FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG

ERLANGEN CENTRE FOR ASTROPARTICLE PHYSICS

ESCAPE

European Science Cluster of Astronomy & Particle physics ESFRI research Infrastructures

The ESCAPE project and the EOSC

Kay GRAF

ECAP, Erlangen Centre for Astroparticle Physics

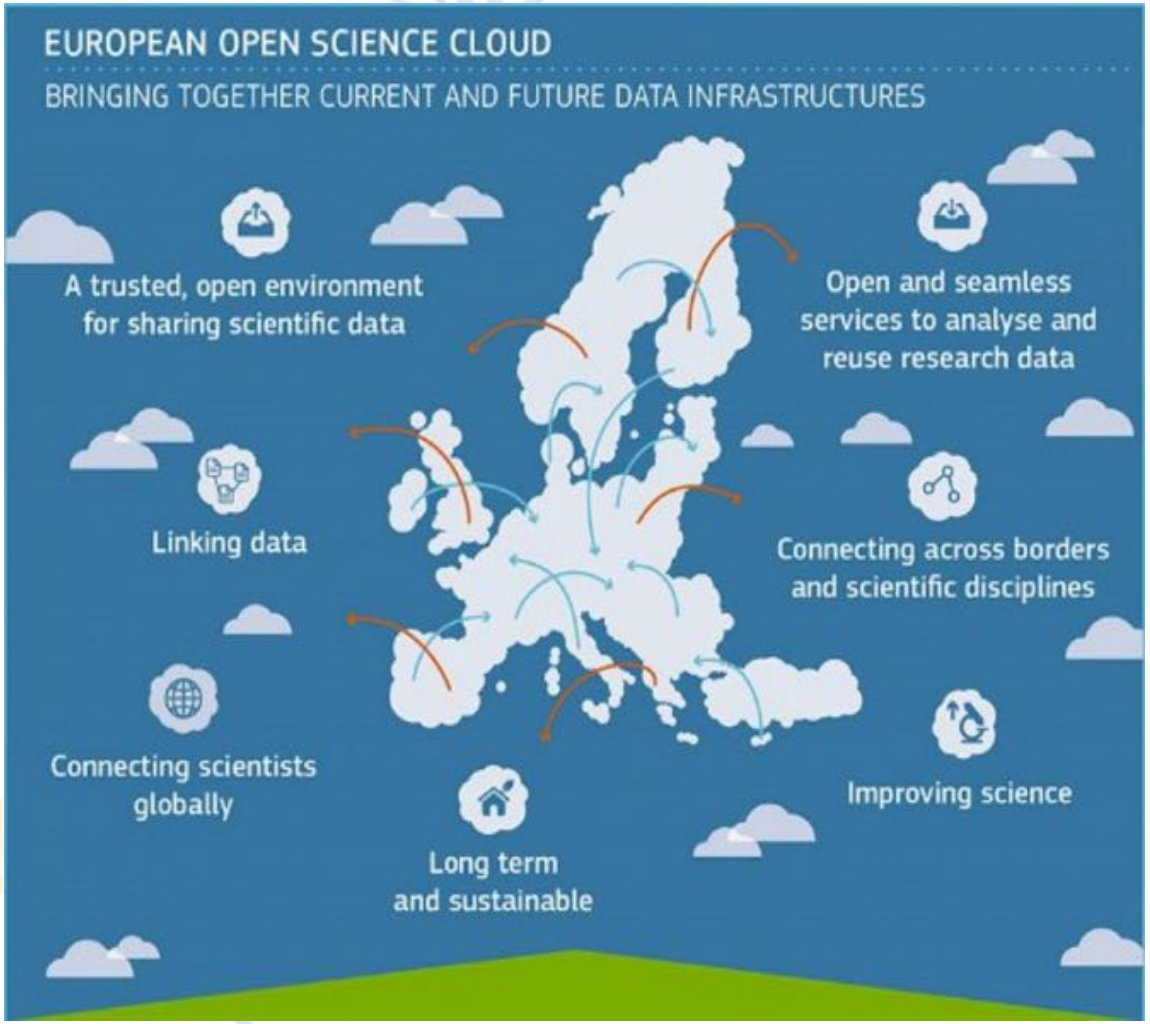
Friedrich-Alexander Universität Erlangen-Nürnberg

Big Data Science in Astroparticle Research – Workshop, Aachen, Feb. 2019

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.

