



# The ascent of Open Science and the the European Open Science Cloud

***Workshop: FAIR Data and the European Open Science Cloud***



eosc-hub.eu



@EOSC\_eu

*Tiziana Ferrari / EOSC-hub Project Coordinator*

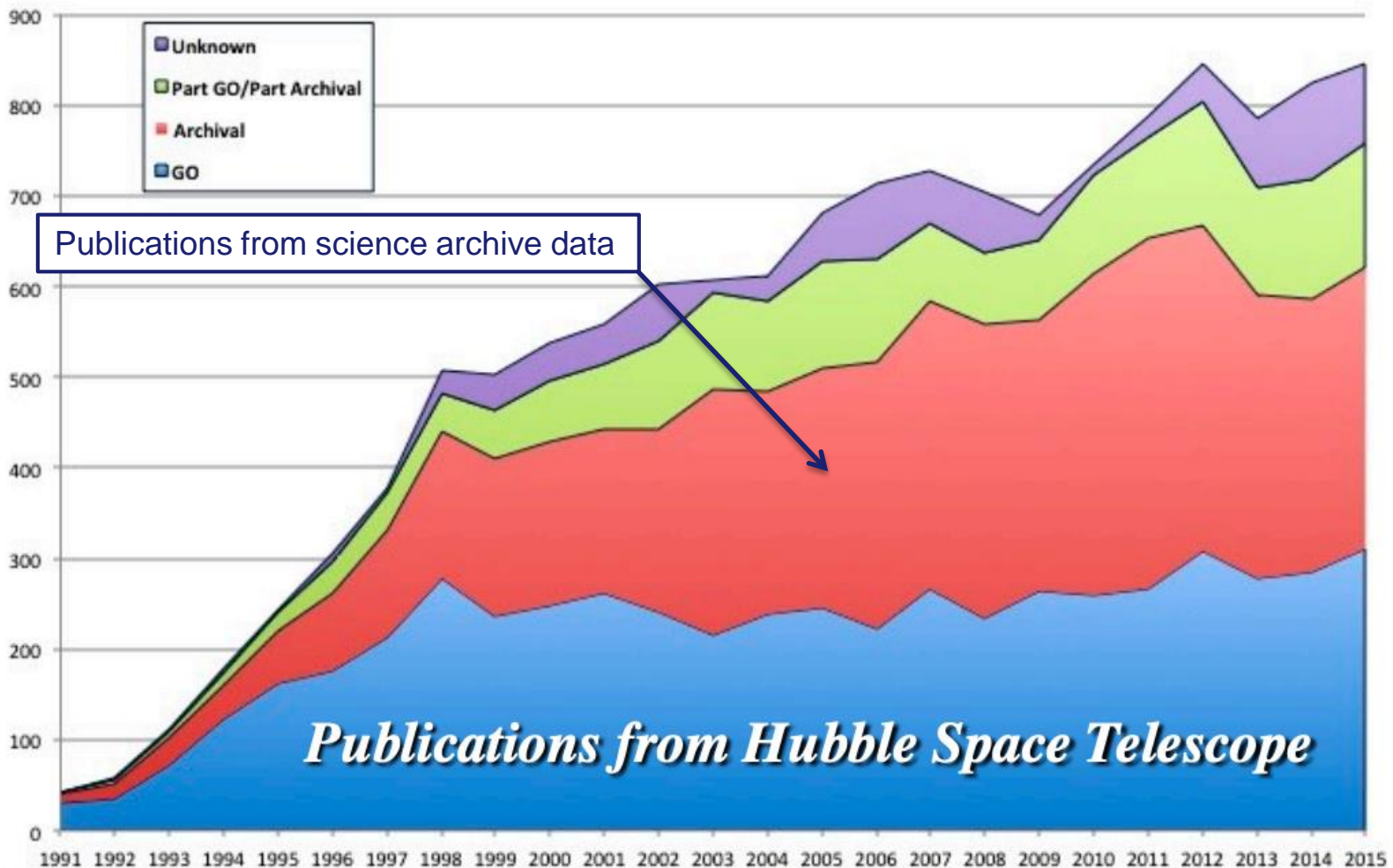


- Open Science needs for European excellence in science
- The European Open Science Cloud (EOSC) and its mission
- From vision to implementation: the EOSC-hub project
- Conclusions

