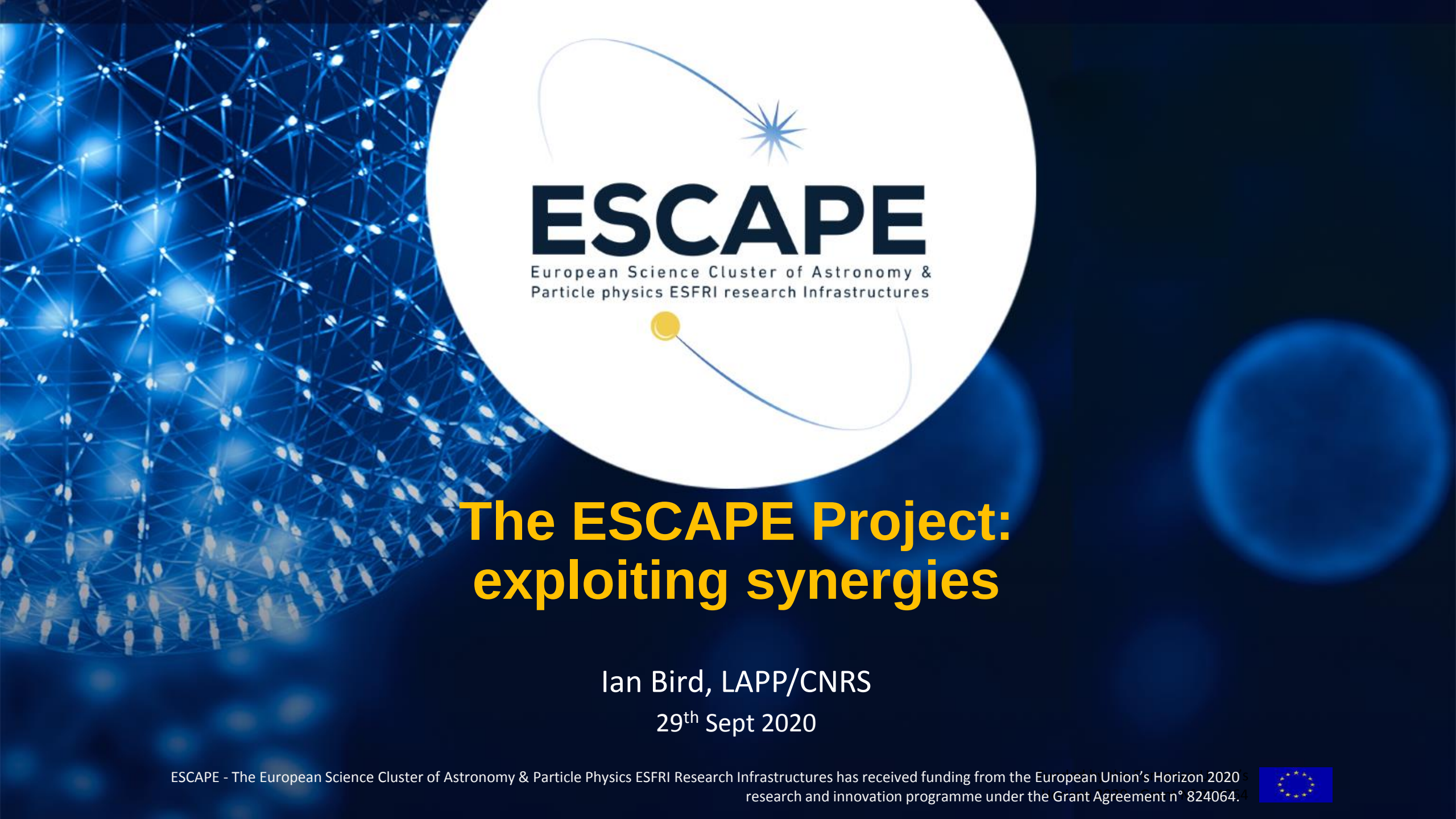

The ESCAPE Project: exploiting synergies

Ian Bird, LAPP/CNRS

29th Sept 2020

ESCAPE - The European Science Cluster of Astronomy & Particle Physics ESFRI Research Infrastructures has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement n° 824064.

ESCAPE: Astronomy and Particle Physics ESFRIs

- Builds on communities' complementary excellences in data stewardship:
  - Astronomy Virtual Observatory infrastructure
  - HENP expertise in Exabyte-scale data management and large-scale distributed computing
- Builds on existing inter-RI synergies, intersections; overlapping competence and authority of national stakeholders
- Recognises that ESCAPE communities will be Exascale data generators, early adopters of ICT and data management innovations, push state-of-the-art
- Both Observatory- and Facility- operations require global, open access to data, long term curation, and sustainability

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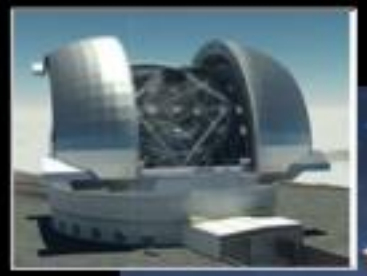
Radio

