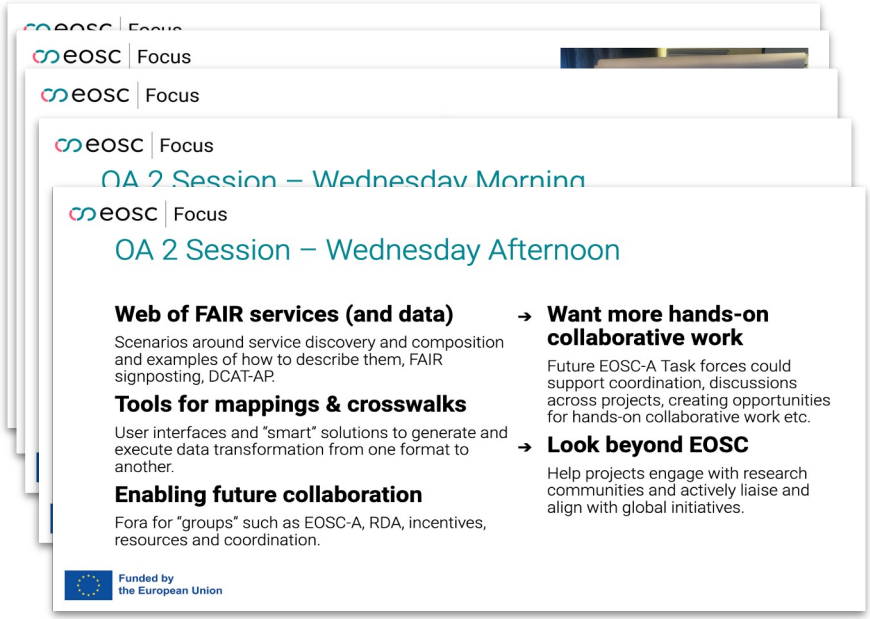
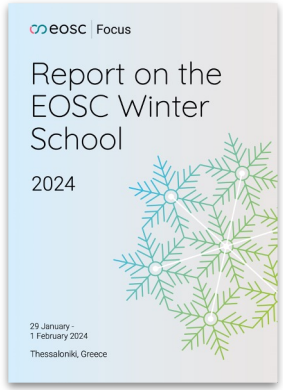
Post-Winter School activities (April)

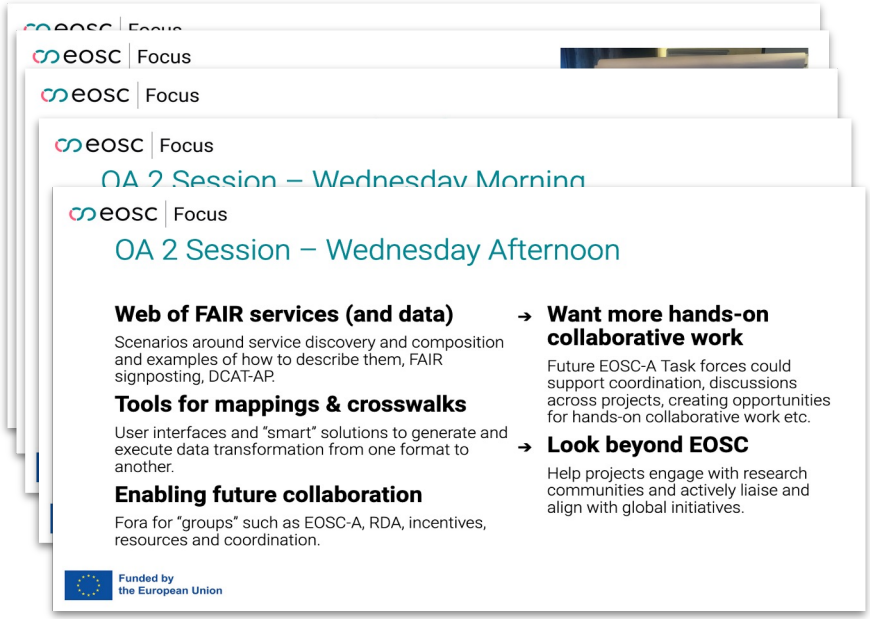


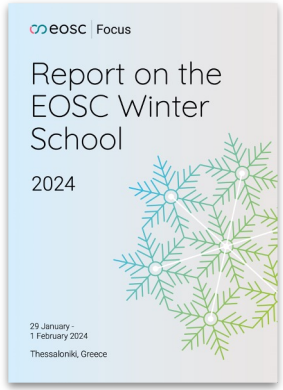


Support hands-on collaborative work across EOSC projects Establish effective channels for cross-project collaboration and to explore how different tools and solutions from EOSC-related projects can be integrated, reused and aligned.	❑Connecting OA2 stakeholders ❑Matchmaking for Opportunities, events and learnings ❑Peer-to-peer interactions between EOSC- related projects
What could an EOSC Interoperability Board (EIB) do for the EOSC projects? Explore the impact that introducing an EOSC Interoperability Board as proposed by Karl Luyben at EOSC Winter School 20246would have on the activities of EOSC-related projects activities and outcomes	❑Workshop/webinar on EIB relevance to EOSC projects ❑Consultation on EIB impact on current EOSC projects
How to align Task Force (TF) learnings and EOSC-related projects? Ensure that EOSC projects adopt, apply or implement, to the extent possible, results and recommendations on interoperability delivered by the TFs.	❑Adopt TF outputs in EOSC projects ❑Shared practices for TF-to-project interactions
What is the EOSC approach to metadata and ontologies? Establish a shared point of departure and frame of reference for current and future EOSC projects to support productive discussions, effective integrations and sustainable projects results going forward.	❑Consultation for input to SRIA 2.0 ❑A shared EOSC approach to metadata and ontologies ❑Consultations on calls 2026-27

Funded by the European Union

Post-Winter School activities (April)





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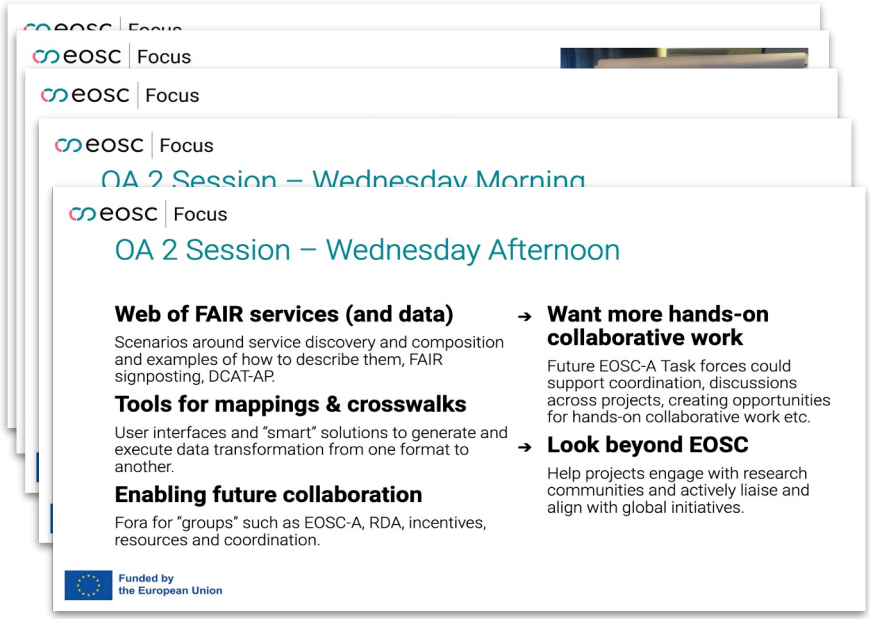
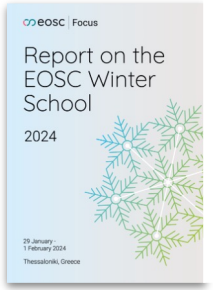
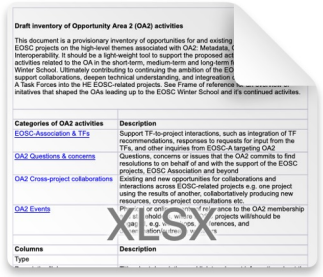
Funded by the European Union

Post-Winter School activities (May)







Draft inventory of Opportunity Area 2 activities.xlsx

	A	B
1	**Draft inventory of Opportunity Area 2 (OA2) activities** This document is a provisionary inventory of opportunities for and existing collaborations across EOSC projects on the high-level themes associated with OA2: Metadata, Ontologies & Interoperability. It should be a light-weight tool to support the proposed actions and shared activities related to the OA in the short-term, medium-term and long-term following the EOSC Winter School. Ultimately contributing to continuing the ambition of the EOSC Winter School to support collaborations, deepen technical understanding, and integreation of deliverables of EOSC-A Task Forces into the HE EOSC-related projects. See Frame of reference for an overview of initatives that shaped the OAs leading up to the EOSC Winter School and it's continued activites.	
2		
3	**Categories of OA2 activities**	**Description**
4	EOSC-Association & TFs	Support TF-to-project interactions, such as integration of TF recommendations, responses to requests for input from the TFs, and other inquiries from EOSC-A targeting OA2
5	OA2 Questions & concerns	Questions, concerns or issues that the OA2 commits to find resolutions to on behalf of and with the support of the EOSC projects, EOSC Association and beyond
6	OA2 Cross-project collaborations	Existing and new opportunities for collaborations and interactions across EOSC-related projects e.g. one project using the results of another, collabortatively producing new resources, cross-project consultations etc.
7	OA2 Events	Physical or online events of relevance to the OA2 membership and stakeholders, where EOSC projects will/should be engaged, e.g. workshops, conferences, and dissemination/outreach webinars

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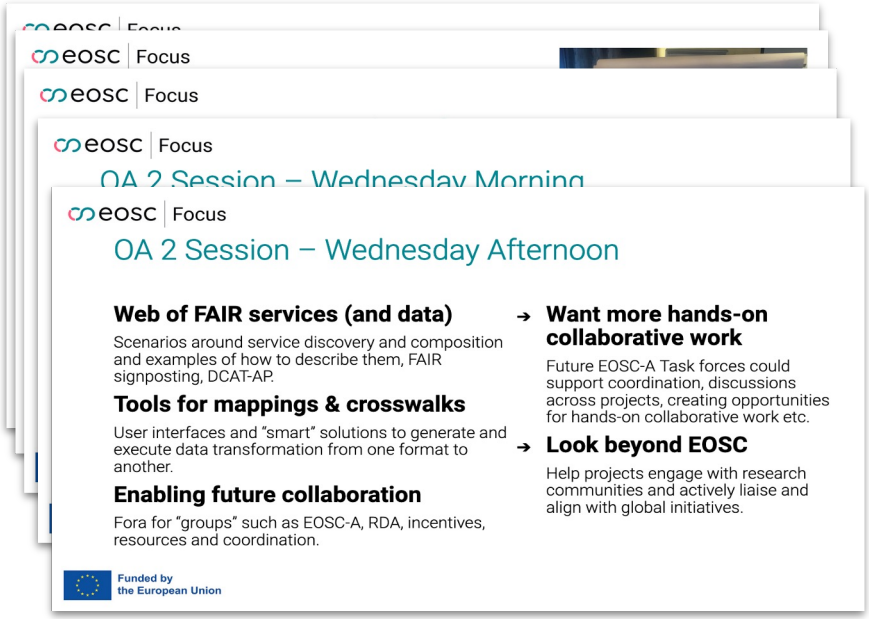
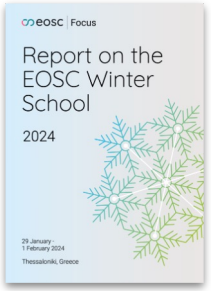
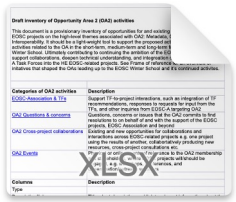
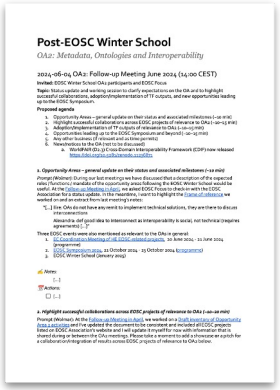
Post-Winter School activities (June)







Draft inventory of Opportunity Area 2 activities.xlsx



2024-06-04 OA2: Follow-up Meeting June 2024 (14:00 CEST)

Invited: EOSC Winter School OA2 participants and EOSC Focus

Topic: Status update and working session to clarify expectations on the OA and to highlight successful collaborations, adoption/implementation of TF outputs, and new opportunities leading up to the EOSC Symposium.

Proposed agenda

1. Opportunity Areas – general update on their status and associated milestones (~10 min)
2. Highlight successful collaborations across EOSC projects of relevance to OA2 (~10–15 min)
3. Adoption/implementation of TF outputs of relevance to OA2 (~10–15 min)
4. Opportunities leading up to the EOSC Symposium and beyond (~10–15 min)
5. Any other business (if relevant and as time permits)
6. News/notices to the OA (not to be discussed)
   a. WorldFAIR (D2.3) Cross-Domain Interoperability Framework (CDIF) now released https://doi.org/10.5281/zenodo.11236871

1. Opportunity Areas – general update on their status and associated milestones (~10 min)

Prompt (Wolmar): During our last meetings we have discussed that a description of the expected roles / functions / mandate of the opportunity areas following the EOSC Winter School would be useful. At the Follow-up Meeting in April, we asked EOSC Focus to check-in with the EOSC Association for a status update. In the meantime, I want to highlight the Frame of reference we worked on and an extract from last meeting's notes:

"[...] Ilire: OAs do not have any remit to implement technical solutions, they are there to discuss interconnections

Alexandra: def good idea to interconnect as interoperability is social, not technical (requires agreements) [...]"

Three EOSC events were also mentioned as relevant to the OAs in general:

1. EC Coordination Meeting of HE EOSC-related projects, 20 June 2024 - 21 June 2024 (programme)
2. EOSC Symposium 2024, 21 October 2024 - 23 October 2024 (programme)
3. EOSC Winter School (January 2025)

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Post-Winter School activities (June–)

Opportunity Area Expert Group

“ a product of the voluntary collaboration across […] EOSC-related projects […]
and serve as the cornerstone of a community of technical experts collaborating to advance the development of EOSC”

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eosc Opportunity Area 2 (OA2)

Metadata, Ontologies and Interoperability

Semantic artefacts, mappings, crosswalks…

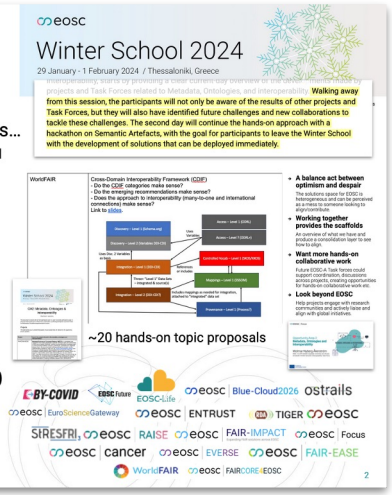
Integrate and advance developments around metadata and ontologies to enable data and service level interoperability

16 of 25 EOSC-related projects involved

Blue-Cloud 2026	EVERSE	RDA Tiger
BY-COVID	FAIR-EASE	STR-ESFRI
EOSC Focus	FAIR-IMPACT	WorldFAIR
EOSC-ENTRUST	FAIRCORE4EOSC	
EOSC4Cancer	OSTrails	(EOSC Future)
EuroScienceGateway	RAISE	(EOSC-Life)

2 of 13 EOSC-A Task Forces (2021–2023)

Semantic Interoperability
Rules of Participation Compliance Monitoring



eosc Activities and next steps (OA2)

Shared point of departure and frame of reference

Integration of project results

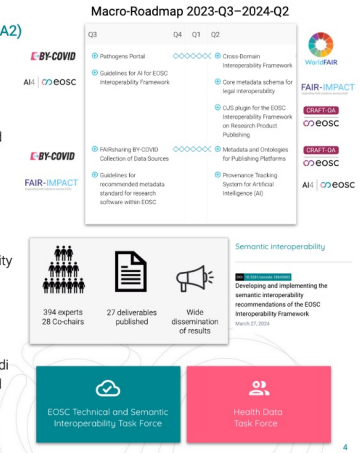
Establish effective channels for cross-project collaboration and to explore how different tools and solutions from EOSC-related projects can be integrated, reused and aligned.

Integration of EOSC-A Task Force outputs

Ensure that EOSC projects adopt, apply or implement, to the extent possible, results and recommendations on interoperability delivered by the TFs.

Onboard projects and new Task Forces

Help current and new members to highlight and discover opportunities for collaborations and establish a modus operandi for exchange with the recently established EOSC Technical and Semantic Interoperability (2024–2025) and Health Data (2024-2025) Task Forces.



eosc Goals and challenges (OA2)

“EOSC approach to metadata and ontologies”

Support Task Force-to-project interactions

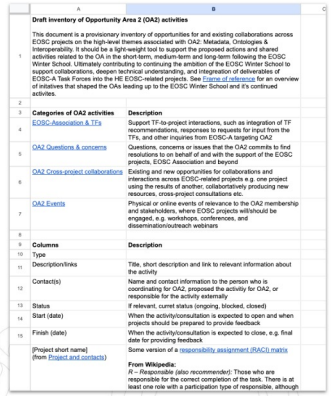
Align TF outcomes on interoperability with EOSC projects. Communicate gaps, challenges, opportunities and results from the implementation in EOSC projects to the related TFs

Track implementation questions & concerns

Commit to find resolutions on behalf of and with the support of EOSC projects, EOSC Association and beyond.

Facilitate cross-project collaborations

Collaboration/alignment between projects and TFs on OA2 topics, A shared interoperability “story” across EOSC projects, Opportunities to collaborate on approaches and solutions adopted across the EOSC projects: Showcase, Validate, Inquire, Co-create, Reuse



eosc Contributions to EOSC (OA2)

Metadata, Ontologies and Interoperability

Liaison between projects and Task Forces

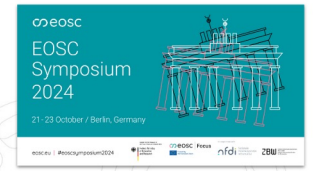
Integration of recommendations and responses to requests for input, and other inquiries concerning implementation aspects of Metadata, Ontologies and Interoperability.