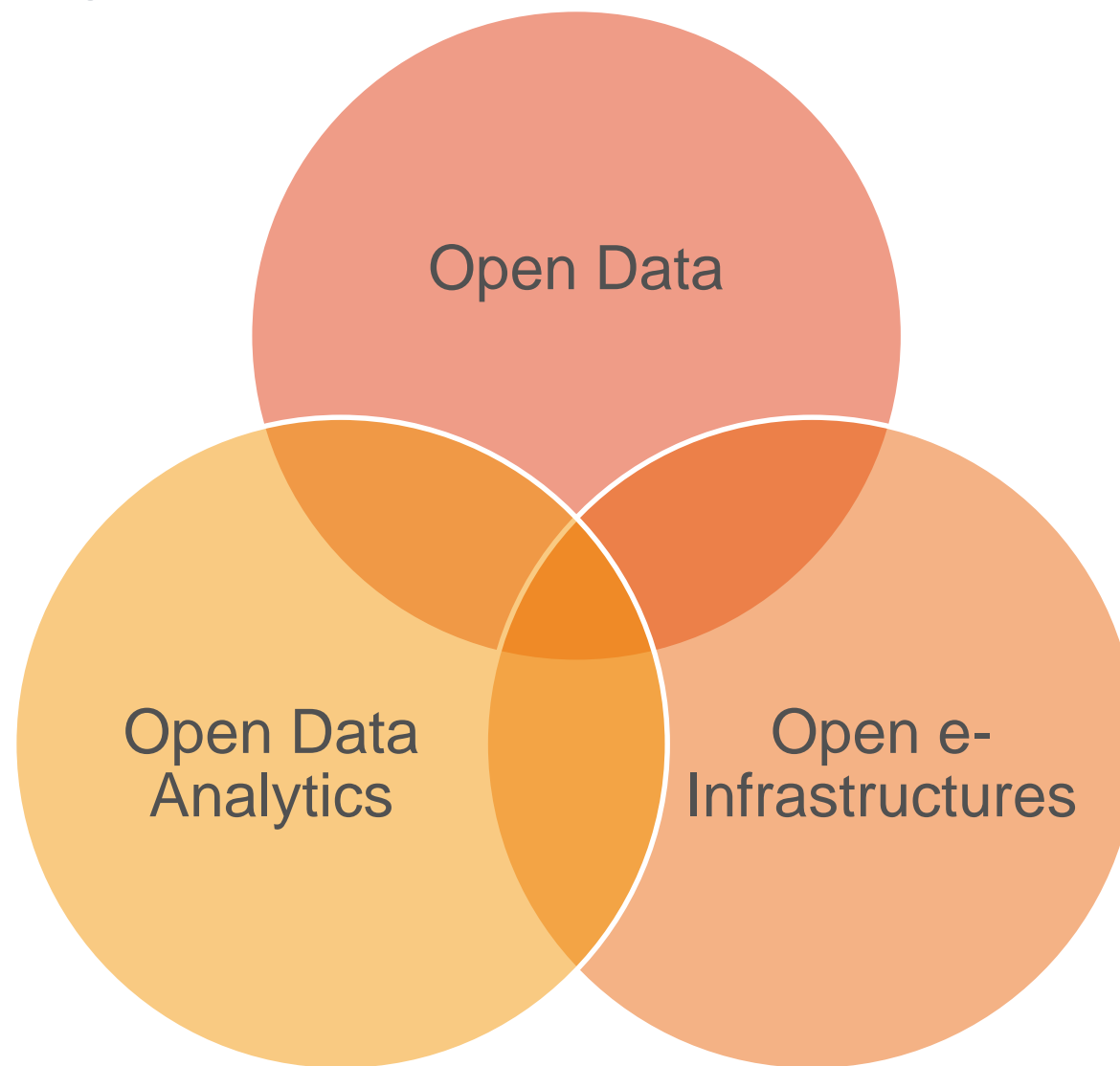
- The movement to make scientific research and its dissemination **accessible to all levels** of an inquiring society, amateur or professional.
  - Need: Scientific products (publications, data, physical samples, and software) and capacities for their access and exploitation
- A continuation of, rather than a revolution in research practices



## *Science archives are a multiplier for total science output*



- Assumes the archives are persistent and maintained
- Assumes archival data is open and accessible to users
- Assumes data products stored are appropriate for general use
- Assumes users retrieving data have resources to process to a science result



# Open Data for Basic Science and Scientific Excellence

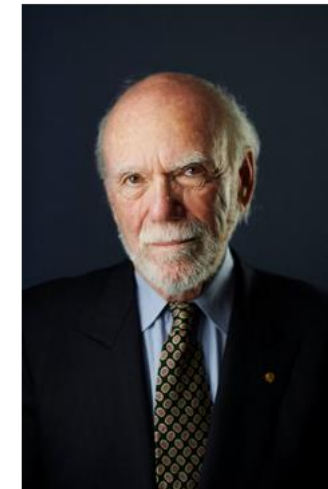
The LIGO-VIRGO Collaboration:  
The discovery of gravitational waves

Expanding and exploring or explore the  
knowledge in physics with the LIGO-VIRGO  
collaboration

## The Nobel Prize in Physics 2017



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



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Barry C. Barish  
Prize share: 1/4



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Kip S. Thorne  
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# Evidence 100 years after Einstein's theory of relativity

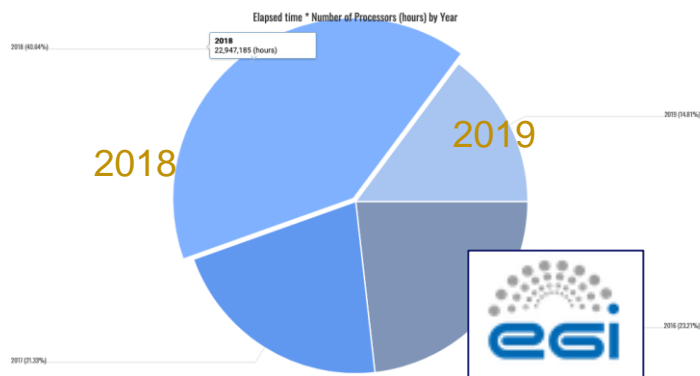


*The masses of the two merging black holes — 29 and 36 solar masses, respectively. The single black hole that resulted from this smashup contains just 62 times the mass of the sun.*

# Sharing data across international user groups



The Virgo detector is located in Italy, within the site of the [European Gravitational Observatory](#).



