EOSC Infrastructure, Resources and services

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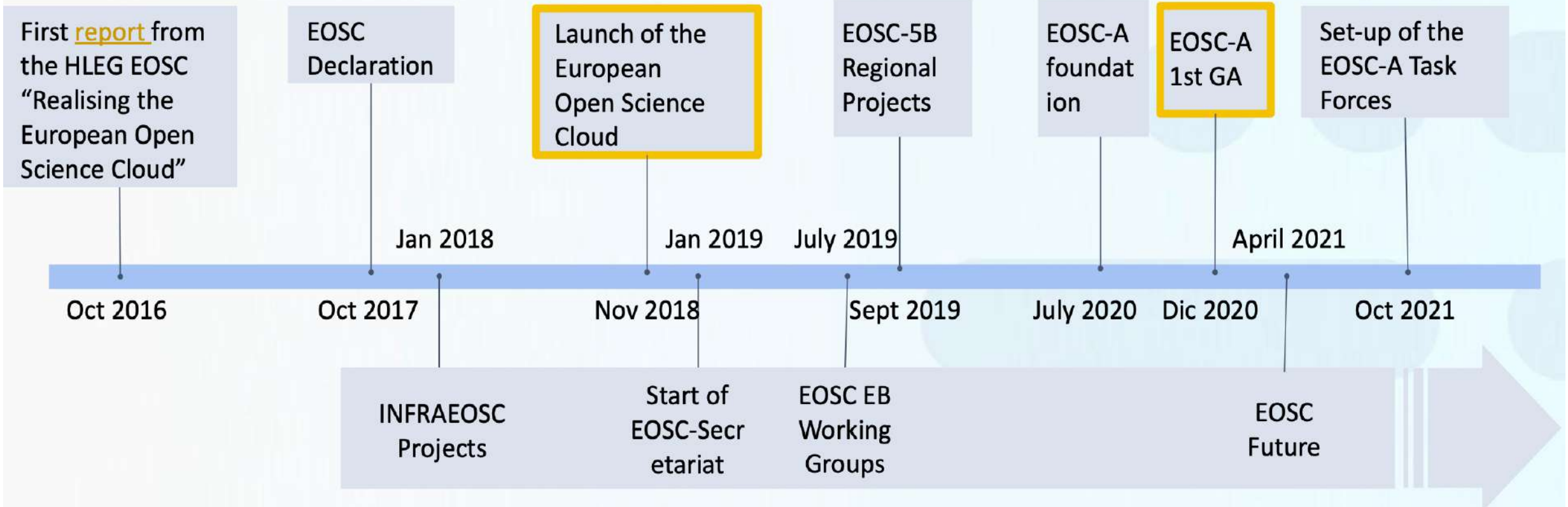
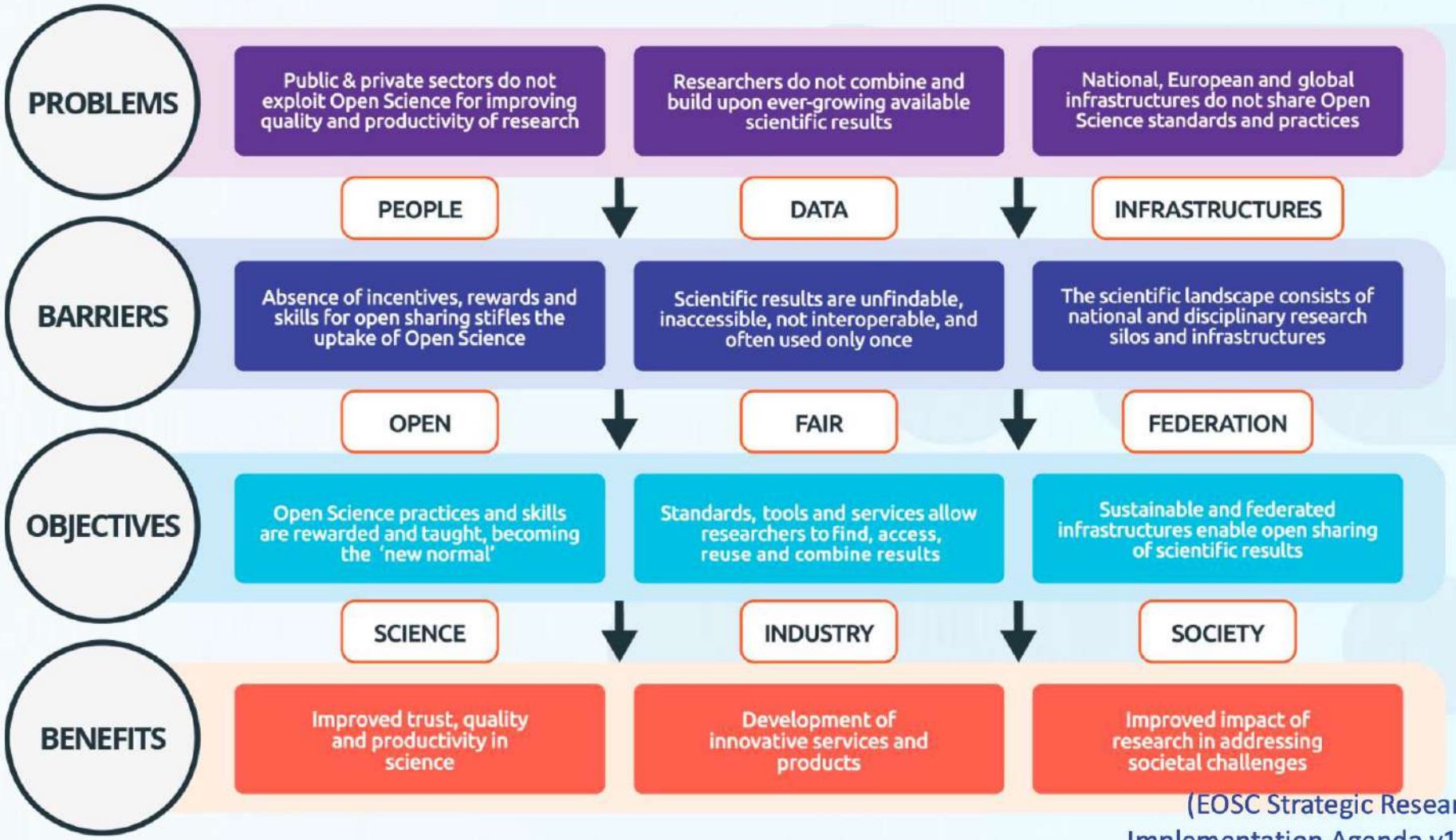
European Open Science Cloud (EOSC) Initiative - Historical Context

- EOSC aims to offer a virtual environment for open access to services to store, share, process and reuse research data and other research digital objects, such as software
  - The EOSC initiative was proposed in 2016 by the EC as part of the European Cloud initiative, funded through the so-called H2020-INFRAEOSC-2018-2020 (€ 157M).
  - Main objective of HEU destination 2 with 89M€ in the HORIZON-INFRA-2021/22-EOSC-01 calls.



