# Open Science Commons: A Participatory Model for the Open Science Cloud


## Tiziana Ferrari

EGI.eu Technical Director

EGI-Engage Technical Coordinator

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# Outline

- Open Science Commons
- E-Infrastructure Commons
  - The EGI example
- EOSC vision

# The needs of modern research

- In research and society, ICT has become one key enabling factor for progress
  - Changing the modus operandi of research, new possibilities for geographically distributed collaboration and sharing
  - Data-driven science and more open access to data and scientific results transforming how science is made
- All large-scale Research Infrastructures and the long tail of science depend on ICT resources
  - Need to find synergies and to develop ways to tackle the ICT challenges at a generic level
  - Effective and cost efficient services that can be of wide and general use

# The Open Science Commons Vision

*Researchers from all disciplines have easy, integrated and open access to the advanced digital services, scientific instruments, data, knowledge and expertise they need to collaborate and achieve excellence in science, research and innovation.*

→ *They feel engaged in governing, managing and preserving these resources for everyone's benefit, with the support of all stakeholders.*

OpenScience Commons

*With this paper, EGI proposes the **Open Science Commons** as a new approach to digital research, tackling policy challenges and embracing open science as a new paradigm for knowledge creation and collaboration.*

*EGI invites organisations from the research landscape to join it in this journey to develop these concepts, and through them to advance the implementation of the European Research Area.*

**European policy context**

The European Research Area (ERA) was endorsed by the European Council in 2000 [1] as a way to build *"a unified research area open to the world based on the Internal Market, in which researchers, scientific knowledge and technology circulate freely and through which the Union and its Member States strengthen their scientific and technological bases, their competitiveness and their capacity to collectively address grand challenges"* [2].

Several actions for the ERA implementation have been undertaken by many actors with the aim of increasing the performance of European research through mobility and cross-border cooperation. Examples are the establishment of the European Strategy Forum on Research Infrastructures (ESFRI) and the e-infrastructure development for connectivity, high performance, grid and cloud computing and data. These initiatives sought to unite major user communities to ensure their expansion to Research Infrastructures.

The 2013 White Paper [3] released by the European e-Infrastructure Reflection Group (e-IRG) stated that *"...Europe needs a single 'e-Infrastructure Commons' for knowledge, innovation and science, as a living ecosystem, which is open and accessible and continuously adapts to the changing requirements of research"*, to support the ERA and the emerging ESFRI communities.

Since then, the rapid growth of scientific data has highlighted the need for an open approach as a core aspect of the ERA. In its Horizon 2020 consultation report on Open Infrastructures for Open Science, the European Commission concluded that *"open data e-Infrastructures increase scope, depth and economies of scale of the scientific enterprise. They are catalysts of new and unexpected solutions to emerge by global and multidisciplinary research. They bridge the gap between scientists and the citizen and are enablers of trust in the scientific process"* [4].

This vision implies a European dimension beyond national and regional approaches, and an increase in capacities and capabilities.

*The European Grid Infrastructure (EGI) – http://www.egi.eu*
*Open Science Commons – http://www.opensciencecommons.org*

https://www.opensciencecommons.org/
http://go.egi.eu/osc

European Council conclusions, May 2015,
http://www.consilium.europa.eu/en/meetings/compet/2015/05/28-29/

# Commons

Institutionalised community governance of the production and/or sharing of a particular type of resource (from natural to intellectual)

GÉANT: European Communications Commons

Constructing Genome Commons

Wikipedia

...

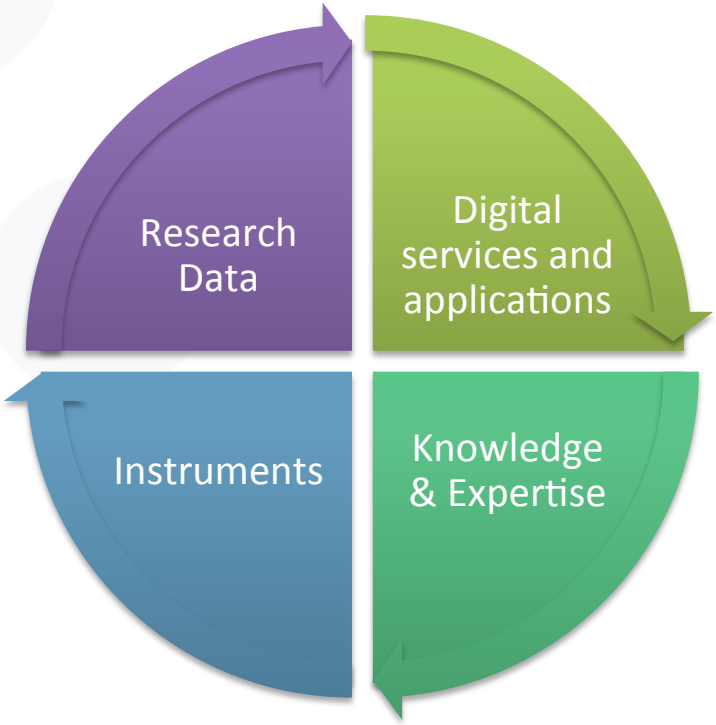
e-Infrastructure Commons

Linux

Internet

# Open Science Commons: Definition

- A set of interrelated resource systems governed as commons that support the open creation and dissemination of scholarly knowledge



# Applying the Commons to Open Science

- Shared resources
  - Integrated, easy and fair access ➔ Compute, Storage, Software and Tools
- Engaged communities
  - Participating in the process ➔ hybrid federation including community infrastructures
  - Culture of sharing ➔ open access to resources and services with opportunistic use
  - Collaborating in the management and stewardship ➔ thematic community-specific services
- Governance
  - Rules to access and participation ➔ for users and providers
  - Rules to resolve conflicts ➔ boards for User Community, Technology and Operations Management coordination
  - Rules to balance quality vs. openness ➔ SLAs and OLAs
- Financial support
  - For long-term availability ➔ National funding for capacity building, EC and national in-kind contribution for operating the federation fabric

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# EOSC principles

http://go.egi.eu/OSCPP

OpenScience Commons

The European Open Science Cloud for Research

EUDAT LIBER OpenAIRE EGI GÉANT

*Release Date: 30th October 2015*

Leading European initiatives, EUDAT, LIBER, OpenAIRE, EGI and GÉANT share their joint vision for the European Open Science Cloud for Research which includes eight elements of success for a concrete contribution to the Digital Single Market.

The Open Science Cloud, part of the European Commission's Digital Single Market Strategy, will empower research data sharing, data stewardship and data reuse in Europe for the benefit of innovation and growth. Today's joint statement sets out the partners' strategic vision for the Open Science Cloud's organisation, sustainability and governance as a contribution towards the practical realisation of the EC's vision.