Hands-on community of implementers

Leverage experts from across the EOSC projects to find answers, discover and improve on existing solutions.

“EOSC approach to metadata and ontologies”

Shared point of departure and frame of reference for current and future EOSC projects to support productive discussions, effective integrations and sustainable results across project timelines.



eosc | Focus

Post-Winter School activities (June–)

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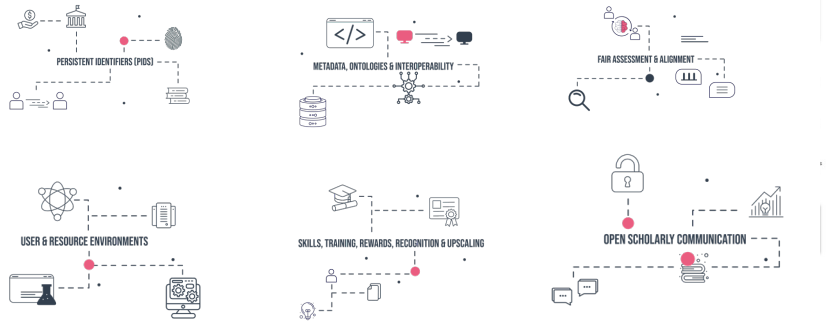
eosc Opportunity Area



eosc Activities and next steps

eosc Goals and challenges

eosc Contributions to EOSC

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the European Union

eosc | Focus

Home / The Association / Task Forces

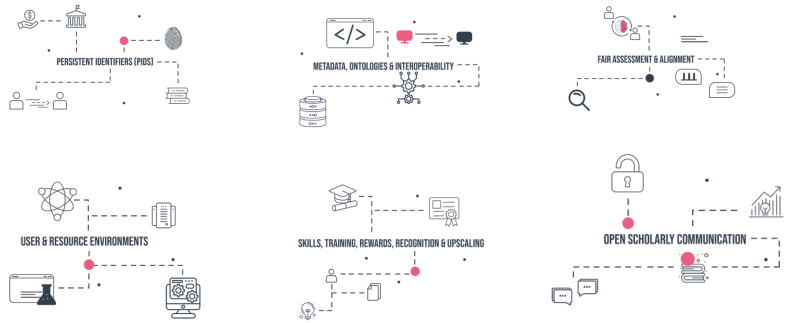
EOSC-A Task Forces n = 4 (+ 13)

Home / Collaborations / Horizon Europe Projects

Horizon Europe Projects n = 25

Jun Oct Feb 2025?

eosc Opportunity Area



eosc Activities and next steps

eosc Goals and challenges

eosc Contributions to EOSC

EOSC | Focus

With the valuable contribution

EOSC-A Board of Directors

EOSC | AquaINFRA
EOSC | Blue-Cloud2026
EOSC | cancer
EOSC | EuroScienceGateway
EOSC | FAIRCORE4EOSC
EOSC | FAIR-EASE
EOSC | FAIR-IMPACT
EOSC | Focus
EOSC | RAISE
AI4 | EOSC
Skills 4 eosc
Scilake
WorldFAIR
RDA TIGER
EOSC
BY-COVID
e-IRGSP7
graspos
open research metrics dataspace
ostrails
StRESFRI 3
EOSC | ENTRUST
European Network of Trusted Research Environments
EOSC | SIESTA
EOSC | TITAN
EOSC | OSCARS
Open Science Clusters' Action for Research & Society
EOSC | EVERSE
EOSC | BEYOND

EOSC | Data Stewardship Curricula and Career Paths Task Force
EOSC | Upskilling Countries to Engage in EOSC Task Force
EOSC | Technical Interoperability of Data and Services Task Force
EOSC | Researcher Engagement and Adoption Task Force
EOSC | Semantic Interoperability Task Force
EOSC | PID Policy and Implementation Task Force
EOSC | Research Careers, Recognition and Credit Task Force
EOSC | FAIR Metrics and Data Quality Task Force
EOSC | Financial Sustainability Task Force
EOSC | Rules of Participation Compliance Monitoring Task Force
EOSC | AAI Architecture Task Force
EOSC | Long-term Data Preservation Task Force
EOSC | Infrastructures for Quality Research Software Task Force

Funded by the European Union

EOSC Beyond Project Overview

Diego Scardaci - Project Coordinator
EGI Foundation

EOSC Beyond - Project Factsheet

Call topic: HORIZON-INFRA-2023-EOSC-01-04

Next generation services for operational and sustainable EOSC Core Infrastructure

Project Officer:
Flavius Alexandru PANA
European Research Executive Agency
Unit REA.C.4

Budget: 10.000.000€

Start: 01/04/2024

Duration: 36 months

16 Work packages

39 Deliverables

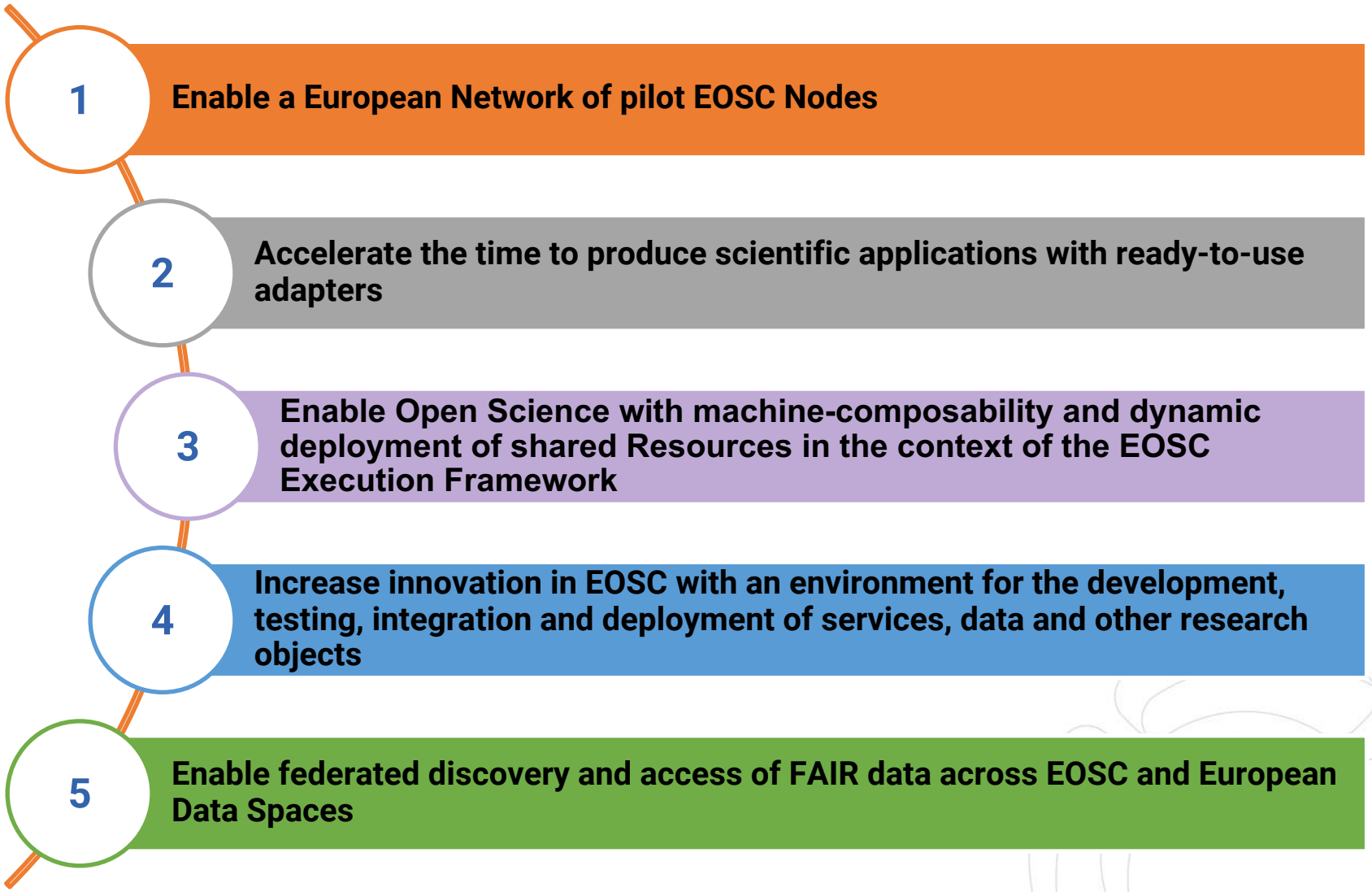
33 Milestones

Consortium: 33

- E-Infrastructures: EGI, OpenAIRE, EUDAT, GEANT
- Technology providers: ATHENA, CERN, CESNET, CYFRONET, DANS, FZJ, GRNET, GWDG, IISAS, INFN, IPB, KIT, LIP, SRCE, UKIM, UPV
- Research communities: CNB-CSIC, CESSDA (EKKE, TARKI), CMCC, DESY, ENEA, INSTRUCT-ERIC, LifeWatch. NFDI. Premotec, UNITN

Coordinator: EGI Foundation

EOSC Beyond objectives
Key Contributions to EOSC SRIA



SO2: Enable the definition of standards, and the development of tools and services, to allow researchers to find, access, reuse and combine results → Objs 2, 3 and 5

SO3: Establish a sustainable and federated infrastructure enabling open sharing of scientific results → Objs 1, 2, 3, 4 and 5

EOSC Beyond objectives
Key Contributions to EOSC SRIA

1. **Enable a European Network of pilot EOSC Nodes**
2. **Accelerate the time to produce scientific applications with ready-to-use adapters**
3. **Enable Open Science with machine-composability and dynamic deployment of shared Resources in the context of the EOSC Execution Framework**
4. **Increase innovation in EOSC with an environment for the development, testing, integration and deployment of services, data and other research objects**
5. **Enable federated discovery and access of FAIR data across EOSC and European Data Spaces**

OO1: Deliver and operate all the necessary components of the Minimum Viable EOSC

OO4: Co-develop domain-specific standards and adopt Open Science practices through the engagement with research communities

OO5: Provide the technical components of a FAIR ecosystem

OO10: Deploy and operate an AAI framework

OO11: Implement the EOSC persistent identifier (PID) policy and architecture

OO12: Co-develop a minimum metadata framework and provide a common search and access mechanism to EOSC resources across the EOSC federation

Next Generation Core services to **support the setup and the Federation of EOSC Nodes**

AAI, Resource Catalogues, Monitoring
Accounting, Helpdesk, etc.

Improved existing EOSC Core services and framework

Advanced IF registry
Machine composability
AWM

The EOSC Execution Framework

SW Libraries implementing interface described in the EOSC IF Guidelines

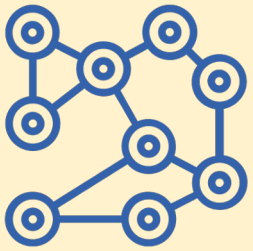
The EOSC Integration Suite

Enhanced EOSC Platform Blueprint

EOSC Core Innovation Sandbox

National/Regional:
Germany (NFDI)
Czech Republic (e-Infra CZ),
NI4OS Southeast Europe (GRNET, IPB, UKIM)

e-Infrastructures:
EGI Federation



Network of EOSC Pilot Nodes

Thematic:
Environmental (LifeWatch)
Health and Food (METROFood-RI)
Structural Biology (Instruct-ERIC)
Climate Science (ENES)

EOSC Beyond - Key impacts and deliverables

Objectives

- O1. Enable European pilot EOSC Nodes
- O2. Accelerate time to product with adapters
- O3. Enable Open Science with composability & dynamic deployment
- O4. Increase innovation in EOSC
- O5. Enable federated discovery and access of FAIR data

Results

- KER1: Improved existing EOSC Core services and framework
- KER2: The EOSC Core Sandbox
- KER3: The EOSC Integration Suite
- KER4: The EOSC Execution Framework
- KER5: The EOSC- SIMPL Interoperability
- KER6: EOSC thematic and regional nodes
- KER7: EOSC Core sustainability

Impacts

- Remove systematic barriers of sharing data and services -> improving efficiency, productivity -> discoveries, breakthroughs and innovations
- Allow small, inexperienced communities to set up EOSC-like environments with little cost -> discovery of previously unknown connections, improving reusability and reproducibility
- Researchers and providers can spend their time on research and improving services, increases research outputs re-usability, foster cooperation between communities
- A stable environment available to the end-users, ensure only reliable and stable services are introduced -> increase the quality of research and foster innovation
- A sustainable EOSC with a stable, reliable, federated, globally accessible environment -> more efficient collaboration, more open and inclusive research culture

Indicators

- # of new guidelines added to EOSC IF registry
  # Deployable service tests (5);
  # of interoperable interfaces agreed with SIMPL
  # Updates to the EOSC Beyond roadmap based on collaboration with SIMPL
- # Pilot regional/thematic EOSC Nodes
  # Pilot Resources published in EOSC
  # Resources and Services pulled into nodes from EOSC
- # New Core service adapters developed
  # New Data Analytics Adapters
  # Existing Community Adapters integrated
  # Community guidelines updated/added to the IF registry
- Availability of Core Components
  # Core services tested using the Sandbox
  # Exchange services tested using Sandbox
- #Contributors in the EOSC Open Source Community
  # Internal/External communities contributing to co-design
  # of Sustainability report downloads
  # of TF and EOSC-A members consulted over sustainability aspects

EOSC Beyond - Dependencies and Collaborations

Collaborations:

- OSCARs projects, Scientific Clusters, RIs and e-Infras
  - to identify more EOSC Pilot Nodes
  - to test and validate the next generation of EOSC Core services
- All EOSC Projects
  - EOSC Core Innovation Sandbox to test and validate integration with EOSC
- EOSC EU Node
  - Technical collaboration on the evolution of the EOSC EU Node
- EOSC-Association
  - Share results from the piloting activities

EVERSE

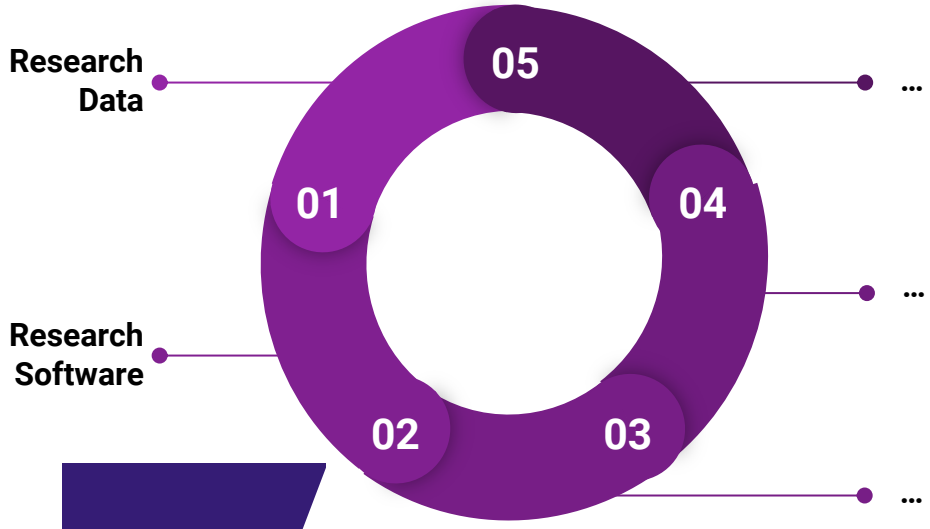
Paving the way towards a European Virtual Institute for Research Software Excellence

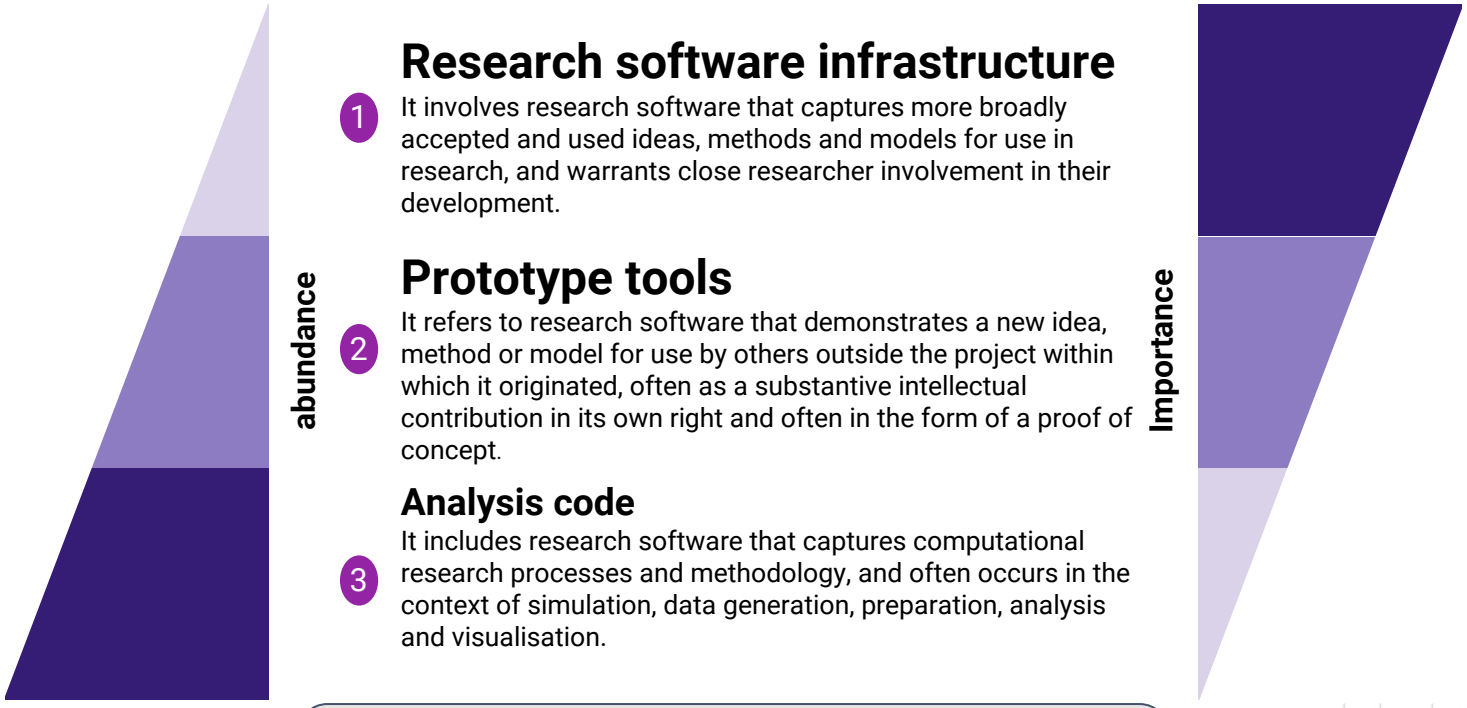
Fotis Psomopoulos (CERTH) · Daniel Garijo (UPM)

Funded by
the European Union

This project has received funding from the European Union's Horizon Europe Programme under GA 101129744 — EVERSE — HORIZON-INFRA-2023-EOSC-01-02

Research Software as a first class citizen for the scientific endeavours





Research software infrastructure

1. It involves research software that captures more broadly accepted and used ideas, methods and models for use in research, and warrants close researcher involvement in their development.