EOSC Objectives Tree

- It structures the aims of EOSC in terms of people, data and infrastructures.
- Three General Objectives identified.



(EOSC Strategic Research Implementation Agenda v1.0)

The Strategic and Research Agenda (SRIA)

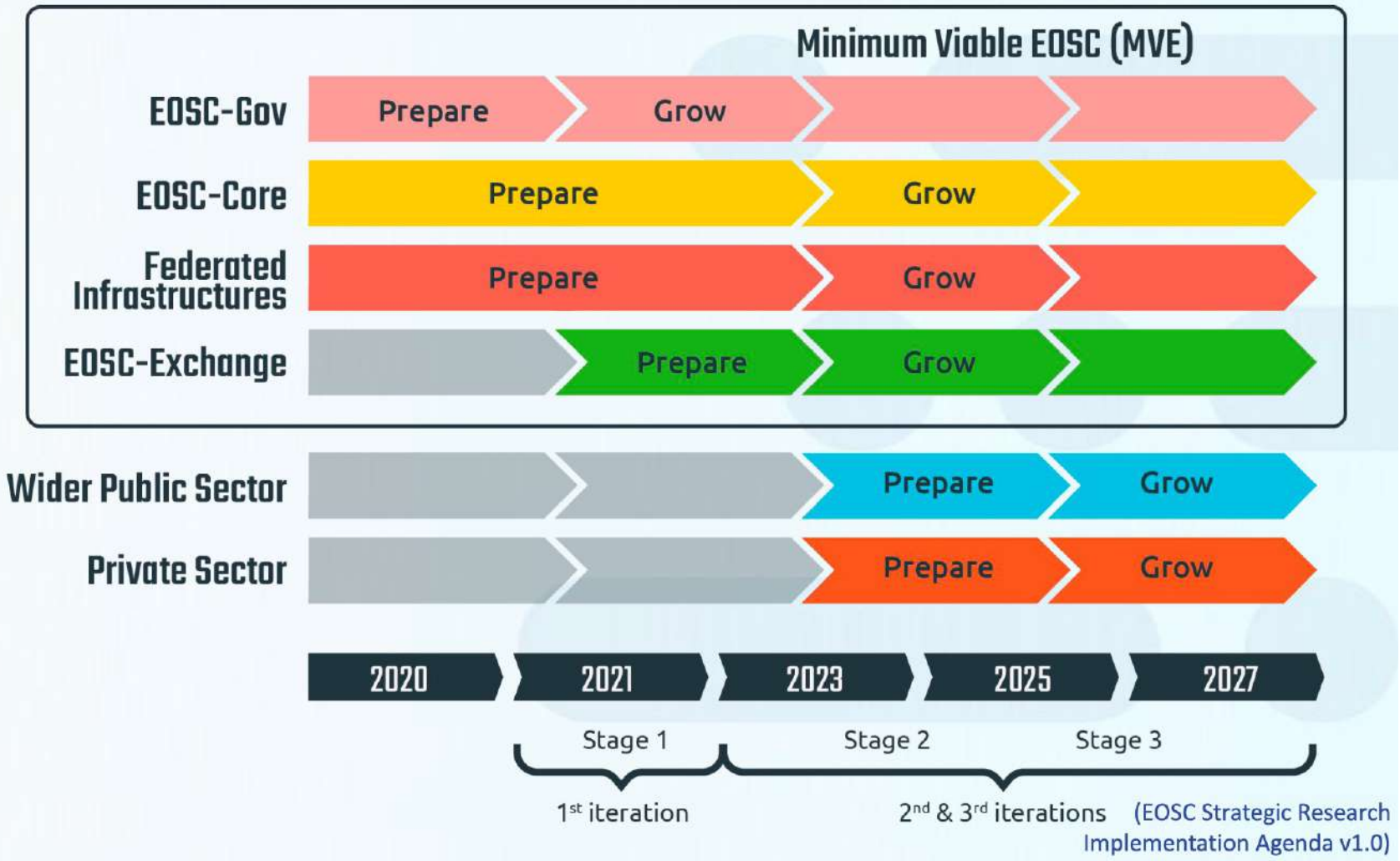
- A key document for the implementation of EOSC is the "Strategic Research and Innovation Agenda" (SRIA)
- It states three General Objectives
  - GO1. Ensure that Open Science practices and skills are rewarded and taught, becoming the 'new normal'.
  - GO2. Enable the definition of standards, and the development of tools and services, to allow researchers to find, access, reuse and combine results.
  - GO3. Establish a sustainable and federated infrastructure enabling open sharing of scientific results.

EOSC Implementation timeline

Stage 1 (2021–2022): Development towards added value from a functional federation of infrastructures Enabling the EOSC operations (the EOSC-Core) to provide necessary core functions of the Minimum Viable EOSC (MVE) that allow federation of existing and future infrastructures.

Stage 2 (2023–2024): Expansion to production that generates added value, During this period, activities will build on pilots/demonstrators and work towards linking EOSC beyond the research communities.

Stage 3 (2025–2027 and beyond): Expansion to develop impact from Open Science Deployment of federated research infrastructures for European researchers with functionality that provisions actors from multiple communities to deliver impactful Open Science.



(EOSC Strategic Research Implementation Agenda v1.0)

INFRAEOSC-H2020 Calls and Projects

EUROPEAN OPEN SCIENCE CLOUD

Building infrastructure services

EINFRA-12-2017

- Integrating and managing services for the European Open Science Cloud (**EOSC-hub**)
- OpenAIRE Advancing Open Scholarship (**OpenAIRE-Advance**)

INFRAEOSC-01-2018

- Open Clouds for Research Environments (**OCRE**)

H2020-EU.1.4.1.3.

