Enabling open science in Europe with data, software and the compute continuum

Tiziana Ferrari, EGI Foundation

Open Science Day 2022, Ljubljana

Open Science practices in international scientific collaborations

1. Open infrastructures – EGI A worldwide scientific computing infrastructure for research

Why a federation?

- Support science at international scale
- Build an hyperscale compute facility for research
- Invest nationally, access globally
- Bring computing to the data

Slovenia/SLING (National Supercomputing Network Consortium)

- ARNES
- SiGNET (Jozef Stefan Institute)

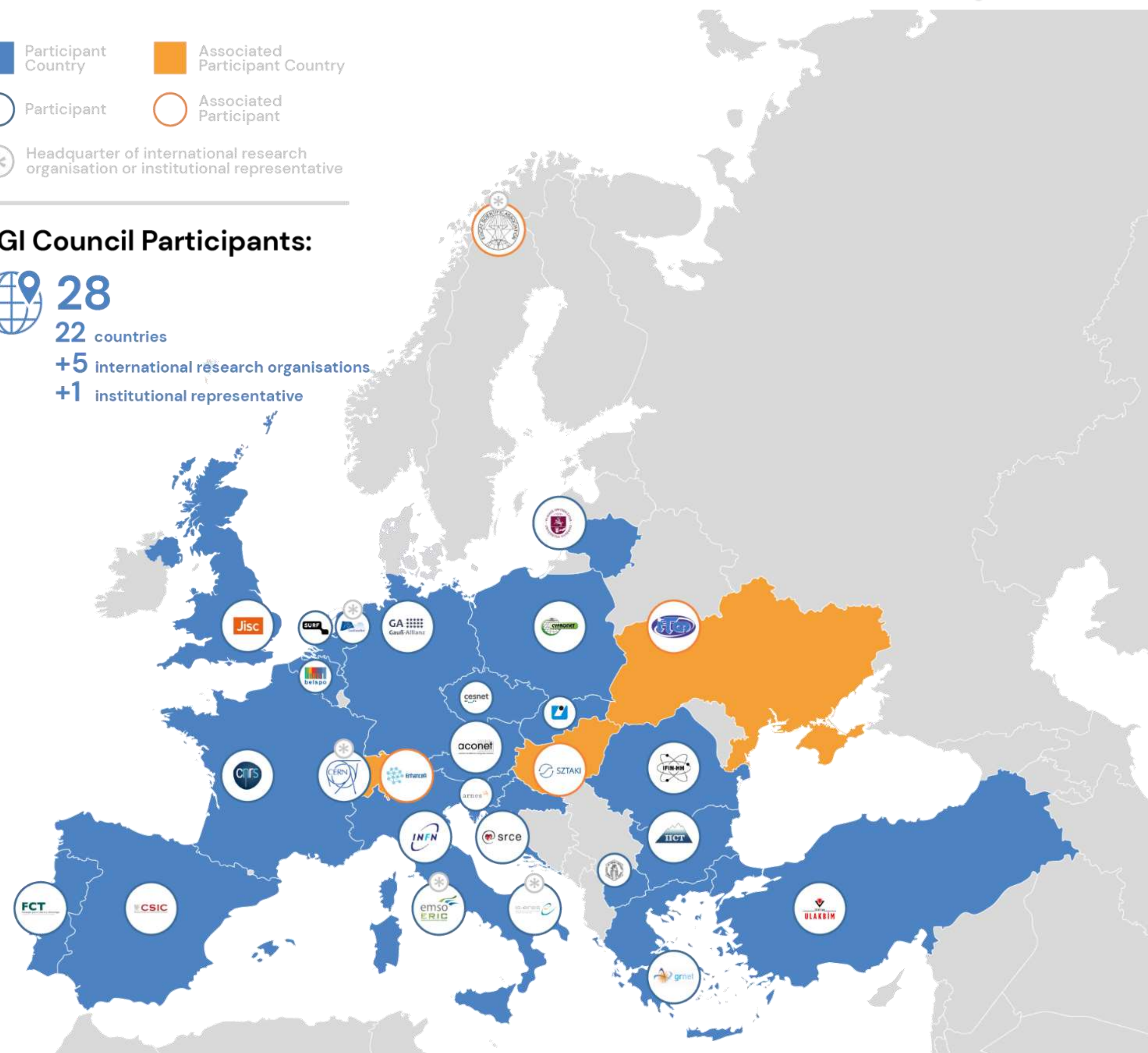# EGI council participants

2021 – 4 new members

2022 – 2 new members

EGI Council Participants:

🌐 **28**
22 countries
+5 international research organisations
+1 institutional representative

EGI Infrastructure and Slovenia (2021)