Prototype tools

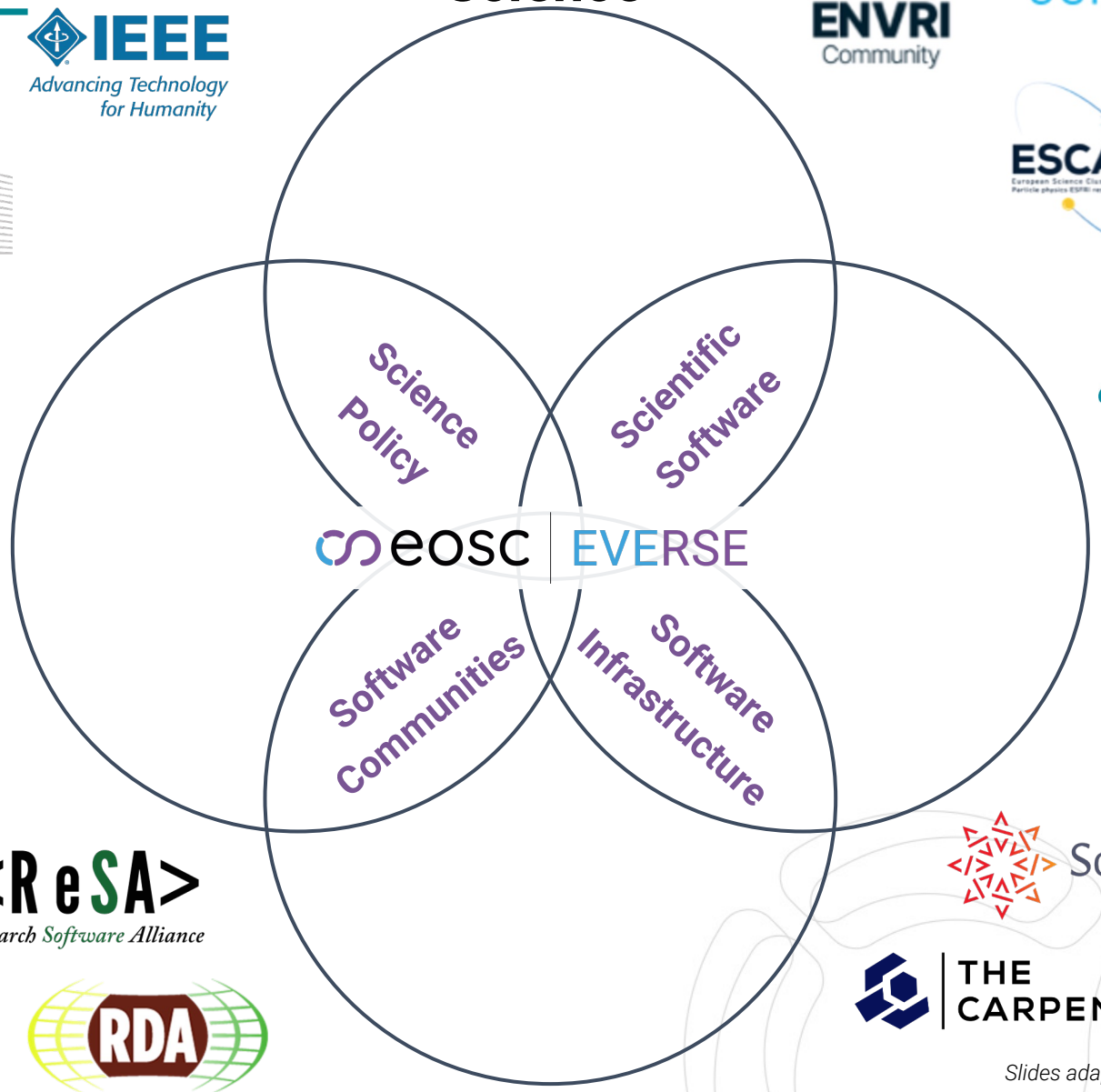
2. It refers to research software that demonstrates a new idea, method or model for use by others outside the project within which it originated, often as a substantive intellectual contribution in its own right and often in the form of a proof of concept.

Analysis code

3. It includes research software that captures computational research processes and methodology, and often occurs in the context of simulation, data generation, preparation, analysis and visualisation.

Foundational Software

Not all software has the same level of importance



Slides adapted from the "OrgMycology - eResearch NZ 2024" by Jonah Duckles (orgmycology)

EVERSE

Paving the way towards a **E**uropean **V**irtual Institut**e** for **R**esearch **S**oftware **E**xcellence

EVERSE aims to create a framework for research software and code excellence, collaboratively designed and championed by the research communities, in pursuit of building a European network of Research Software Quality and setting the foundations of a future Virtual Institute for Research Software Excellence

ensure research software curation, quality, preservation and adoption of best practices, by the Communities, for the Communities, build on collaboration with the five EOSC Science Clusters

adopt a three-tier model for research software, i.e., analysis code, prototype tools and research software infrastructure, which captures the varying complexity of research software and its development, and can be used as a basis for research software excellence

credit and recognition for both developers and software are essential components of our strategy to promote sustainable software practices

Mar/2024 > Feb/2027 (36 months)

15 Beneficiaries, 1 Associated partner & 2 Affiliated entities

Coordinated by CERTH

Pilots & Drivers

OSCARS
Open Science Clusters' Action for Research & Society

Environmental Sciences: *Integration of Science Cluster ENVRI through ENVRI-HUB*

- Integrate EVERSE framework into the ENVRI-HUB Knowledgebase and Virtual Research Environment
- Apply to the development of the Essential Climate Variable computing program and cloud workflows

Life Sciences: *Integration of Science Cluster EOSC-Life through ELIXIR*

- Make RO-Crate actionable by incorporating the five safes concept into WfExS for secure and federated workflow orchestration
- Use of community-led standards for materialising research software packaged using container technologies and mobilising encrypted data whenever needed

Astronomy and particle physics: *Integration of Science Cluster ESCAPE through the Dark Matter Test Science Project*

- ML for scientific data compression (standalone code, python)
- A Common Tracking Software
- Choose an ATLAS trigger algorithm as an option for the collaboration

Photon and neutron science: *Integration of Science Cluster PaNOSC through LEAPS/LENS*
Transition software to high performance computing (HPC) and heterogeneous computing architectures

Social sciences: *Integration of Science Cluster SSHOC*
Develop a multilanguage textual analysis pipeline of tools that use a combination of open source tools and own code to create an integrated SotA tool capable of deploying locally or as a service

EVERSE

Technical Overview

T1.1 Establish EU Research Software Quality Network

T1.2 Engage diverse science communities

T1.3 Establish global links for collaboration

T5.1 Organize domain-specific training

T5.2 A framework for recognition of Trainers and RSEs

T5.3 Long-term training activity

T2.1 Best practices in research software development

T2.2 Curate & standardize best research software practices

T2.3 Evaluate software quality, FAIRness, and maturity

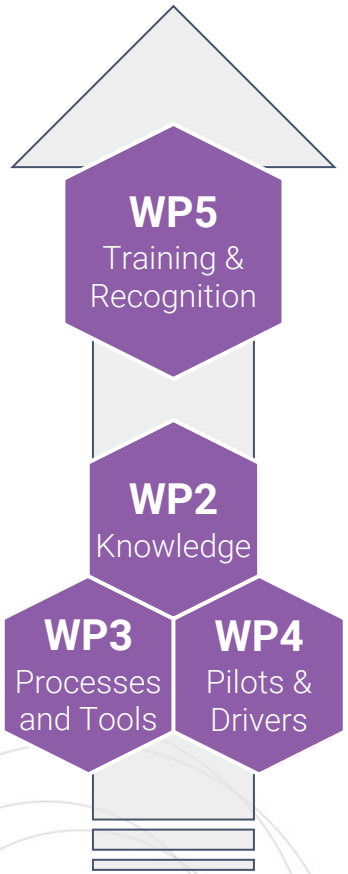
T3.1 Tools for enhancing scientific software quality

T3.2 Streamline tools for easier research community adoption

T3.3 Global measure of Science Clusters' software quality

T4.1 Software assessment in Science Clusters

T4.2 Best practices via community-driven pilots



Project objectives (1/2)
Key Contributions to EOSC SRIA (*v1.2 – November 2023*)

Contribution of EVERSE

Objective #1: *Ensure that Open Science practices and skills are rewarded and taught, becoming the 'new normal*

EVERSE will:

- ✓ Provide a **framework** that will ensure appropriate **recognition, reward, and career development** for researchers and RSEs who implement research software and code quality assurance practices and policies

Objective #2: *Enable the definition of standards, and the development of tools and services, to allow researchers to find, access, reuse and combine results*

EVERSE will:

- ✓ **Leverage existing tools and resources** to support the evaluation, verification and improvement of research software and code quality, based on **existing practices and standards** across research communities represented by the five EOSC Science Clusters.
- ✓ Establish a **sustainable and collaborative ecosystem of stakeholders** across the research communities associated with the five **EOSC Science Clusters** to ensure research software and code quality assurance and support the advancement of reliable and reproducible research.

Project objectives (2/2)
Key Contributions to EOSC SRIA (*v1.2 – 1 November 2023*)

Contribution of EVERSE

Objective #3: *Establish a sustainable and federated infrastructure enabling open sharing of scientific results*

EVERSE will:

- ✓ Build a **collaborative, community-led structure** for evaluating, verifying, and improving the quality of research software and code, by **actively involving** researchers, software developers, and other stakeholders in the research community.

Key impacts and deliverables

EVERSE

→ A framework of **community curation** is established and promoted that ensures **quality** of **software** and **code** across the **different disciplines**.

→ **Infrastructure, tools and services** are deployed that allow researchers to properly develop, describe with proper metadata, version, archive, share and reuse research software.

→ The **notion of software quality** is **defined** in the context of **EOSC** and builds upon established practices by the FAIR and other communities.

→ **Baseline quality indicators** of “minimum quality” defined for the different types of digital objects targeted (software, code, etc), taking into account the concept of “**fit for purpose**”.

Expected impact

✓ The quality of research software (technical and organisational) improved, in general (e.g. software for data analysis) and in particular for software used in the services offered through EOSC.

✓ Software is developed in a sustainable way and its reuse is maximized.

Dependencies and Collaborations

eosc | EVERSE

Immediate collaborations

OSCARS
Open Science Clusters' Action for Research & Society

Skills 4 eosc

eosc | FAIRCORE4EOSC

related projects

eosc | FAIR-IMPACT
Expanding FAIR solutions across EOSC

AI4 | eosc

graspos
open research assessment dataspace

TIER 2

eosc | cancer

Scilake

eosc | RAISE
Research Analysis Identifier System

projects that can benefit from/contribute to EVERSE

<add your project here>

ostrails

eosc | SIESTA

eosc | ENTRUST
European Network of Trusted Research Environments

HSF
HEP Software Foundation

elixir STEERS

SWIFT HEP

European Genomic Data Infrastructure

eosc | EuroScienceGateway

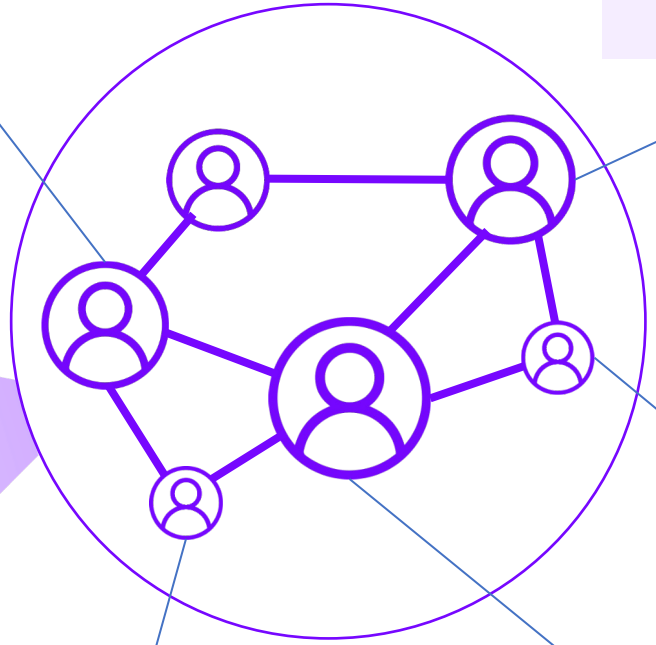
Your vision

EVERSE

Thematic community nodes

EUROPEAN OPEN SCIENCE CLOUD

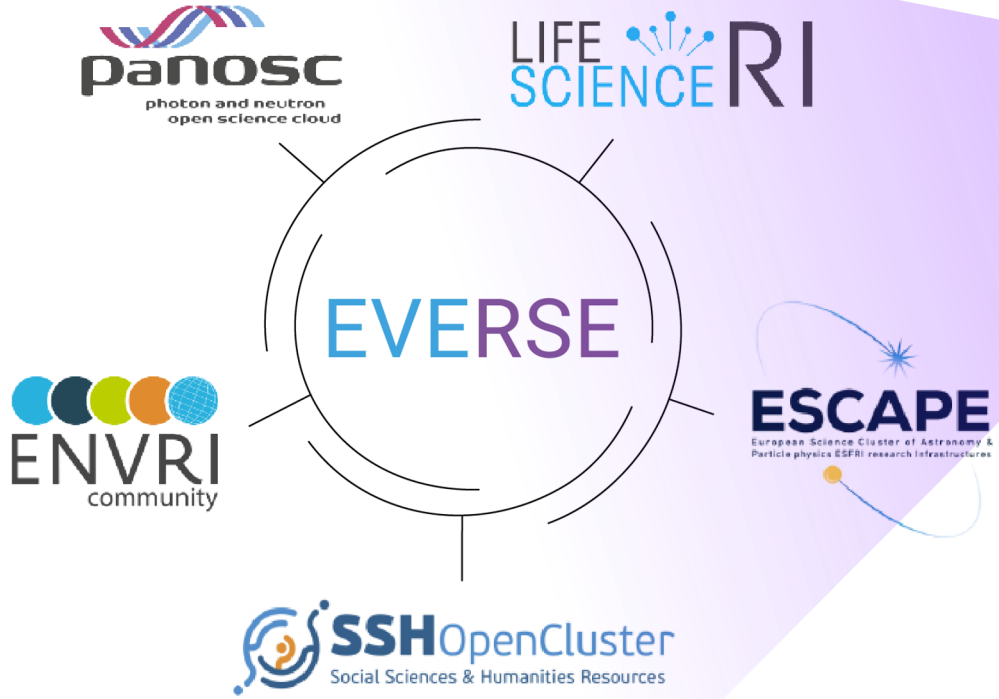
National nodes



software
Other ~~data~~ infrastructure nodes

Reference EOSC EU Node

European e-infrastructures



EOSC Association AISBL

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info@eosc.eu | www.eosc.eu
Reg. number: 0755 723 931
VAT number: BE0755 723 931

Thank you!

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X: https://x.com/eosc_everse

LinkedIn: https://www.linkedin.com/company/eosc-everse/

FOSSTodon: https://fosstodon.org/@eosc_everse

OSCARS

In a Nutshell

OSCARS is a four-year Horizon Europe project that will foster the uptake of Open Science in Europe by consolidating the achievements of world-class European Research Infrastructures (RIs) in the ESFRI roadmap and beyond into lasting interdisciplinary FAIR data services and working practices.

Fostering the uptake of Open Science in Europe

OSCARS will strengthen the role of the Science Clusters (SCs) in the European Research Area (ERA) by developing **Community-based Competence Centres (CCCs)** and **Composable Open Data and Analysis Services (CODAS)**, and by fostering the implementation of **Open Science projects and services** funded through a cascading-grant mechanism.

www.oscars-project.eu

eosc OSCARS

Consortium

ENVRI Community · ESCAPE · EOSC-Life · panosc · SSHOpenCluster

cnrs · CERN · CERIC Central European Research Infrastructure Consortium · cessda · CLARIN · COMMpla Communication Platforms and Online Solutions

DARIAH-EU · DESY · eatris · EMBL · erinha European Research Infrastructure on Highly Pathogenic Agents · ESRF The European Synchrotron

FMI · JÜLICH FORSCHUNGSZENTRUM · KNAW · LifeWatch ERIC · MUNI Masaryk University

Trust-IT Services communicating to markets · Universiteit van Amsterdam · Uni Freiburg · University of Ljubljana · universität wien

OSCARS Open Science Clusters' Action for Research & Society

www.oscars-project.eu

Led by: SCIENCE-CLUSTERS.eu Research Infrastructures for Open Science

eosc OSCARS

OSCARS
Open Science Clusters' Action for Research & Society

Setup and implementation of

Clusters' Open Science Competence Centres (CLOCCs)

Community-based virtual hubs dedicated to fostering research excellence through training and knowledge transfer, and providing expertise, best practices and services in relation to Open Science.

