Status overview

Isabel Campos

CSIC
Consejo Superior de Investigaciones Científicas

on behalf of the IBERGRID collaboration

IBERGRID 2022 - Faro, 11/10/2022

ES-NGI

INCD

On the western edge of Europe on the Iberian Peninsula, sit Spain and Portugal….

Iberian Peninsula map by Robert Wilkinsons as of 1798

https://sciencenode.org/feature/ibergrid-tale-two-countries.php

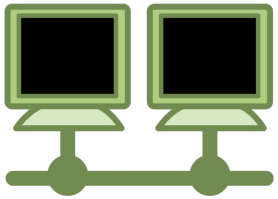
The two countries have many things in common and one of them is their grid infrastructure.

Since the early days of the European grid, they have shared responsibility for the infrastructure, combining expertise to provide the best support to their users.

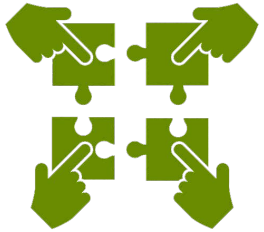
In 2007, they officially created IberGrid to formalise the arrangement and five years on they are still going strong.

Distributed computing infrastructure

a) Federates infrastructures from Iberian research and academic organizations (PT + ES) mainly focused:
   - Cloud Computing
   - Grid Computing
   - Data Processing



b) Enables a joint participation in European initiatives including EGI and EOSC supporting research communities
   - Provides the regional operations coordination for the computing and data processing activities of several user communities including WLCG, ESFRIs and others



c) Forum for common activities and sharing of knowledge.
   - Participation in EU and cross-border projects including both R&D and infrastructure oriented projects

Structure

GOBIERNO DE ESPAÑA
MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

REPÚBLICA PORTUGUESA
Ministério da Ciência, Tecnologia e Ensino Superior

CSIC
Consejo Superior de Investigaciones Científicas

FCT
Fundação para a Ciência e a Tecnologia
Ministério da Educação e Ciência

ES-NGI

IFCA
Instituto de Física de Cantabria
Tech coordination

INCD

LIP
Tech coordination

Iberian summit of Valladolid in Nov 2018

Valladolid, 21st November 2018

2. Na área de Computação Distribuída, os Signatários pretendem promover a colaboração nas seguintes áreas:

a) Apoiar a realização anual da conferência IBERGRID, realizada alternadamente no território de ambos os Estados dos Signatários;

b) Reforçar a colaboração entre os Signatários, com vista a otimizar e apoiar a participação da infraestrutura Ibérica IBERGRID em infraestruturas e iniciativas internacionais de computação distribuída e repositórios de dados, entre as quais se destaca o *European Open Science Cloud* (EOSC) e o *European Grid Infrastructure* (EGI);

c) Apoiar o desenvolvimento e integração de serviços temáticos de interesse para a comunidade científica a disponibilizar através da infraestrutura Ibérica IBERGRID;

d) Apoiar e fomentar a utilização da infraestrutura Ibérica IBERGRID no apoio à participação em projetos científicos estratégicos de interesse comum tais como a participação no CERN, o suporte aos ESFRIs e o AIR Center.

Assinado em Valladolid, no dia 21 de novembro de 2018, em dois originais, nas línguas portuguesa e castelhana, sendo ambos os textos igualmente válidos.