- Delivering Agile Research Excellence on European e-Infrastructures (**DARE**)
- eXtreme DataCloud (**XDC**)
- Designing and Enabling E-infrastructures for intensive Processing in a Hybrid DataCloud (**DEEP-HybridDataCloud**)
- European e-Infrastructure for Extreme Data Analytics in Sustainable Development (**EUXDAT**)
- Connected Open Identifiers for Discovery, Access and Use of Research Resources (**FREYA**)

User Communities

INFRAEOSC-04-2018

- ENVironmental Research Infrastructures building Fair services Accessible for society, Innovation and Research (**ENVRI-FAIR**)
- Providing an open collaborative space for digital biology in Europe (**EOSC-Life**)
- European Science Cluster of Astronomy & Particle physics ESFRI research infrastructures (**ESCAPE**)
- Photon and Neutron Open Science Cloud (**PaNOSC**)
- Social Sciences & Humanities Open Cloud (**SSHOC**)

INFRAEOSC-02-2019

- Co-designed Citizen Observatories Services for the EOS-Cloud (**COS4CLOUD**)
- Interactive & agile/responsive sharing mesh of storage, data & applications for EOSC (**CS3MESH4EOSC**)
- INODE - Intelligent Open Data Exploration (**INODE**)
- Novel EOSC services for Emerging Atmosphere, Underwater and Space Challenges (**NEANIAS**)
- Transforming Research through Innovative Practices for Linked interdisciplinary Exploration (**TRIPLE**)

Building EOSC

INFRAEOSC-05-2018-2019 a/c

- EOSCsecretariat.eu (**EOSCsecretariat.eu**)
- Fostering FAIR Data Practices in Europe (**FAIRsFAIR**).

INFRAEOSC-06-2019

- Enhancing the EOSC portal and connecting thematic clouds (**EOSC Enhance**)

INFRAEOSC-05-2018-2019 b

- EOSC-Nordic (**EOSC-Nordic**)
- Coordination and Harmonisation of National Initiatives, Infrastructures and Data services in Central and Western Europe (**EOSC-Pillar**)
- European Open Science Cloud - Expanding Capacities by building Capabilities (**EOSC-synergy**)
- EOSC Photon and Neutron Data Services (**ExPaNDS**)
- National Initiatives for Open Science in Europe (**NI4OS-Europe**).

EOSC Services

INFRAEOSC-03-2020

- Integrating and managing services for the European Open Science Cloud (**EOSC-Future**)

INFRAEOSC-07-2020

- Copernicus - eoSC AnaLytics Engine (**C-SCALE**)
- Data Infrastructure Capacity for EOSC (**DICE**)
- EGI Advanced Computing for EOSC (**EGI-ACE**)
- OpenAIRE-Nexus Scholarly Communication Services for EOSC users (**OpenAIRE Nexus**)
- REsearch LIfecycle mAnageмeNt for Earth Science Communities and CopErnicus users in EOSC (**RELIANCE**)

EOSC Future

Vision

- Operational EOSC Platform
  - Consisting of data, services, open research products
  - Accessed and used by European researchers
    - Engaged, facilitated, trained, supported

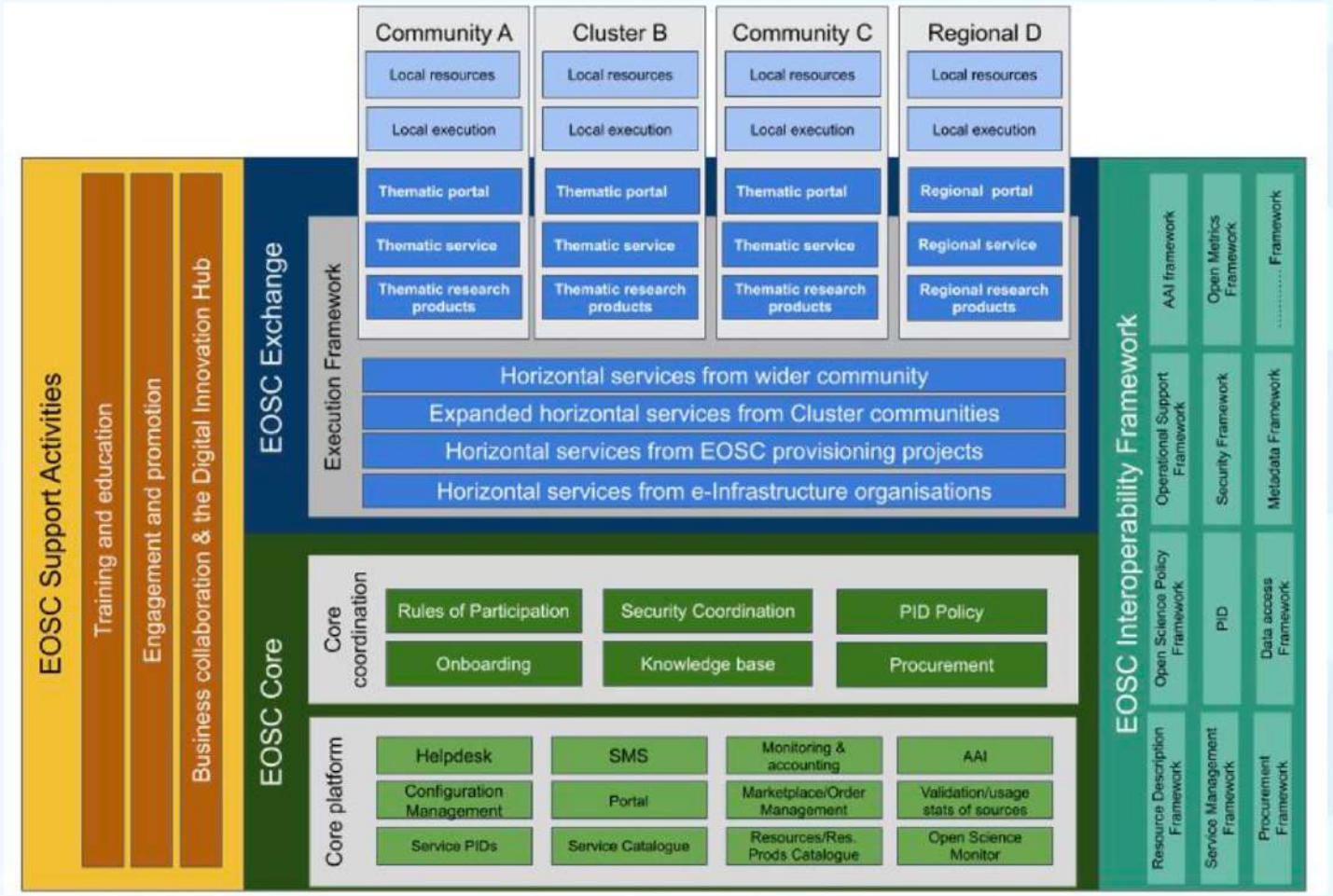
Mission

- To bring the e-Infrastructures and Science Cluster communities together to implement an operational EOSC Platform focusing on technology and interoperability, resources, user engagement and user experience.