About EOSC …

- Bridging todays fragmented and ad-hoc solutions, towards a **federation of data infrastructures**
- **FAIR data and services** for data storage, management, analysis and re-use **across borders and disciplines**
- Added value for **data-driven science**, reproducible science, interdisciplinary research, digital innovation



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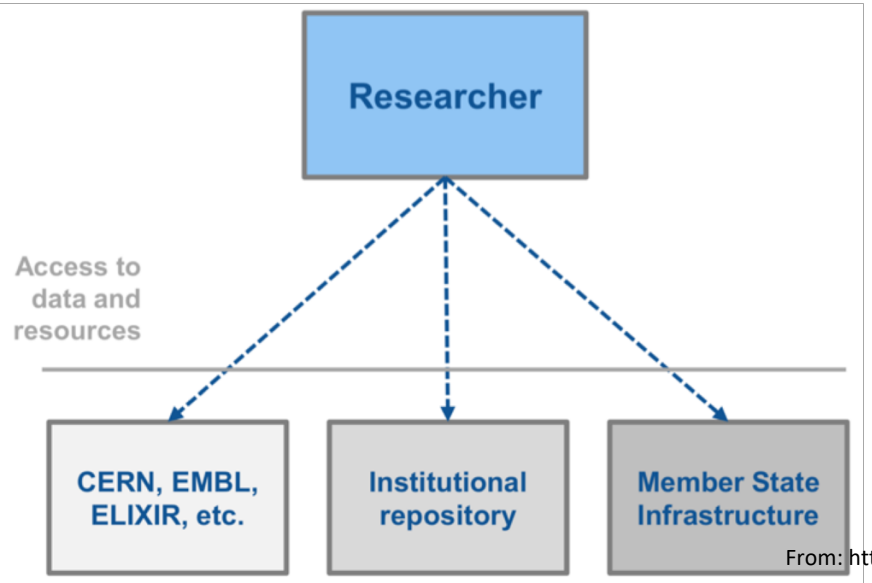
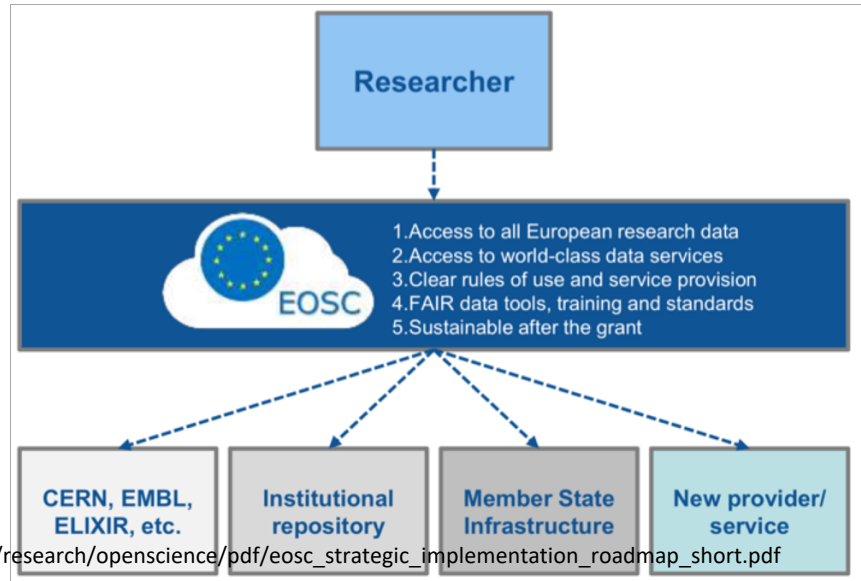
… continued

EU research ministers endorsed the roadmap for EOSC in May 2018

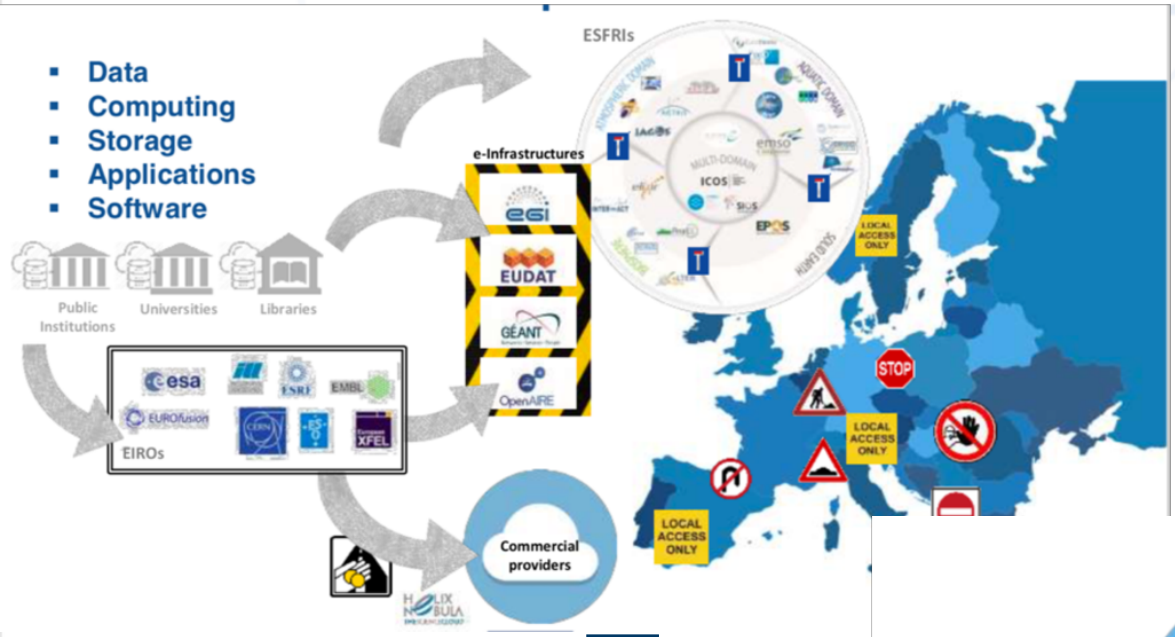
- the Cloud should be a wide, pan-European federation of existing and emerging excellent infrastructures, which respects the governance and funding mechanisms of its components;
- membership in this federation would be voluntary; and
- the governance structure would include member state ministries, stakeholders and scientists.