JIVE-VLBI

SKA

Visible light

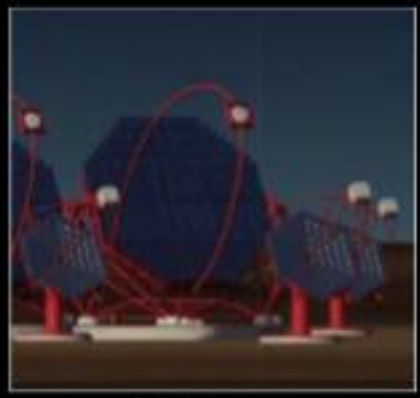


ELT

ESO

EST

Gamma rays



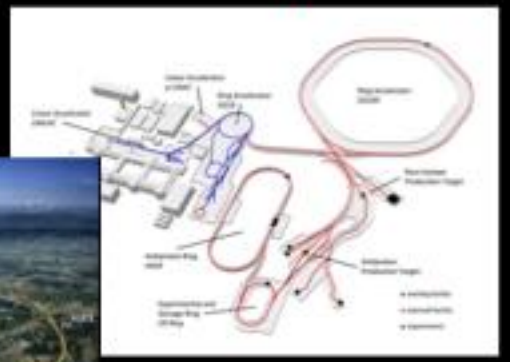
CTA

Accelerator-based
Particle Physics

HL-LHC

CERN

Accelerator-based
Nuclear Physics

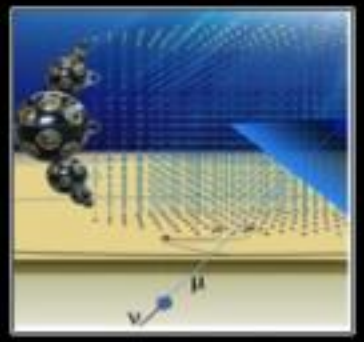


FAIR

Gravitational Waves

EGO-VIRGO

Cosmic-rays
Neutrinos



KM3NeT

ESFRI Science Projects

HL-LHC	SKA
FAIR	CTA
KM3Net	JIVE-ERIC
ELT	EST
EURO-VO	EGO-VIRGO
(LSST)	(CERN,ESO)

ESCAPE

European Science Cluster of Astronomy & Particle physics
ESFRI research infrastructures

Horizon 2020 funded project

EUROPEAN OPEN SCIENCE CLOUD

Goals:

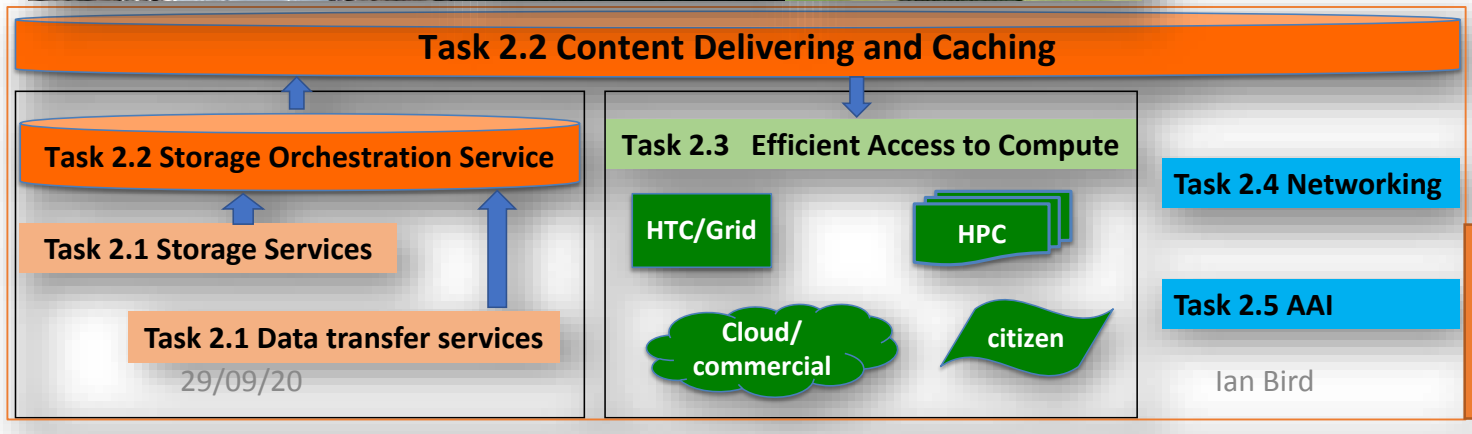
Prototype an infrastructure for the EOSC that is adapted to the Exabyte-scale needs of the large ESFRI science projects.

Ensure that the science communities drive the development of the EOSC.

Has to address *FAIR* data management, long term preservation, open access, open science, and contribute to the EOSC catalogue of services.

Work Packages

WP2 – Data Infrastructure for Open Science
WP3 – Open-source scientific Software and Service Repository
WP4 – Connecting ESFRI projects to EOSC through VO framework
WP5 – ESFRI Science Analysis Platform
WP6 – Citizen science platforms



Data centres (funded in WP2)
CERN, INFN, DESY, GSI, Nikhef, SURFSara, RUG, CCIN2P3, PIC, LAPP, INAF

ESCAPE Goals

- Implementing Science Analysis Platforms for EOSC researchers to stage data collections, analyse them, access ESFRIs' software tools, bring their own custom workflows.
- Contributing to the EOSC global resources federation through a Data-Lake concept implementation to manage extremely large data volumes at the multi-Exabyte level.
- Supporting "scientific software" as a major component of ESFRI data to be preserved and exposed in EOSC through dedicated catalogues.
- Implementing a community foundation approach for continuous software shared development and training new generation researchers.
- Virtual Observatory standards and methods for FAIR principles to a larger scientific context; demonstrating EOSC capacity to include existing frameworks.
- Further involving SMEs and society in knowledge discovery.