> **1.2 Million CPUs,**
1.3 Exabyte of data

10 Research Infrastructures

with Slovenian participation (e.g. Astronomy, High Energy Physics, Linguistics, biodiversity, marine science, struct biology)
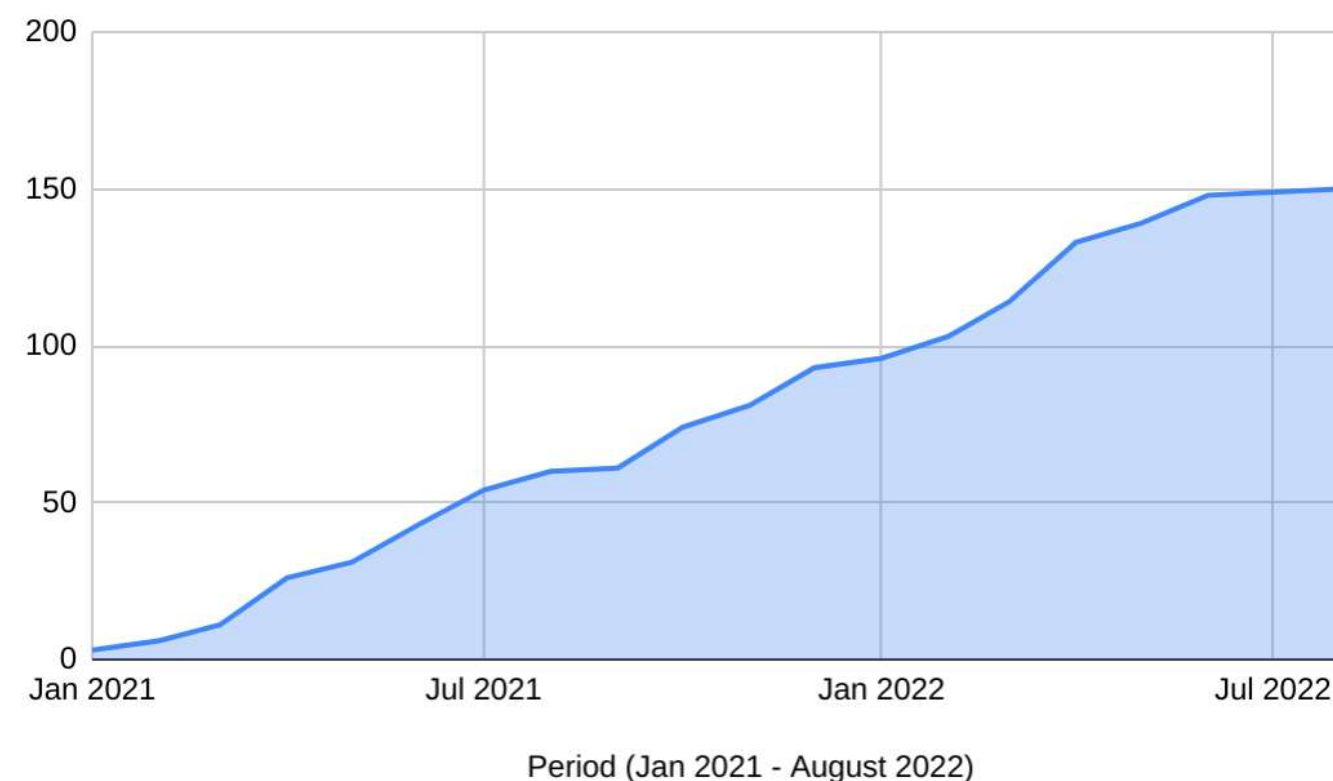
200+