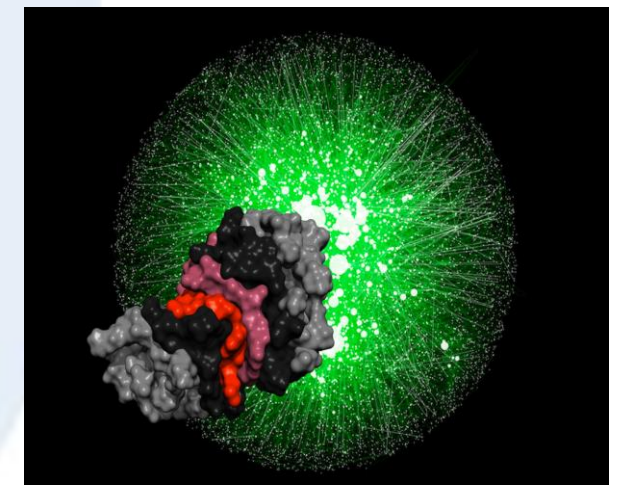
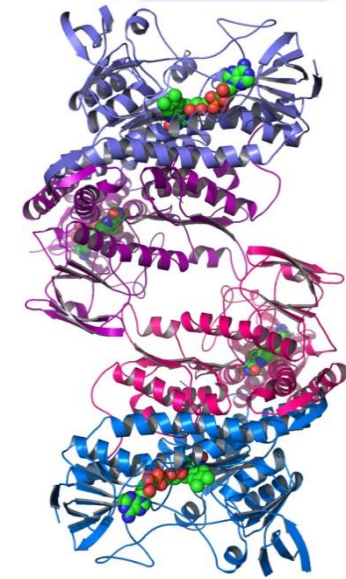
- The [LIGO Scientific Collaboration](#)
  - > 1000 scientists from the USA and 14 other countries. The two LIGO detectors are located in Hanford and Livingston in the US.
- The [Virgo Collaboration](#)
  - > 250 physicists and engineers affiliated with European
- Data from the LIGO and VIRGO detectors is shared and used for cross-correlation and validation of observation results
- 56 Million CPU hours in EGI (2016-2019)