OBJECTIVES

- Support researchers and RIs
- Foster communication and collaboration for Open Science between RIs in the Science Clusters (SCs) and across the SCs
- Create a collaborative network to provide expertise, best practices and services in relation to Open Science
  - ★ Registry of data stewards
- Promote cross-disciplinary collaborations for Open Science
- Set up a common dashboard model and a mentoring strategy to support the efforts of SCs in training, and to disseminate skills and best practices.

Identify and provide

Composable Open Data and Analysis Services (CODAS)

accessible via

Virtual Research Environments (VREs)

OBJECTIVES

- Provide portfolios of Clusters' Services and FAIR Data Sources.
- Undertake a survey to identify where services may be made composable.
- Identify and select a set of services for further development, to provide the basis for CODAS.
- Build 1-2 "Composability demonstrators" per Science Cluster.

eosc OSCARS

Contribute to the

EOSC Federation for science, research and innovation

Pursuing the creation of

Pan-European research-enabling value-added services

OBJECTIVES

- Involve a broad range of research communities in Open Research via the development of new **Open Science projects and services** to drive the uptake of FAIR data-intensive research throughout the ERA.
- Engage with existing networks, projects, international fora and working groups contributing to the implementation of the EOSC Federation as a “Web of FAIR Data and Services for Science”.

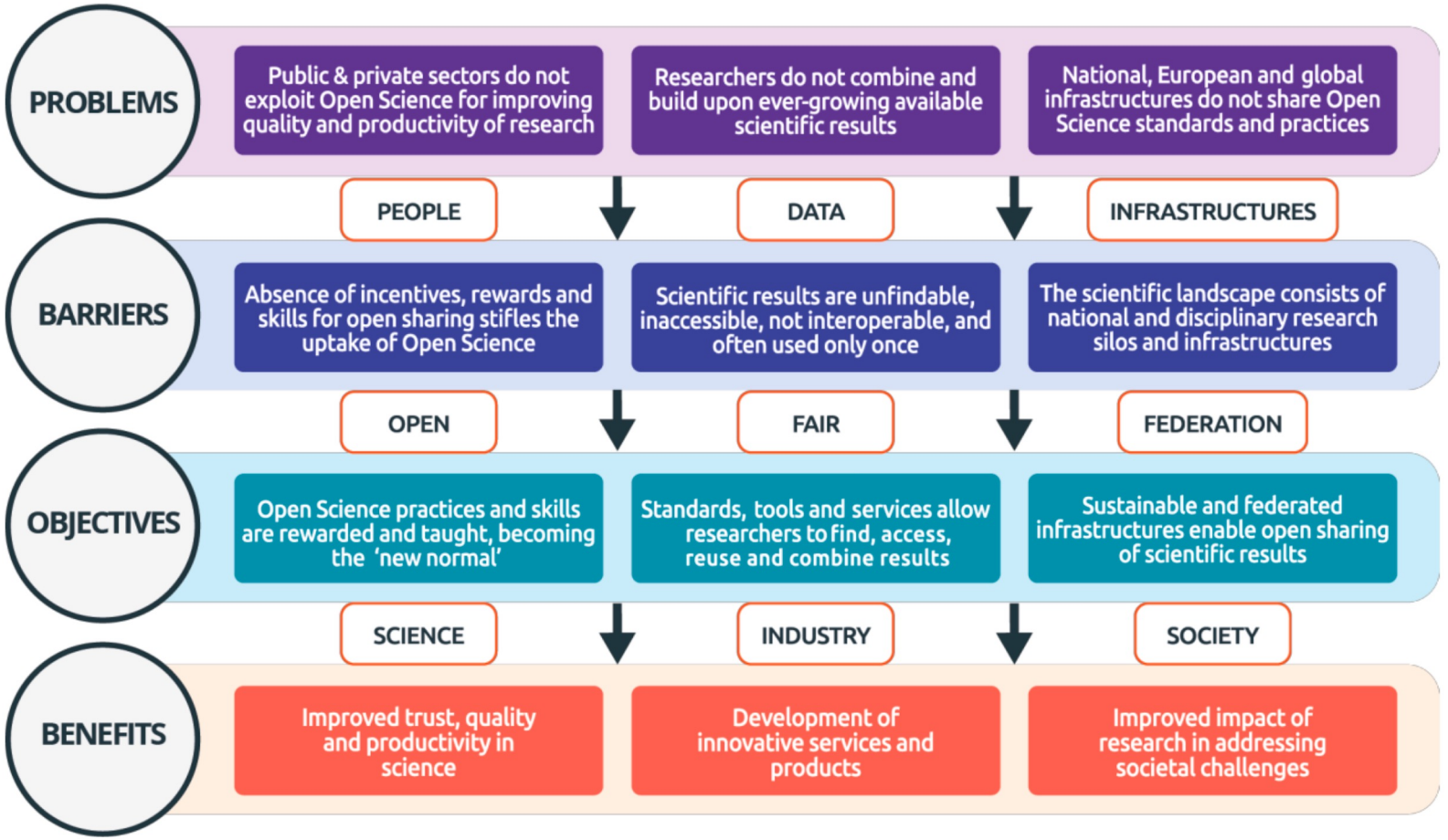
€ 16 MILLIONS

IN OPEN CALLS FOR

OPEN SCIENCE PROJECTS AND SERVICES

OSCARS
Open Science Clusters’ Action for Research & Society

SRIA - Strategic objectives of the European Open Science Cloud



SRIA - Strategic objectives of the European Open Science Cloud

EOSC Objectives Tree … and some of the Science Clusters' (SCs) contributions through OSCARS and other actions.

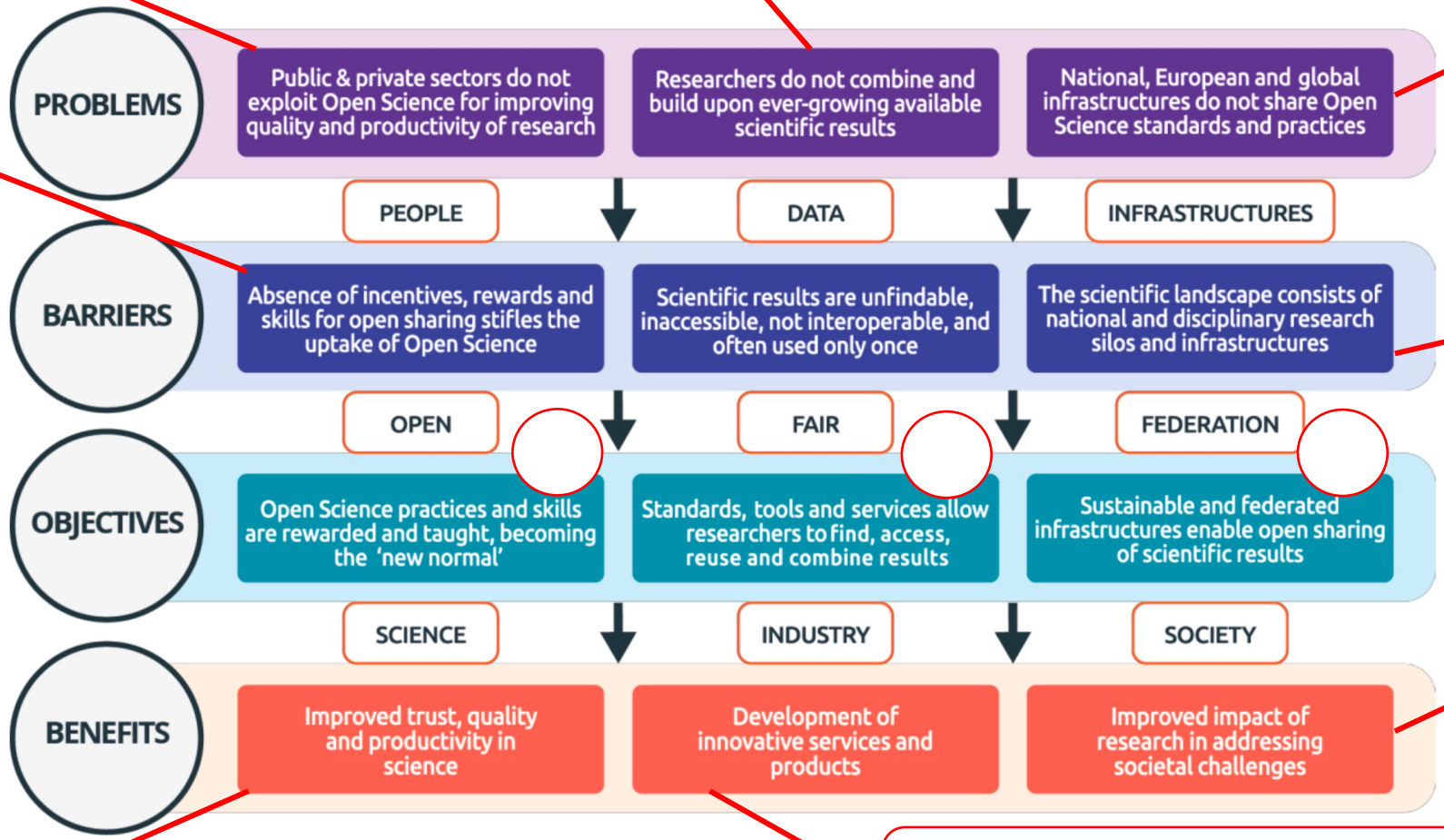
SCs commit in:
- Citizen Science Projects;
- Training events and high-level schools;
- Mentoring for OS and data stewardships.

SCs Competence Centres and the Virtual Institute for Software Research (VRE) are ultimate solutions for addressing this problem.

SCs ESFRIs communities together aim at economy of scale solutions among national agencies, develop EU domain-based as well as cross-domain practices.

The SCs' framework offers outstanding cross-collaboration incentives against barriers; fostering innovation in data science, software and training.

EU commitment in ESFRIs requires disciplinary focus. SCs have strengthened the disciplinary objectives while deploying cross-fertilisation to align intents and a long-term vision : a federation of EOSC SCs Nodes.



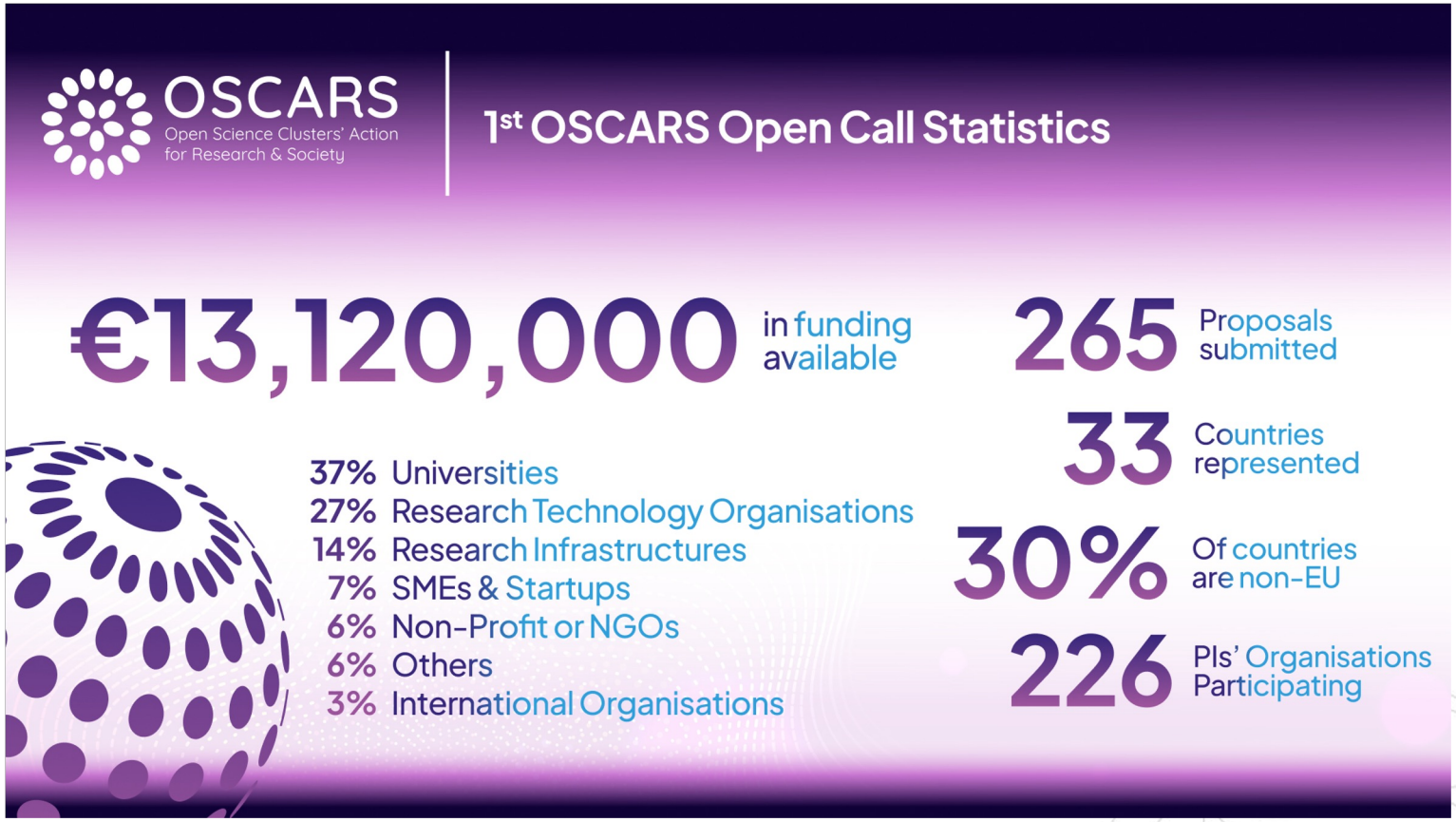
Cascading Grant call projects target scientific and societal benefits.

SCs action has contributed to improvement of practice and quality of data production of concerned RIs (and all future Cascading Grant call projects).

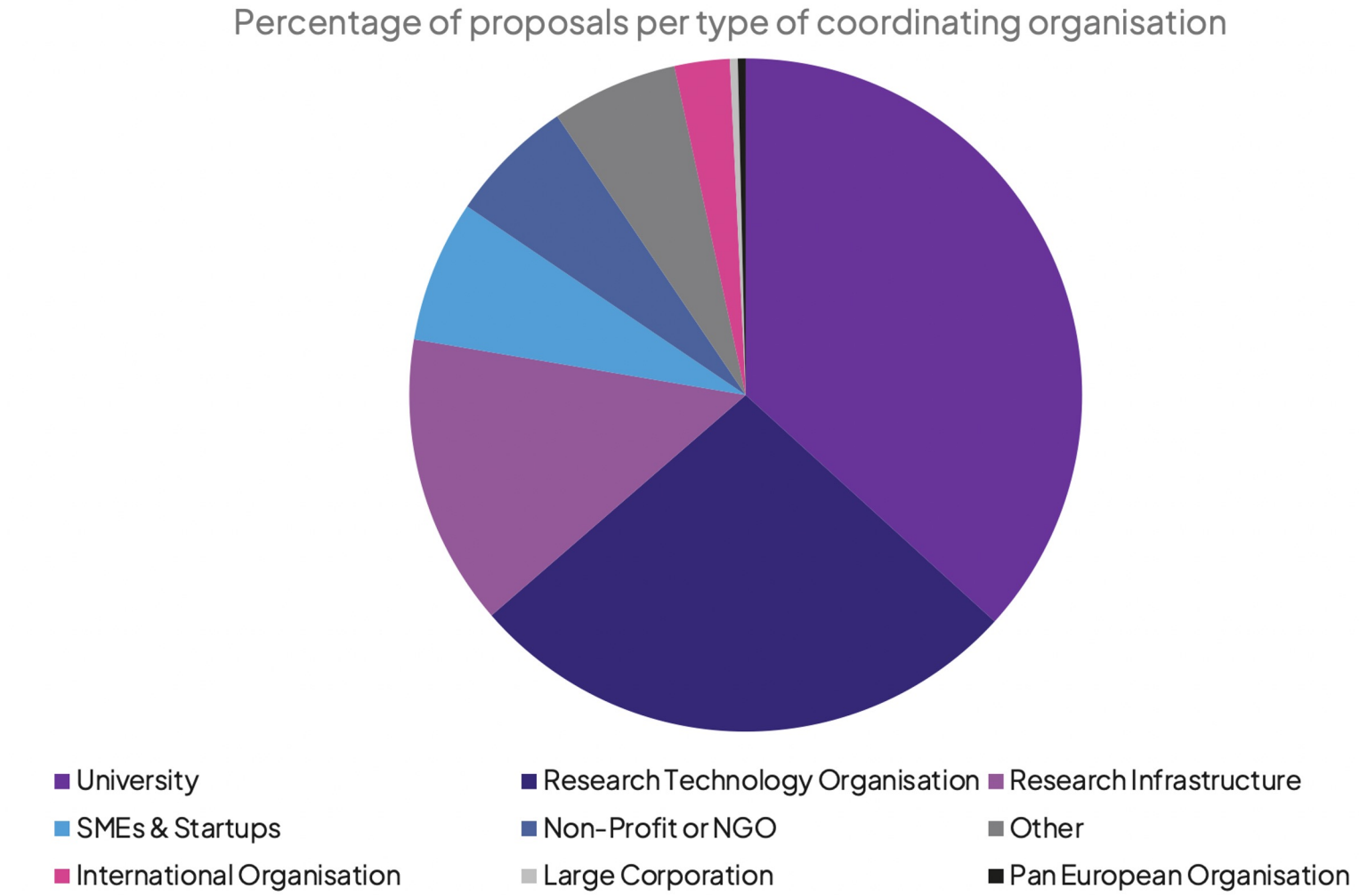
Many of them are the results of the SCs' work programmes, as well as of the Cascading Grant call projects for innovative open services. One on top of all is the "VRE" that would address exhaustively this objective (although the involvement of industry is not the main goal).