The European Open Science Cloud initiative is strategically important as Open Science is a key driver, not only of scientific progress, but also of economic and societal innovation. To harness its full value and reap the fruits of public and private investment, Europe needs to foster an open, collaborative platform for the management, analysis, sharing, reuse and preservation of research data on which innovative services can be developed and delivered.

For this, Europe can and must build on decades of public investment in scientific infrastructures—experimental facilities, networking, high-performance and high-throughput computing, cloud services, scientific software and institutional and community data repositories—by connecting national and international infrastructures and services.

The European Open Science Cloud for Research must be:

1. **Open** in design, participation and use
2. **Publicly funded & governed** with the 'commons approach'
3. **Research-centric** with an agile co-design with researchers and research communities
4. **Comprehensive** in terms of universality and inclusiveness of all disciplines
5. **Diverse & distributed** empowering network effects
6. **Interoperable** with common standards for resources and services
7. **Service-oriented** as well as protocol-centric
8. **Social** connecting diverse communities

Following these principles will ensure that the Open Science Cloud is an open, trusted, service-driven endeavour, inclusive of all stakeholders, which gives researchers from all areas seamless, open access to the advanced digital capabilities, resources and expertise they need to collaborate and to carry out data- and computing-intensive science. Secure and trustworthy, the Open Science Cloud will engage researchers in governing, managing and preserving resources for everyone's benefit. Governed as a commons, it will leverage two decades of public and

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# E-Infrastructure Commons

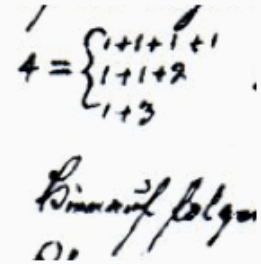
## The EGI example

www.egi.eu

EGI-Engage is co-funded by the Horizon 2020 Framework Programme
of the European Union under grant number 654142

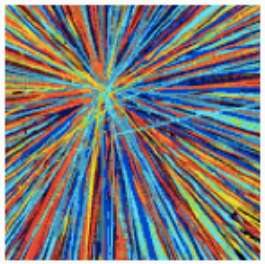
# EGI

- A globally distributed ICT infrastructure that federates the digital capabilities, resources and expertise of national and international research communities in Europe and worldwide.
- Mission: empower researchers from all disciplines to collaborate and to carry out data- and compute-intensive science and innovation.



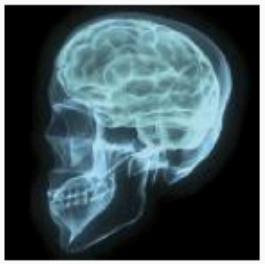
[Natural Sciences](#)

*Life Sciences, Earth Sciences, Mathematics, etc*



[Physical Sciences](#)

*Physics, Astronomy, Chemistry etc*



[Medical and Health Sciences](#)

*Medicine, Clinical sciences, etc*

[Engineering & technology](#)

*Material science, civil and mechanical engineering, etc*

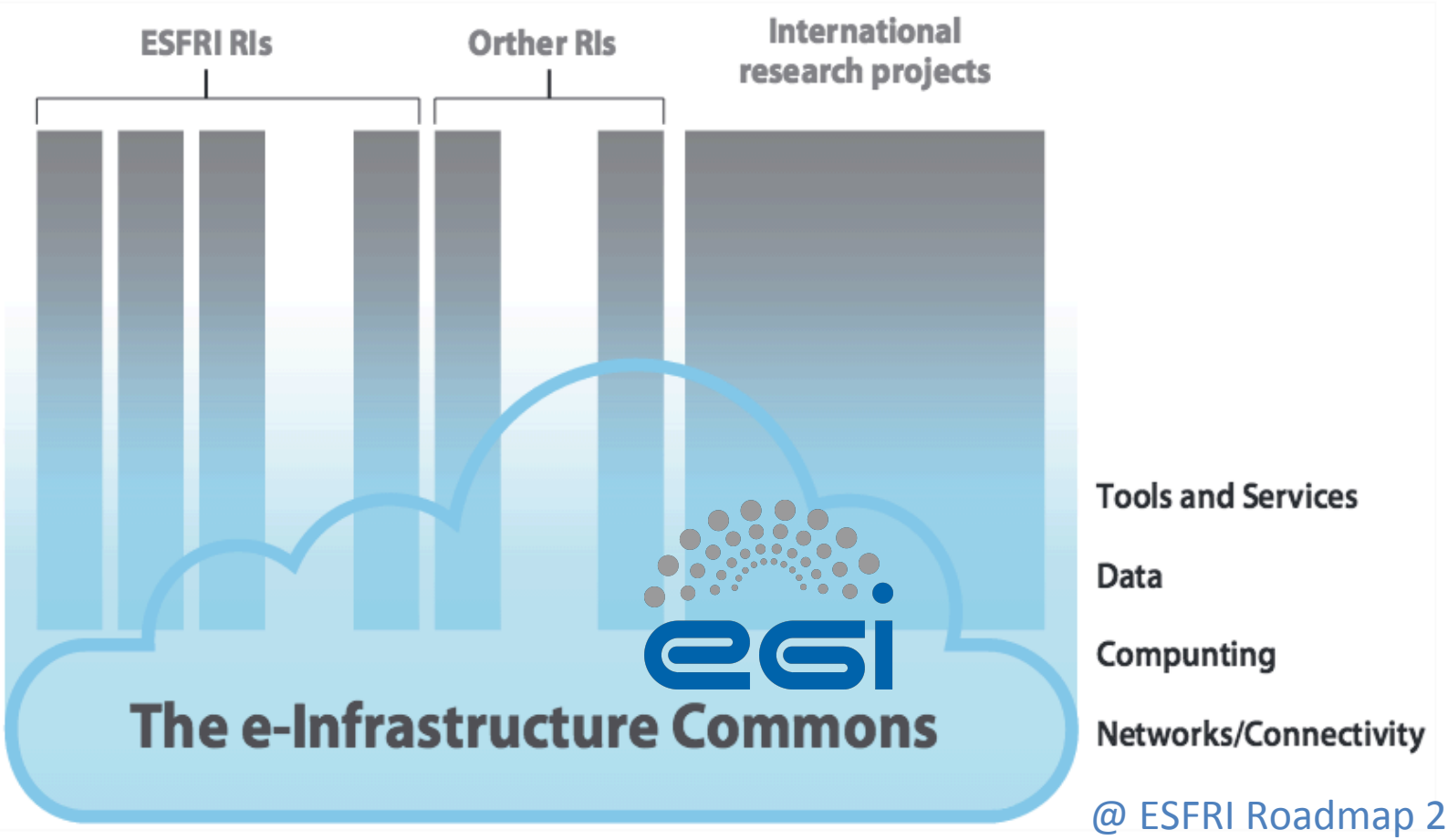
[Agricultural sciences](#)