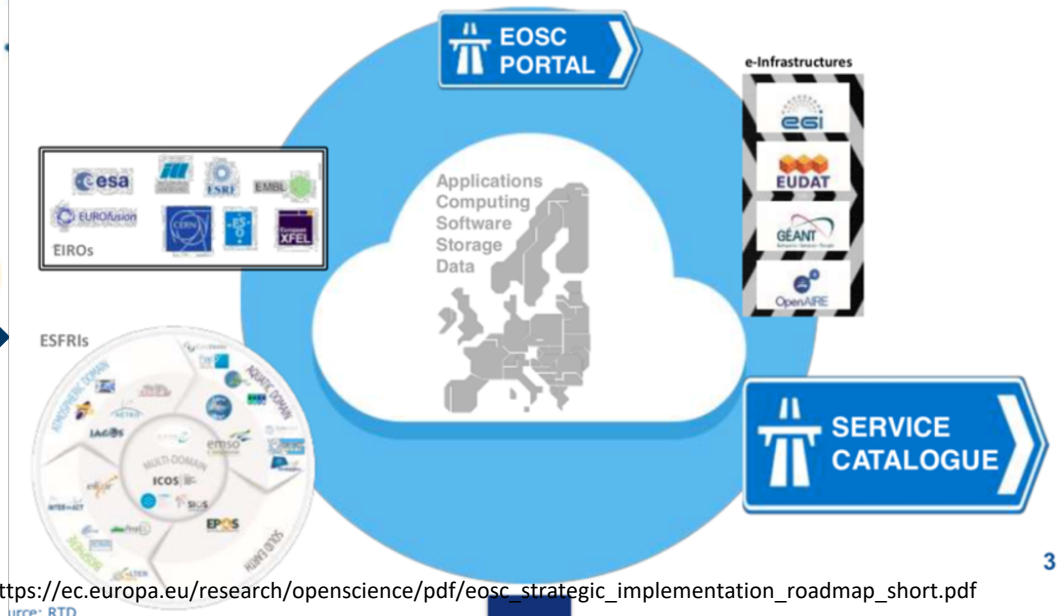


From: https://ec.europa.eu/research/openscience/pdf/eosc_strategic_implementation_roadmap_short.pdf

Model of eInfrastructures: from Fragmentation to Federation



Centralisation possible but not found suitable!



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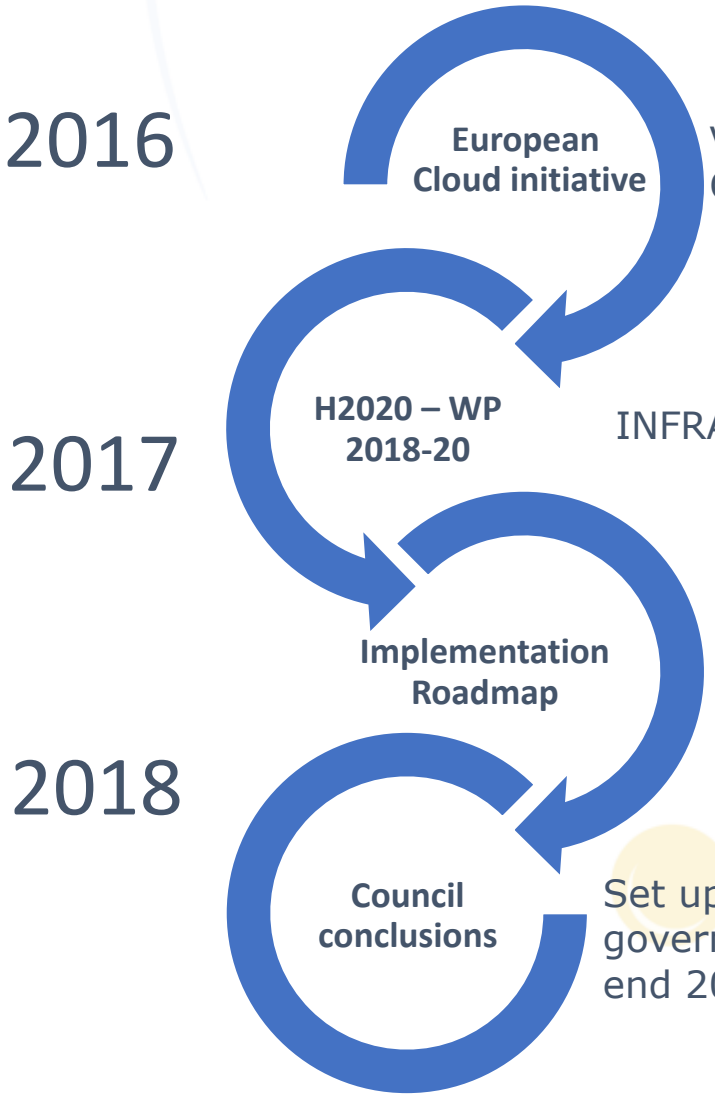
EOSC Timeline