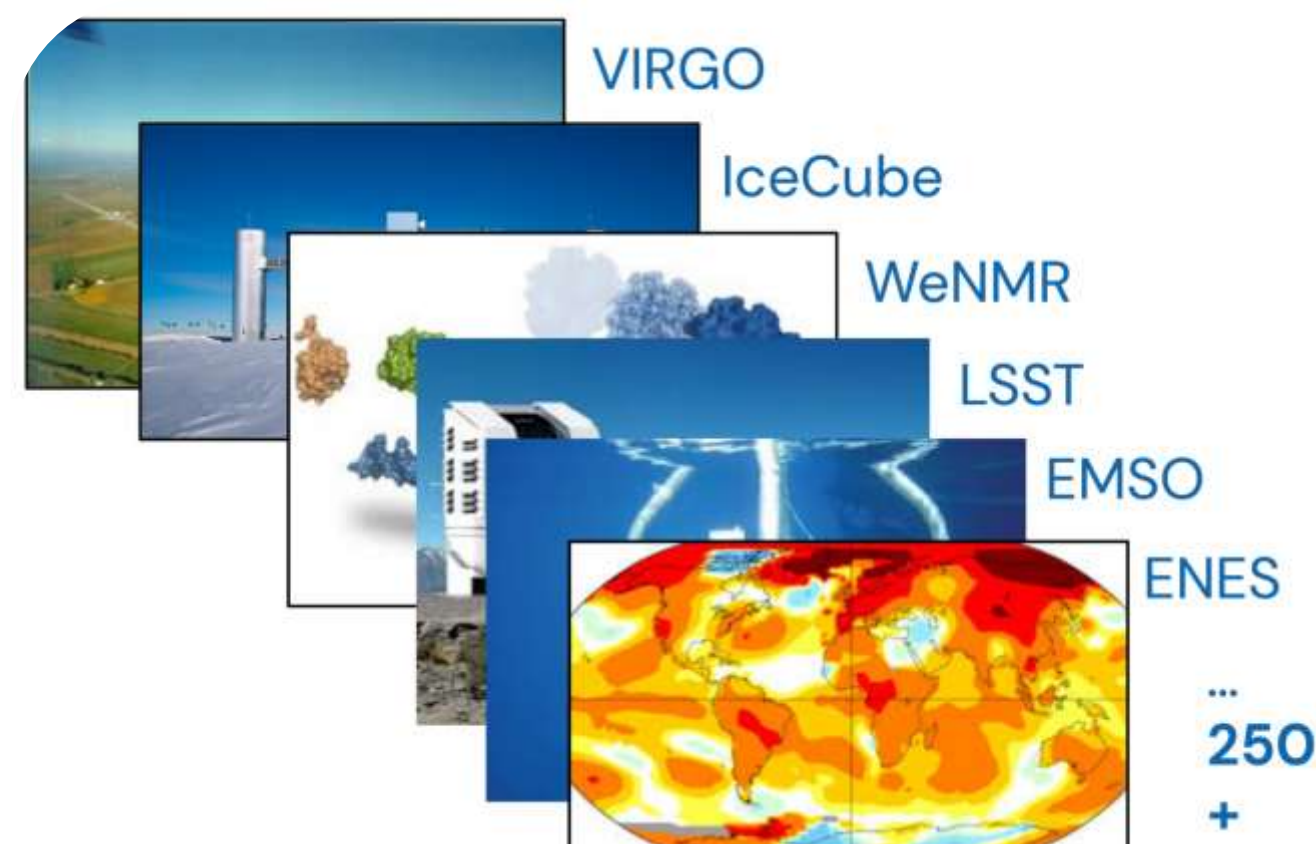Resource data centers

82.000+

Scientists

~370

Peer reviewed publications with Slovenian authors

EGI Federation in figures
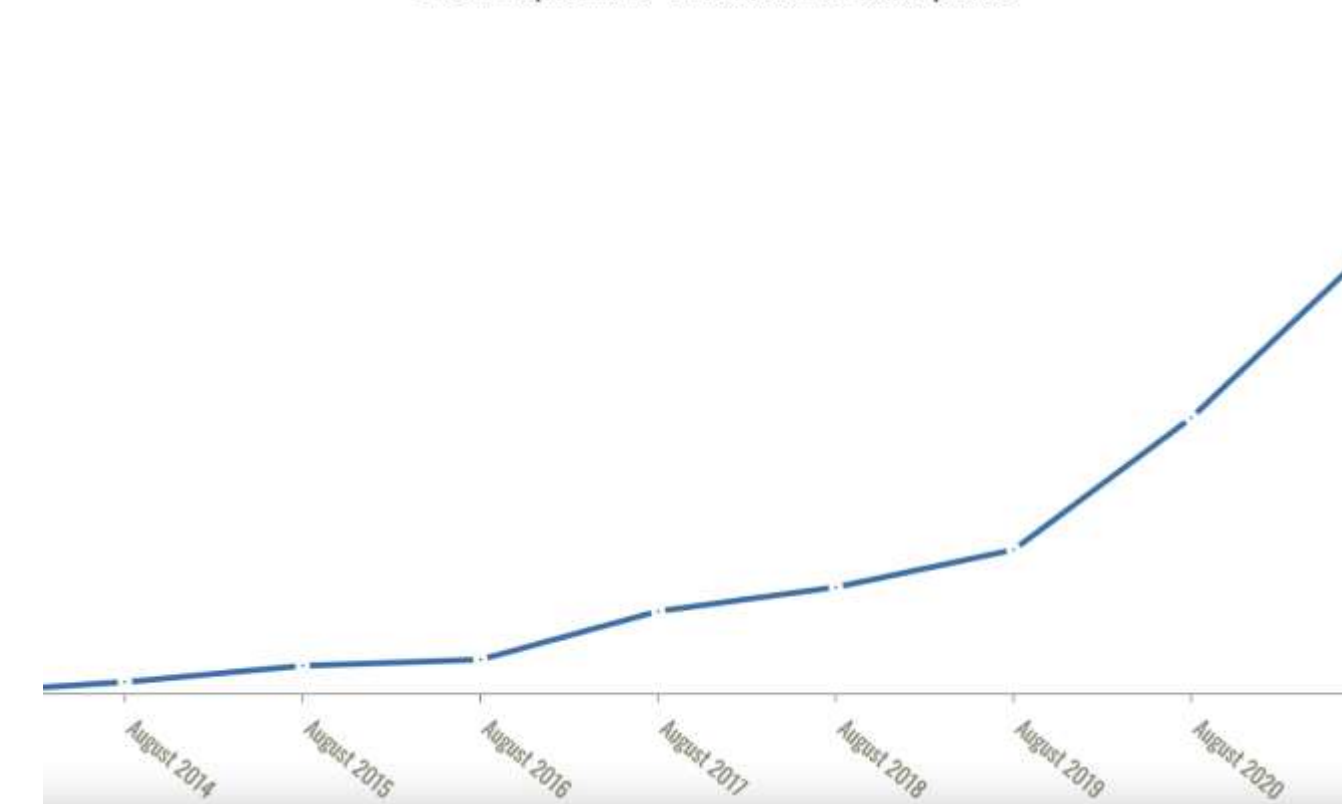

+82,000 users