OSCARS
Open Science Clusters' Action for Research & Society

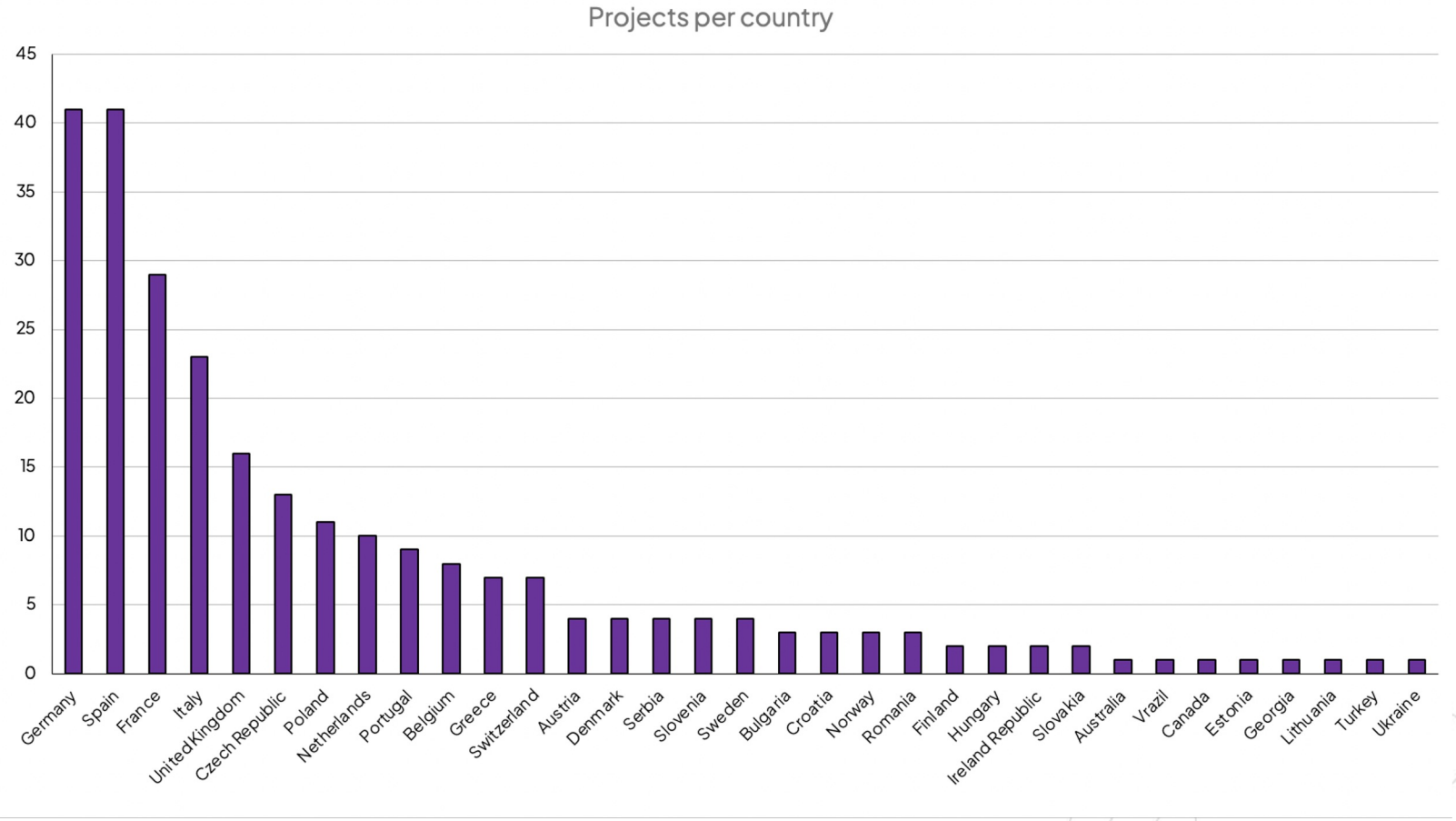
First statistics from the 1st Open Call



First statistics from the 1st Open Call



First statistics from the 1st Open Call – Coordinating organisations



Key impacts and deliverables

OSCARS

- **Operational Cluster-based Competence Centres**
- Uptake of **web-based highly composable platforms for Open Science data analysis**;
- **Stronger involvement of scientific communities in Open Science** and the shaping of EOSC;
- Setting up of a collaborative network to provide expertise, best practices and services in relation to Open Science;
- Enhancing and further structuring of the successful **cross-fertilization** work built by the Science Clusters;
- **Economy of scale** of (cross-cluster) services;
- Enable a **largely participative research ecosystem**, promoting provenance tracking to research outputs and contributing to the evolution of research assessment methodologies.
- Build-up and deployment of **EOSC Science Cluster Nodes**

Dependencies and Collaborations

OSCARS

Collaborations established with other projects/initiatives relevant for the development of the EOSC

EVERSE

Open Data and Analysis Services /
Virtual Research Environments

BEYOND

Contribution to the definition of EOSC Nodes and their federation, requirements for EOSC Core services from a use case perspective and integration activities.

Skills 4 EOSC

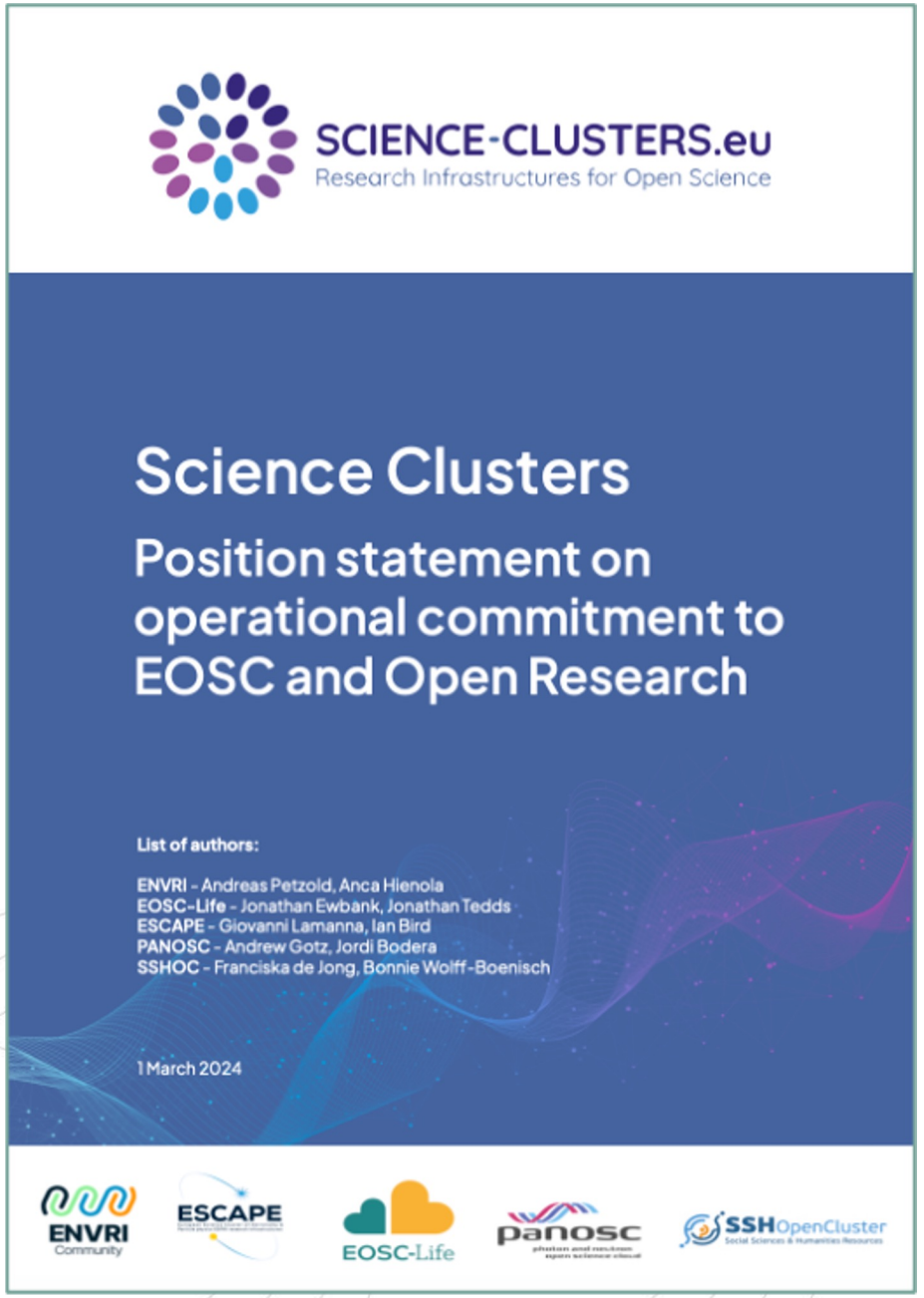
Open Science Competence Centres,
Training, Best practice

More to follow…

OSCARS vision

The ESFRI Science Clusters, operating as a cluster of clusters in projects like OSCARS and EVERSE, have released the **Science Clusters Position Statement on operational commitment to EOSC and Open Research**, which articulates the Science Clusters' vision for the future towards the successful implementation of the EOSC, as the result of five years of collaborative efforts, including interactions with the European Commission, EOSC Association, ESFRI-EOSC task force, and e-Infrastructure Reflection Group (e-IRG).

[Read the position paper here]



OSCARS
Open Science Clusters' Action for Research & Society

www.oscars-project.eu

Led by:

EOSC as a Federation of EOSC Nodes Basic Concepts

- **EOSC Beyond**
  - Advancing Technical Requirements needed to enable EOSC Federation
  - Federation governance/legal aspects will be decided by EOSC Tripartite
- **EOSC Platform**
  - Blueprint architecture and reference services to set up an EOSC Node
- **“Node Core Services”**
  - Required to enable the operation of a given Node
    - EOSC Beyond developing a “master list” of Core Services, and overarching architectural framework, to support future interoperability
    - Not all Nodes need all possible Core Services for their own operation
  - Core Services might be provided by
    - Components from the EU Node (with copies installed in the Node)
    - Improved components from EOSC Beyond (with copies installed in the Node or SaaS)
    - Components from other providers
- **EOSC Federated Capabilities**
  - Required or offered across all EOSC Nodes → Enabled by 1 or more EOSC Nodes
  - All Federated Capabilities require data to be shared between Nodes in agreed formats via agreed interfaces
    - Per **EOSC IF Interoperability Guidelines (IGs)**
  - Required data is provided by Core Service components operating in each Node.

Open Science Plan-Track-Assess Pathways

In a Nutshell

OSTrails

Description: Open Science Trails (OSTrails) is a Horizon Europe project focused on enhancing the planning, tracking, and assessing of scientific knowledge production. By collaborating with service providers and research communities across countries and domains, it aims to streamline FAIRness, interconnectivity and machine actionability that improve and extend existing Research and Innovation (R&I) ecosystems and align them with EOSC.

Duration: 1 February 2024 - 31 January 2027

Coordinator: OpenAIRE

DOI: 10.3030/101130187

eosc Consortium

Walking the pathways together

Project objectives
Key Contributions to EOSC SRIA

DESIGN

Define the OSTrails Plan-Track-Assess Interoperability Reference Architecture (OSTrails-IRA) towards a pan European research knowledge ecosystem where DMPs, SKGs, FAIR Assessments cover a wide range of Digital Objects, and are seamlessly coupled to provide end-to-end solutions within EOSC

IMPLEMENT & FEDERATE

Enhance existing, widely used services and DMP/SKG/FAIR Assessment platforms with new capabilities for automation and enable their interoperation to streamline FAIR assessment from early research stages.

EMPOWER FAIRNESS

Develop a set of methods, tools, services and guidance and training to support assessment at all levels: FAIR assessment of DOs, DMP assessment for completeness and adequacy, SKGs assessment for accuracy and coverage.

CO-CREATE & ADOPT

Drive uptake by participation, bringing together different communities to co-design, validate, and evaluate how the OSTrails methods, tools, services, guidance and training can be applied in the real-world and create a federated Plan-Track-Assess infrastructure.

6 SKGs | **35** SKG consumable sources | **8** FAIR Assessors | **6** DMP Software

Key impacts and deliverables

- R1. FAIRness Reference Model: A rich metadata model to capture minimum, legacy and novel domain-specific FAIR assessments over a wide spectrum of DO types.
- R2. Plan-Track-Assess Interoperability Reference Architecture: interoperability specifications, common models, application profiles, flows, APIs.
- R3. OSTrails Commons, a place to share, access and re-use common resources.
- R4. Enhanced versions of widely used DMP, SKGs, FAIR Assessment platforms that integrate new models and automate interactions of Plan-Track-Assess building blocks.
- R5. Discipline specific maFAIRTests and Toolkits
- R6. A DMP Evaluation rubric and a DMP Evaluation service
- R7. SKG Research Product Quality toolbox, a set of annotation tools to improve quality in SKGs
- R8. An integrated Competence Centre to be embedded in national & RI settings.
- R9. Guidance toolkit: Case studies, Policy & Technical Briefs, recommendations for governance structure for adoption and compliance of metrics and tests.
- R10. Proof of concepts , co-defining and adopting the project results at national and thematic settings

Dependencies and Collaborations

- EOSC Nodes
- EOSC TFs
  - FAIR Metrics and Digital Objects
    - *In the past: FAIR Metrics and Data Quality*
- RDA
  - Active DMPs IG & DMP Common Standard WG
    - *New WG in the making!*
  - SKG-IF Model
  - FAIR Maturity Model
- Projects
  - Scilake and Graspos
  - FAIR-IMPACTFAIR assessment output metadata schema
  - FC4EOSC
  - Skills4EOSC
  - EVERSE
  - OSCARS

Delivering the Commons to Plan-Track-Assess research in EOSC

"A future where scientific knowledge within the European Open Science Cloud (EOSC) is universally accessible, seamlessly interoperable, and fully reusable at every stage of the research lifecycle, fostering transformative innovation and collaboration across the scientific community."

EOSC-ENTRUST

European Network of Trusted Research Environments

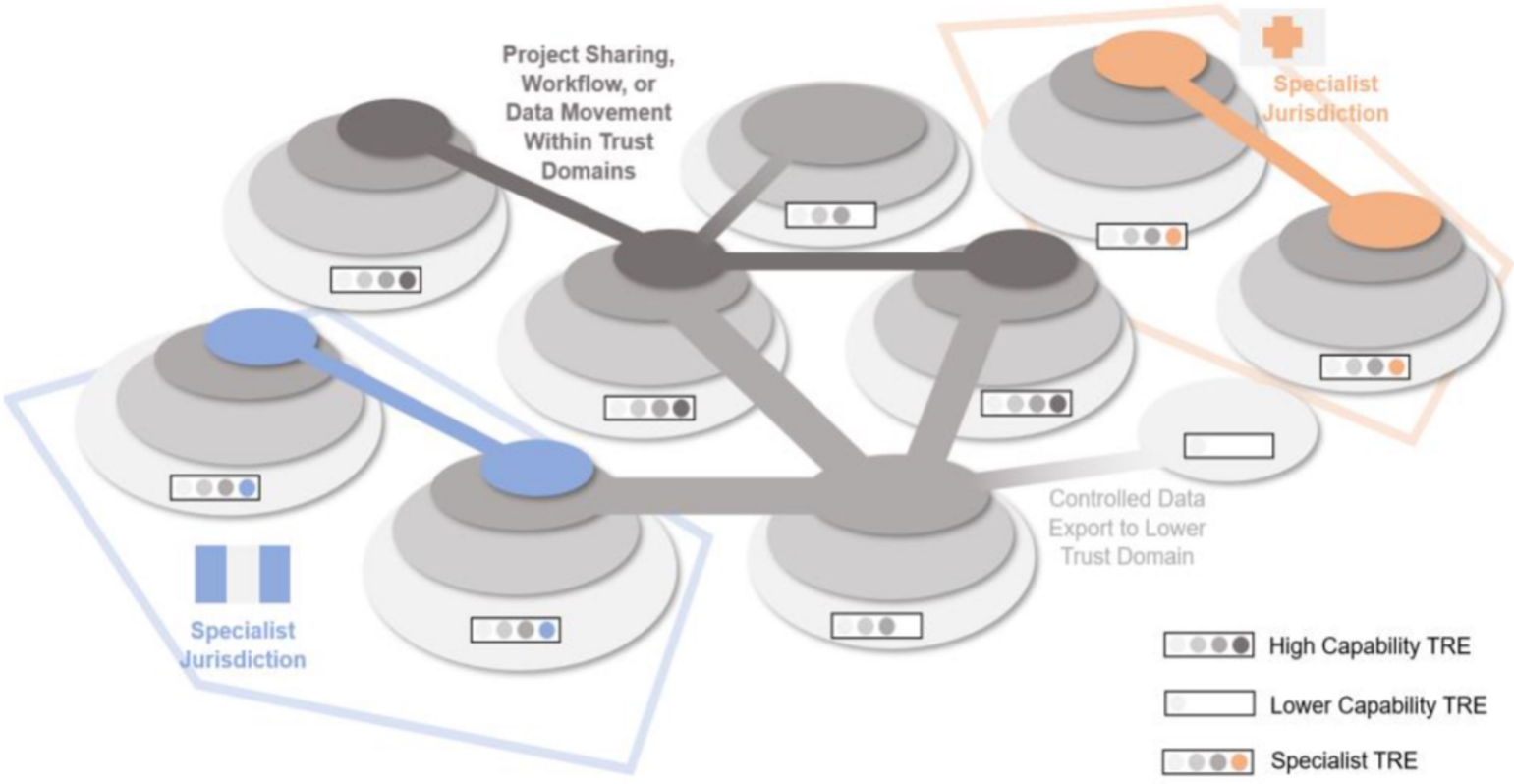
Funded by
the European Union

This project has received funding from the European Union's Horizon Europe Programme under GA 101131056 - EOSC-ENTRUST - HORIZON-INFRA-2023-EOSC-01-06

We have a problem ‘Open Science’ finds hard

Biomolecular research is increasingly about individuals - genomes, proteomes, metabolomes, with clinical context.