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EOSC Architecture Milestones

- **Q4 2018:** Prototype of the EOSC catalogue of services
- **Q2 2019:**
  - Minimal requirements for becoming an EOSC federated centre or a FAIR-accredited/certified data infrastructure
  - Launch of a wide survey of European data infrastructures, including RIs and eInfras (by EC)
- **Q4 2019**
  - Initial list of eligible and interested data infrastructures
  - **Initial EOSC federating core in place**
- **Q4 2019:**
  - **Registry of data infrastructures of the EOSC (initial)**
- **Q2 2020**
  - **Preliminary connection of most infrastructures and services to the EOSC**

From: https://ec.europa.eu/research/openscience/pdf/eosc_strategic_implementation_roadmap_short.pdf

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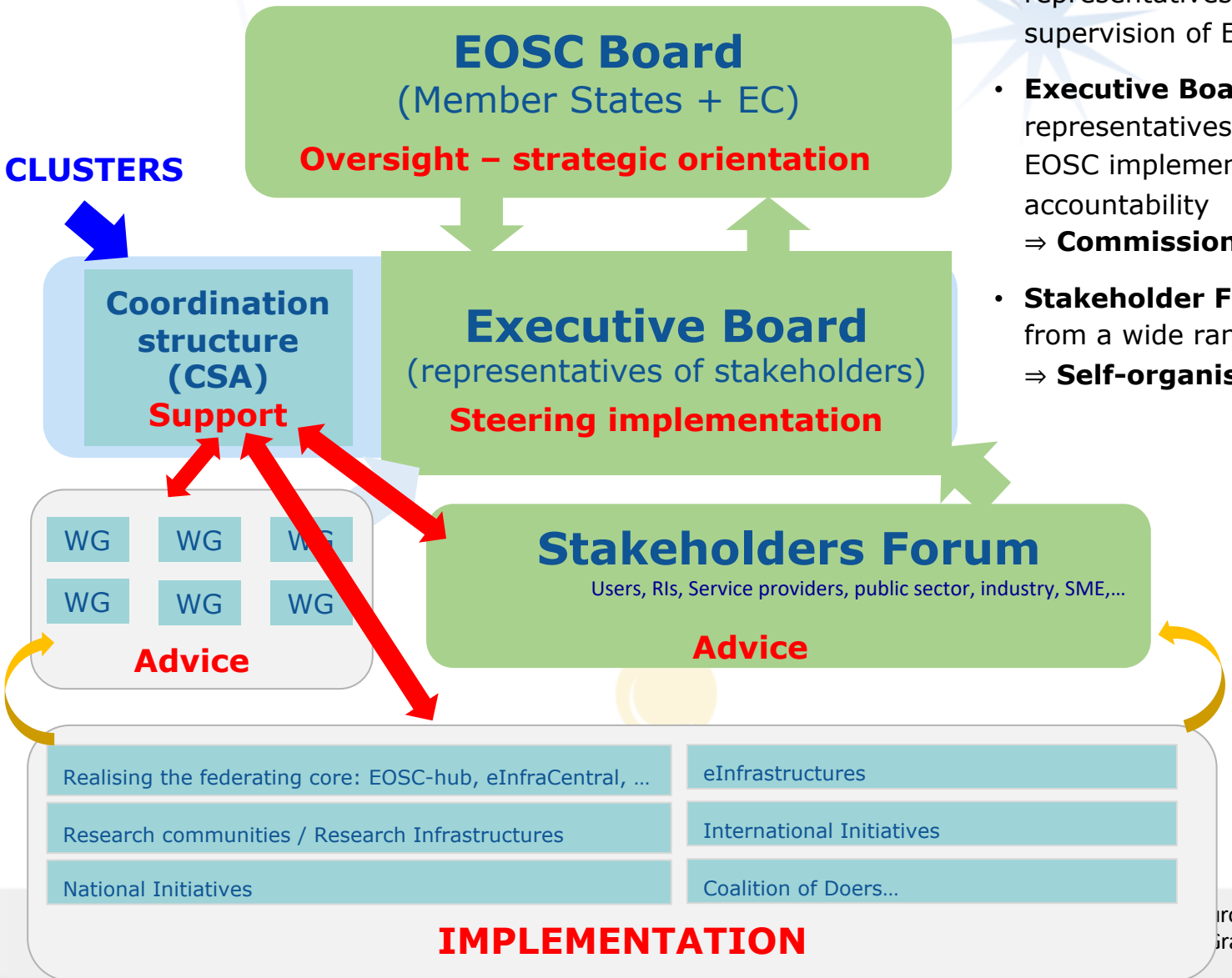
EOSC Organisational Structure