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ESCAPE consortium

ESCAPE convenes a large scientific community

- **31** partners (including 2 SMEs)
- **7** ESFRI projects & landmarks: CTA, ELT, EST, FAIR, HL-LHC, KM3NeT, SKA
- **2** pan-European International Organizations: CERN, ESO (with their world-class established infrastructures, experiments and observatories).
- **4** supporting ERA-NET initiatives: HEP (CERN), NuPECC, ASTRONET, APPEC
- **1** involved initiative/infrastructure: EURO-VO
- **2** European research infrastructures: EGO and JIV-ERIC
- Budget: **15.98 M€**
- Started: **1/2/2019**
- Duration: **42** months (end date 31/7/2022)
- Coordinator: **CNRS**

Home page: https://escape2020.eu ; Twitter: @ESCAPE_EU

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ESCAPE Work Programme

- Data Lake:
  - Build a scalable, federated, data infrastructure as the basis of open science for the ESFRI projects within ESCAPE. Enable connection to compute and storage resources.
- Software Repository:
  - Repository of "scientific software" as a major component of the “data” to be curated in EOSC. Implementation of a community-based approach for the continuous development of shared software and for training of researchers and data scientists.
- Virtual Observatory:
  - Extend FAIR standards, methods, tools of the Virtual Observatory to a broader scientific context; demonstrate EOSC ability to include existing platforms
- Science Platforms:
  - Flexible science platforms to enable the analysis of open access data
- Citizen Science:
  - Open gateway for citizen science on ESCAPE data archives and ESFRI community CS projects

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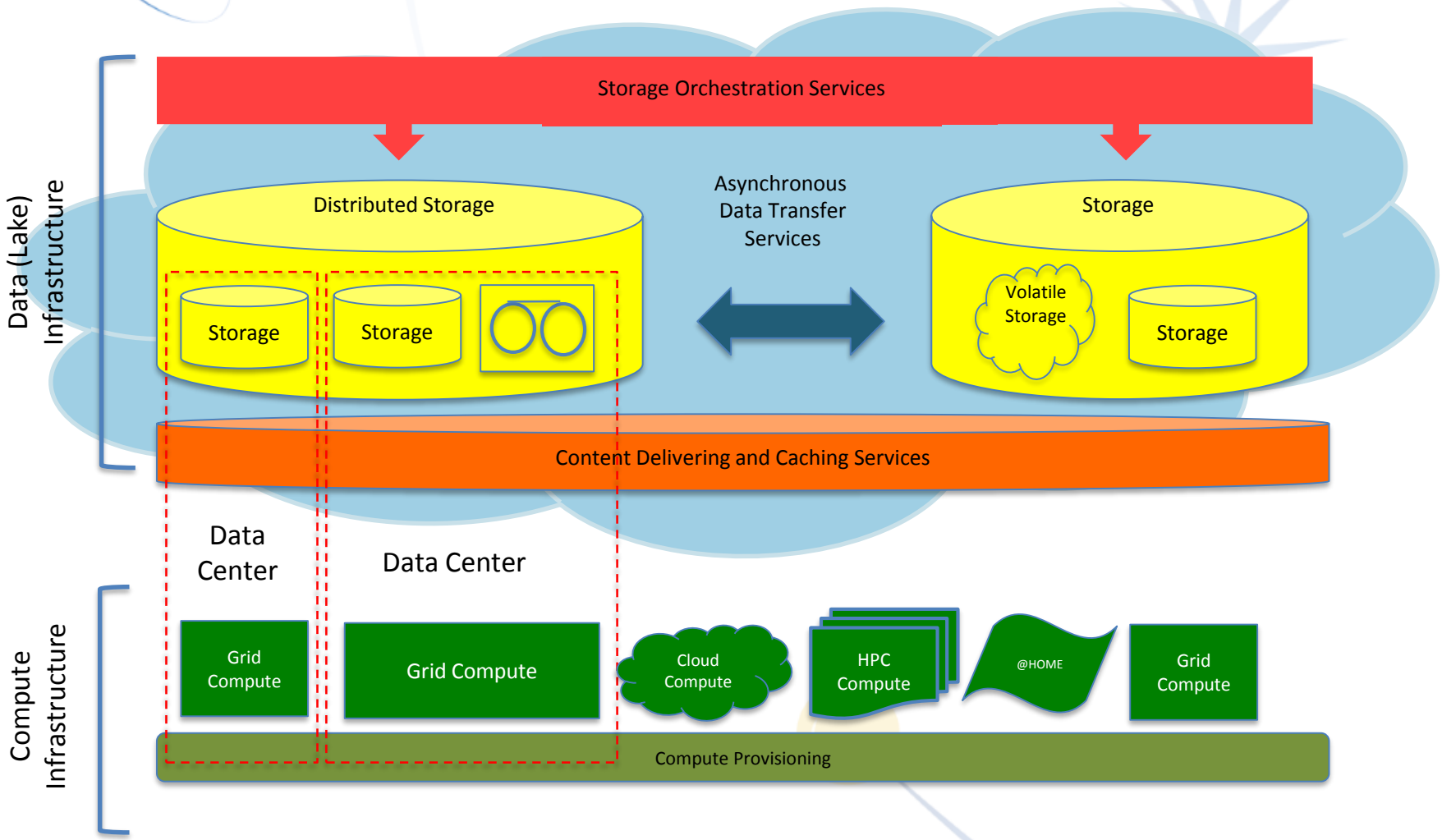
Data Lake concept