+150 support applications received in 2021–2022 via EOSC-funded projects

~7 Billion CPU h*processors/year

14 Research Infrastructures supported on the ESFRI roadmap
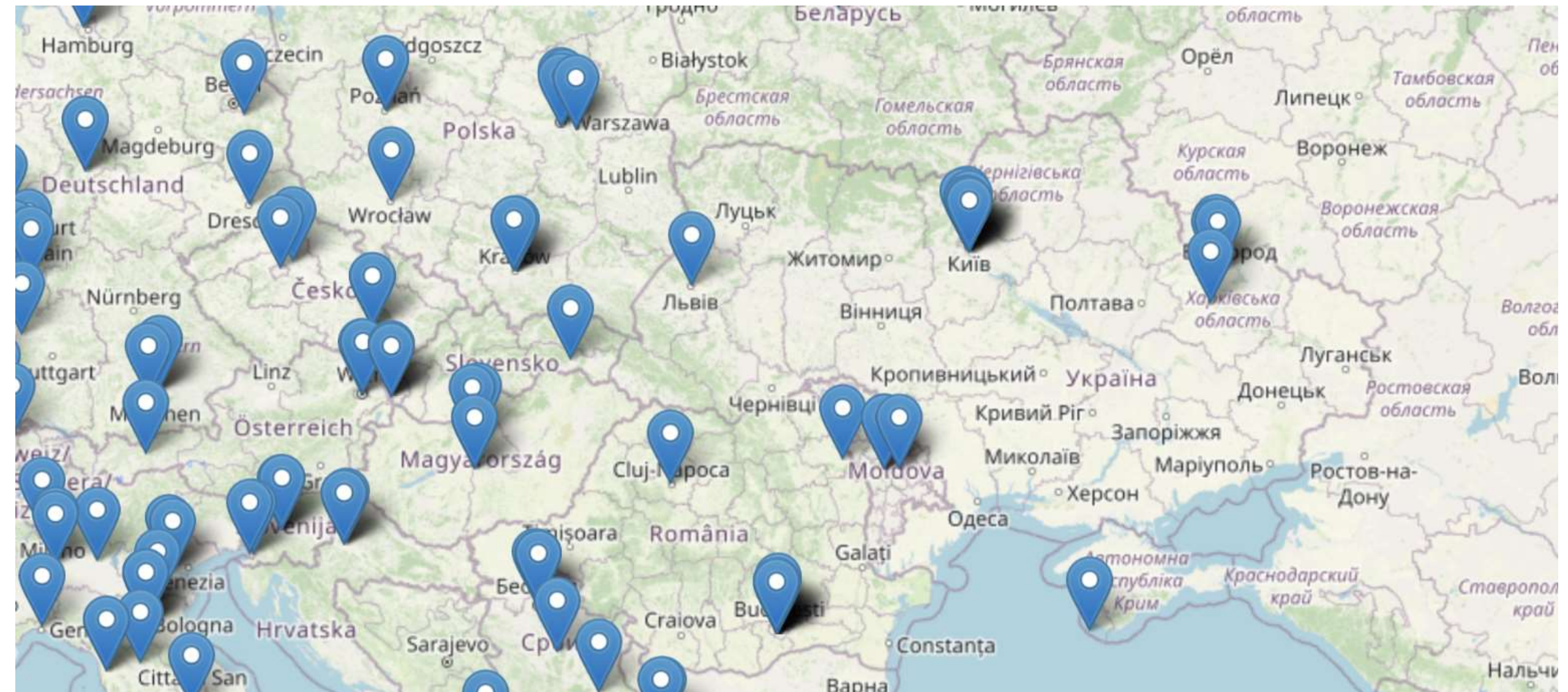
EGI Federated Cloud

1 new user community per week!