- **EOSC Board** of MS and EC representatives to ensure effective supervision of EOSC implementation
- **Executive Board** of stakeholder representatives to help ensure proper EOSC implementation and accountability
  ⇒ **Commission expert group**
- **Stakeholder Forum** to provide input from a wide range of actors
  ⇒ **Self-organised with EC support**



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EOSC CSA Support

EOSC Secretariat

- supports the EOSC Governance (**notably the Executive Board**)
- works openly and inclusively together with communities to co-create an all-encompassing EOSC

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EOSC Projects

- **eInfraCentral**
  catalogue of e-Infrastructure services and resources
- **EOSC-hub**
  bring together multiple service providers to create the hub: a single contact point for researchers and innovators
- **EOSCpilot**
  supports the first phase in the development of the EOSC
- **FREYA**
  extend the infrastructure for persistent identifiers (PIDs)
- **OCRE**
  access to commercial digital services (IaaS, SaaS and PaaS cloud services)
- **OpenAIRE-Advance**
  set of services to embed Open Science into researcher workflows
- **RDA Europe**
  European plug-in to the Research Data Alliance

- **(ESF)RI clusters**

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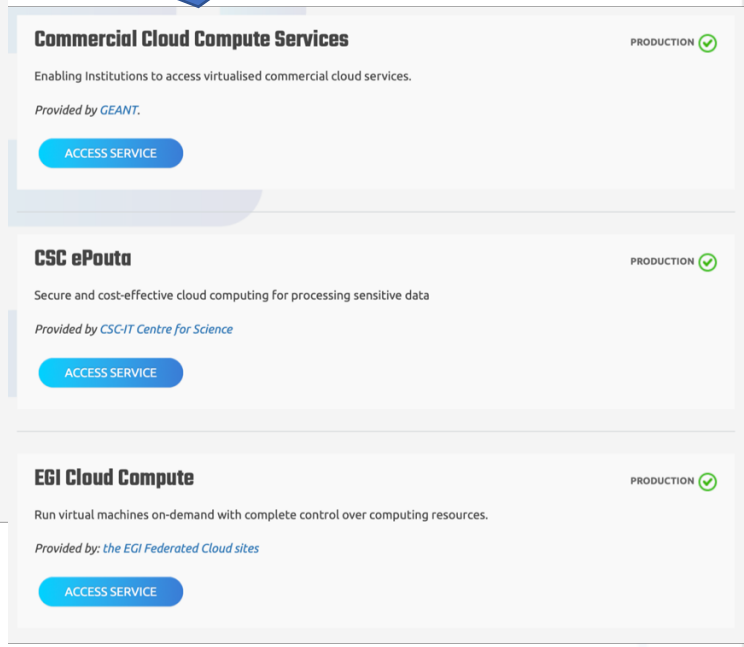
EOSC Catalogue of Services

- First catalogue of services available – to be extended by the user and provides



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Domain Cluster Projects

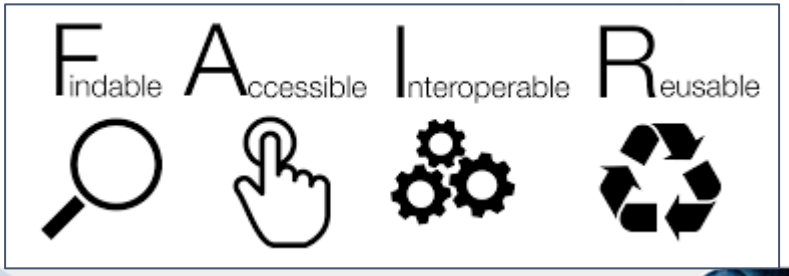
H2020-INFRAEOSC-04-2018 call

Clusters to ensure the connection of the ESFRI RIs with EOSC (and the construction of EOSC)

Expected impact:

- Improve access to data and tools leading to new insights and innovation
- Facilitate access of researchers to data and resources for data driven science.
- Create a cross-border open innovation environment.
- Rise the efficiency and productivity of researchers through open data services and infrastructures for discovering, accessing, and reusing data.
- Foster the establishment of global standards.
- Develop synergies and complementarity between involved research infrastructures.
- Adopt common approaches to the data management for economies of scale.