Credits: EOSC-Future, Mission and Outcomes, EOSC Symposium 2021

EOSC Architecture – the Minimum Viable EOSC (MVE)

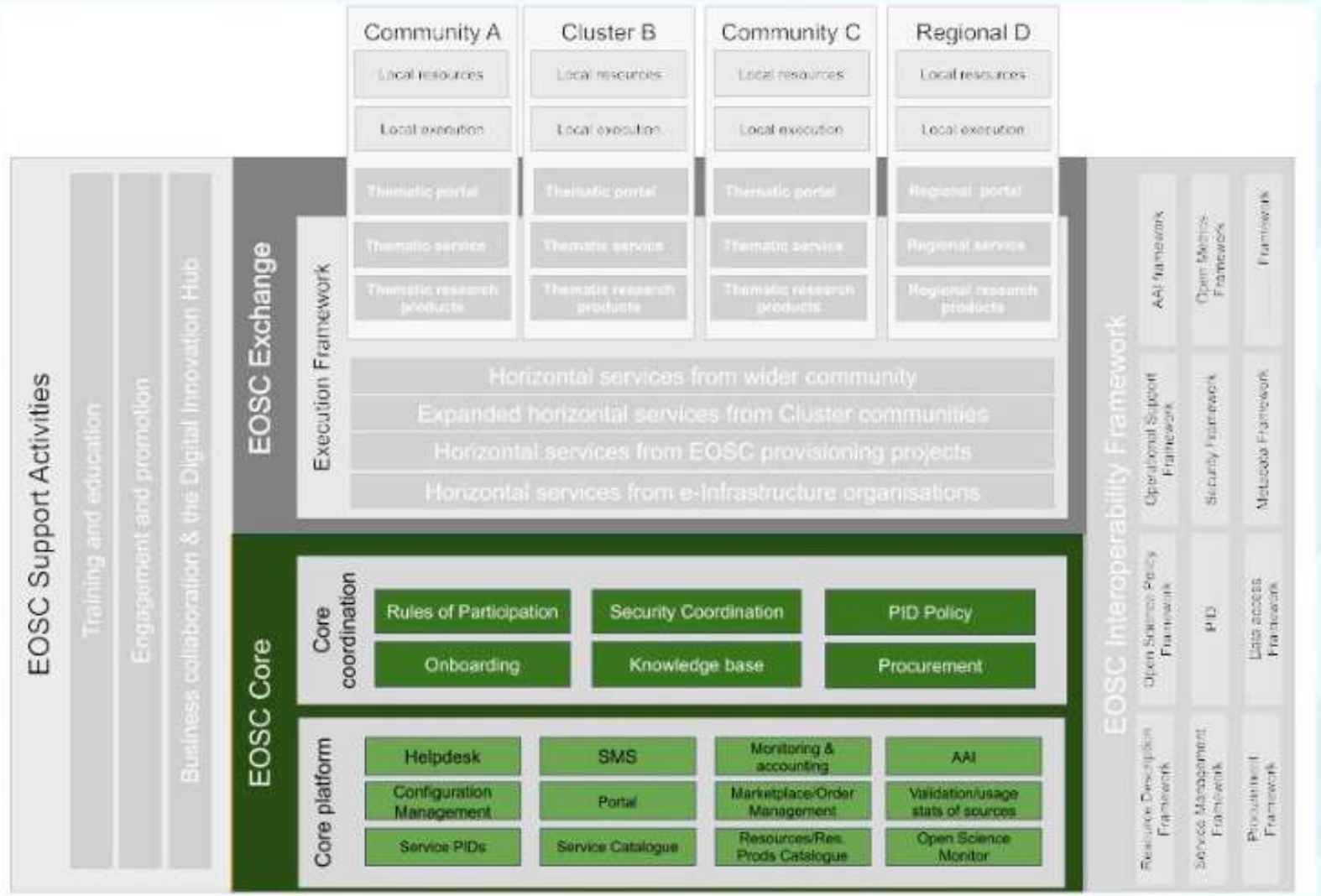
- The EOSC MVE Concept:
  - **EOSC-Core**: Enabling services required to operate the EOSC.
  - **EOSC-Exchange**: Federation services registered to the EOSC by RIs and clusters to serve the needs of users.
  - **EOSC Interoperability Framework**: Scientific services provided by RIs and Clusters to the respective communities.