Opening infrastructures to support scientists during times of war

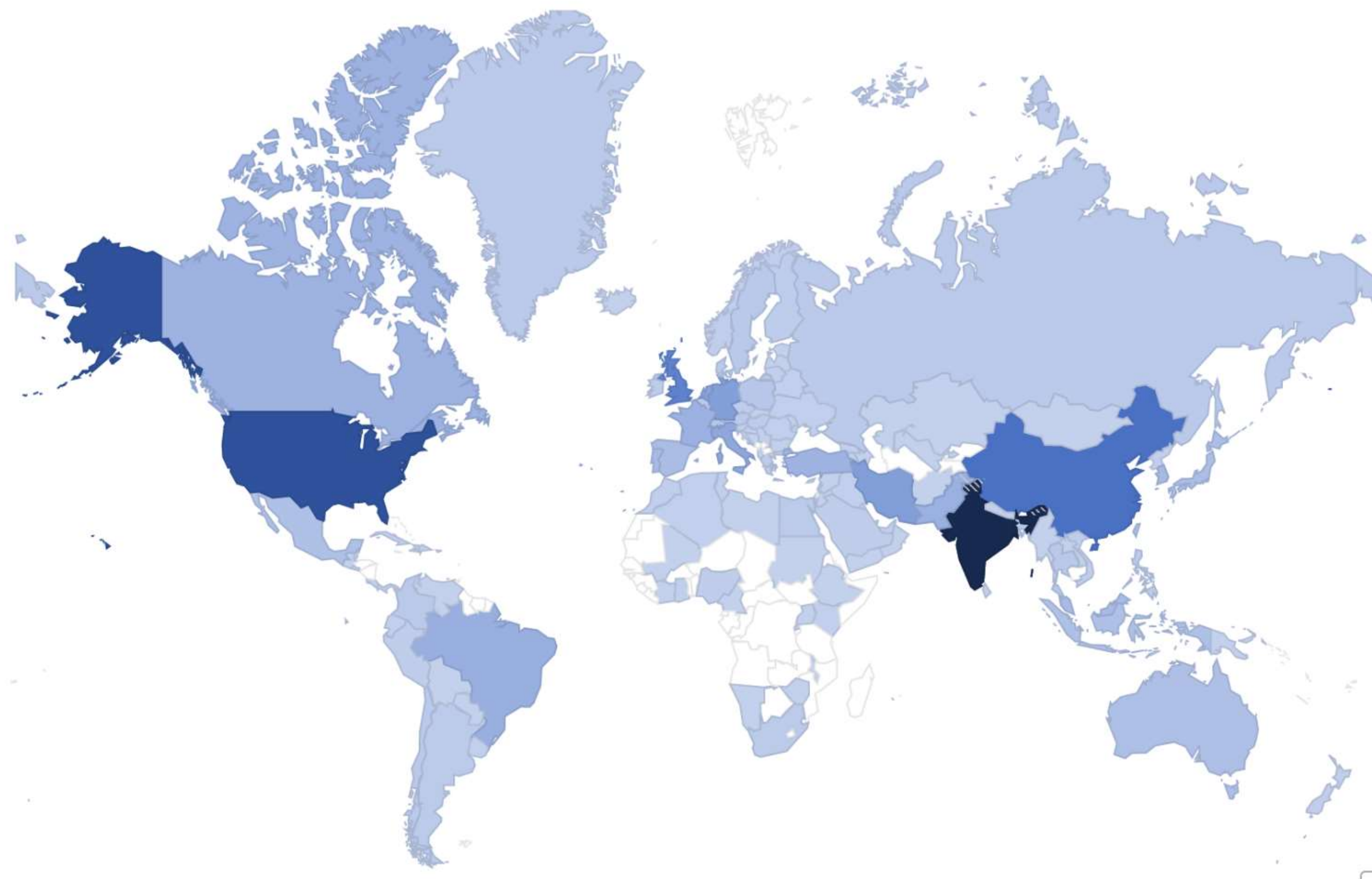# Open Science practices in international scientific collaborations
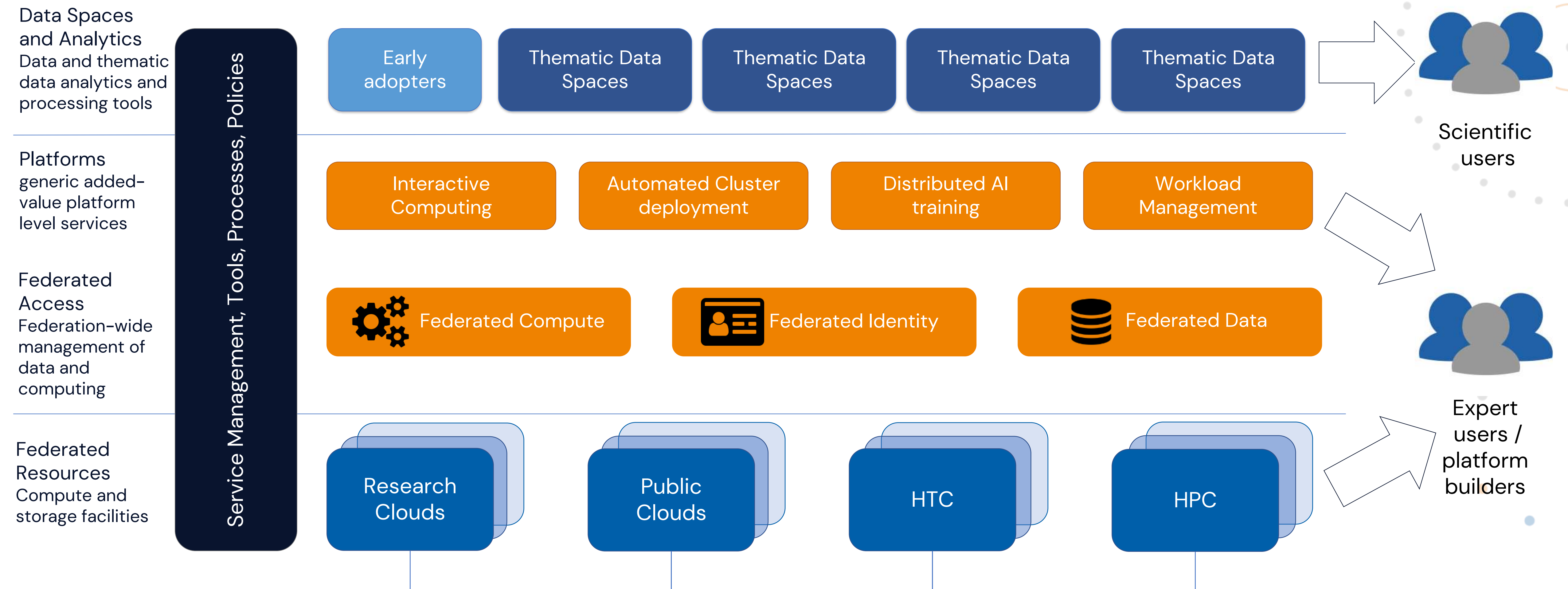
2. Open research software

Open tools for simulation addressing the COVID-19 pandemic

A joint effort of WeNMR, EGI Federation (Europe),
Open Science Grid (USA) and CBPF (Brazil): +100% capacity during
2020–2022

Worldwide User Map

The HADDOCK web portal is being used by **31748 users** accross **136 countries**!