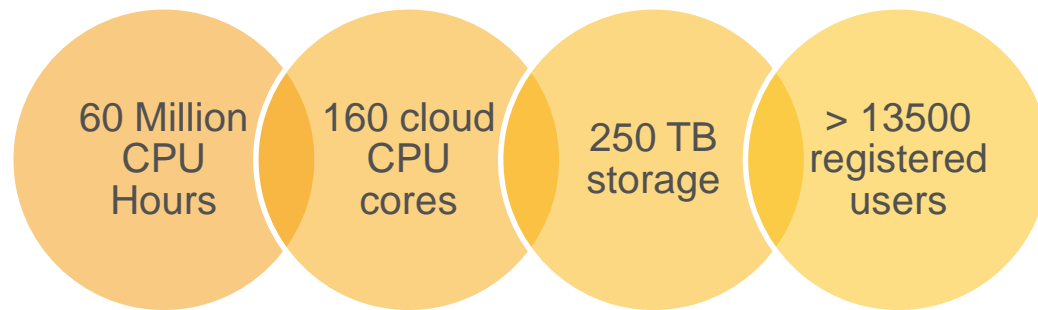


# Open Data Analytics to Understand the Pathways to Disease

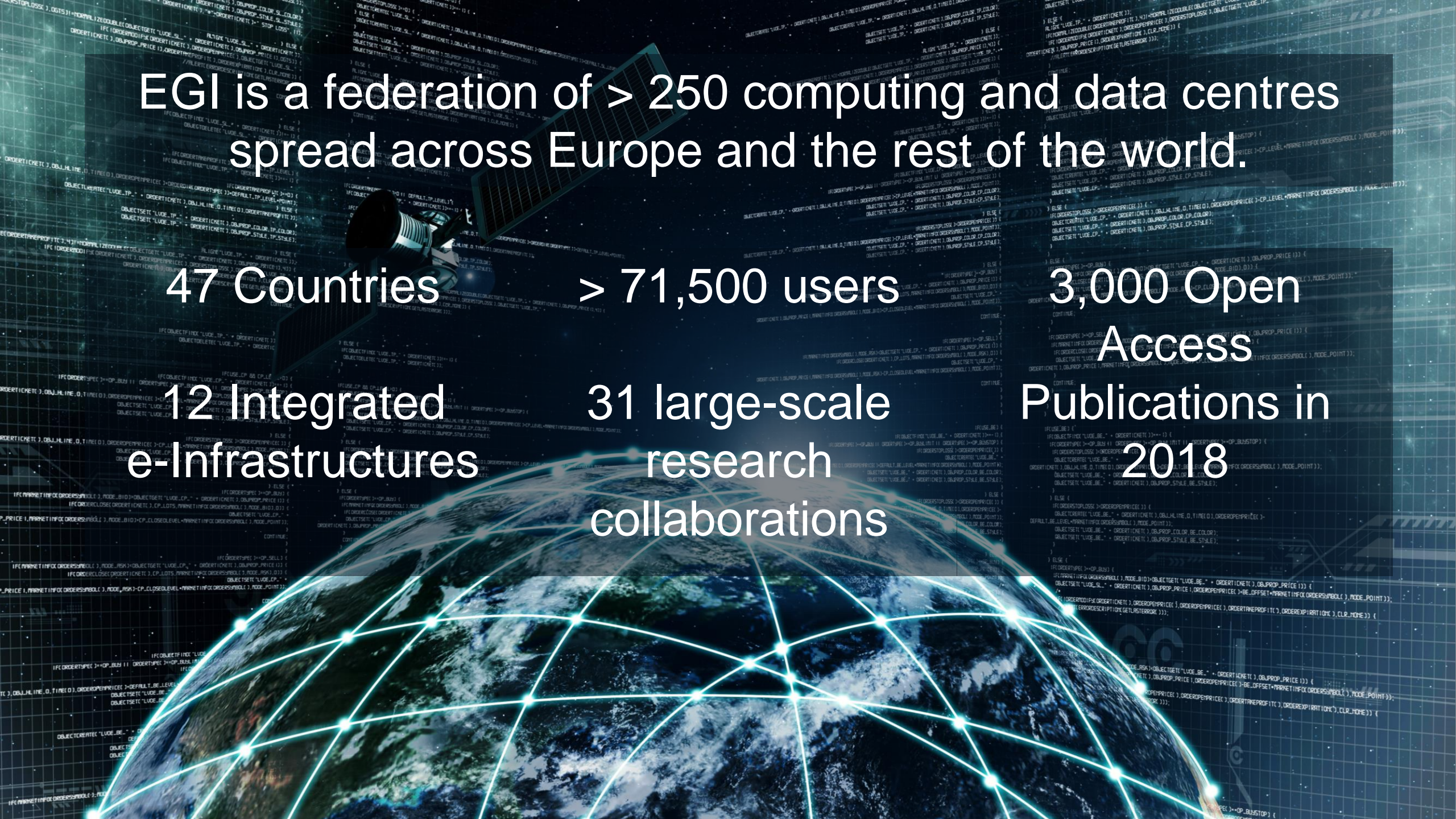
The WeNMR international community of practice

- *Proteins and biomolecules interact in a complex network*
- *Glitches in this network can cause diseases like cancer*
- *Researchers use 3D models to study how protein and biomolecules interact*
- *This structural information is key to understand the origins of disease and to develop new drugs*





- The analysis and interpretation of the results relies on specialised software
- Standalone software applications are difficult to install and maintain
- The complex workflows involved in 3D structural modelling are difficult to manage
- National digital infrastructures are **not open by default** to international research groups → Need for a long-term resource, data and platform infrastructure
- *Access to compute resources is difficult to obtain, negotiate and/or guarantee for extended periods of time → EGI Federation (EU) and Open Science Grid (USA)*



EGI is a federation of > 250 computing and data centres spread across Europe and the rest of the world.