*Veterinary sciences, food technology, etc*

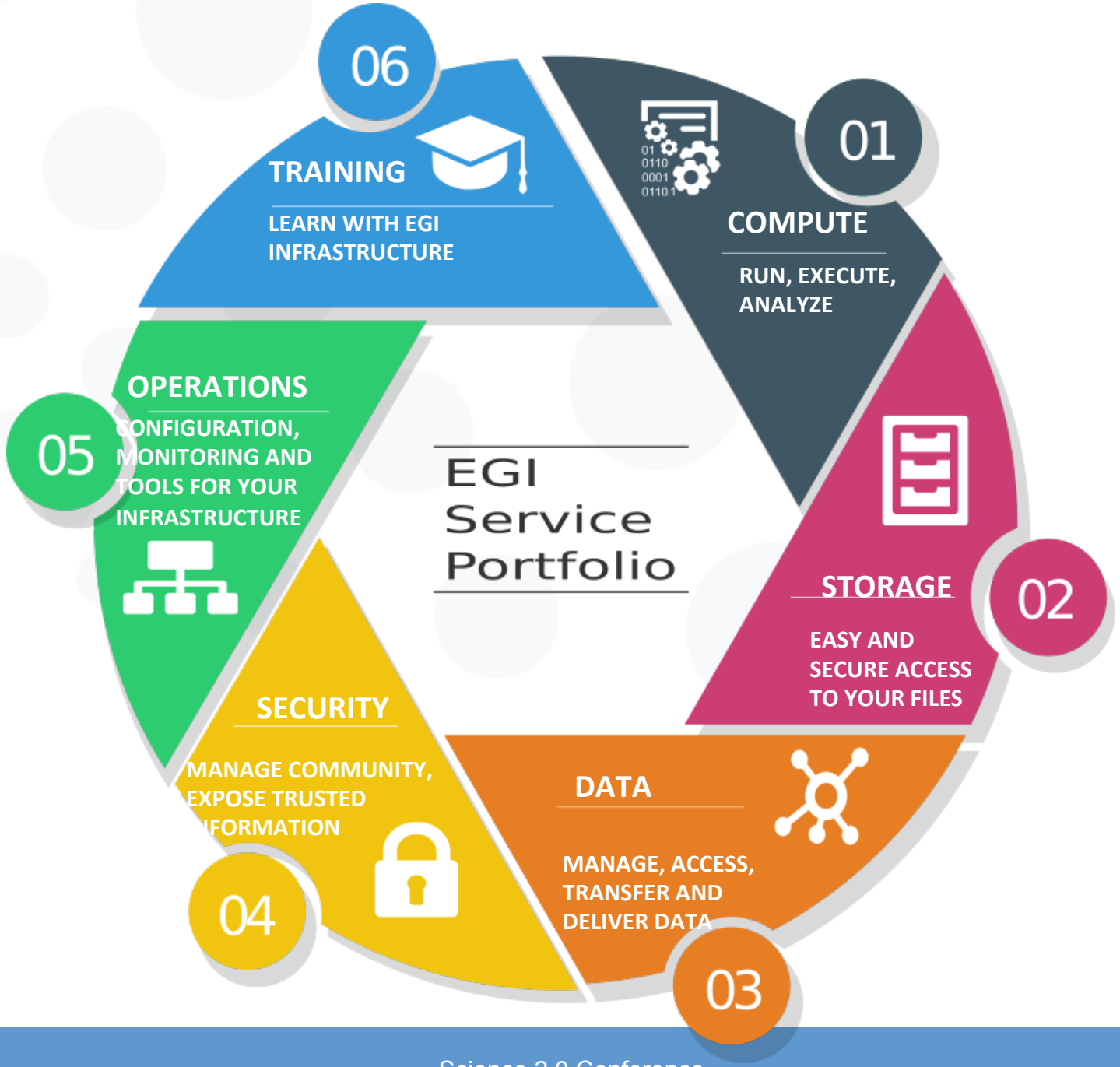
http://www.egi.eu/case-studies/

# Horizontal and thematic infrastructures

EGI contributes to the “e-Infrastructure Commons” with generic solutions for shared needs and requirements




@ ESFRI Roadmap 2016


EGI-Engage
06
TRAINING
LEARN WITH EGI INFRASTRUCTURE
01
COMPUTE
RUN, EXECUTE, ANALYZE
02
STORAGE
EASY AND SECURE ACCESS TO YOUR FILES
03
DATA
MANAGE, ACCESS, TRANSFER AND DELIVER DATA
04
SECURITY
MANAGE COMMUNITY, EXPOSE TRUSTED INFORMATION
05
OPERATIONS
CONFIGURATION, MONITORING AND TOOLS FOR YOUR INFRASTRUCTURE
EGI Service Portfolio

# EGI access policies

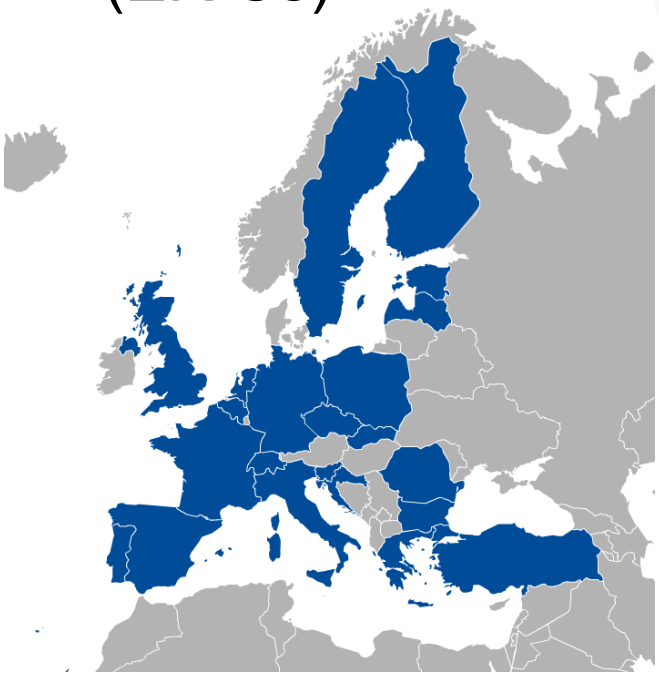
http://www.egi.eu/services/access_policy/

- Policy-based
  - users are granted access based on policies defined by the EGI resource providers or by EGI.eu; such policies usually apply to resources being offered “free at point of use” to meet some national or EU level objective
- Wide access
  - users can freely access scientific data and digital services provided by EGI resource providers
- Market-driven
  - users can negotiate a fee to access services either directly with EGI resource providers or indirectly with EGI.eu
- EGI aligned with the charter for access to RIs