The data is sensitive, high volume, complex to analyse, difficult to move…



Biomolecular data

We want to be able to move sensitive data - but only when it’s safe to do so.

We can consider moving the workflows to the data - but have similar trust issues with the code.

Some types of export can be to lower capability environments, but this needs careful management.

The boundaries are not just technical, but also about legal jurisdiction and regulatory compliance.

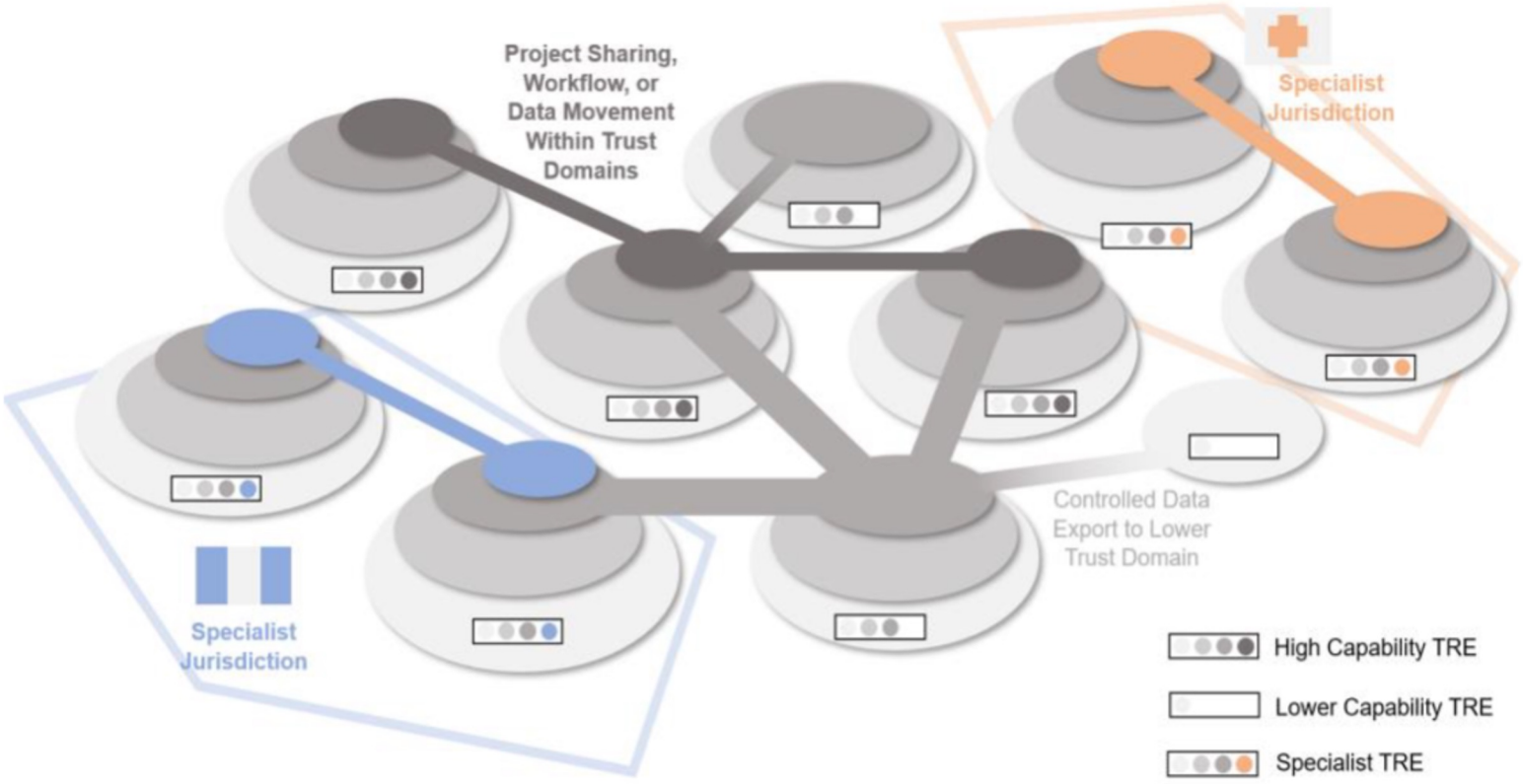
EOSC | ENTRUST

European Network of Trusted Research Environments

…and we aren't alone in this

Other European Research Infrastructures, and research subject areas, share the same problems and have experience with the same point to point solutions.

In many cases, depending on the same infrastructure providers for TREs.



elixir

Biomolecular data

EUDAT

Data e-Infrastructure

ECRIN
EUROPEAN CLINICAL RESEARCH INFRASTRUCTURE NETWORK

Clinical Trials

cessda

Social Sciences

HDRUK
Health Data Research UK

EOSC-ENTRUST - our project

The mission of EOSC-ENTRUST is

- to create a European network of trusted research environments for sensitive data

...and...

- to drive European interoperability by joint development of a common blueprint for federated data access and analysis.

Start date: 01 Mar 2024 (36 months)

EU contribution: € 4,218,809.75

Coordinator: ELIXIR

eosc | ENTRUST

European Network of Trusted Research Environments

Objectives

EOSC-ENTRUST aims to create a tightly knit network of nationally operated and governed TREs capable of supporting large-scale European research…

- Objective 1: Create a *European network of Trusted Research Environments*, linked to EOSC and EuroHPC, to enable transnational collaborative research on sensitive or restricted data.
- Objective 2: Trusted Research Environment providers implement, validate, and promote their capabilities through a *European framework using common standards and shared legal, operational and technical language.*
- Objective 3: *National funders and governments understand the network of TRE capabilities* serving their needs, and how TREs support their national priorities and their contributions to selected transnational programmes.
- Objective 4: The European Network of Trusted Research Environments (ENTRUST) is embedded in the *European Open Science Cloud* and the *European Data Spaces* and fosters an ecosystem of public, private and joint-venture providers of TRE services.

Drivers

A portfolio of Multidisciplinary Drivers informs and validates the blueprint.

- Driver 1: Federated Human Genomics as a catalyst for European TRE provision
- Driver 2: Common standards to enable trans-national sharing of administrative/register and social science data
- Driver 3: Enabling secure transnational re-use of clinical research data in a legally and ethically compliant manner
- Driver 4: Public-Private interactions between TRE in health and environmental data

Providers

The EOSC-ENTRUST TRE Providers Forum will consolidate existing expertise and good practices - catalogue existing capabilities and evaluate and adopt the blueprint and technologies

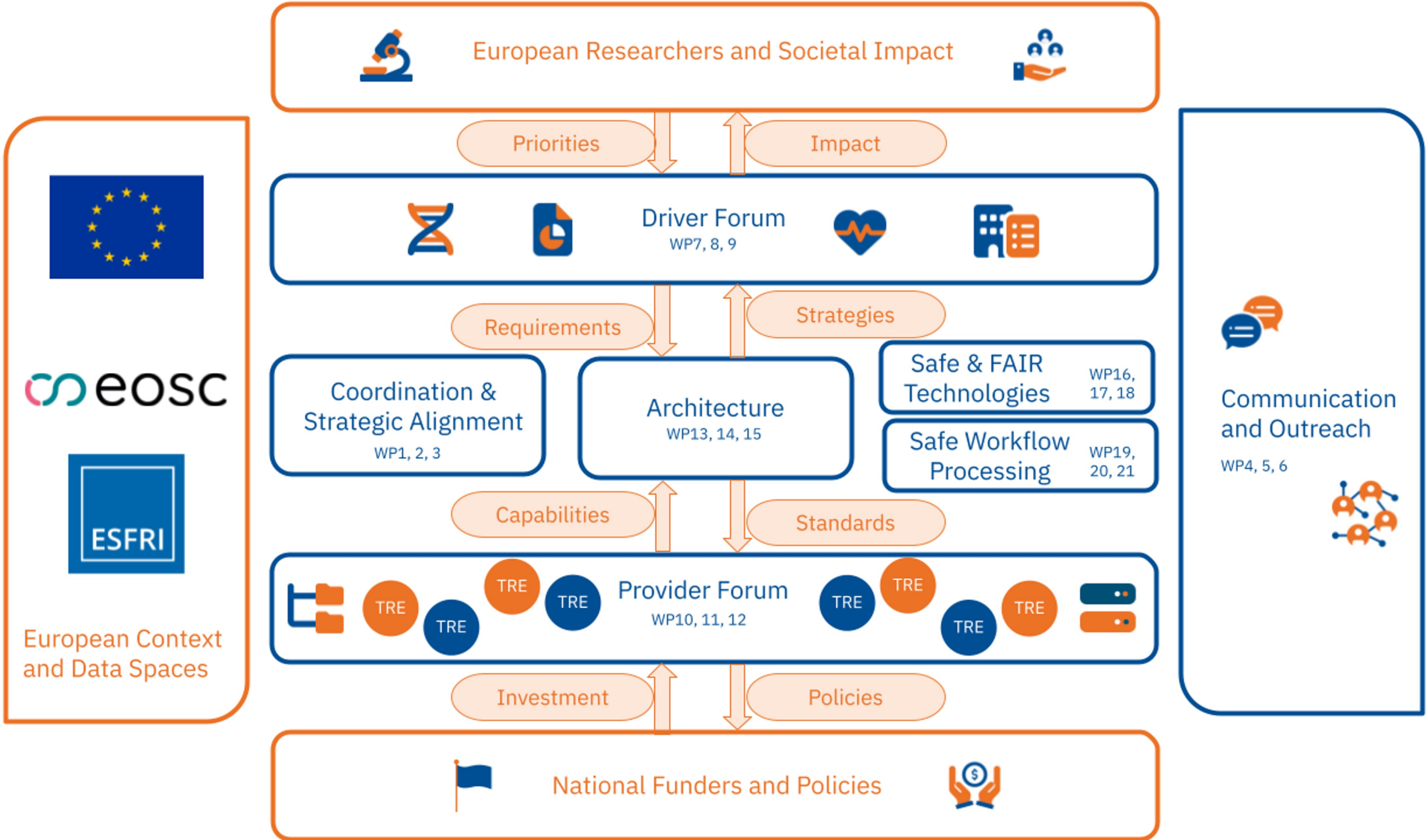
- 16 representatives in the TRE Providers Forum
- expertise across Europe (including UK, NO)
- developments of TRE technology driven by national and institutional use
- significant national capital investment in many of the TRE services

Strong links to national and institutional context are critical: long-term sustainability requires that the TREs are embedded into local strategies and funding streams.

Architecture & Technologies

Blueprint architecture for composable TREs - and beyond the state of the art in some foundational technologies:

- *Trusted research environment blueprint* - will gather the requirements and build a roadmap for a blueprint that enables an interoperable network of TRE services in Europe.
- *Trusted researcher identities and data authorisation* - will deal with the need of higher trust in the authentication and authorization in the TREs context.
- *FAIR digital objects and workflow processing* - the combination of RO-Crates and workflows provides the interoperability framework and execution approach for practical pan-TRE analysis.


European Researchers and Societal Impact
Priorities
Impact
Driver Forum
WP7, 8, 9
Requirements
Strategies
Coordination & Strategic Alignment
WP1, 2, 3
Architecture
WP13, 14, 15
Safe & FAIR Technologies
WP16, 17, 18
Safe Workflow Processing
WP19, 20, 21
Capabilities
Standards
TRE
Provider Forum
WP10, 11, 12
Investment
Policies
National Funders and Policies
eosc
ESFRI
European Context and Data Spaces
Communication and Outreach
WP4, 5, 6

Ambition

We will take European research beyond the State of the Art…

- …in European collaboration: a European network of Trusted Research Environments (TREs) expands EOSC's access to resources and valuable data sets for research.
- …in European connectivity: delivering a Blueprint for connecting TREs into large-scale networks for federated data via a standard set of methods.
- …in FAIR data workflows: secure and reproducible cross-TRE analysis of sensitive data.
- …in European HPC: pilot inclusion of EuroHPC sites into the TRE network

A note on the ‘EOSC-ENTRUST’ year

The Work Plan is designed to give us an iterative annual development cycle focused on requirements and delivery:

- March - General Assemblies - we have just two in person, one Kick-Off and one at the end. The others will be online only.
- May - Requirements and Capabilities workshops - to assess the ENTRUST baseline/SOA and measure adoption
- November - Evaluation & Adoption workshops - to showcase the development of the blueprint & technologies

This will give us regular checkpoints to interact with partner projects and EOSC:

- January, October - EOSC calendar - EOSC will run a Winter School and an autumn Symposium - the major dissemination forum for our outputs

EOSC ENTRUST

European Network of Trusted Research Environments

www.eosc-entrust.eu

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/company/eosc-entrust

Funded by the European Union

EOSC-SIESTA

Project overview

Álvaro López García aloga@ifca.unican.es
IFCA, CSIC-UC

CSIC
Consejo Superior de Investigaciones Científicas

Funded by
the European Union

SIESTA in a nutshell

- HORIZON-INFRA-2023-EOSC-01-06 call
- 5M€, lump-sum scheme
- Duration: 1st Jan 2024 – 31st Dec 2026
- 13 partners (ES, IT, FR, SK, DK, SE)
  - Academic and Research: CSIC, IISAS, INSERM, ISI, CNRS, ULE, SRU, NRU
  - Law: Javier de la Cueva
  - SMEs & Industry: algoWATT, Cendio, interWAY
  - Statistical offices: INE
- https://cordis.europa.eu/project/id/101131957

Objectives

Deliver trusted cloud-based environments for the analysis of sensitive data, built in a reproducible way, and a set of services to ease the secure sharing through state-of-the-art anonymization techniques

1. Enhance the EOSC Exchange services with cloud-based trusted environments for the analysis of sensitive data in the EOSC demonstrating the feasibility of the FAIR principles over them
2. Study, explore and demonstrate the feasibility of FAIR management and processing of sensitive data, showcasing the benefits for society, science and research
3. Deliver tools for the secure anonymization or pseudonymisation of datasets, allowing rightholders to safely release sensitive data through the EOSC Exchange
4. Provide rightholders with best practices and methodologies for the release of sensitive data following FAIR principles
5. Extend the service offer and the capabilities being offered through the EOSC portal, coordinating with the operational and management activities carried out by the EOSC partnership and related projects

SIESTA Concept

- Different access methods based on the data sensitivity: from collaborative development environments (like JupyterHub) for low risk data, to access through security hardened remote desktop solutions with limited capabilities, strict network controls and VPN access for higher sensitivity levels.
- Internal repositories allow the installation of software components and libraries only from trusted sources that have been previously approved.
- User-provided predefined software components that have been endorsed and approved, allowing the offload of user workflow tasks into the platform, accessing sensitive data.
- Assisted anonymization tools for data ingestion and risk-disclosure evaluation tools for data stage out, allowing the improvement of the privacy levels of the shared data.
- A tamper-proof component for keeping track of all relevant transactions, providing auditing mechanisms.
- Integrations with the EOSC Core and Exchange, allowing for instance the inclusion of existing datasets, the generation and storage of anonymized or synthetic data in EOSC compliant repositories or the delivery of trusted and secure thematic data spaces into the EOSC.

SIESTA Concept

- Provide safe and trusted access to sensitive data
- Following tiered model for data sensitiveness
  1. Fully open data. no need to use a trusted research environment.
  2. Very low risk. Pseudonymised data with very low linking risk. Unlikely to cause harm.
  3. Low risk. Strongly pseudonymised datasets with some indirect identifiers.
  4. Average risk. Pseudonymised personal data and confidential organisations information.
  5. High risk. Weak or no de-identification and very sensitive commercial data.
  6. Very high risk. Very sensitive personal data or highly confidential government or commercial data.
- Initially Focus on categories to 2 to 5+6, with increased level of security, different entry methods, different restrictions.
- Infrastructure as Code to ensure reproducibility of the compute environment.