47 Countries

> 71,500 users

3,000 Open Access

Publications in

12 Integrated e-Infrastructures

31 large-scale research collaborations

2018

# The EGI Federation (Sep 2019)



5.0 Billion  
CPU core wall  
time / year

> 1 Million  
computing  
cores in 2019

> 740 PB disk  
& tape

2,915 service  
end-points

## The worldwide resource platform hosting WeNMR applications, computing and data



USA

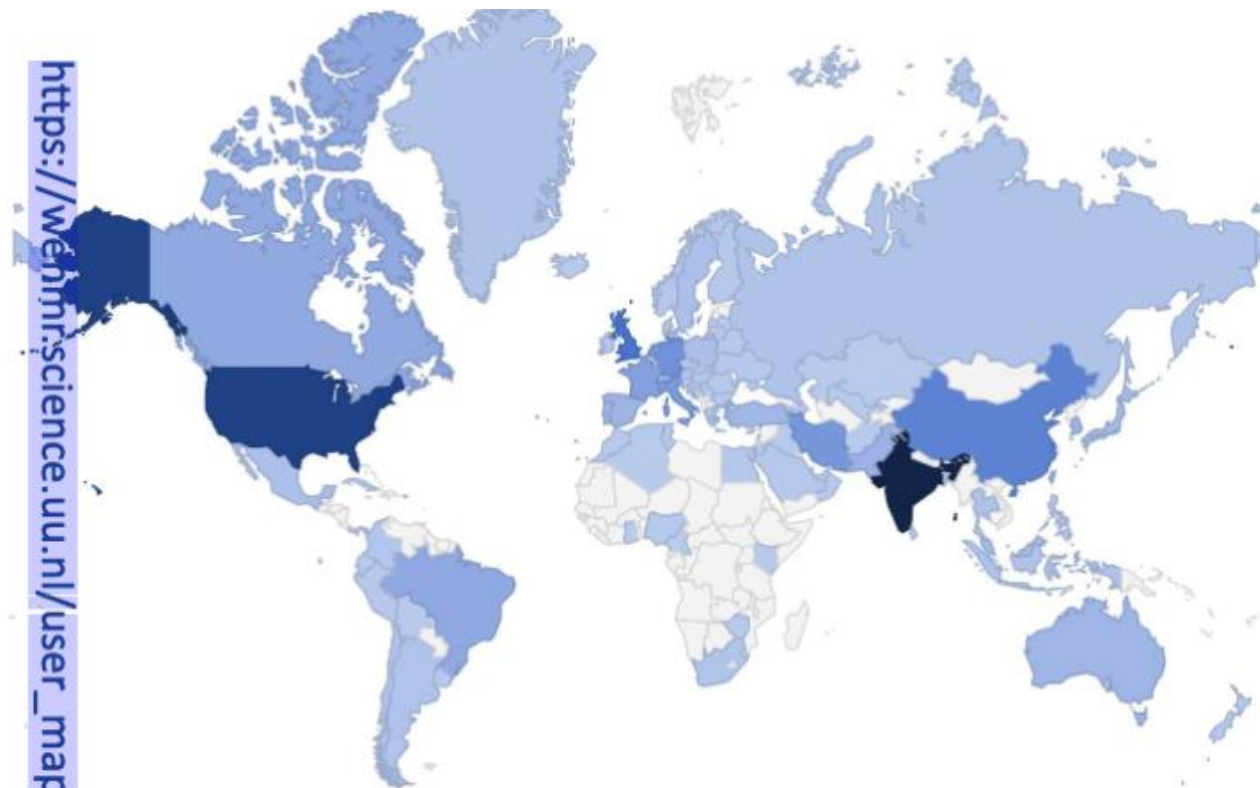


Europe, Africa and Asia Pacific Region

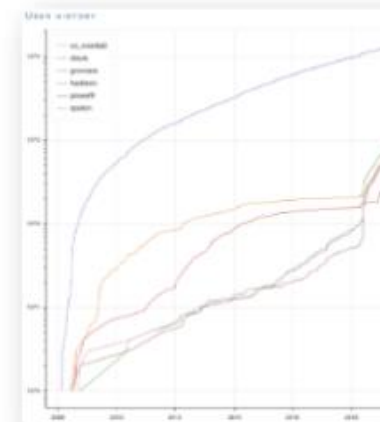
Shared and federated resources for  
the Structural Biology WeNMR  
community via

# WeNMR: An international User Community of > 15,000 researchers

[https://wennr.science.uu.nl/user\\_map](https://wennr.science.uu.nl/user_map)



**Sustained growth of our user base**



	Country	All_Users ▼	HADDOCK	DISVIS	POWERFIT	SPOTON	CS_ROSETTA3	GROMACS
1	Total Users	13,647	13,108	861	611	688	643	421
2	EU Users	3,085	2,873	244	141	154	158	84
3	India	2,947	2,897	119	98	133	97	107
4	United States	2,166	2,081	147	86	111	93	45



## EOSC from vision to implementation



# About the European Open Science Cloud

*The **federated infrastructure** and supporting initiative providing  
all researchers, innovators, companies and citizens  
with **seamless access** to an **open-by-default, efficient and  
cross-disciplinary** environment  
for storing, accessing, reusing data, tools, publications and other  
scientific outputs for research, innovation and educational purposes*



## Project Overview

*20 digital research infrastructures, EGI, EUDAT CDI and INDIGO-DataCloud jointly offering services, software and data for advanced, data-driven research & innovation*