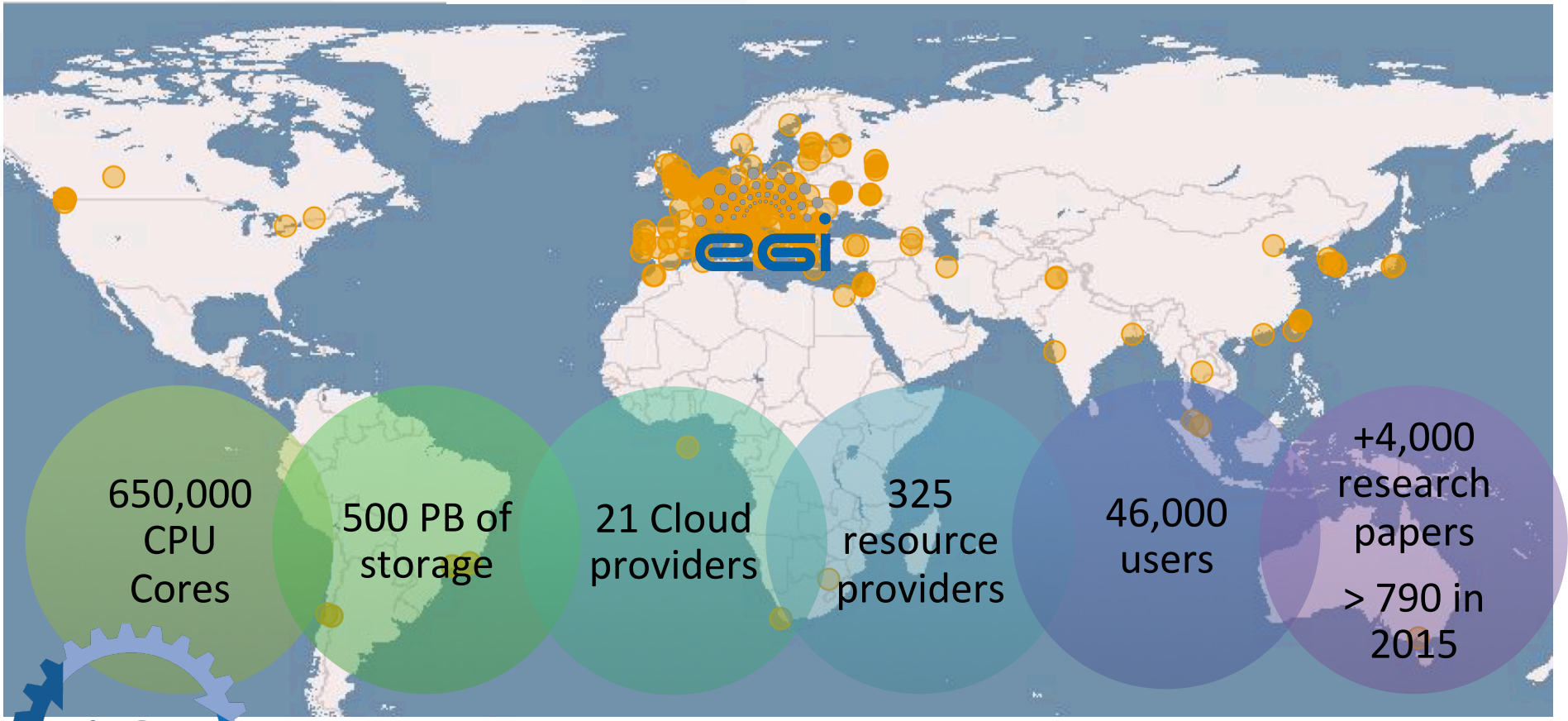
# EGI Membership

http://www.egi.eu/about/EGI.eu/

- Major national e-Infrastructures: 22 NGIs
- EIROs: CERN and EMBL-EBI
- EGI Foundation
- (ERICs)