Picture credits: EOSC Future Consortium

EOSC Core

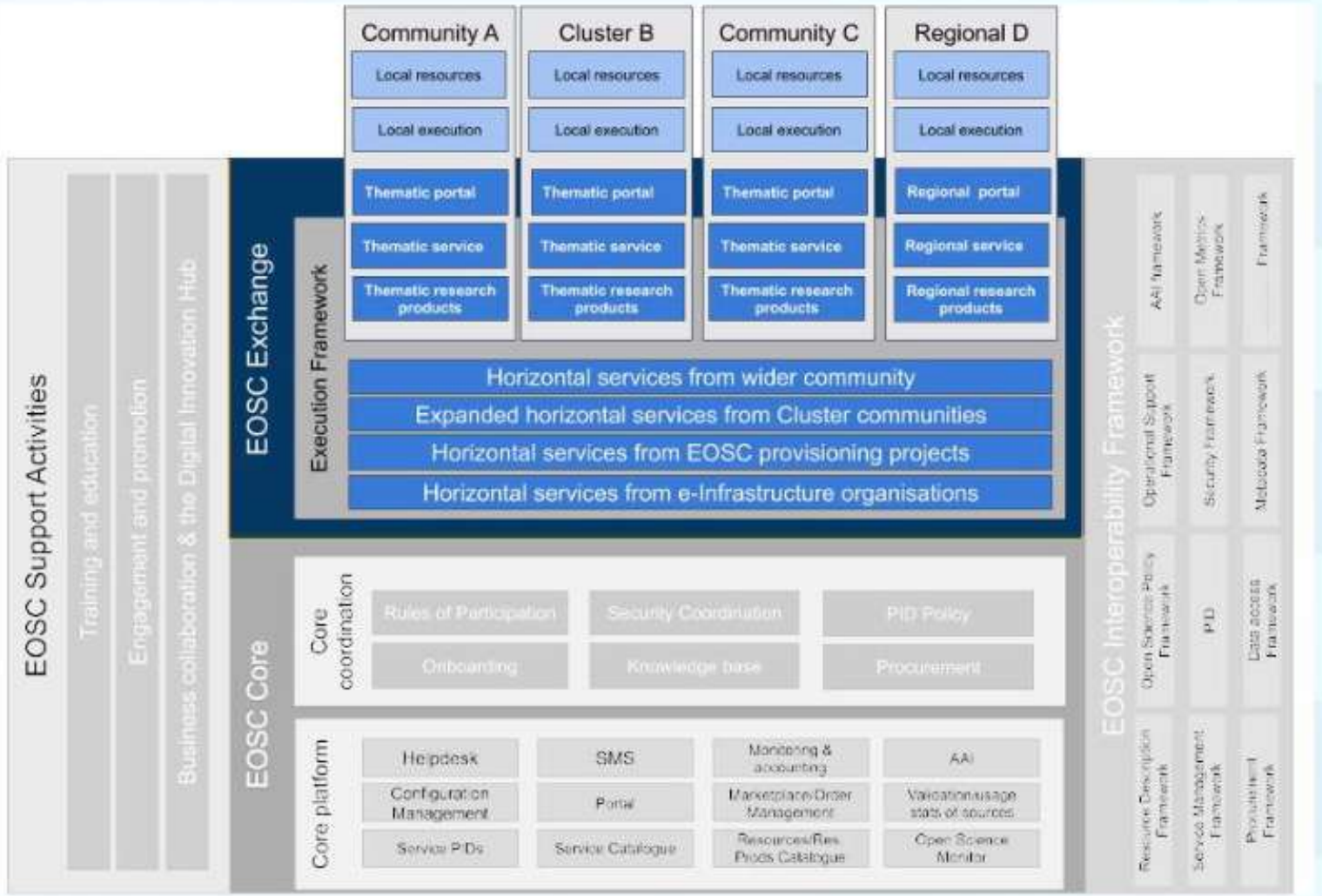
- EOSC Portal.
- EOSC Resource Catalogue, including a provider portal.
- EOSC Federated AAI.
- Monitoring and Accounting.
- Helpdesk and Security Coordination.



Picture credits: EOSC Future Consortium

EOSC Exchange

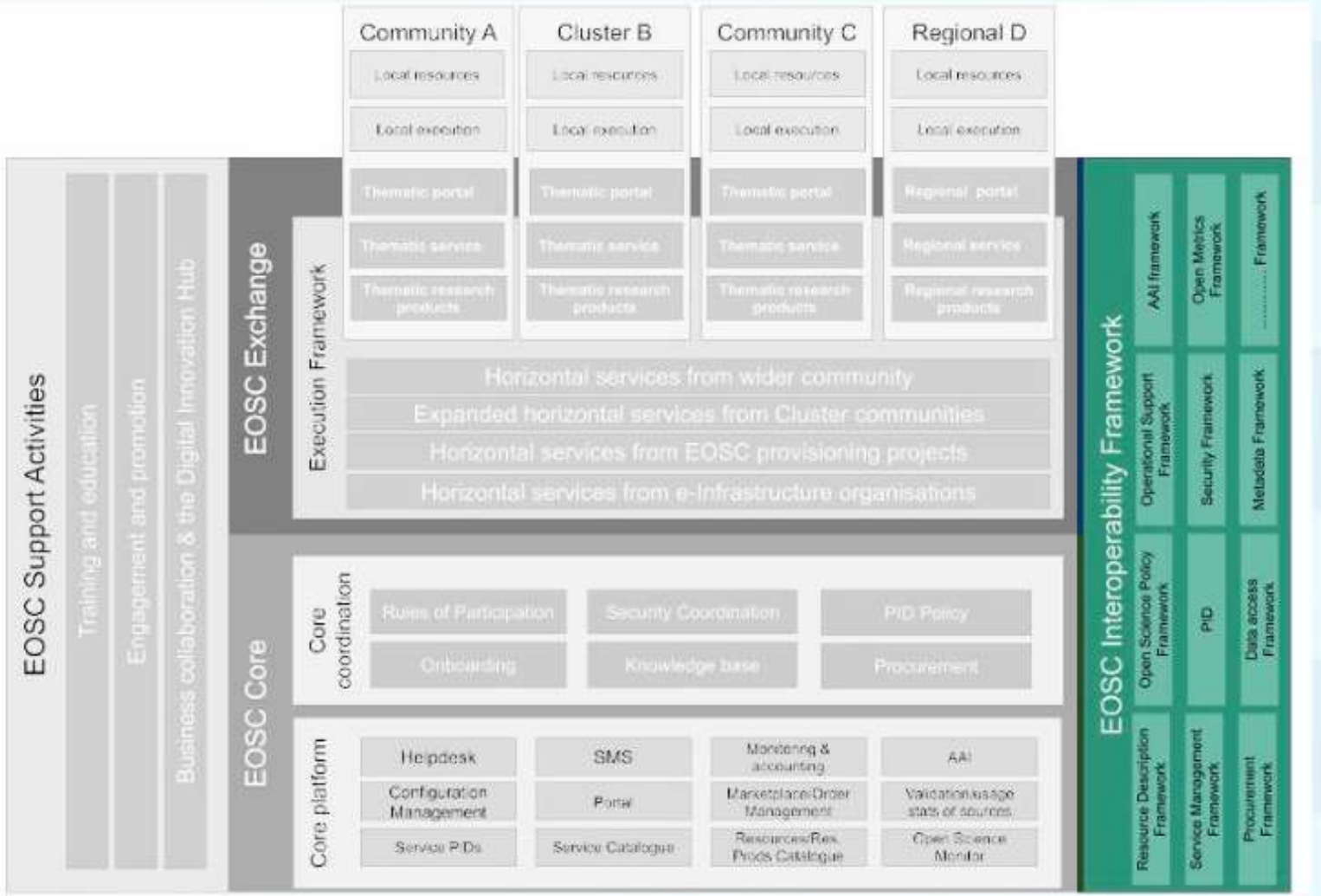
- Horizontal Services provided by e-Infrastructures and Science Cluster Communities.
- Cluster, Community and Regional specific resources such as Thematic/Regional Resources and Portals.
- Execution Framework allowing composability for EOSC resources complying to the EOSC Interoperability Framework.