- ❑ Federation through token-based AAI
- ❑ Policy-driven data replication and distribution
- ❑ Distributed storage for reliability, accessibility, sustainability
- ❑ Serving data, remote, cached, streaming, to heterogeneous compute facilities
- ❑ Hide complexity – transparent access to data

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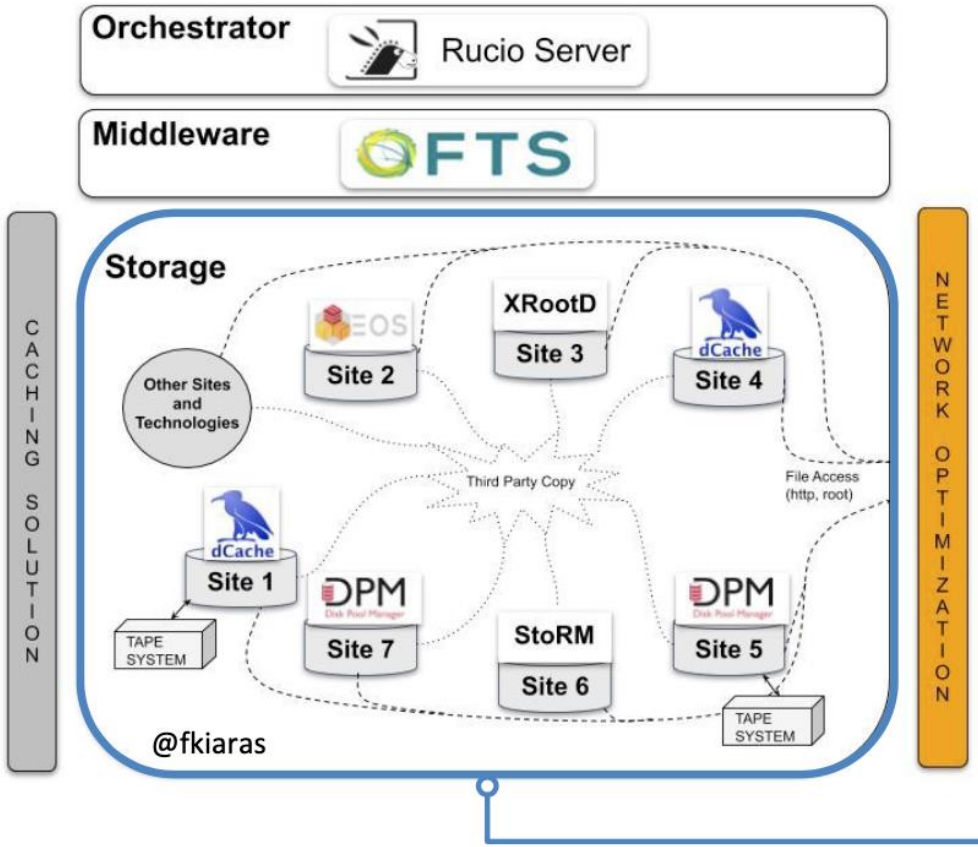
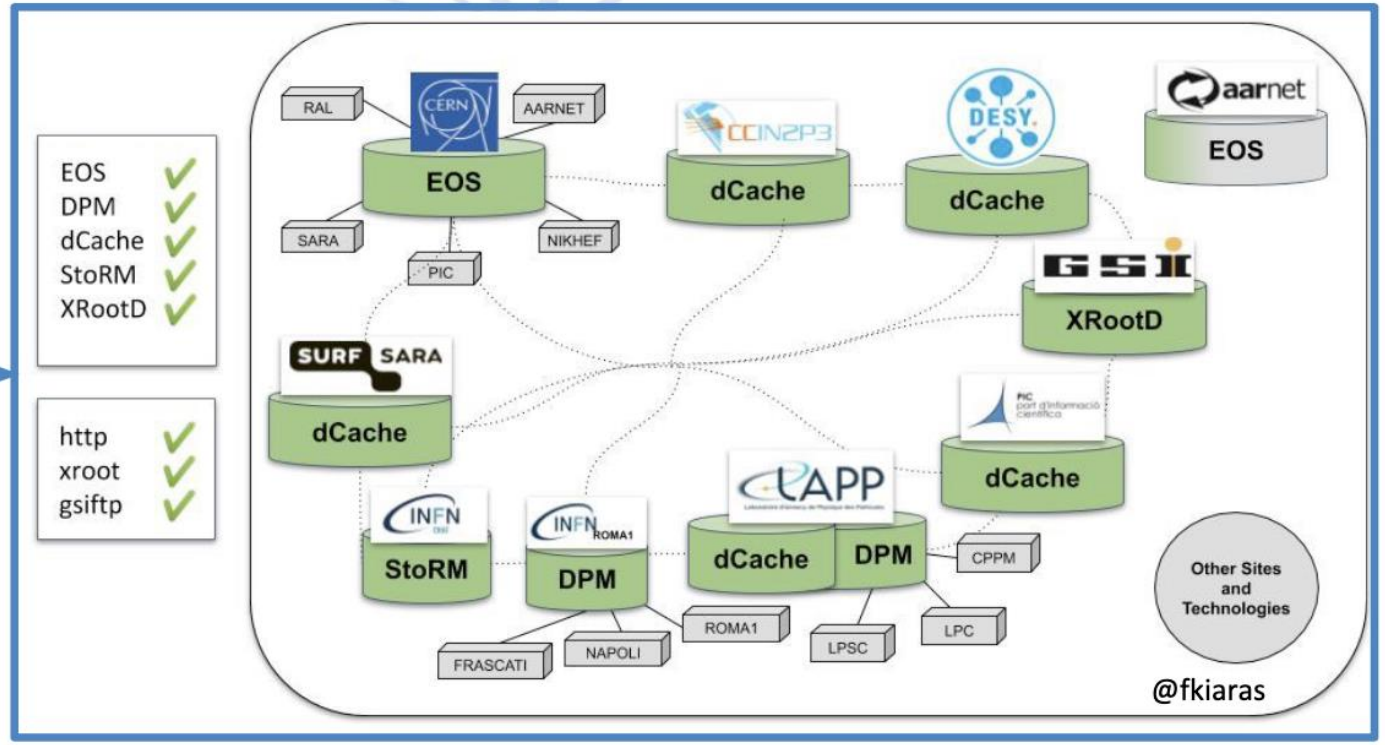
Data Lake status