# EGI Federation, 2016 QR1



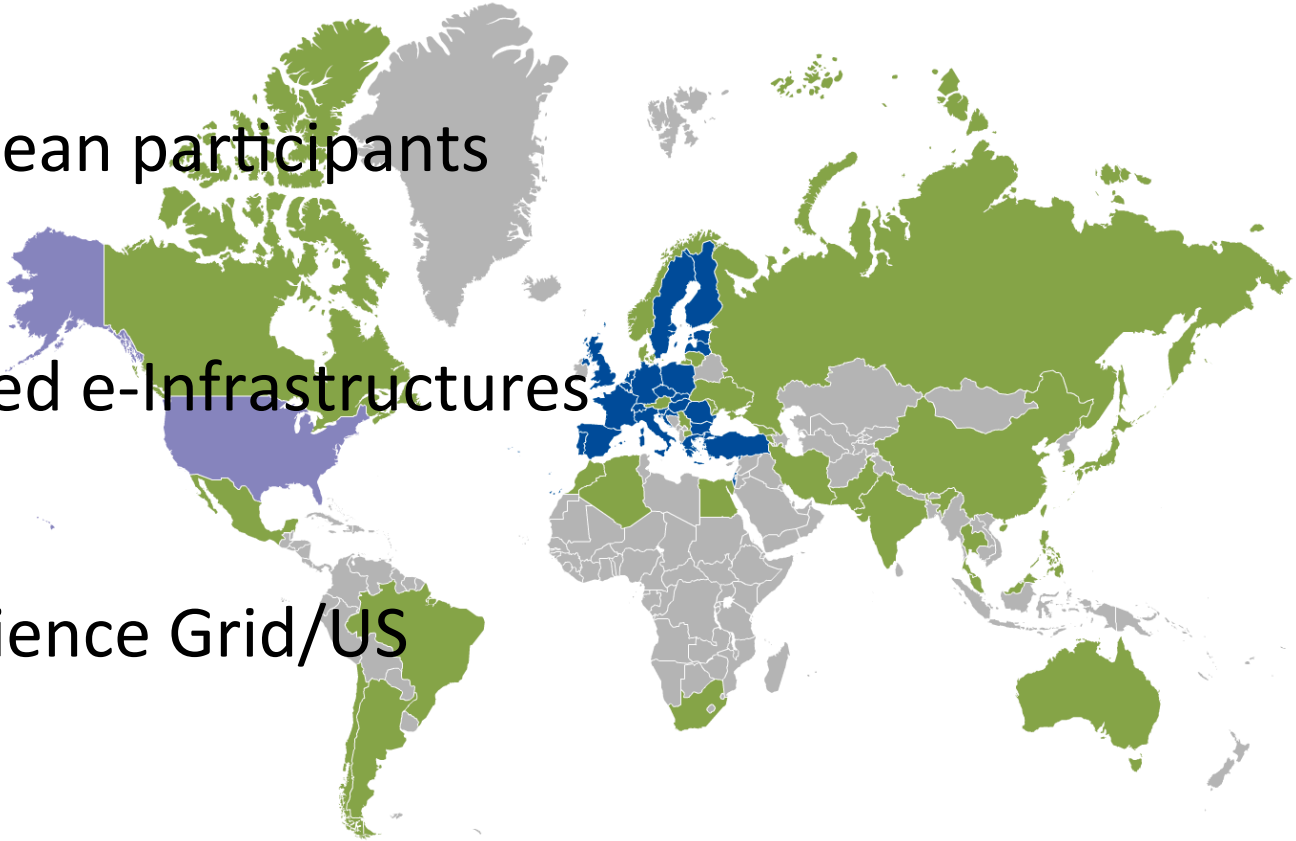
# A system of open e-Infrastructures

http://www.egi.eu/infrastructure/

EGI 24 European participants

6 Integrated e-Infrastructures

1 peer Open Science Grid/US



# A system of open e-Infrastructures

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Open Science Grid

compute canada | calcul canada

Ukrainian National Grid

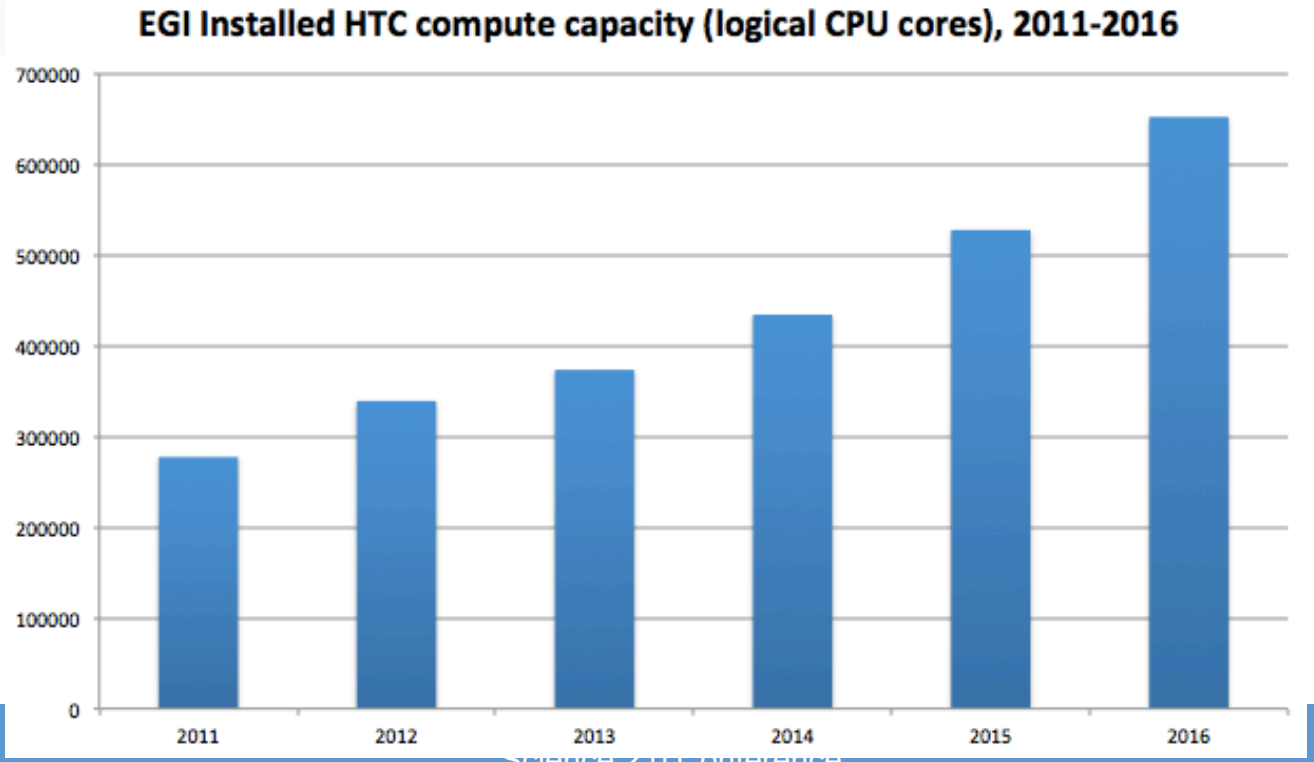
CSIR

CDAC

CLAF Centro Latino-Americano de Física

# High Throughput data analysis

| | Logical cores | Computing power (HEP_SPEC06) | Online storage (PB) | Nearline storage (PB) |
|---|---|---|---|---|
| February 2016 | 652,000 | 5,842,000 | 264 | 239 |
| Increase from January 2015 | + 23% | + 38% | + 11.8% | + 42% |



# EGI Federated Cloud

https://wiki.egi.eu/wiki/EGI_Federated_Cloud

21 providers

- Publicly funded, one commercial
- Offer of virtual access to GPU
- + 2 sites ready to enter production (JINR, BITP)

28 projects over the last 12 months

- Activities involving Elixir, MoBrain, LifeWatch

Training infrastructure

- 5 sites, +10 events run on the infrastructure

# Users and disciplines

## 46,000 users

- Natural sciences, 66%
- Medical and Health sciences, 6.5%
- Engineering and Technology, 6.3%

## SLAs

- MoBrain/INSTRUCT and Structural Biology
- BILS/Bioinformatics
- DRIHM/Hydro-meteorology

## 9 RIs using the EGI federation

## 7 RIs preparatory stage

# Servicing the long tail of science

https://www.wenmr.eu/

## NMR and structural biology

- EGI SLA: 50 Mhours CPU for the coming 2 years
- > 100 publications/ year
- 3.4 Million computational tasks in 2015

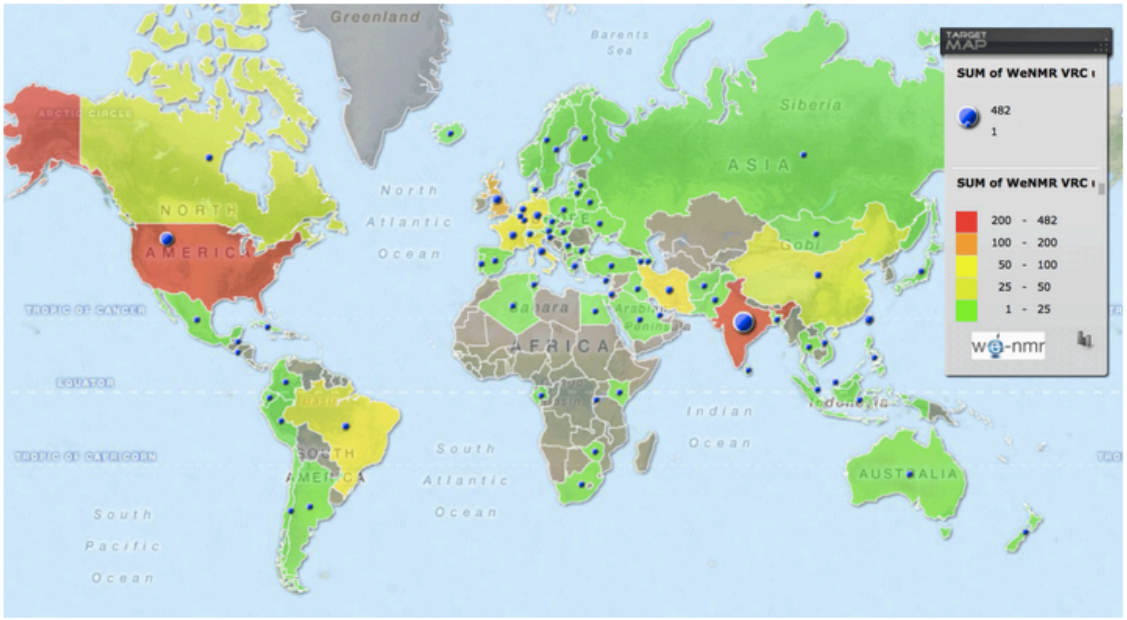
### Reaching 1800 registered WeNMR VRC users