Architecture

Data Spaces and Analytics
Data and thematic data analytics and processing tools

Platforms
generic added-value platform level services

Federated Access
Federation-wide management of data and computing

Federated Resources
Compute and storage facilities

Service Management, Tools, Processes, Policies

Early adopters

Thematic Data Spaces

Thematic Data Spaces

Thematic Data Spaces

Thematic Data Spaces

Interactive Computing

Automated Cluster deployment

Distributed AI training

Workload Management

Federated Compute

Federated Identity

Federated Data

Research Clouds

Public Clouds

HTC

HPC

Scientific users

Expert users / platform builders

Integrating HPC access in EGI and EOSC

Use cases

- **Climate research** use case from ENES (CMCC, Italy)
- **High Energy Physics** simulations for the High Luminosity run of the Large Hadron Collider (CERN) HEP
- **Cross platform fusion** workflows (UK Atomic Energy Authority) PROMINENCE
- **Photon and neutron science** use case from the ELI–NP Research Infrastructure (IFIN–HH, Romania)
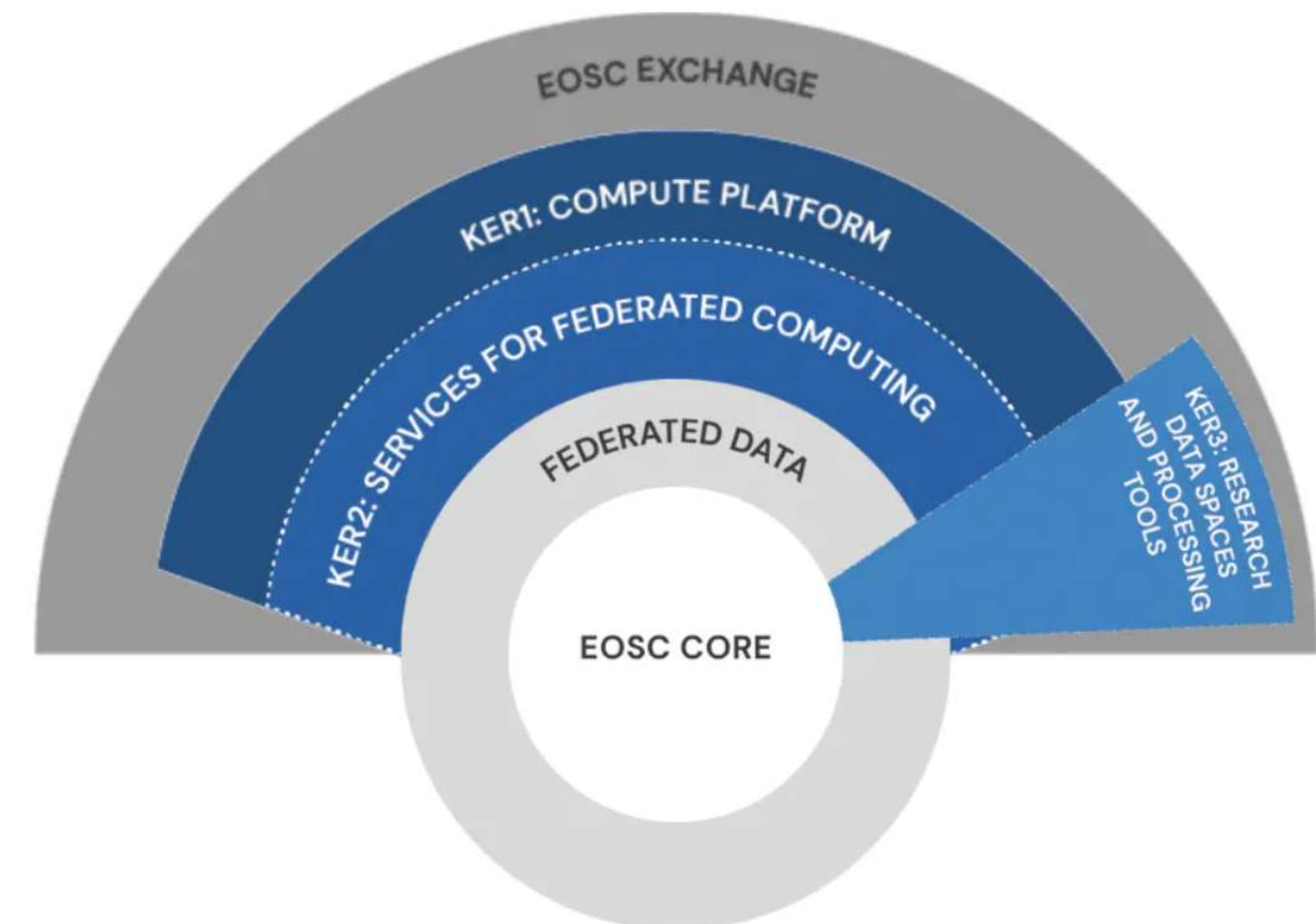
Providers

- CESGA (Spain)
- IICT BAS (Bulgaria)
- LIP/INCD (Portugal)
- TUBITAK (Turkey)

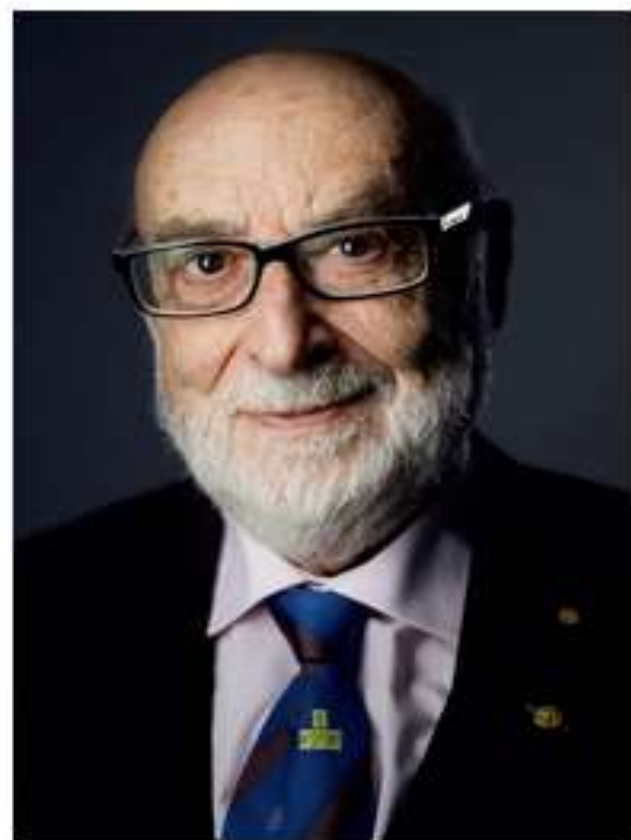HPC Integration [Handbook](#)