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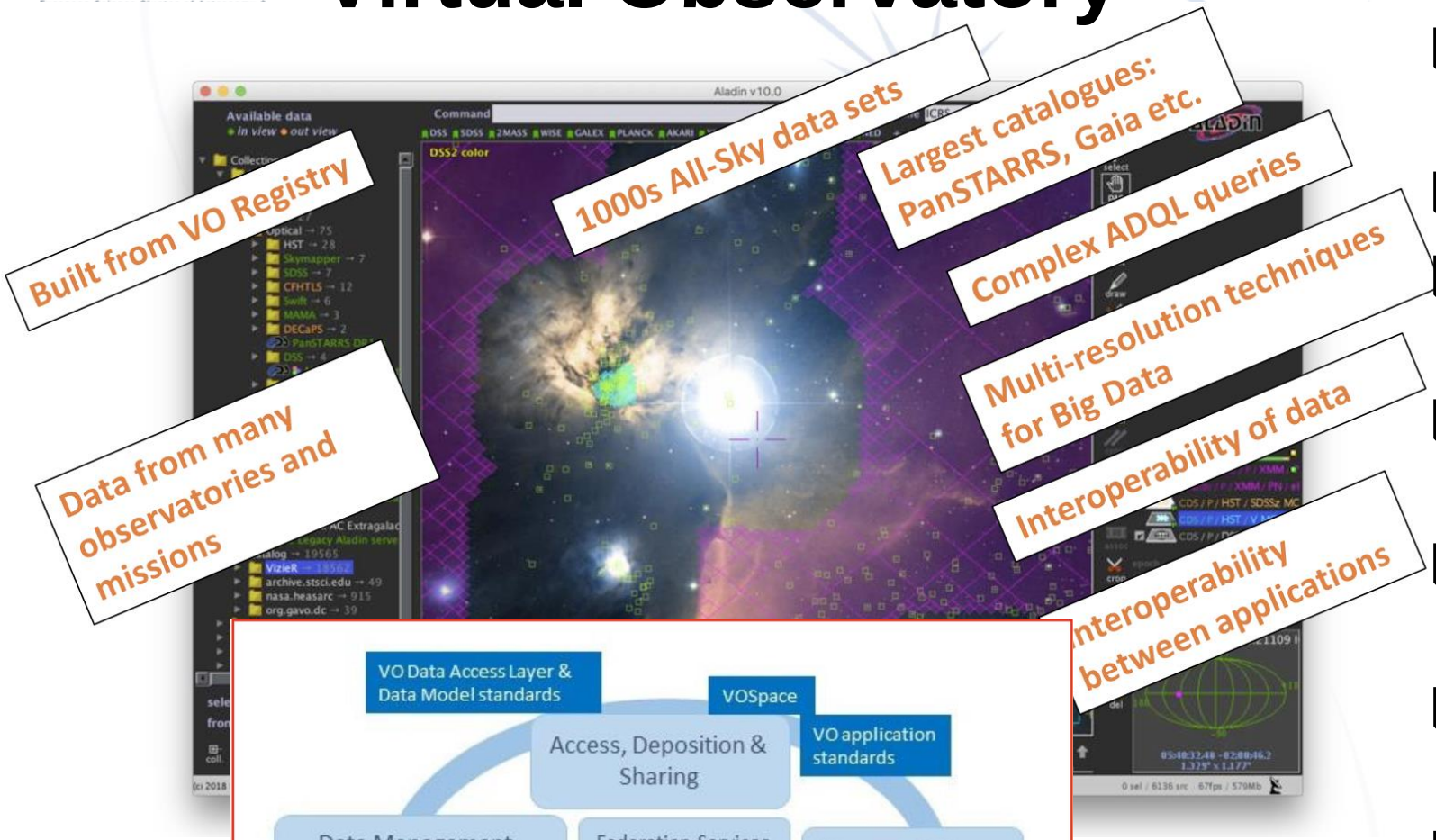
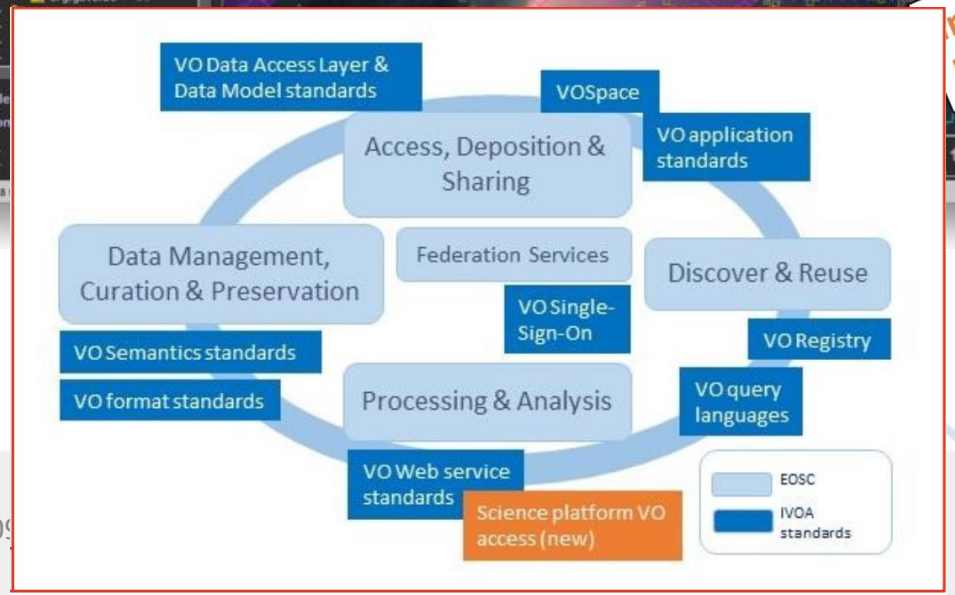
ESCAPE