Submitted by amjjbonvin on Tue, 2015-05-19 13:19

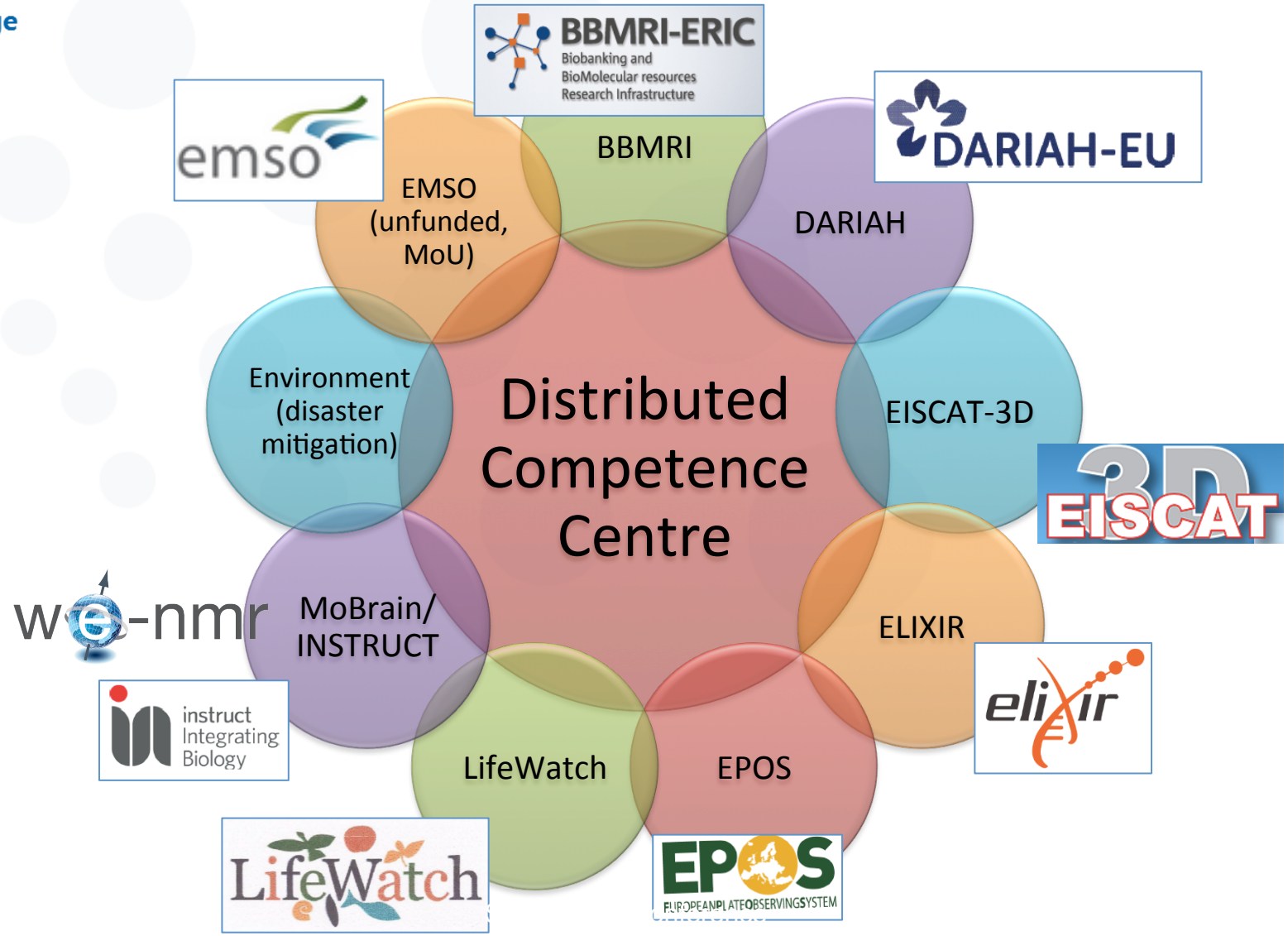
We are slowly (or actually not so slowly) reaching 1800 registered users in the WeNMR VRC!

The user growth is sustained, and this more than 1 1/2 year after the official end of the EU funding.

Users and usage are thus key to sustainability.