Pelo Governo
da República Portuguesa

O Primeiro-Ministro

Antonio Costa

Pelo Governo
do Reino de Espanha

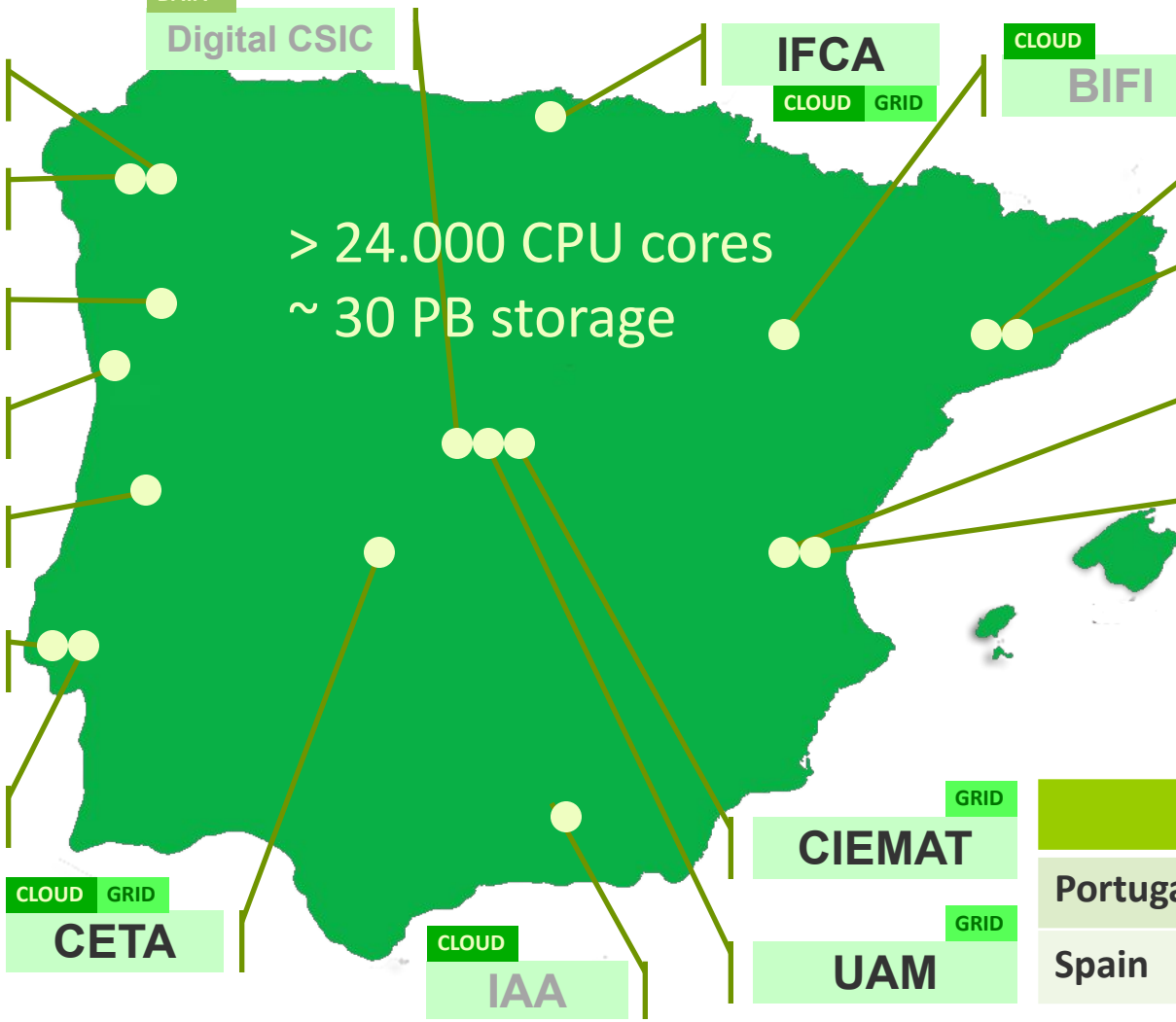
O Presidente do Governo

Pedro Sánchez Pérez-Castejón

Current MoU between Governments (2018-2024)

- Support the IBERGRID conference organized annually in each of the two countries.
- Reinforce the collaboration between both countries to support the IBERGRID participation in international initiatives and infrastructures of distributed computing and digital repositories among which EOSC and EGI.
- Support the development and integration of thematic services of interest to the scientific community to be made available through the IBERGRID infrastructure.
- Support and promote the use of the IBERGRID infrastructure to support the participation in common scientific projects of strategic interest ,such as the participation at CERN, in ESFRIs and in the AIR Center.