Virtual Observatory





ESFRI-VO-EOSC connection:

- ❑ Map VO framework into EOSC
- ❑ VO Registry in EOSC
- ❑ Portfolio of Astronomy VO services
- ❑ Contribution to EOSC hybrid cloud
- ❑ Containerised domain-specific services
- ❑ Training – interoperable data schools
- ❑ Ensuring EOSC connects with VO and astronomy needs

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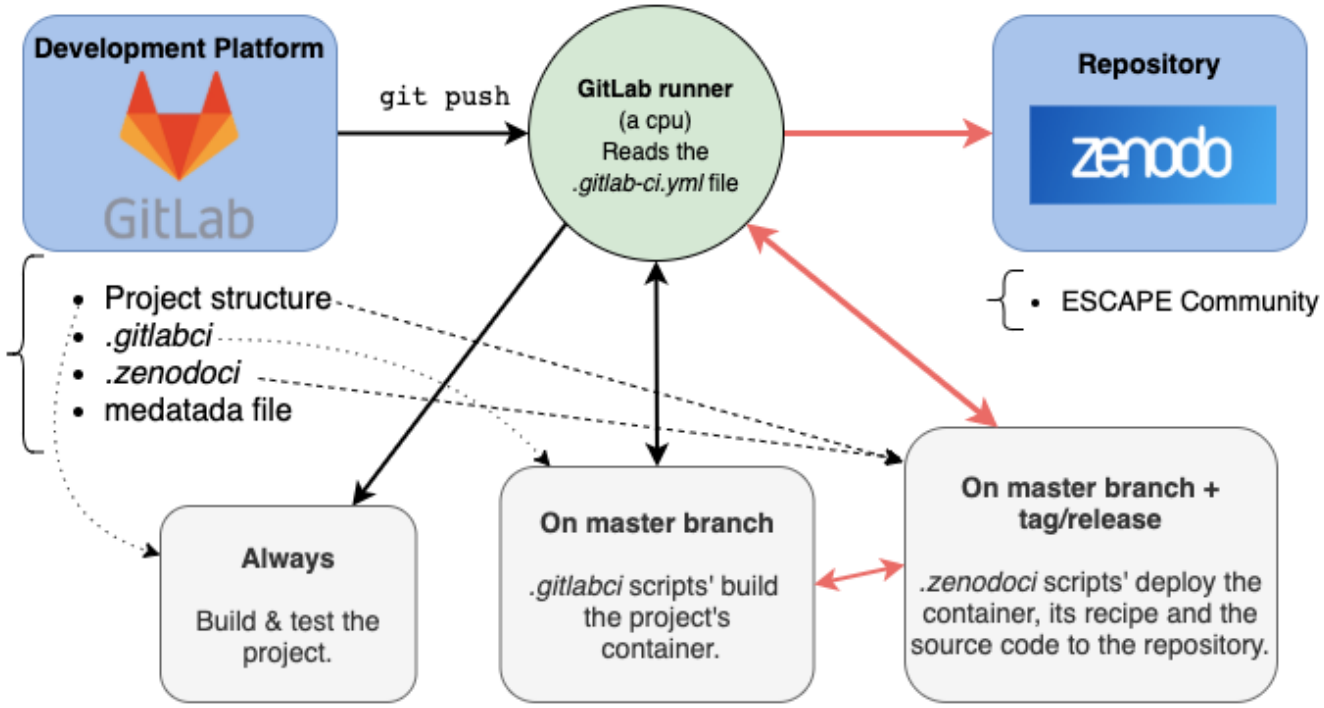
ESCAPE repository