Tiered model (data sensitiveness) implications

- Data sensitivity definition is not static, it depends on the context and dynamically defined via policy tooling
  - E.g. depending on data rightholder, audience (who is going to use it),
- Different data sensitiveness (tiered model) coupled with different access models.
  - Provide different access levels: e.g. remote interactive sessions (levels 0-2), remote desktop (level 3), remote desktop with limited capabilities (level 4), execution of trusted code or SMPC (level 5)
- Other platform level security implications
  - e.g. SIESTA audit system has high sensitivity
- SIESTA aims to address these security aspects through an Infrastructure as Code
  - Map platform deployments to certified resource providers (SIESTA involves partners whose compute resources are certified with ISO27001:2017 and National Cybersecurity Schemes)

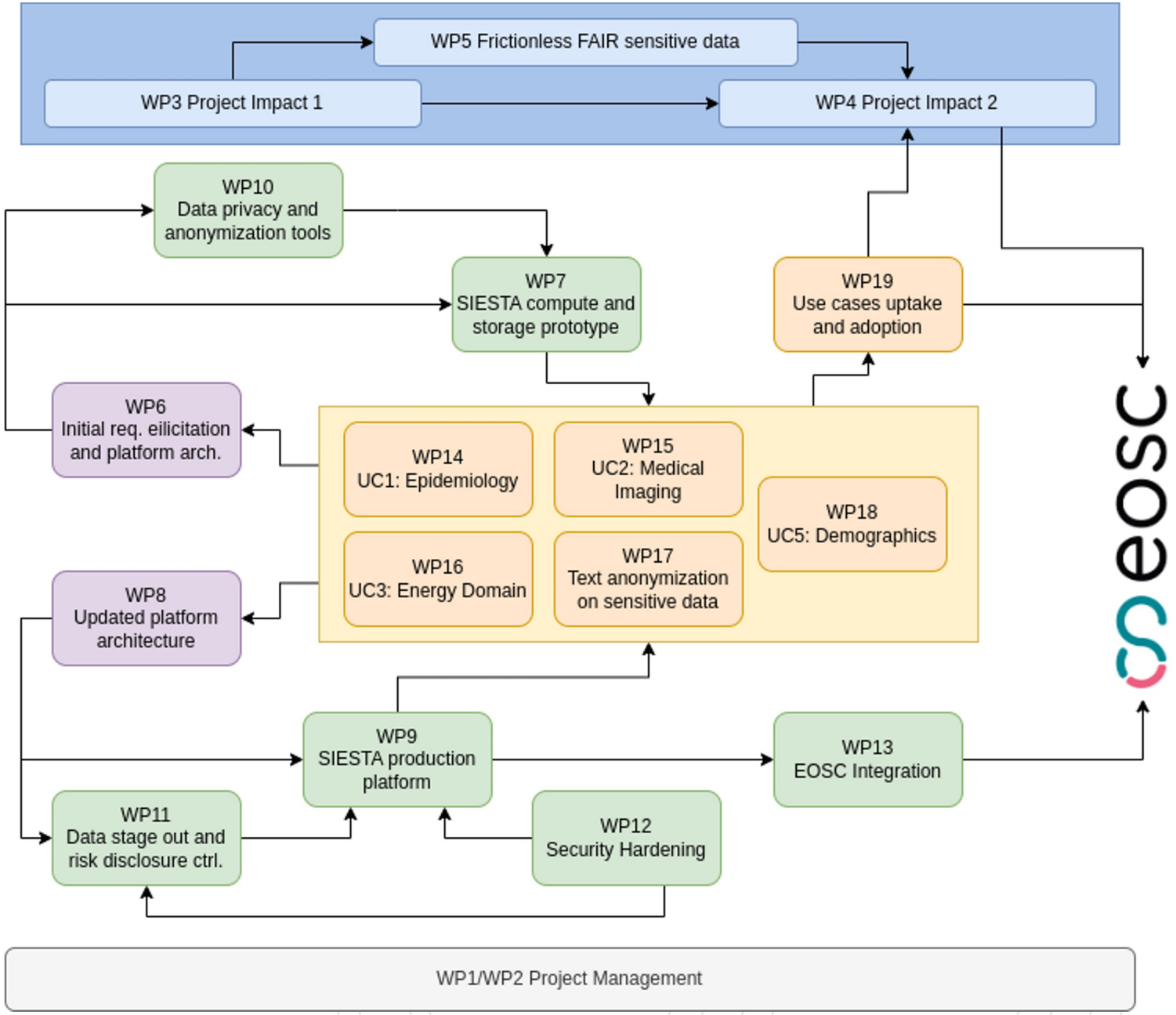
SIESTA implementation and co-design

Five complementary cases:

1. Epidemiology: (CSIC, INSERM, ISI) development of an ecosystem with data collected by the SIESTA team from different sources (population, mobility, surveillance, etc.), plus data from collaborative surveillance systems, and with the addition of last generation models able to study propagation patterns of generic infectious diseases.
2. Medical imaging: (SRU, NRU, CNRS) development of (neuro)imaging data analysis pipelines integrated with the EOSC platform that allow expert and non-expert users to carry out analyses on public and non-public neuroimaging (fMRI, EEG, MEG) datasets including demographic, health and questionnaire (tabular) data as covariates.
3. Energy: (ALWA) secured Renewable Energy Community (REC) information hub, able to guarantee a trusted, privacy-compliant, seamless and even cross-border access, reuse and valorization of technical information associated with energy consumption, production and storage.
4. Text anonymization on sensitive data: (ULE) tools that allow anonymizing documents or any information containing text, with special focus on personal data and also on information related to locations, organisations, addresses, emails, finance or any information that could lead to identifying a person or organisation.
5. Demography: (CSIC, INE) tools to improve the anonymization of the data to be shared, the creation of designed populations whose data can be shared without privacy concerns and systems to analyse in a reproducible FAIR way the data without the need of a direct access.

WP structure

Project organization

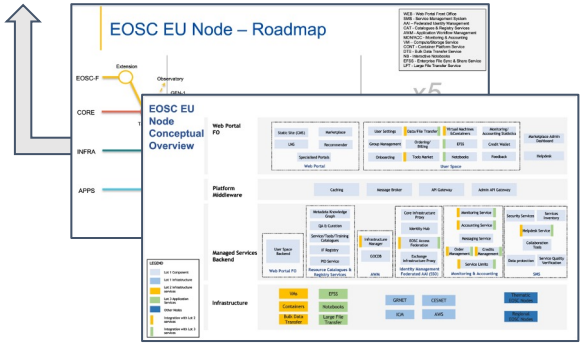


Roadmap

now

Start | M6 | M12 | M18 | M24 | M30 | M36

Requirements elicitation
Architecture definition
Platform implementation plans



User workshop
All hands meeting

Early release (preview) of anonymisation tools
(common privacy models, differential privacy, etc.)

1st platform release
EOSC SIESTA anonymisation tools

Tension between FAIR guiding principles and sensitive data: report

EOSC Integration

SIESTA risk control tools

External user workshop

EOSC DevSecOps practises and processes

2nd platform release
User uptake and validation

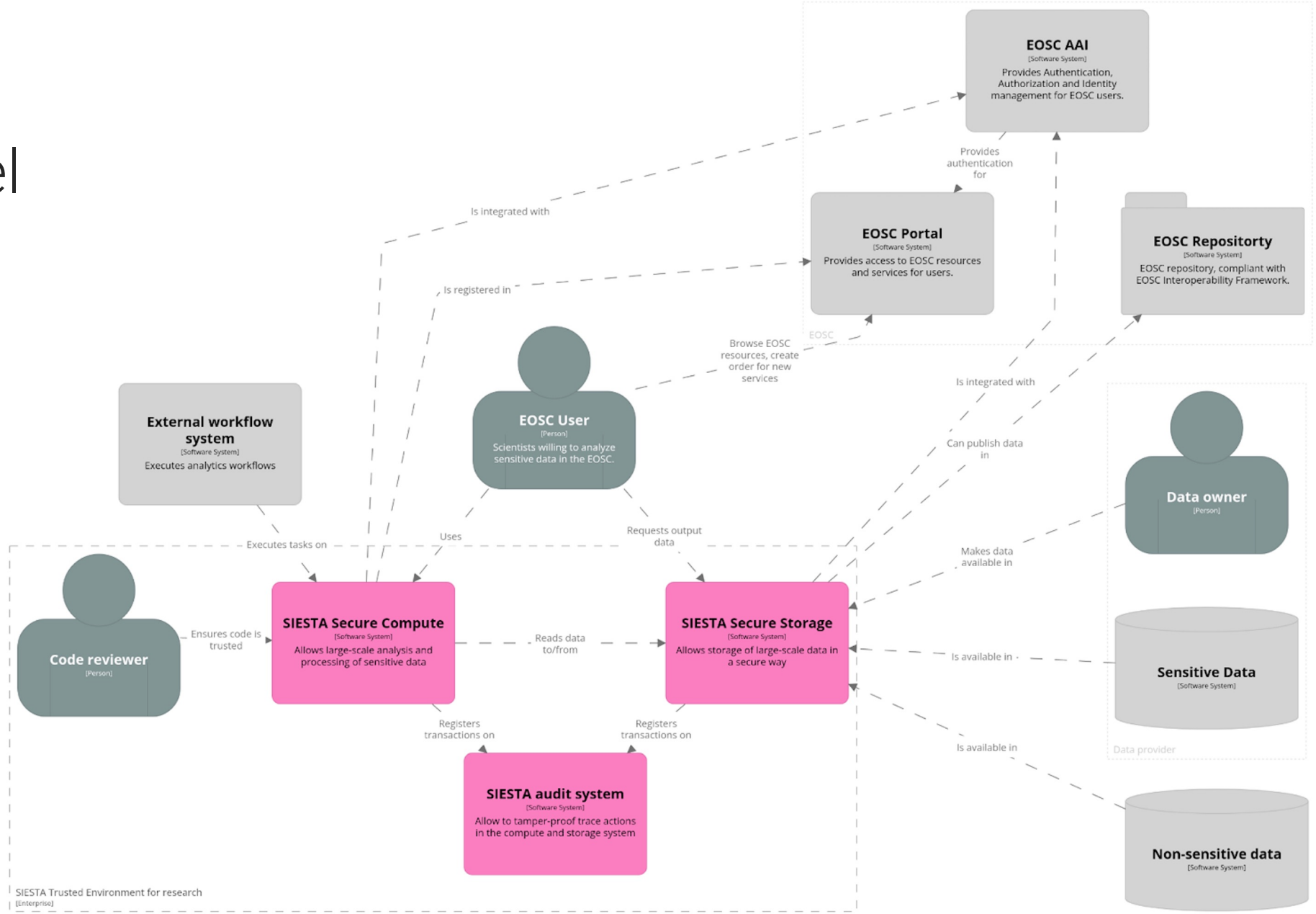
Agile project development (Personas, Epics, user stories, requirements) towards first platform prototype

Foster platform and tools usage and use case uptake
Good practices and guidelines
Dissemination and KPI maximization, KER (re)definition

Results (early) published in SIESTA Zenodo community:
https://zenodo.org/communities/siesta/

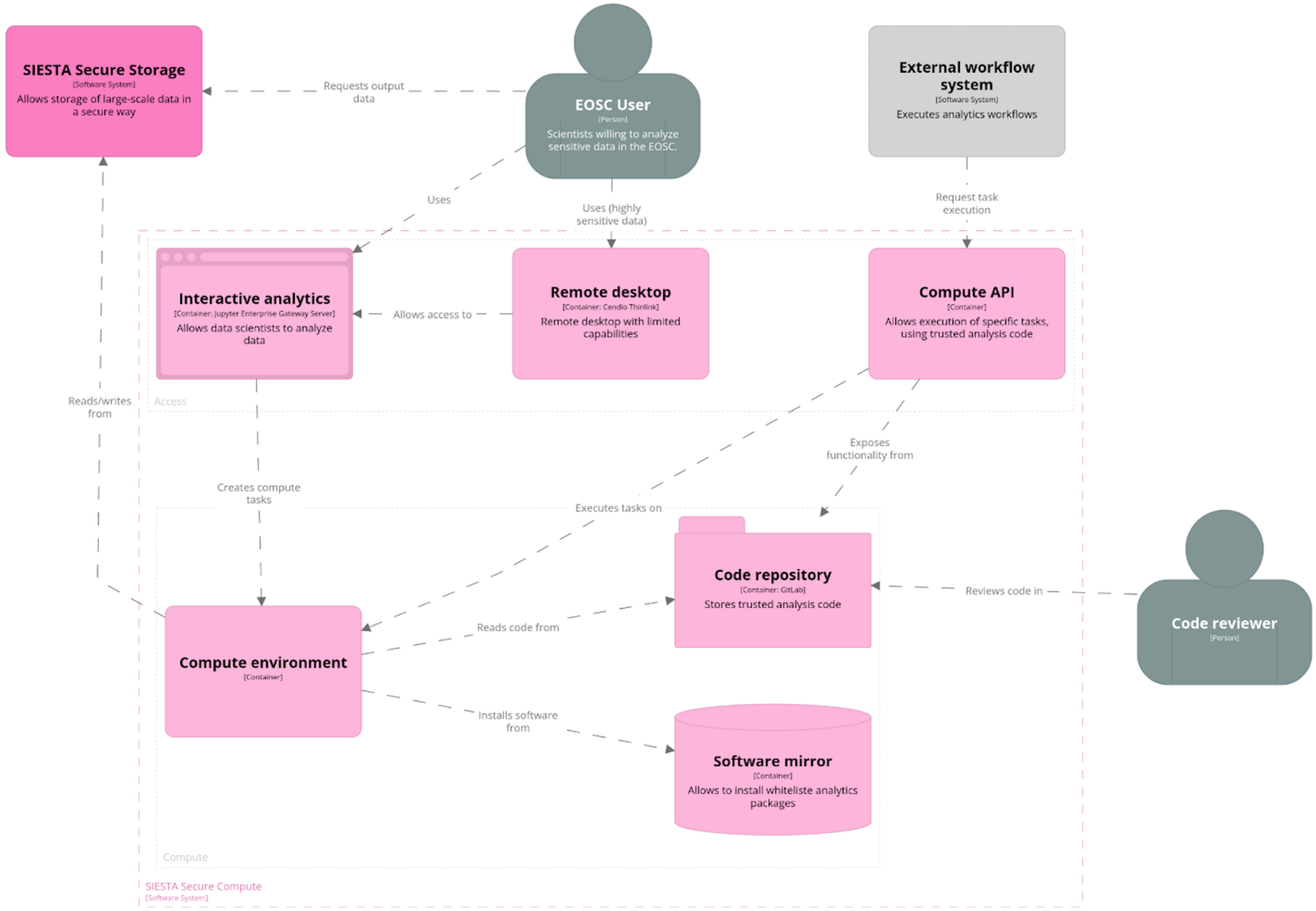
Initial high level architecture

EOSC-SIESTA follows the C4 model and notation for its architecture definition



[System Landscape] SIESTA Trusted Environment for research
Tuesday, March 7, 2023 at 1:00 PM Central European Standard Time

Initial high level architecture

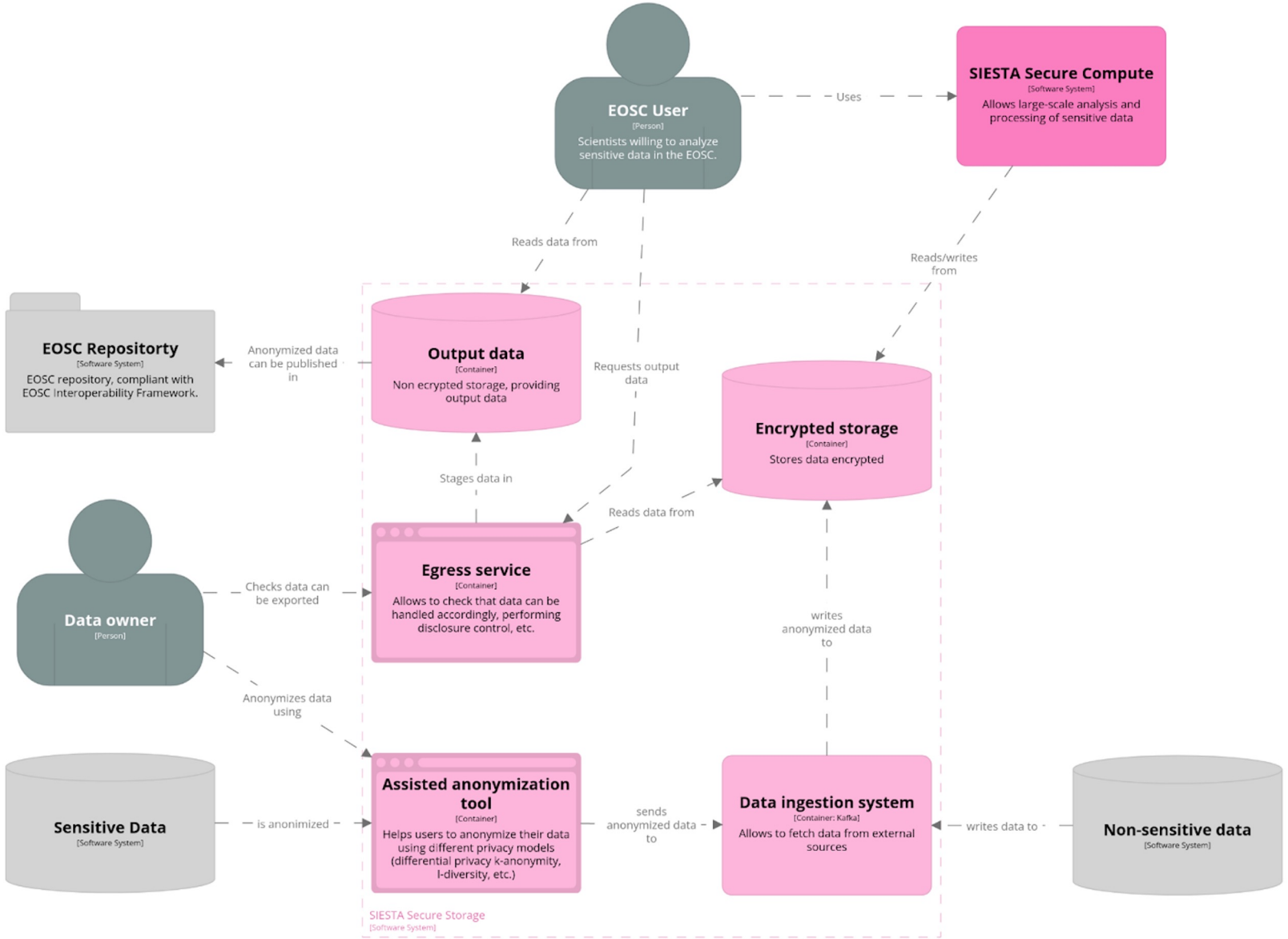


[Container] SIESTA Secure Compute
Tuesday, March 7, 2023 at 1:00 PM Central European Standard Time

EOSC-SIESTA follows the [C4 model] and notation for its architecture definition

Initial high level architecture

EOSC-SIESTA follows the C4 model and notation for its architecture definition



[Container] SIESTA Secure Storage

Tuesday, March 7, 2023 at 1:00 PM Central European Standard Time

Exploring collaborations

- Ongoing collaboration with sister projects EOSC-ENTRUST and TITAN
  - EOSC Symposium unconference session “Open as possible, restricted as necessary; EOSC sensitive data exchange”
  - https://indico.cern.ch/event/1408259/timetable/#b-563302-unconference-open-as
- Identified potential synergies in INFRAEOSC context
  - AI4EOSC
    - Leveraging AI4EOSC federated learning platform to develop AI/ML models over sensitive data
    - Close collaborations with Flower.ai: Code contributions, participation in pilot programmes, FlowerLLM; MONAI FL and NVIDIA FLARE: Model compatibility
  - RAISE
    - (exploring) work together on analysis of sensitive data, synthetic and exemplary datasets, etc.
- Potential further collaborations outside EOSC: e.g. EUCAIM (Cancer Image Federation) project funded by DIGITAL:
  - Synergies to be explored: de-identification, distributed analysis of sensitive data,..)