**EOSC-hub: Integrating and managing services for the European Open Science Cloud**

**Grant Agreement ID 777536**

**Tot budget: €33,287,542**

**100 Partners, 76**

**beneficiaries**

**EU Budget**

**€ 30 000 000**

**3830 PMs, 106 FTEs**

**+150 staff involved**

**Coordinator  
STICHTING EGI**

**Consortium**

**100 partners**

**53 countries**



# EOOSC-hub



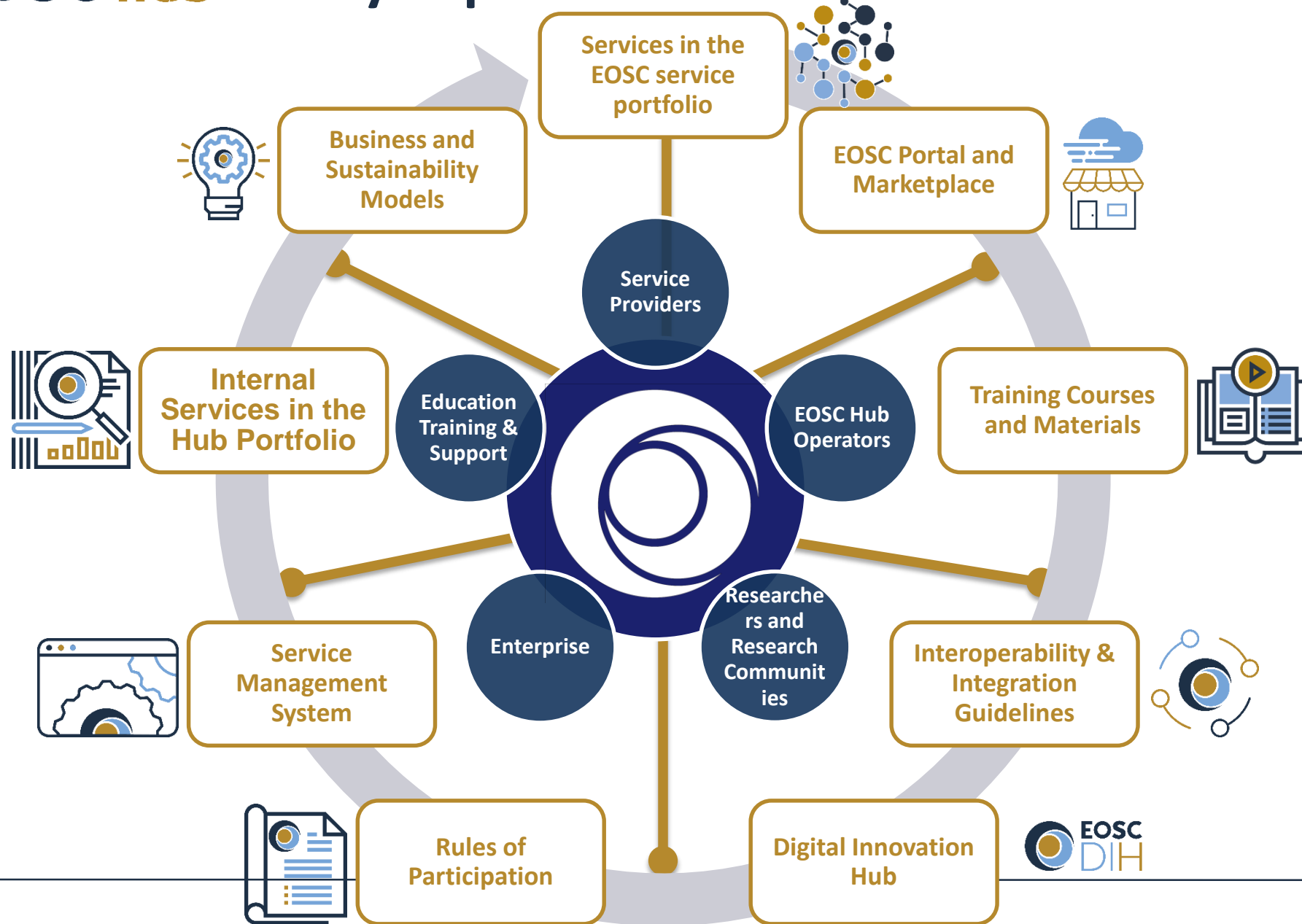
## Mission

*The EOOSC-hub project mobilises providers of pan-European relevance offering services, software and data for advanced data-driven research and innovation.*

*These resources are offered via the Hub – the integration and management system of the European Open Science Cloud, acting as a European-level entry point for all stakeholders.*

OBJECTIVE	EOSC-hub RESPONSE
<p>Increase the ability to <b>exploit research data across scientific disciplines</b> and between the public &amp; private sector</p>	<ul style="list-style-type: none"> <li>&gt; <b>Publish, discover, access</b> services and resources for all scientific disciplines</li> <li>&gt; <b>Open</b> to national, regional, pan-European providers, and supports different exploitation models (e.g. free at point of use, commercial)</li> </ul>
<p>Increase interoperability, <b>interconnect the existing and the new research digital infrastructures across Europe</b></p>	<ul style="list-style-type: none"> <li>&gt; Provide <b>thematic services integrated with European compute/data platforms</b> for data exploitation</li> <li>&gt; <b>Single sign on, integrated access and order management</b></li> </ul>
<p>Support <b>open science</b></p>	<ul style="list-style-type: none"> <li>&gt; <b>Services to share and discover research artefacts</b> (publications, datasets, software, workflows etc.), research artefacts data sources (publication repositories, publishers, data archives, software archives, etc.)</li> </ul>





*“The project developed and operates key components of the EOSC Federating Core”*



Organizational Model



Regulatory Tier: Harmonized policies, technical architecture and interoperability guidelines



Federating Tier: Federation tools, Portal and Marketplace; order management system, accounting, monitoring and helpdesk; AAI; Service Manage



Shared Resources Tier: Compute and data management integration, piloting



Service Portfolio Management

*“The project engages with Service Providers daily and provides integration and service aggregation tools”*



Daily operations of the EGI Federation and EUDAT CDI




Service Provider Forum



Service Management System with 13 processes



Onboarding procedure and 42 new service registration requests, the Service Description Template 



SP integration model based on packages of access enabling and federation services



Creation and promotion of harmonized policies for EOSC (data sharing policies, AUP, security policies)