Joins PT + ES cloud, grid and data:

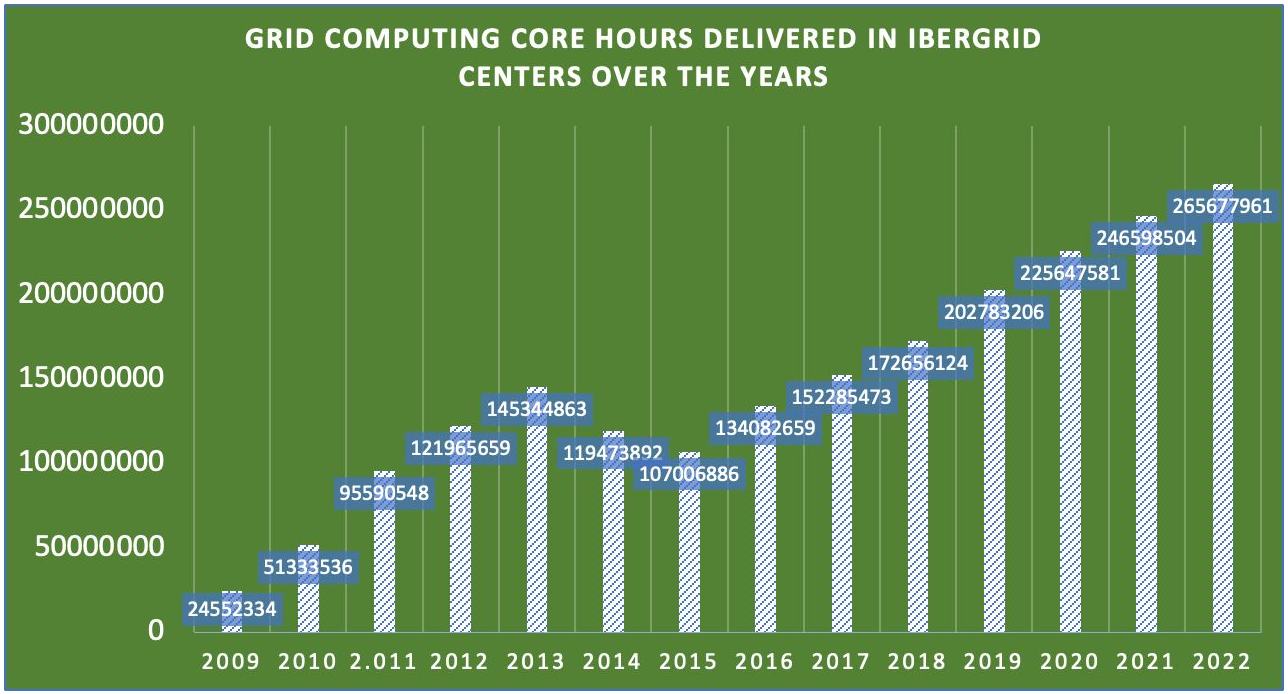


	Current	Planned
Portugal	2	+ 2
Spain	10	+ 3

HTC (GRID) COMPUTING

From 2006 to 2022
> 2000 million CPU hours
> 300 millions jobs

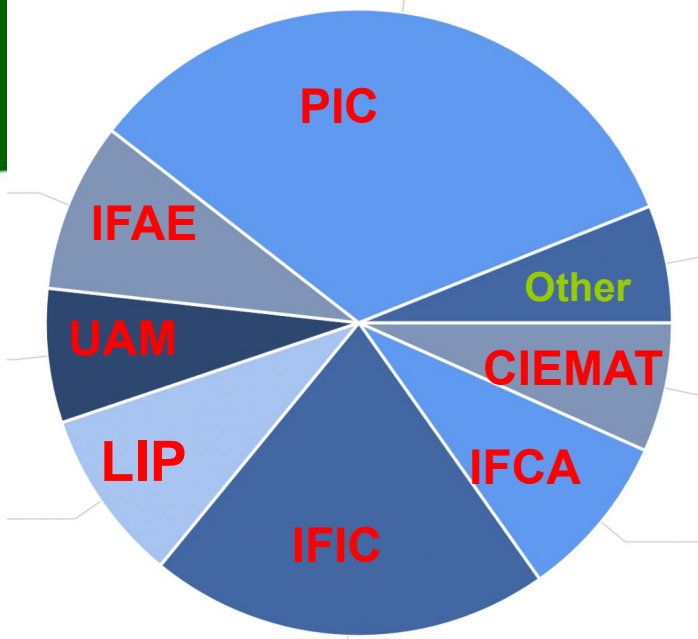
Last year
~ **260 million** CPU hours
~ **8 million jobs**