EOSC Compute Platform

Open Science practices in international scientific collaborations

3. Open data

The Nobel Prize in Physics 2013

© Nobel Media AB. Photo: A. Mahmoud
François Englert
Prize share: 1/2

© Nobel Media AB. Photo: A. Mahmoud
Peter W. Higgs
Prize share: 1/2

The Nobel Prize in Physics 2013 was awarded jointly to François Englert and Peter W. Higgs "for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider."
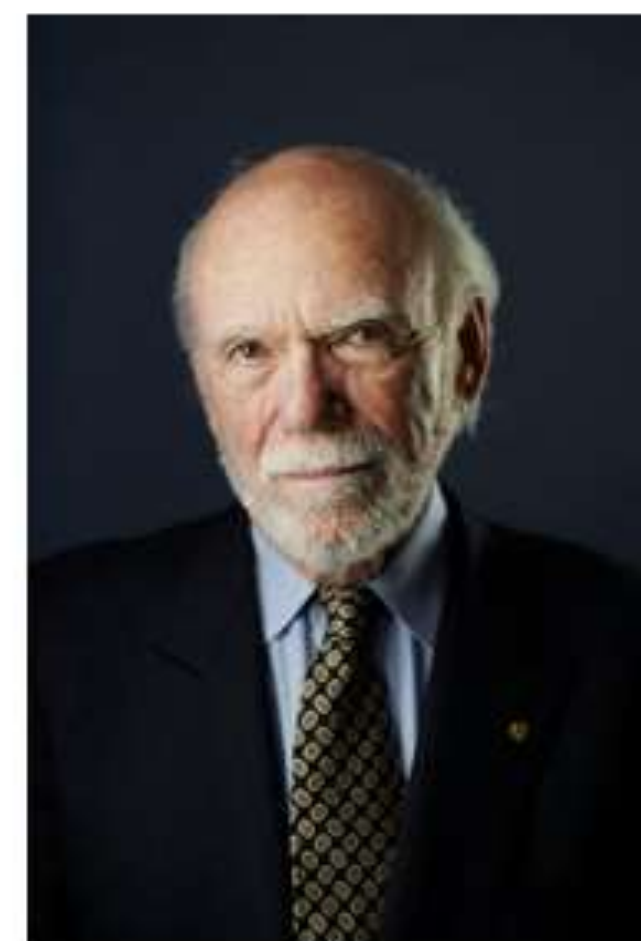
The Nobel Prize in Physics 2017