- Aim: expose the tools of the ESCAPE ESFRI projects in a repository under the EOSC catalogue of services
- Objectives:
  - continuous development, deployment, exposure and preservation of software/tools/services
  - interoperability, software re-use and cross-fertilisation
  - open innovation environment for open standards, common regulation and shared (novel) software for multi-messenger & multi-probe data



Horizon 2020 - Grant N° 824064

Integrators: Test Science Projects

- Two projects are proposed to demonstrate science integration across ESCAPE
  - Demonstrate new cutting edge open science capabilities, making use of the services implemented within ESCAPE
  - feedback on the capabilities delivered by ESCAPE
  - ensure a clean integration of facilities across the project
- TSP:
  - Gravitational Waves and Extreme Universe
    - push the frontier in Multi-Messenger Astronomy, by
    - fully exploiting the data available in ESCAPE and the
    - capabilities of the science and e-infrastructure platforms
  - Fundamental science question: Dark Matter search
    - integrating all of the data from the astronomy and particle physics ESFRIs and
    - providing a unique opportunity to explore that data coherently

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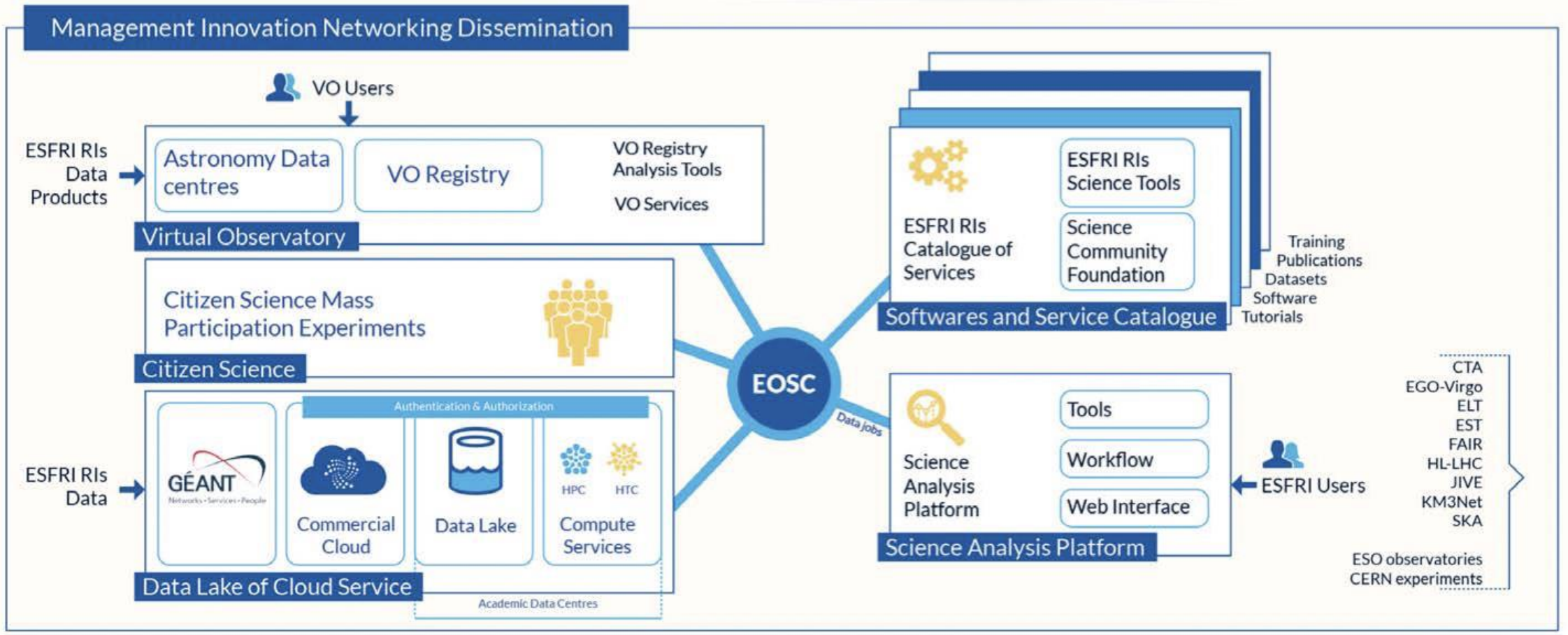
ESCAPE & EOSC



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Broader synergies with other research clusters

ESCAPE
European Science Cluster of Astronomy & Particle physics ESFRI research infrastructures