Making data FAIR …



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Five EOSC Clusters

- *The EC funds clustered participation to EOSC; funding based* ***on the number*** *of pan-European research infrastructures (****EUR 1.5 - 2 million for each ESFRI project/landmark)*** *in the clusters*
- **Clusters funded in H2020-INFRAEOSC-04-2018**
  - **EOSC-LIFE:** Life science RIs
  - **ENVRI-FAIR:** Environmental Research Infrastructures
  - **ESCAPE: Astronomy and Particle Physics**
  - **PANOSC:** Photon and Neutron sources RIs
  - **SSHOC:** Social Sciences and Humanities

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ESCAPE Background

- ESCAPE based on the H2020 ASTERICS cluster of ESFRI projects
  - capacity building in astrophysics and astroparticle physics
  - addressing Big-data challenges
  - successes:
    - enabling interoperability between the facilities,
    - minimising fragmentation,
    - encouraging cross-fertilisation and
    - developing joint multi-messenger capabilities.

Astronomy ESFRI & Research Infrastructure Cluster
ASTERICS - 653477

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Astronomy and Particle Physics

ESCAPE is a step forward…

- The astronomy-related ESFRI projects and the accelerator-based particle physics ESFRI facilities will open together new paths towards the understanding of the Universe through a multi-probe approach.

- Enhance the coordination leveraging two major complementary excellences in data stewardship:

  i) the astronomy Virtual Observatory infrastructure;

  ii) long-standing expertise of the particle physics community in large-scale distributed computing and Big-data management.

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ESCAPE ESFRI Facilities Aligned Expectations

- Big-data generators up to multi-Exabyte scale level: not only early adapters of the latest ICT and data-management developments but also constantly pushing the envelope of the current state-of-the-art.
- “Observatory” and “Facility” type of operation requires global open access and long-term sustainability of the extremely large volume of *FAIR* research data and services of the ESFRI facilities.
- Training and extension of FAIRness standards and tools for data access and data preservation.
- Operating a common open innovation environment.
- Already existing inter-RI cross-talk, intersections; overlapping competence and authority of national stakeholders.

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ESCAPE in a Nutshell

ESCAPE - *https://escape2020.eu* - convenes a large scientific community

- **31** partners (including 2 SMEs), representing:
  - **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**
- *Each RI commits to ESCAPE,* ***teaming up with a sub-set of associated national stakeholders.***

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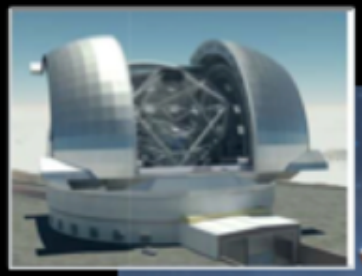
Radio

JIVE-VLBI

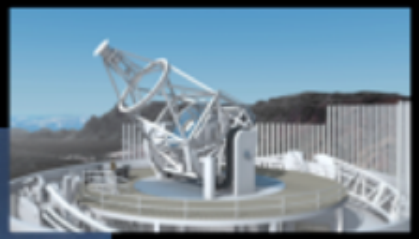
SKA

Visible light



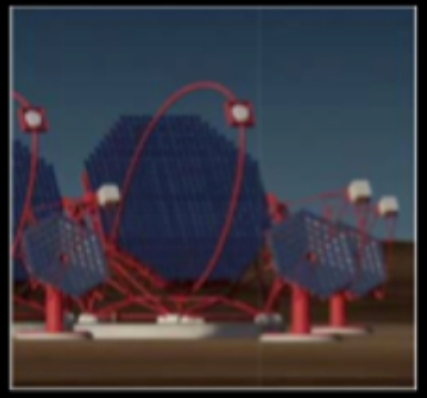
ELT

ESO



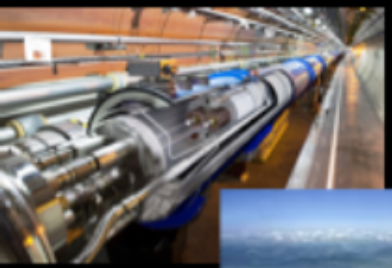
EST

Gamma rays



CTA

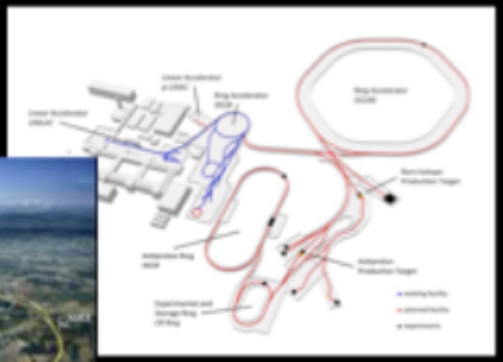
Accelerator-based
Particle Physics



HL-LHC

CERN

Accelerator-based
Nuclear Physics

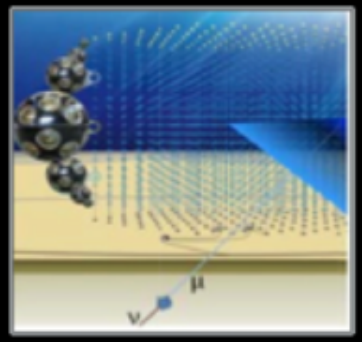


FAIR

Gravitational Waves

EGO-VIRGO

Cosmic-rays
Neutrinos



KM3NeT

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ESCAPE Goals

1. Implementing Science Analysis Platforms for EOSC researchers to stage data collections, analyse them, access ESFRIs' software tools, bring their own custom workflows.