© Nobel Media AB. Photo: A. Mahmoud
Rainer Weiss
Prize share: 1/2

© Nobel Media AB. Photo: A.Mahmoud
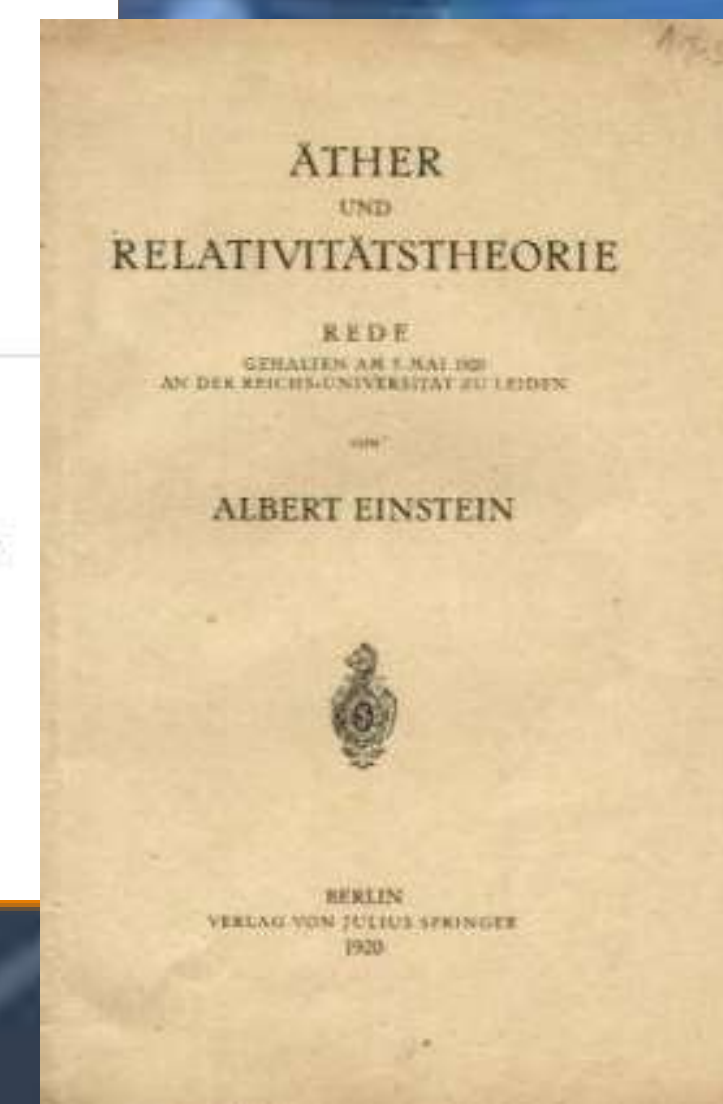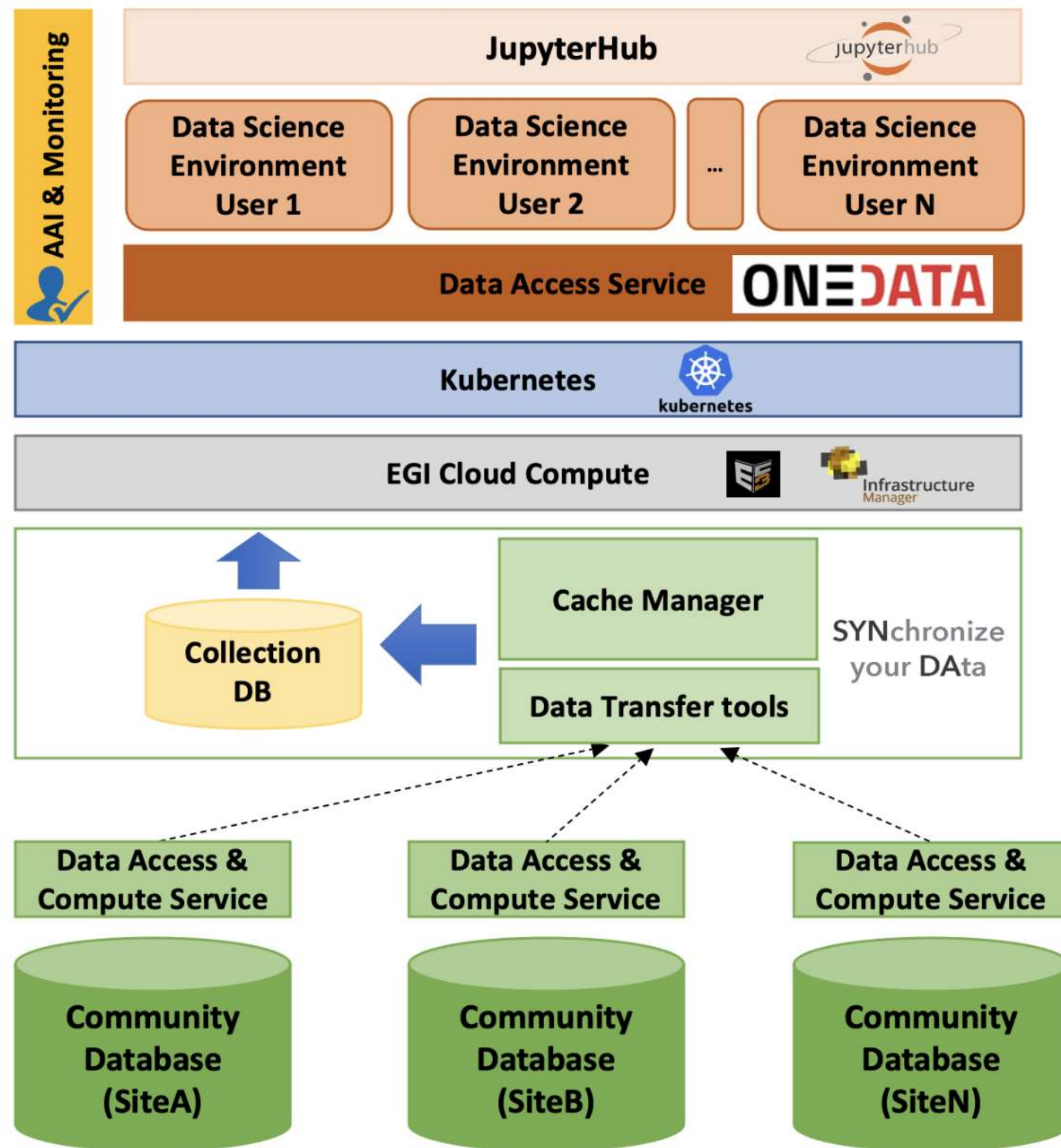**Barry C. Barish**
Prize share: 1/4

© Nobel Media AB. Photo: A.Mahmoud
Kip S. Thorne
Prize share: 1/4

The Nobel Prize in Physics 2017 was divided, one half awarded to Rainer Weiss, the other half jointly to Barry C. Barish and Kip S. Thorne "for decisive contributions to the LIGO detector and the observation of gravitational waves."

ÄTHER
UND
RELATIVITÄTSTHEORIE

REDE

ALBERT EINSTEIN

BERLIN
VERLAG VON JULIUS SPRINGER
1920

ENES Data Space

ENES delivers an open, scalable and cloud-enabled data science environment for climate data analysis on top of the EGI Federation

Single entry point for:

- Datasets
- Storage & Compute resources
- Data Science Software Stack
- IDE & Applications
- SaaS/PaaS approach

A multi-disciplinary environment where researchers can publish, find and re-use data, tools and services, enabling them to better conduct their work

> Builds on existing infrastructures and services supported by the European Commission, Member States and research communities.
> Brings these together in a federated 'system of systems'

Openness in science has been successfully adopted to enable breakthrough discoveries

Science has no borders.
With open science we can tackle the scientific challenges of tomorrow