Project coordination:

- siesta-po@listas.csic.es

Thank you for your attention

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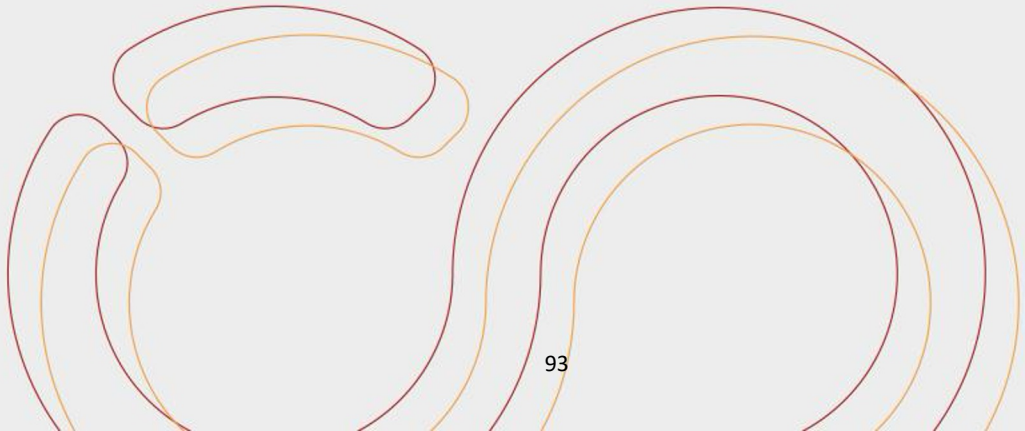


TITAN In a Nutshell

Project start Feb 1st 2024

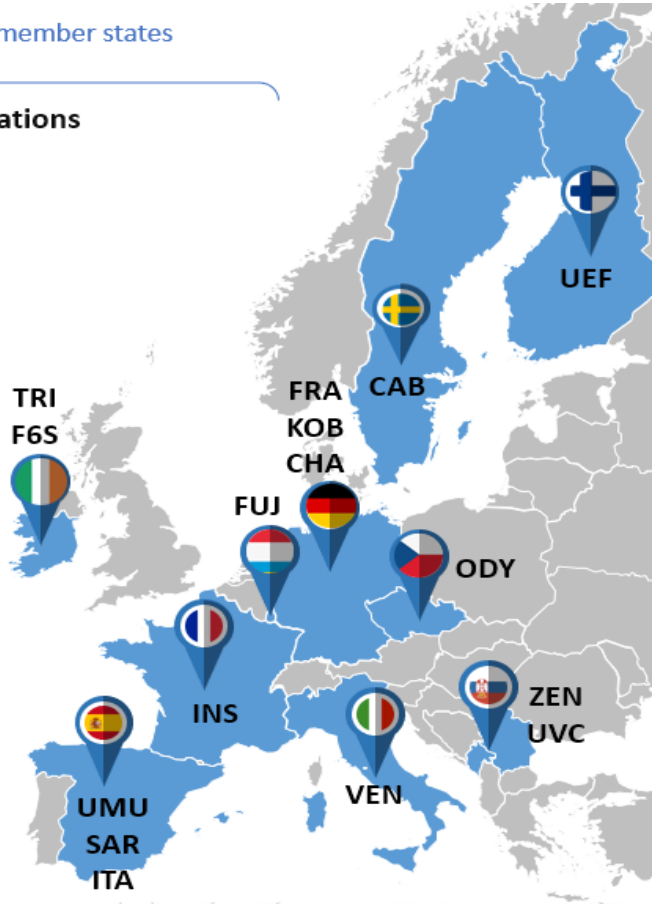
36 months

Coordinator: Antonio Skarmeta

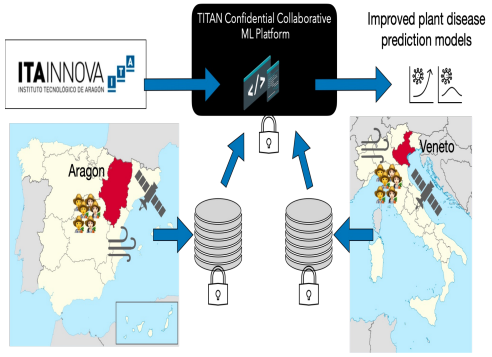
Universidad de Murcia - Spain

16 consortium partners **8** EU member states

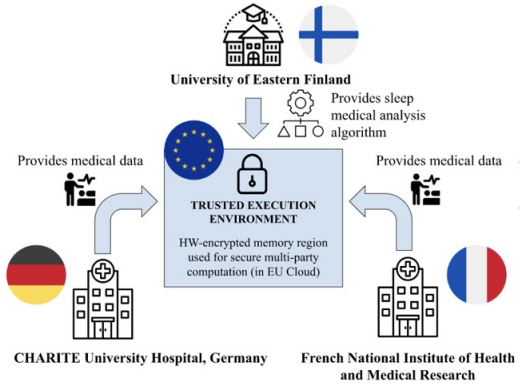
7 Academic & research organisations
1 Industrial partners
5 SMEs
3 Governments



Use Case 1: Confidential sharing and collaboration with sensitive agrifood government data.



Use Case 2: Collaborative Use of ML in Healthcare



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Project objectives
Key Contributions to EOSC SRIA

Contribution of TITAN

Enriching the EOSC with a **software platform solution for confidential data collaboration and secure and privacy-preserving data processing.**

- Objective 1: Collect legal, technical, and architectural requirements and define a platform architecture for secure sharing of sensitive data and publishing anonymised data sets in the EOSC Interoperability Framework IF.
- Objective 2: Develop secure data sharing and auditing mechanisms for sensitive data, including secure data zones, data access control, and end-to-end data protection (storage - transfer - processing).
- Objective 3: Develop an end-to-end secure data processing framework for collaborative and privacy-preserving Machine Learning (ML) using Trusted Execution Environments.
- Objective 4: Implement confidential mechanisms, algorithms, and tools with cloud infrastructure platforms and the EOSC IF, and validate solutions in sensitive data-driven use cases (government and healthcare)
- Objective 5: Disseminate and promote the solutions for data governance and stewardship through collaboration with EOSC Partnership initiatives, standardisation, and integrating with the EOSC infrastructure

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Key impacts and deliverables

TITAN

New paradigm of secure access to sensitive public data and applications.

- **TITAN will focus on end-to-end secure data sharing and collaboration platform** requires advancements in network security, **distributed access control**, security domain segmentation, application of state-of-the-art **protection for data in use**, as well as **usable and scalable data anonymisation**
- **Three main areas**
  - Domain 1: Confidential data processing enabling confidential collaborative data processing: memory encryption, confidential computing, remote attestation, confidential GPUs, confidential ML.
  - Domain 2: Scalable data anonymisation for wide data access: Differential Privacy, k-anonymity, Secure Multiparty Computation (SMC), Multi-Party Computations (MPC), Zero-Knowledge Proof (ZK-SNARKs), and Homomorphic Secret Sharing (HSS).
  - Domain 3: Distributed access control and transaction logging using decentralised solutions: blockchain technologies, network security domains, cloud security zones, access control and management.

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Your vision

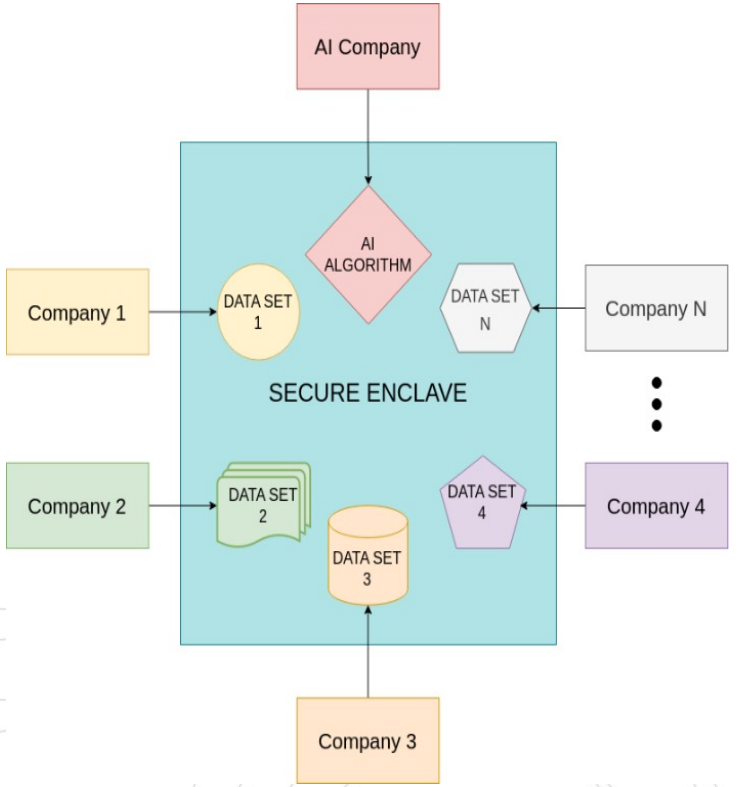
TITAN

Privacy-preserving, collaborative (confidential multi-party) ML by combining the aforementioned techniques and leveraging Federated ML. To achieve immutability of the learning data model, the model will be stored on the **distributed ledger**.

Discovery, sharing, and federation of heterogeneous data from multiple sources, **semantic interoperability data models**

TEEs to implement confidential data processing for the shared datasets

TITAN will develop an improved **access control management ecosystem through the application of DLTs**, and more concretely **smart-contract-enabled blockchains**



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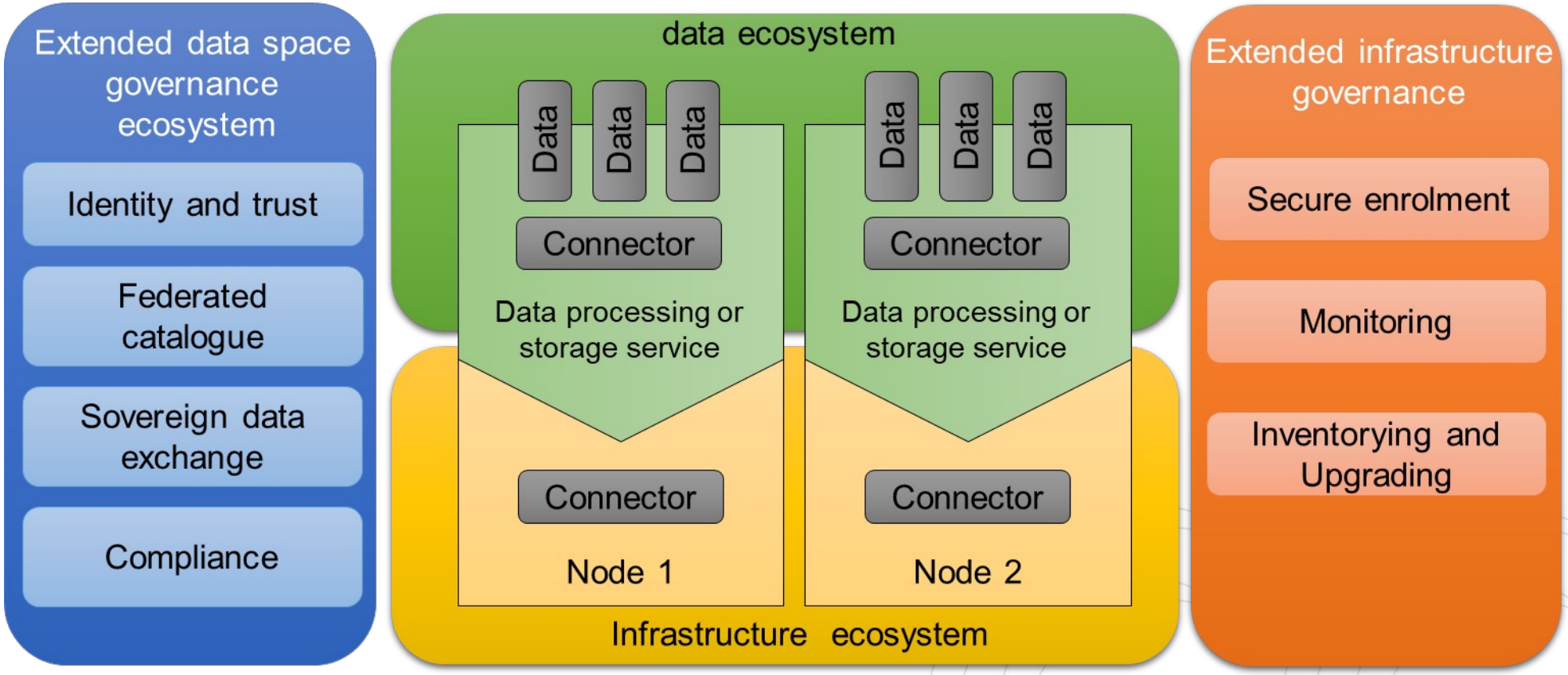
Your vision

TITAN High Level Architecture



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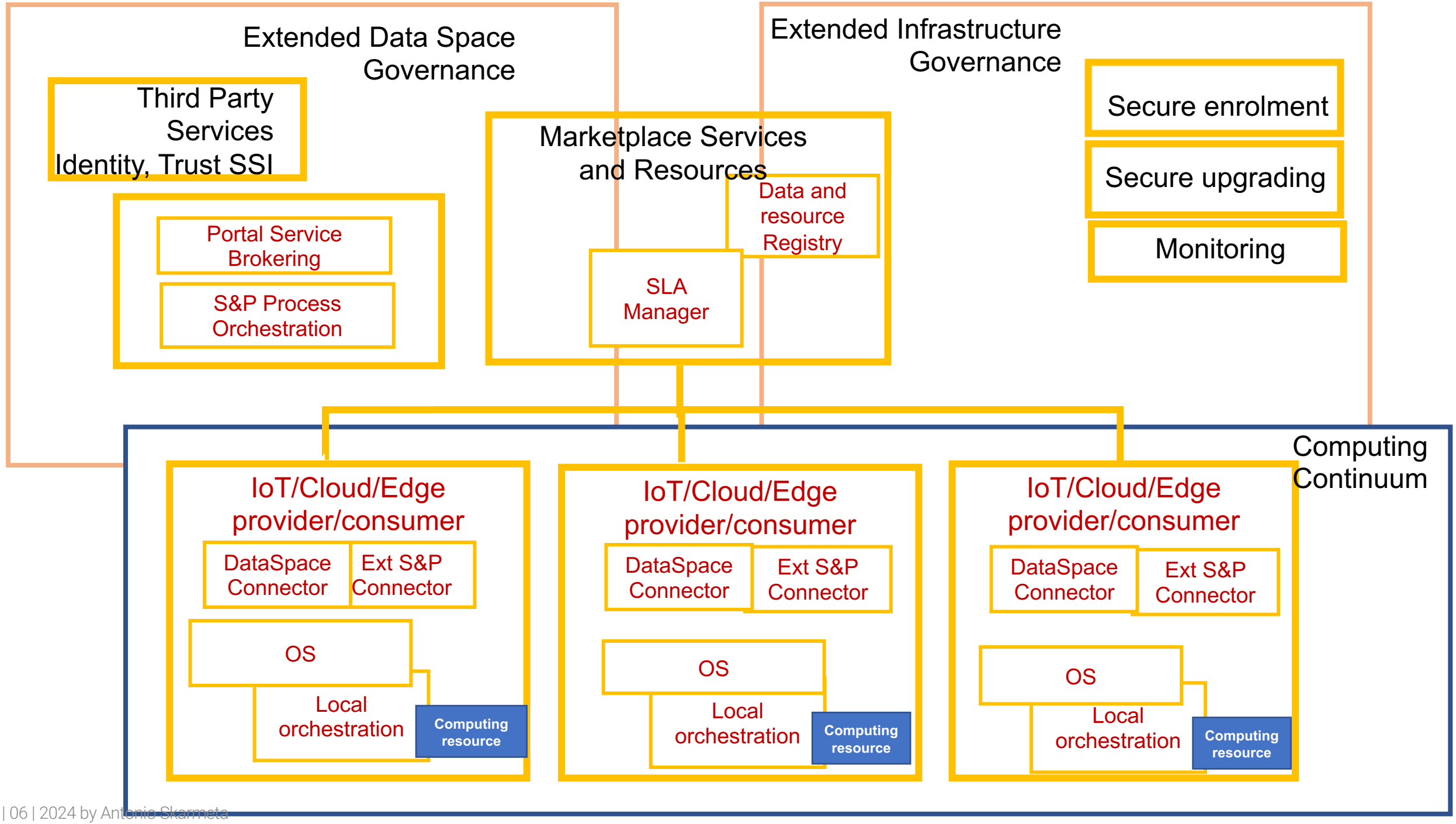
Extended Data Space Governance
Third Party Services
Identity, Trust SSI
Portal Service Brokering
S&P Process Orchestration
Marketplace Services and Resources
Data and resource Registry
SLA Manager
Extended Infrastructure Governance
Secure enrolment
Secure upgrading
Monitoring
Computing Continuum
IoT/Cloud/Edge provider/consumer
DataSpace Connector
Ext S&P Connector
OS
Local orchestration
Computing resource
IoT/Cloud/Edge provider/consumer
DataSpace Connector
Ext S&P Connector
OS
Local orchestration
Computing resource
IoT/Cloud/Edge provider/consumer
DataSpace Connector
Ext S&P Connector
OS
Local orchestration
Computing resource

Dependencies and Collaborations

Collaborations:

- Already started discussion with SIESTA and ENTRUST as we have been involved in each kickoff meeting
- A common session proposed for next EOSC Symposium Unconference: "**Open as possible, restricted as necessary; EOSC sensitive data exchange**
- Also initial meeting with LAGO project from DG HOME

Dependencies/Links:

- Interoperability between Trust model of GAIA-X and AARC Blueprint Architecture interaction
- Data Spaces Architecture and EOSC nodes
- EOSC node Resource Hub and Notion of Resources of TITAN Architecture

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