2. Contributing to the EOSC global resources federation through a Data-Lake concept implementation to manage extremely large data volumes at the multi-Exabyte level.

3. Supporting "scientific software" as a major component of ESFRI data to be preserved and exposed in EOSC through dedicated catalogues.

4. Implementing a community foundation approach for continuous software shared development and training new generation researchers.

5. Extending the Virtual Observatory standards and methods according to *FAIR* principles to a larger scientific context; demonstrating EOSC capacity to include existing frameworks.

6. Further involving SMEs and society in knowledge discovery.

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ESCAPE Work Programme

WP1 MIND. Leader: Giovanni Lamanna, LAPP-CNRS

Management and policy.

WP2 DIOS. Leader: Simone Campana, CERN

Contribute to the federation of global EOSC resources through an implementation of the Data-Lake concept (evolution of WLCG and other ESFRI RIs computing models) to manage extremely large volumes of data up to the multi-exabyte scale

WP3 OSSR. Leader: Kay Graf, FAU

Support for "scientific software" as a major component of the ESFR-RI “data” to be stored and displayed in EOSC via dedicated community-based catalogues. Implementation of a community-based approach for the continuous development of shared software and for training of researchers and data scientists.

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ESCAPE Work Programme

WP4 CEVO. Leader: Mark Allen, CDS-CNRS

Extend FAIR standards, methods, tools of the Virtual Observatory to a broader scientific context;
demonstrate EOSC's ability to include existing platforms.

WP5 ESAP. Leader: Michiel van Haarlem, ASTRON-NWO

Implementation of scientific analysis platforms enabling EOSC researchers to organize data collections, analyse them, access ESFRI's software tools, and provide their own customized workflows.

WP6 ECO. Leader: Stephen Serjeant, Oxford Open University

Citizen Science, Open Science et Communication

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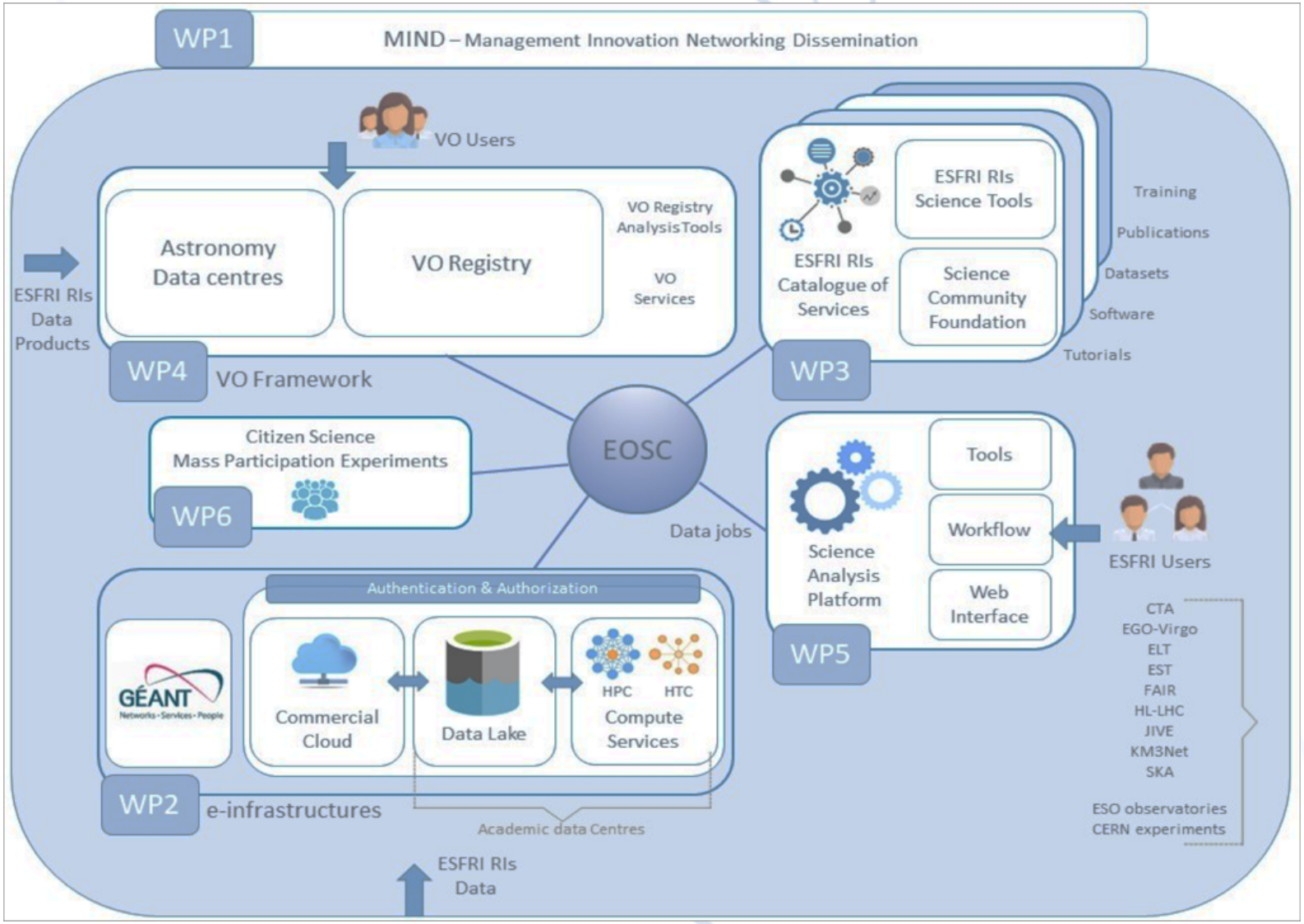
ESCAPE Project Overview