# Highlights – Engagement with Research Communities and Projects

*“The project engages and supports users on a daily basis with a dedicated enabling programme, order management and training”*



Unified EOSC-hub helpdesk



Early Adopter Programme and selection procedures, 12 applicants



Digital Innovation hub and Competence Centres, with some integrated services already brought to the Marketplace



> 60 training events, > 1500 people trained



65 unique user orders



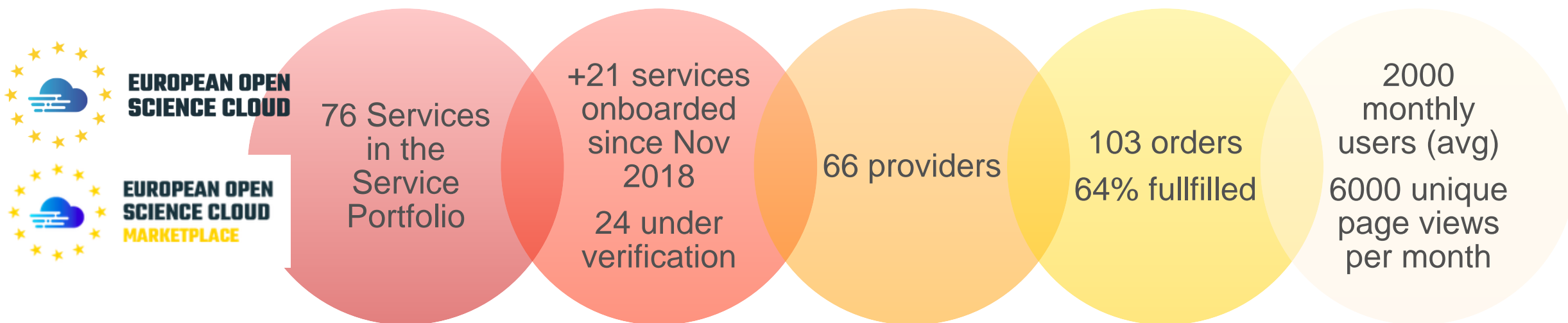
Market analysis to understand the need for / level of demand for digital services





From implementation to impact

- An operational Marketplace adopting a service Integration and Management approach to managing suppliers and integrating them to provide a single business-facing EOSC Hub



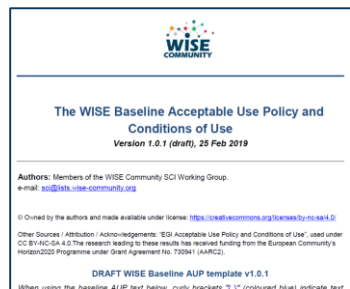
# Avoid the locking-in to particular hardware or software platform



## success story: Security for Collaborating Infrastructures SCI



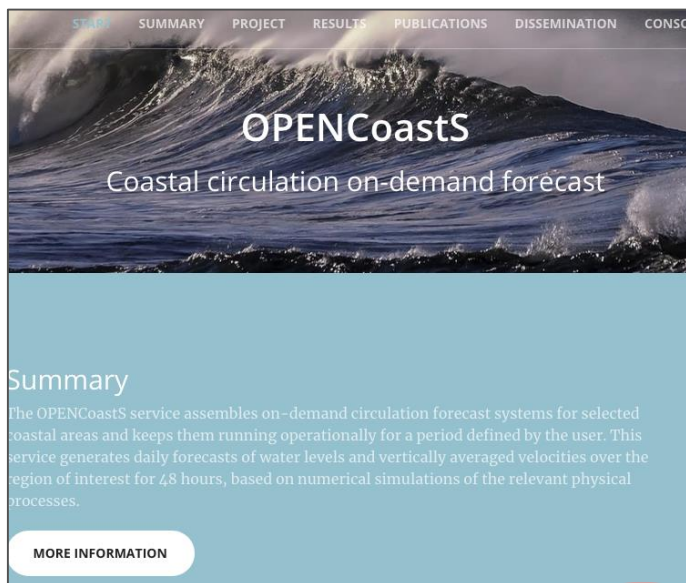
Moving between all major infrastructures – endorsement of SCI, starting the AUP work



In NL: SURF Science  
 Collaboration Zone, DE:  
 Helmholtz Data Federation,  
 UK-IRIS & GridPP

- **Common Acceptable Use Policy** baseline in research communities & e-Infrastructures
  - Transparent and clear: ‘10 commandments’
  - Simplify load on users: ‘accept’ **only once**
  - Users can **move seamlessly** between service providers and infrastructures
- Developed **in WISE-SCI** jointly by EOSC-hub, AARC, GEANT, EGI, EUDAT, ...
- **Global interoperability:** within Europe (NL, DE, UK, ...), XSEDE (US), communities like SKA, WLCG, life sciences ...  
*More joint policy templates being prepared!*