# Knowledge Commons



# A vision for the EOSC federation

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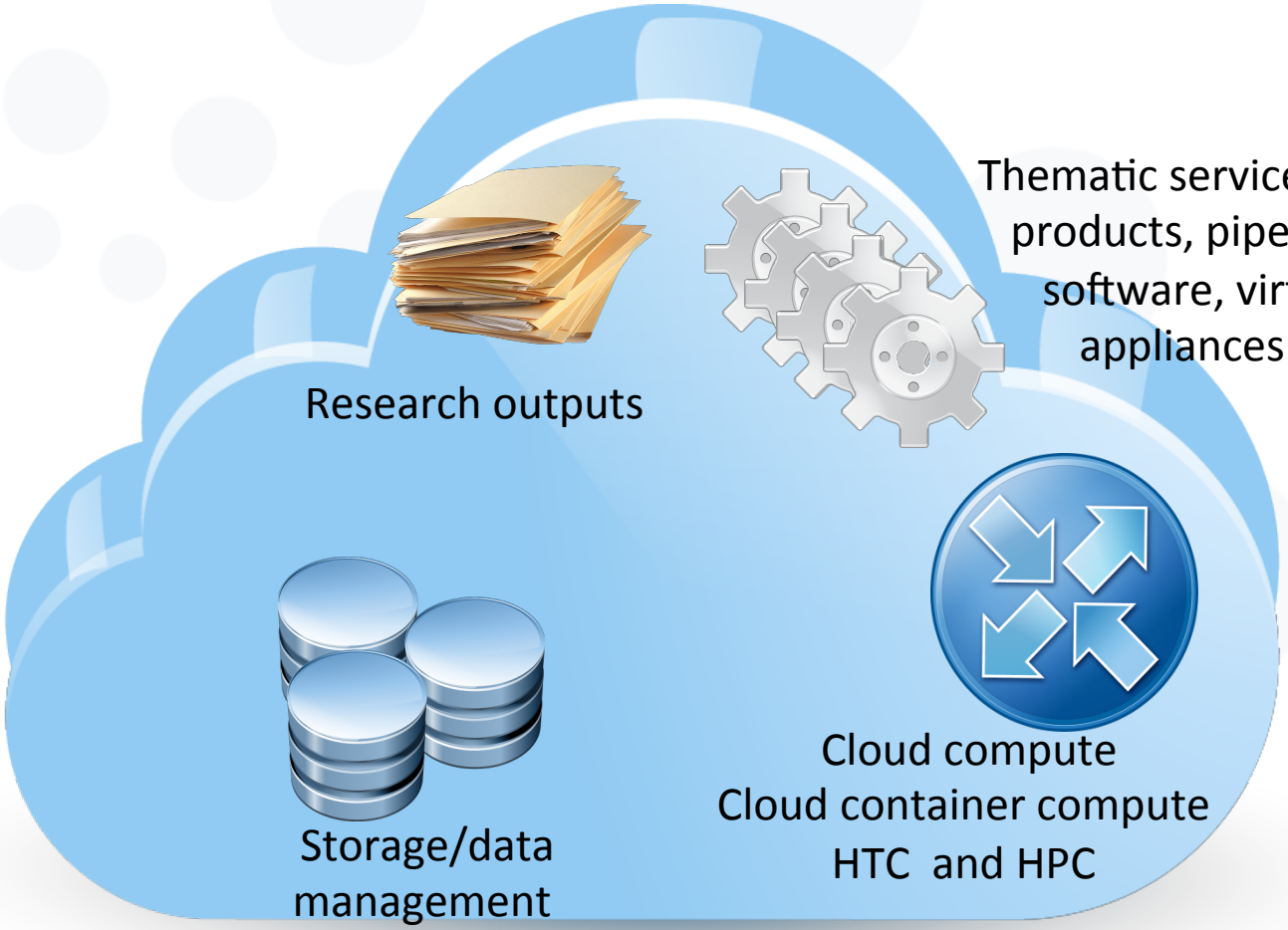
# EOSC Research Objects Hub




Hub-specific service management processes, business processes, policies

# Federation services and processes

## EOSC federation services and activities (examples)

Research objects libraries

Markeplaces

Federated IdP, Auth, Authz

Federation services/processes (accounting, monitoring,..
Business processes and channels

Standards and policies

Research Object Indexing and discovery services

Knowledge an d training

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# Federation

- A mechanism for achieving a minimal level of interoperation across distributed services
- Various levels of integration possible from loose to tight
  - The level of integration critically affects the user experience and determines how easily services in a federated environment can be accessed

# International loose federation

- Achieved today with
  - Single Sign On
  - Research object identification (PID)
  - Harmonized security and access policies
  - Community platform ensuring interoperation between different technologies to handle the complexity of different interfaces
    - Risk of community-specific ad hoc solutions
    - Some agreement achieved on data management protocols/interfaces for access and transport
    - Plethora of standards of de facto standards for distributed access to compute resources

# European tight Federation

Definition of minimum set of security policies
(security for collaborating e-Infrastructures initiative)
Harmonization of access policies, accounting and support channels
(e.g. policy-based, excellence-driven, membership-based)

Regional/National infrastructures

Nat. Access policies
Revenue streams
Customer segments
Service Portfolio
Service management processes

Federated service management

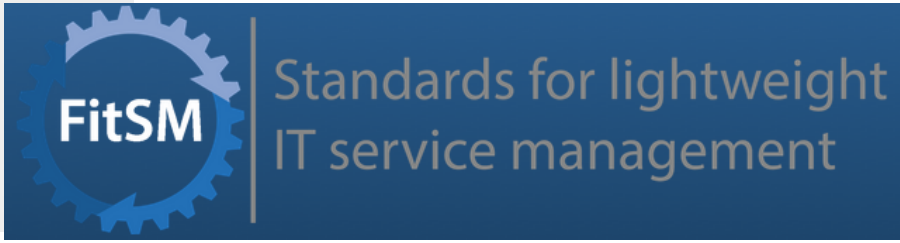
European infrastructures

# Federated service management

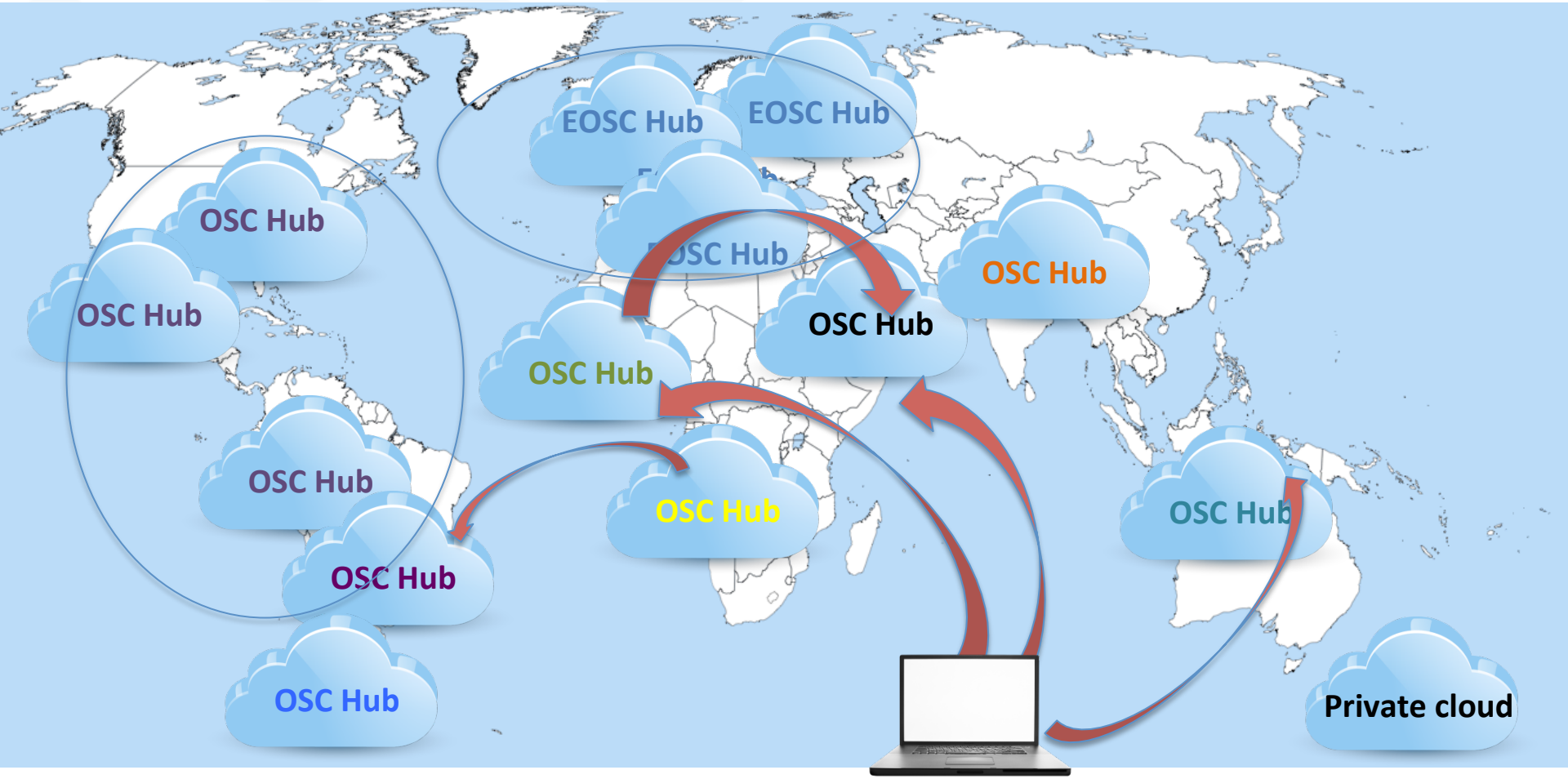
- FitSM standard to simplify service management implementation in a federated environment