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Community Foundation

- ESCAPE main focus on partner (ESF)RIs – however, it can serve the full astroparticle physics community:
  - wide range of experiments included (though no full coverage)
  - community integration foreseen via open workshops and trainings (appropriate communication channels will be installed)
  - it will help defining (and developing) the access points to the central EOSC services

⇒ ESCAPE as leverage point from APP community to EOSC

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Conclusions

- EC started the EOSC programme to overcome fragmentation of eInfrastructures
  - Federated, open-access cloud environment
  - EU funding of computing and (IT) services will be channelled through this project
  - Available now:
    - Governance structure and support actions
    - First catalogue of services
- ESCAPE project: ESFRI Cluster for AstroParticlePhysics
  - Bring the communities point of view into EOSC
  - Solve open science issues based on RI needs and expectations
- Challenges:
  - Resource management and resource funding
  - Harmonisation of access and service provisioning
  - …
- EOSC will bring up many opportunities enriching open science output
  ⇒ we are part of defining the scope

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Conclusions II

In short:

- What can EOSC provide to you now:
  - A diverse catalogue of services (provided by many hosts)
  - A platform for discussion and cooperation
  - Guidelines and rules for data and services
- What can EOSC not provide (yet):
  - A harmonised scientific cloud as computing resource (to submit your analysis job to “the cloud”)
- What should it provide in the future:
  - A platform to do cross-disciplinary open science

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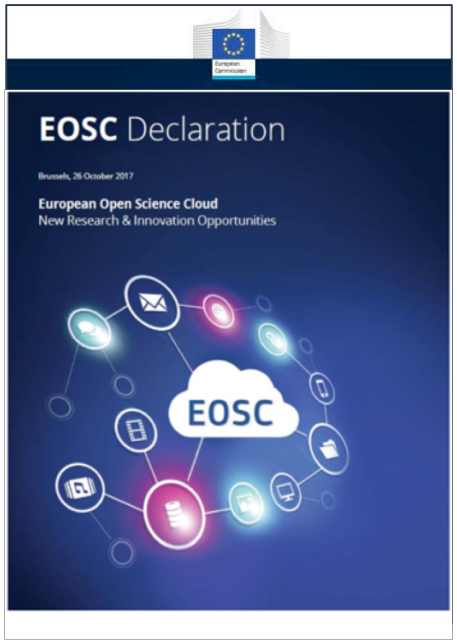
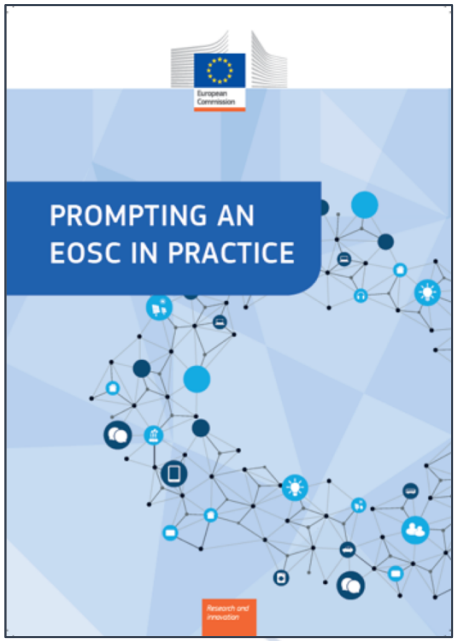
Further Reading…

EOSC Portal: https://eosc-portal.eu
ESCAPE Portal: https://escape2020.eu

EOSC Summit of 12 June 2017
https://ec.europa.eu/research/openscience/pdf/eosc_declaration.pdf



2nd HLEG on EOSC
https://ec.europa.eu/info/events/2nd-eosc-summit-2018-jun-11_en



FAIR Data Expert Group
https://doi.org/10.2777/1524

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Thank you!

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