Picture credits: EOSC Future Consortium

EOSC Interoperability Framework (EIF)

- The EIF will enable connecting different kinds of resources across thematic domains and infrastructure boundaries.
- The EIF will provide guidelines for providers to connect resources to EOSC-Exchange and EOSC-Core, supporting the composability of resources.



Picture credits: EOSC Future Consortium

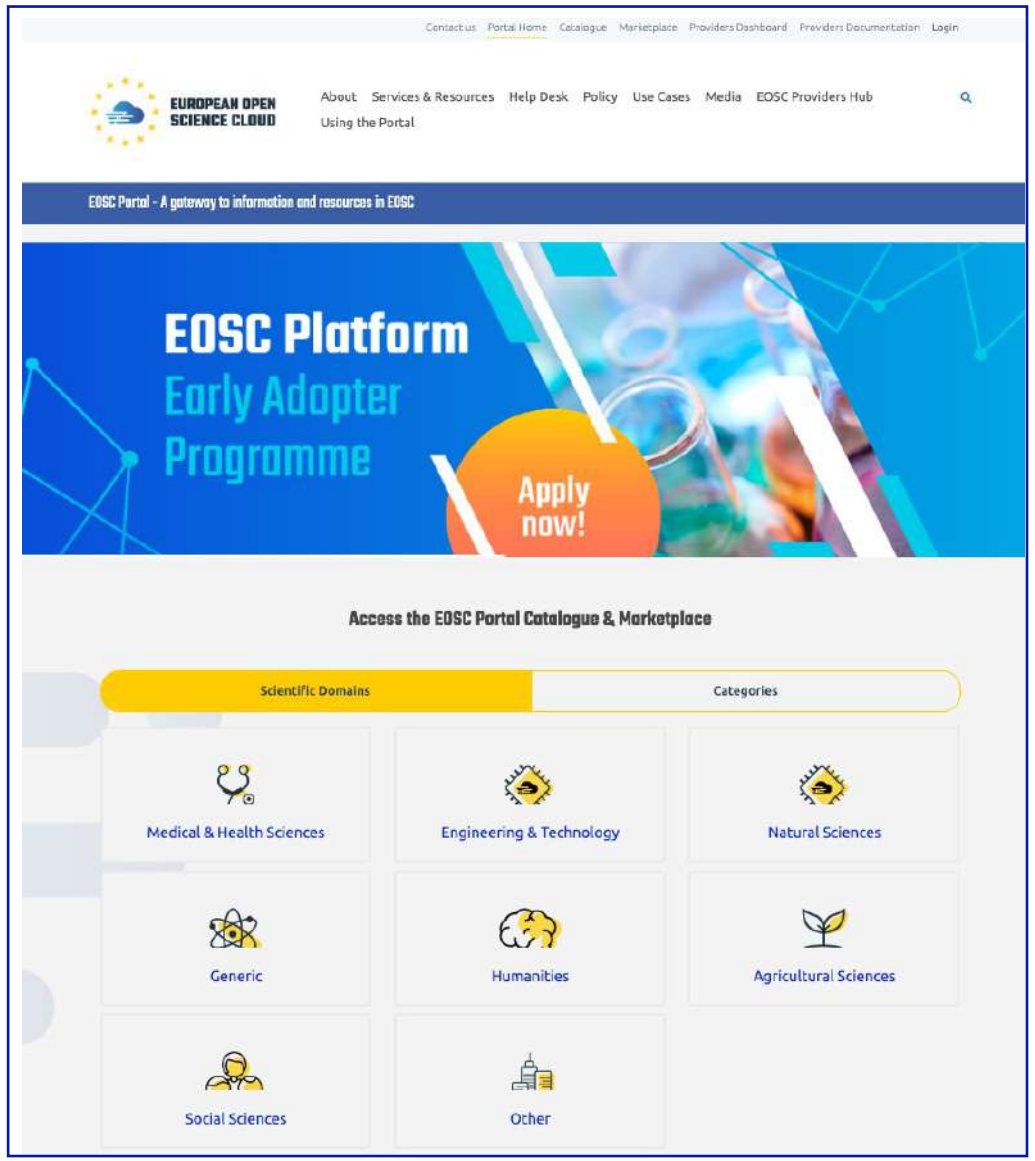
EOSC Future Vision for the Users

- Users have a personalised dashboard integrating ALL services and data necessary for their work
  - Thematic (vertical) - European, regional, national
  - Generic (horizontal) - European, regional, national
- Users log in with their credential (AAI-Authentication and Authorization Infrastructure) and see the personalised environment.
- Users look for new services/datasets and the system is intelligent to recommend relevant services/datasets available (Artificial Intelligence)
- The system includes various metrics, #downloads, ratings and comments, as in modern marketplaces.
- Not a single portal for everybody

Source: EOSC Future, EOSC Services for the Users, 3rd ESFRI RIs -EOSC Workshop: What does EOSC bring to RI users?