- Service portfolio management (SPM)
- Service level management (SLM)
- Service reporting management (SRM)
- Service availability and continuity management (SACM)
- Capacity management (CAPM)
- Information security management (ISM)
- Customer relationship management (CRM)
- Supplier relationship management (SUPPM)
- Incident and service request management (ISRM)
- Problem management (PM)
- Configuration management (CONFM)
- Change management (CHM)
- Release and deployment management (RDM)
- Continual service improvement management (CSI)

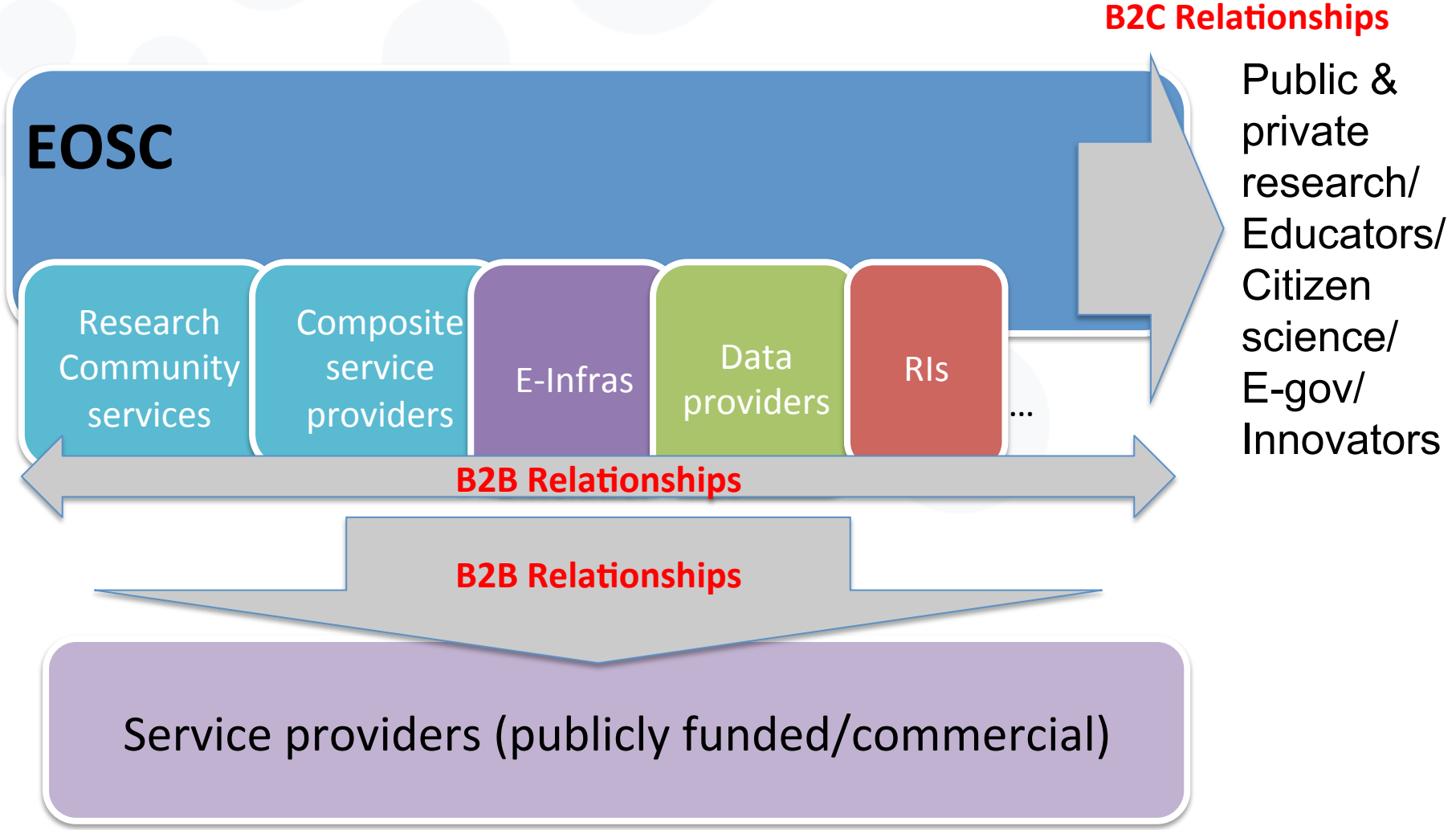
http://fitsm.itemo.org/



# A worldwide OSC



# Business relationships



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# Input to HLEG. Challenge 1

## Bridge data preservation infrastructures and computing

**Via a federation of service hubs, offering storage, computing, software, thematic tools, geo-replication of research data, with sustained national and European public co-funding**

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# Input to HLEG. Challenge 2

## Open Science platforms: sharing of open tools, applications, scientific software, research data

**Community platforms can be discovered, offered, supported, shared and accessed through grants**

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# Input to HLEG. Challenge 3

## From “services” to “solutions” involving multiple providers (e-Infras, RIs, research communities, data providers, commercial service providers…)

**Co-design, harmonized access policies, federated service management processes, support, training, service discoverability**

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# Summary

- EGI
  - a service component of a global system of e-Infrastructures that support Open Science
- European Open Science Cloud
  - EOSC: a window opportunity to address the governance, funding, sustainability of national and European e-Infrastructures

# Thank you for your attention.

## *Questions?*

Acknowledgements
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