panosc
photon and neutron open science cloud
About

ENVRI FAIR

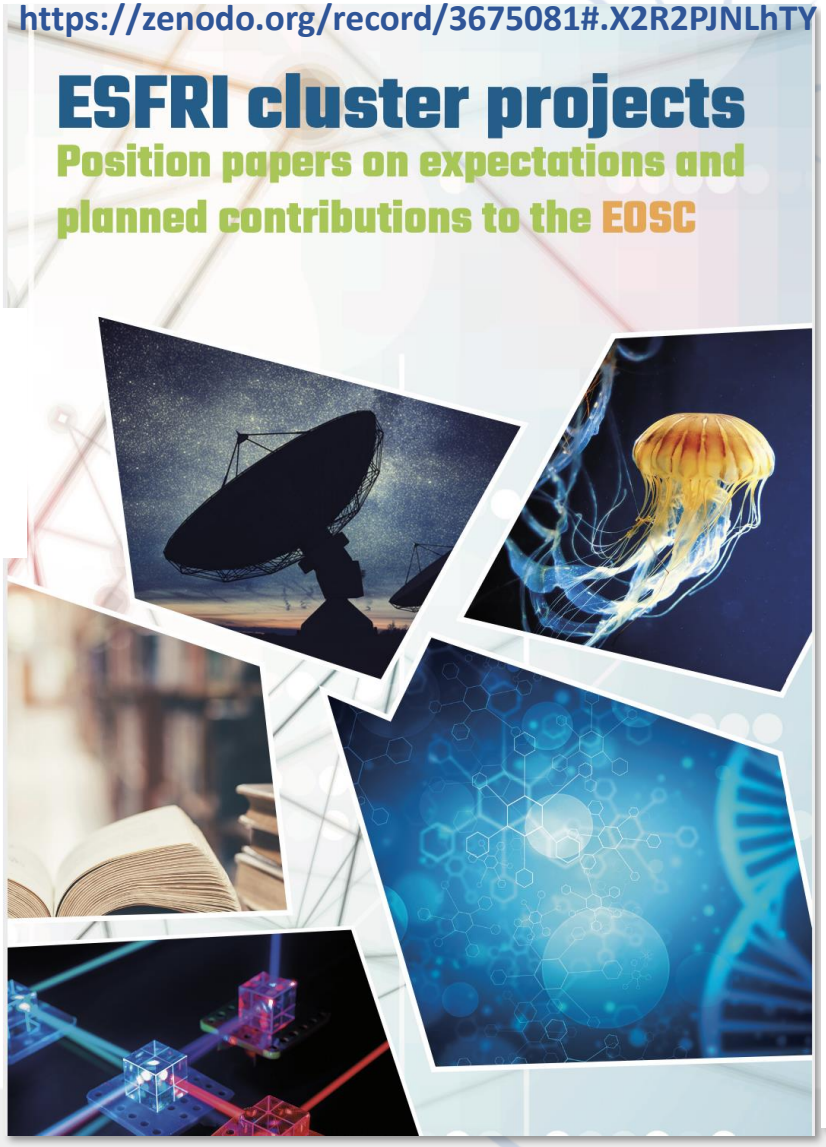
EOSC-Life

SSHOC
social sciences & humanities open cloud

Social Sciences & Humanities Open Cloud (SSHOC)

ESCAPE
European Science Cluster of Astronomy & Particle physics ESFRI research infrastructures

https://zenodo.org/record/3675081#.X2R2PJNLhTY



https://zenodo.org/record/4044010#.X2oaYtaxVcs

EOSC - a tool for enabling Open Science in Europe

The European Open Science Cloud (EOSC) will "enable a trusted, virtual, federated environment in Europe to store, share and reuse digital outputs from research (including publications, data, metadata and software) across borders and scientific disciplines"[1]. Today, at the end of 2020, many building blocks are in place and on-going EOSC projects endeavour to enrich the EOSC ecosystem. To ensure strong engagement by research communities, we believe that this is the time to re-orient the EOSC activities towards higher relevance for these communities.

With the creation of the EOSC Association and the new Horizon Europe framework programme taking shape, the H2020 Science Cluster projects and the European e-infrastructures believe that efforts of the EOSC construction have now to focus on the uptake by researchers. This uptake will be the main KPI against which the success of the EOSC will be measured.

The Strategic Research and Innovation Agenda (SRIA) defines important action items to ensure rapid progress on the construction of EOSC. However, more emphasis should be placed on making EOSC user centric. User requirements should be at the heart of the next phase of the EOSC implementation.

To this aim we believe that the following points need careful consideration and reflection on how to integrate them in the EOSC roadmap:

1. **Research-oriented services:** Our vision is an EOSC which is an inclusive and federated ecosystem based on FAIR data and other open science outputs, integrating many services such as data visualisation, analysis and physical resources to store and re-use data for open science. We expect EOSC to take up the mandate of providing the resources required for the re-use of data.
2. **Trust based open access:** Using EOSC services must be easy, with low barriers and transparent access mechanisms. Similarly, contributions to EOSC should not be subjected to overly complex regulation. A careful balance between a top-down and bottom-up approach in the design and governance needs to be built on trust to allow for a user friendly EOSC.
3. **Collaboration support:** The EOSC user communities, service providers and governance must closely work together to ensure that EOSC is capable of adapting to innovative emerging needs. This implies a stronger coordination of on-going and future EU funded projects and a strong participation of the user communities in the EOSC governance.
4. **Sustainability:** The EOSC must have sustainable funding from the relevant authorities, particularly the Member States, allowing for long-term service provisioning, data preservation, and concrete support. Simple funding mechanisms which avoid complex

[1] https://www.eoscsecretariat.eu/sites/default/files/open_consultation_booklet_sria-eosc_20-july-2020.pdf

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Summary

- ESCAPE brings together Astronomy, Astrophysics, Astro-Particle, High Energy and Nuclear Physics communities
  - Common interests in Exabyte-scale FAIR data management and open science
  - While European (ESFRI) based, all are global collaborations
  - Objectives are science-driven (MMA, and key science projects) as well as commonality and synergies across infrastructure, services, and tools
- Broader synergies with the other ESFRI science cluster projects
  - All acting in concert towards the EOSC – aligned goals and common interests across a broad range of European Research

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