EOSC Portal today

https://eosc-portal.uk



Gateway for:

- information about EOSC

Users

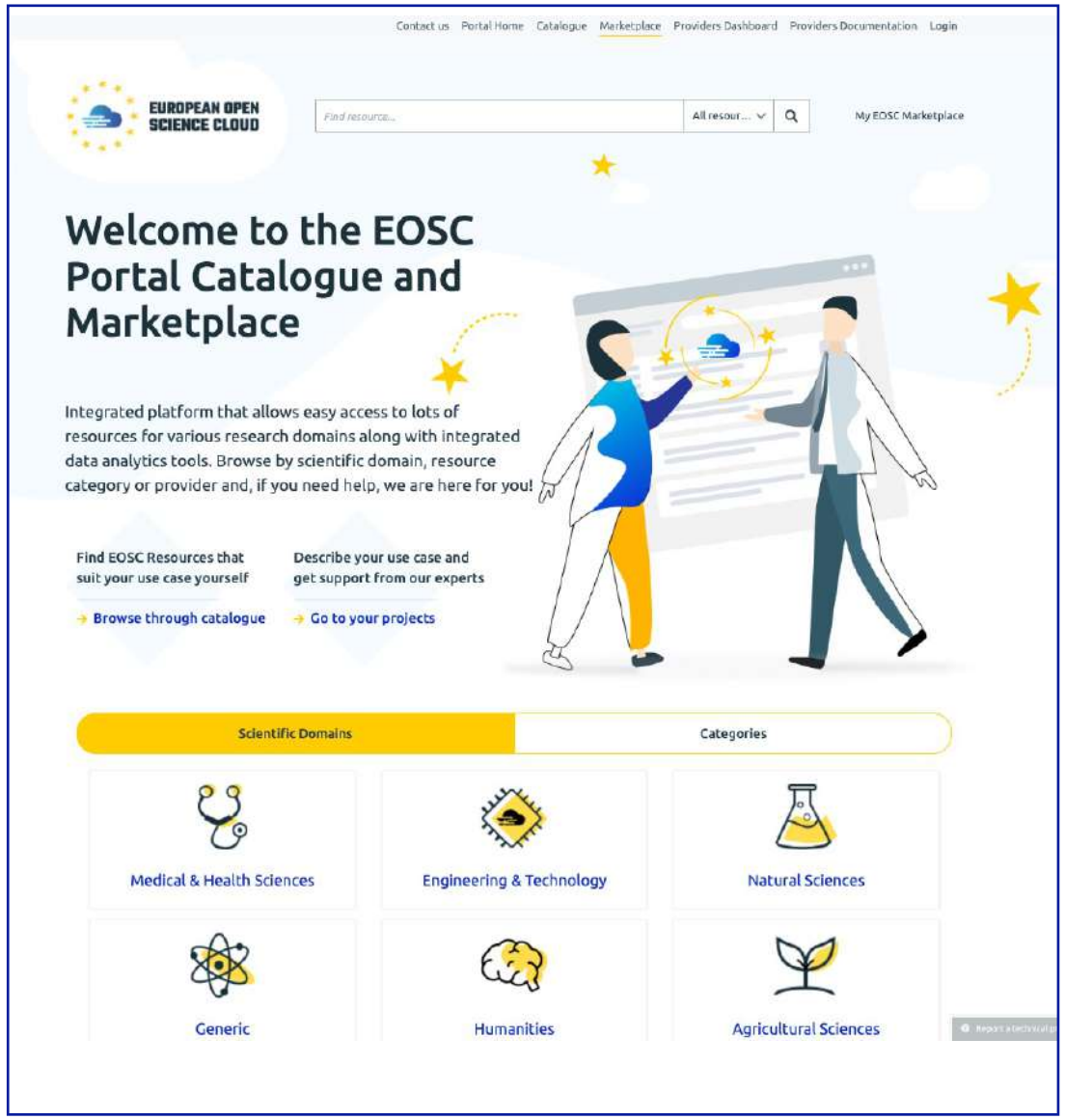
- *discovering* resources
- *ordering* resources
- *accessing* resources
- *composing* resources

Resource providers

- *onboarding* resources
- *discovering new users*
- *integrating* with the Core

EOSC Portal Marketplace – resources

https://marketplace.eosc-portal.eu



Currently onboarded:

- **237** Providers
- **312** Resources
- **52** Communities and Infrastructures
- **17** defined target groups