## Success story: OPENCoastS



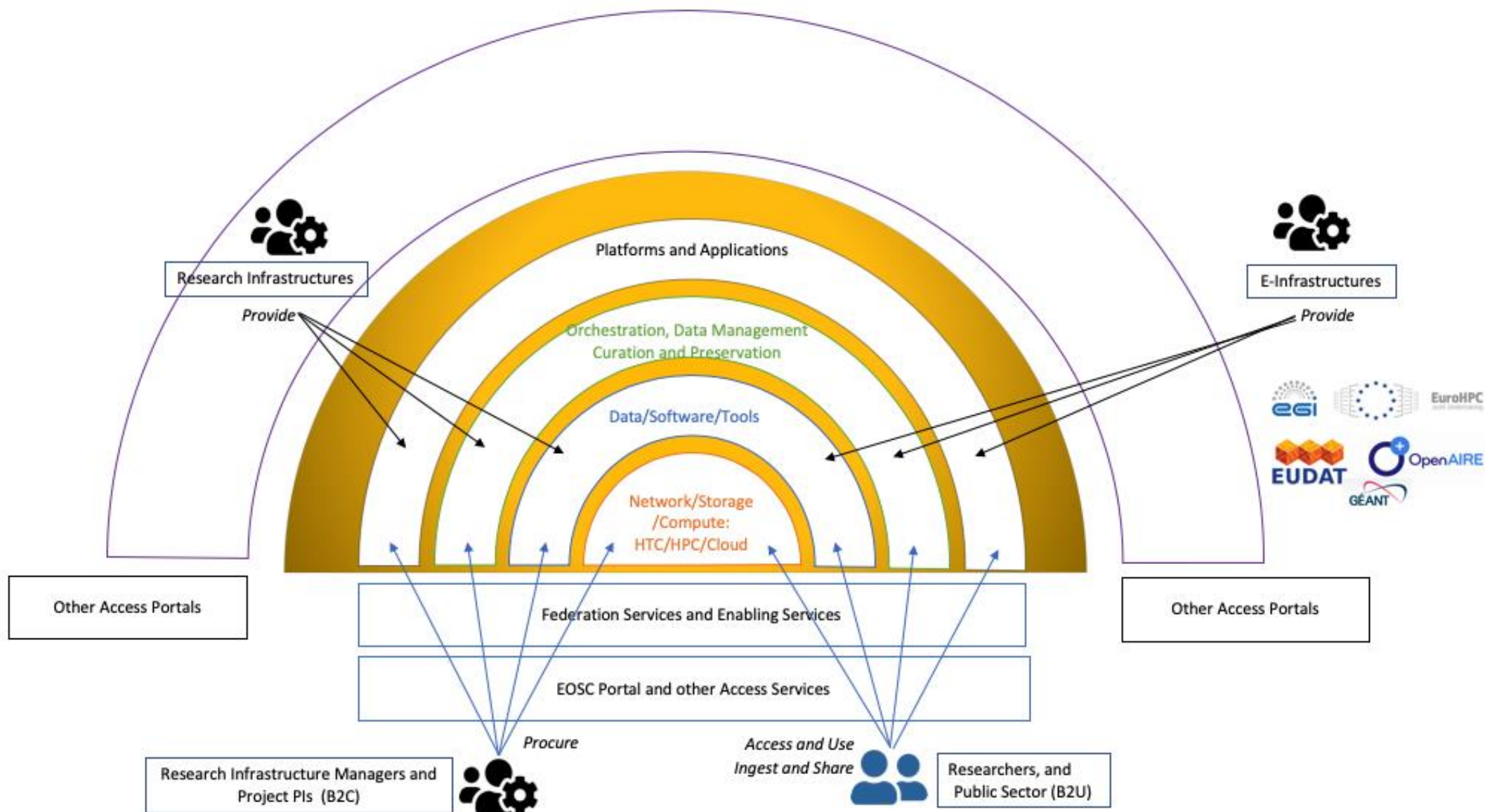
+100% cloud utilization in 2019

2 events, 150 participants from 14 countries

1 hands-on in the 14<sup>th</sup> SILUSBA conference, a major conference for water in the Portuguese speaking countries of Africa

- OpenCoastS: an innovative and free platform to generated on-demand forecasts
  - **First** national EOSC-hub thematic service provider which joined the Marketplace, **opening access to international user communities** thanks to VA funding
  - International cooperation with the Atlantic Interactions Research Centre
- After the start of EOSC-hub, 46 international deployments (forecast systems) of the service were created while, previously, it was only used in Portugal

	Baseline	M9	M18	Increase M9→M18	Increase from project start
Thematic service	1,786	2,820	6,846	4,026 (+143%)	5,060 (+283%)
Federation service	15,287	16,480	20,966	4,486 (+27%)	5,679 (+37%)
Common service	3,327	4,303	6,791	2,488 (+75%)	3,464 (+104%)
<b>Total</b>	<b>20,400</b>	<b>23,603</b>	<b>34,603</b>	<b>11,000 (+54%)</b>	<b>14,203 (+70%)</b>



- The European Open Science Cloud has the opportunity to boost the current support to open science by providing the necessary **policy, funding and organizational framework** needed by data-driven science
- After one year from the launch of EOSC in Vienna in November 2018 the first **impacts** on scientific communities and business are already tangible
- We expect EOSC to **sustain the costs of open data policies** and remove today's **service provisioning barriers** that divide Research Infrastructures and e-infrastructures

**Thank you  
for your attention!**

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*Questions?*



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