Now started to onboard Catalogues

Next: Training, Data/research products and EIF guidelines

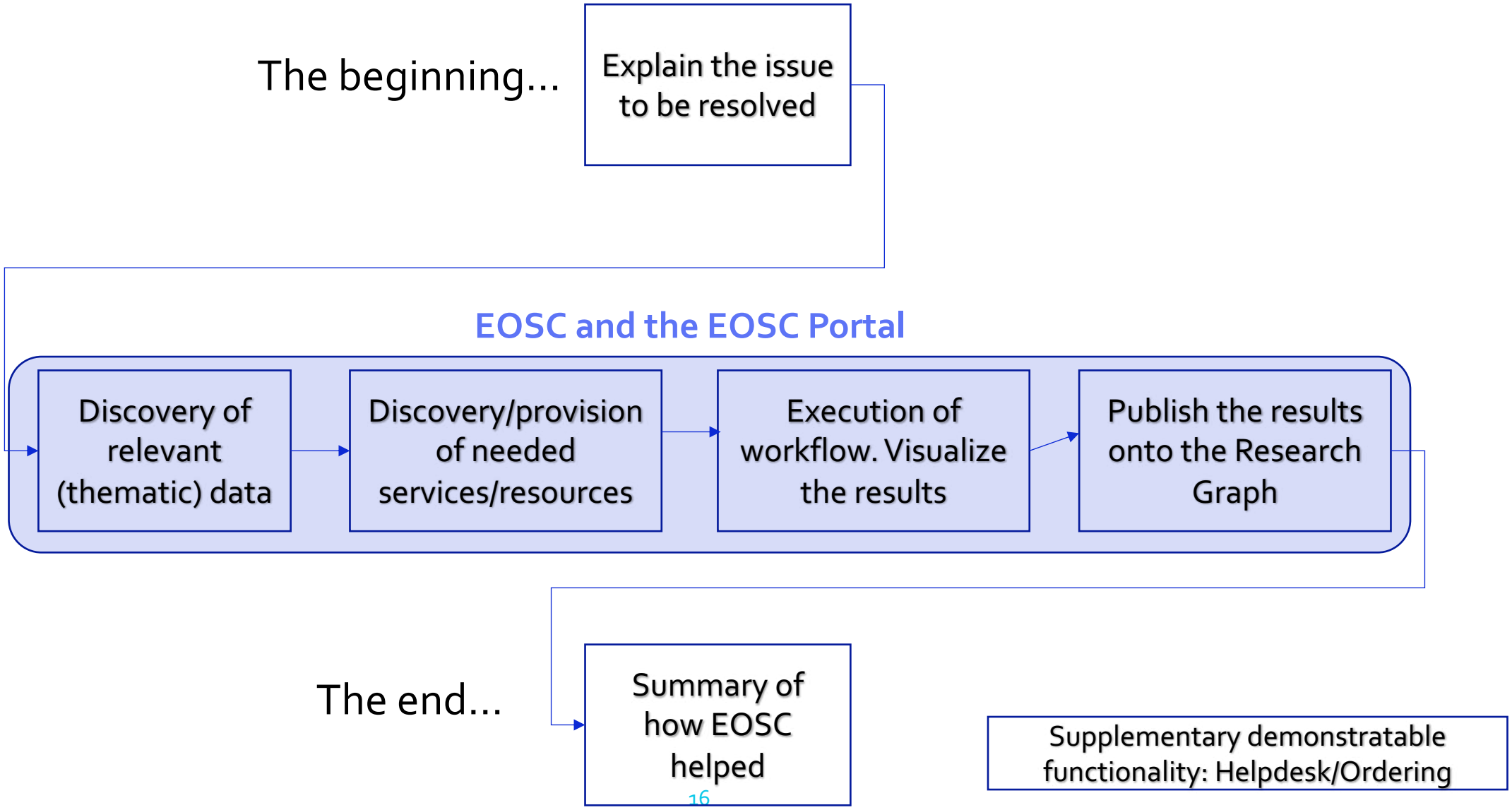
From Infrastructure to Usecases …

Funded Science Projects within EOSC Future:

1. Climate Change Impact on Biodiversity and Ecosystems in Europe - Assessing the impact of Non-Indigenous Invasive Species (NIS) in European ecosystems (ENVRI FAIR)
2. Dashboard on the State of the Environment (ENVRI-FAIR)
3. COVID-19 metadata findability and interoperability in EOSC (EOSC Life)
4. Imaging Data in EOSC - COVID-19 as Demonstrator (EOSC Life)
5. Indirect Detection of Dark Matter (ESCAPE)
6. Extreme Universe and Gravitational Waves (ESCAPE)
7. Tracing Biostructures (PaNOSC)
8. Dynamics of Biological Processes (PaNOSC)
9. Climate neutral and smart cities (SSHOC and ENVRI-FAIR)
10. Access Management for distributed RIs (SSHOC, EOSC Life)

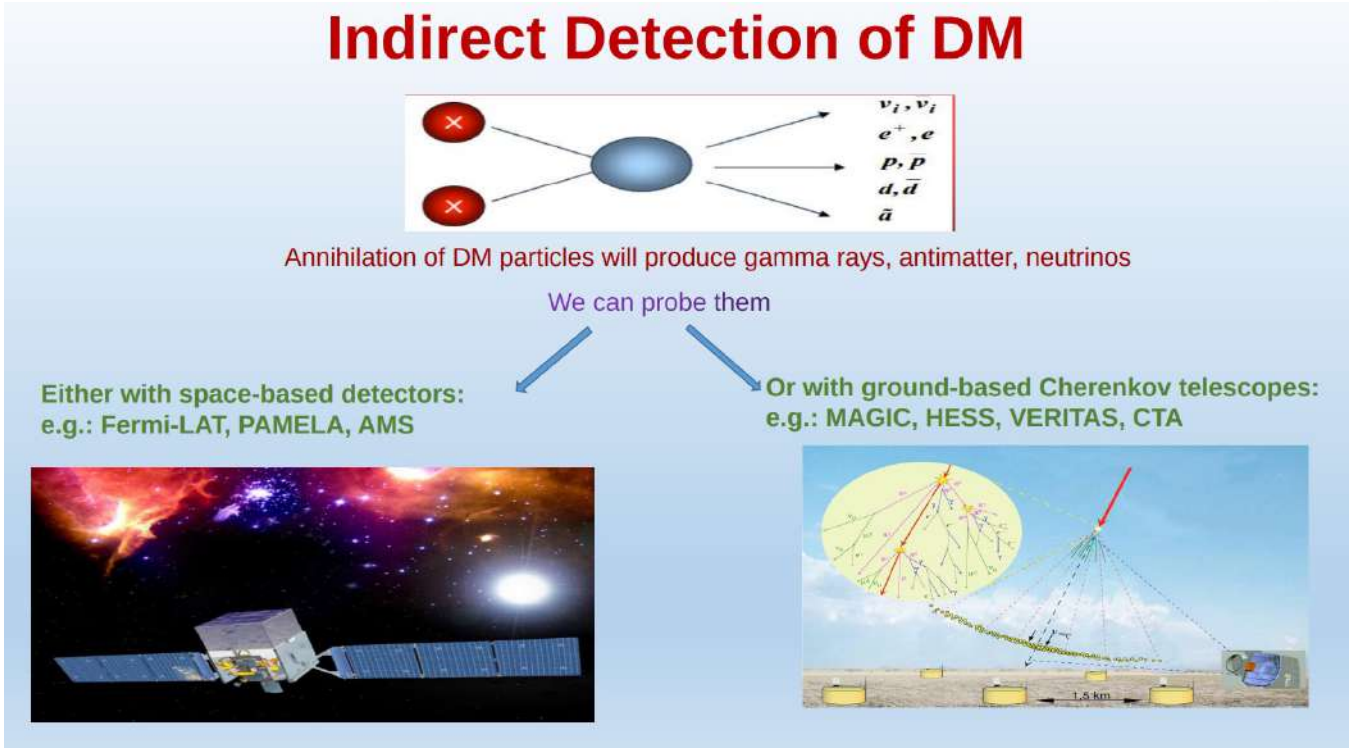
… and Showcase Integration Stories (SISs)

Demonstrating to Scientists and Researchers how to use EOSC



Example SIS - *Indirect detection of Dark Matter using Open Science Tools on EOSC*

- Workflow already possible on ESCAPE resources & published code
- SIS will demonstrate its porting to EOSC
- Input data from Fermi-LAT detector, hosted on ESCAPE RUCIO DataLake
- Core resources needed: EOSC AAI, Portal, Marketplace
- Horizontal resources needed: Jupyter Notebook, Fedcloud VM + storage (EGI-ACE) and Zenodo
- Improved future exploitation via OpenAIRE



https://indico.cern.ch/event/1173792/contributions/4968444/attachments/2483298/4263342/EOSC-Future_P-Bhattacharjee.pdf

Thank you!

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