CSIC Consejo Superior de Investigaciones Científicas
PIC port d'informació científica
INCD Infraestrutura Nacional de Computação Distribuída
CESGA
IFAE Institut de Física d'Altes Energies
Ciemat Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas
LIP
UAM Universidad Autónoma de Madrid
USC Universidade de Santiago de Compostela

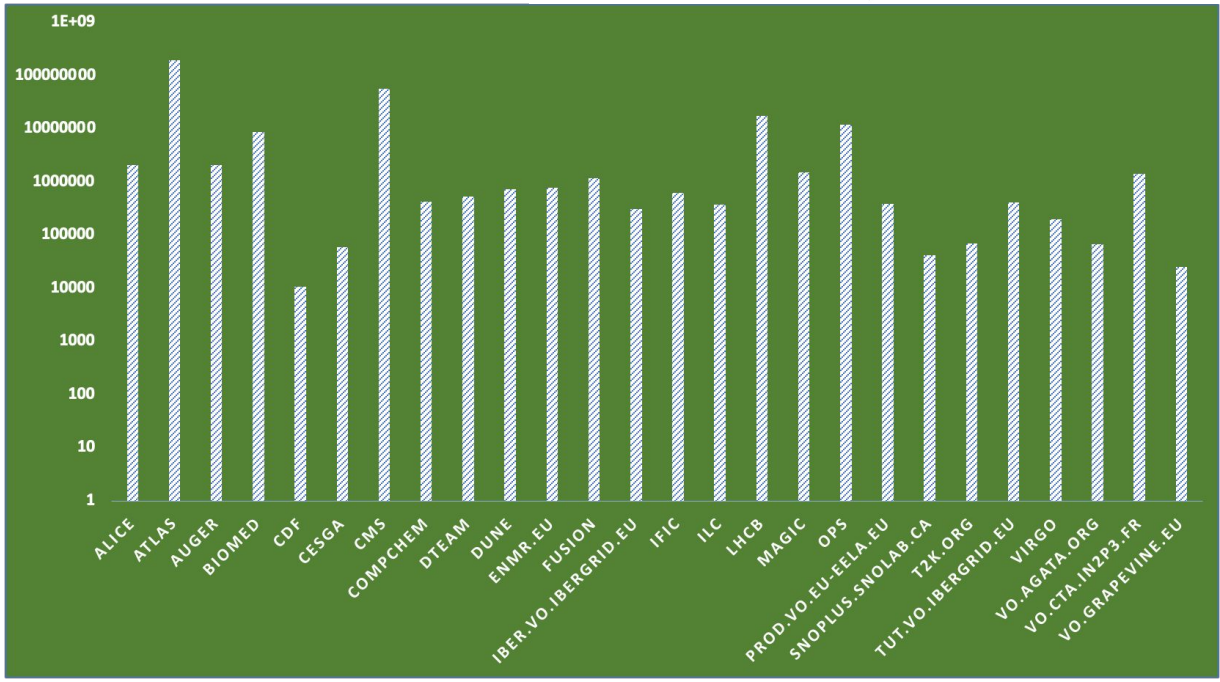
Grid Jobs

- By site and VO
- From 2006 to 2022
- Removing small usage



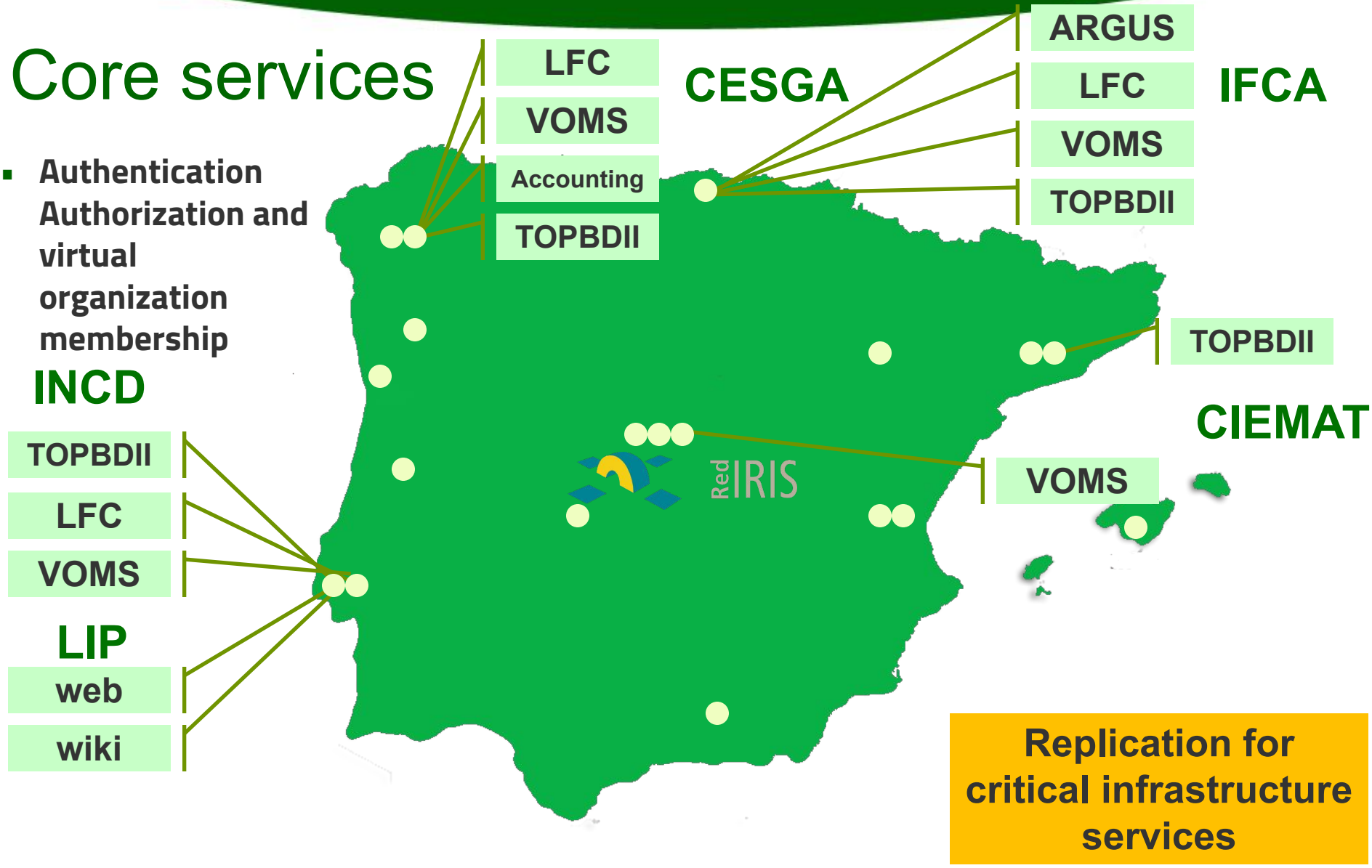
Usage in Grid
mostly (85%) LHC Data
analysis and simulations

Astroparticle experiments,
Biomedicine
Comput. Chemistry



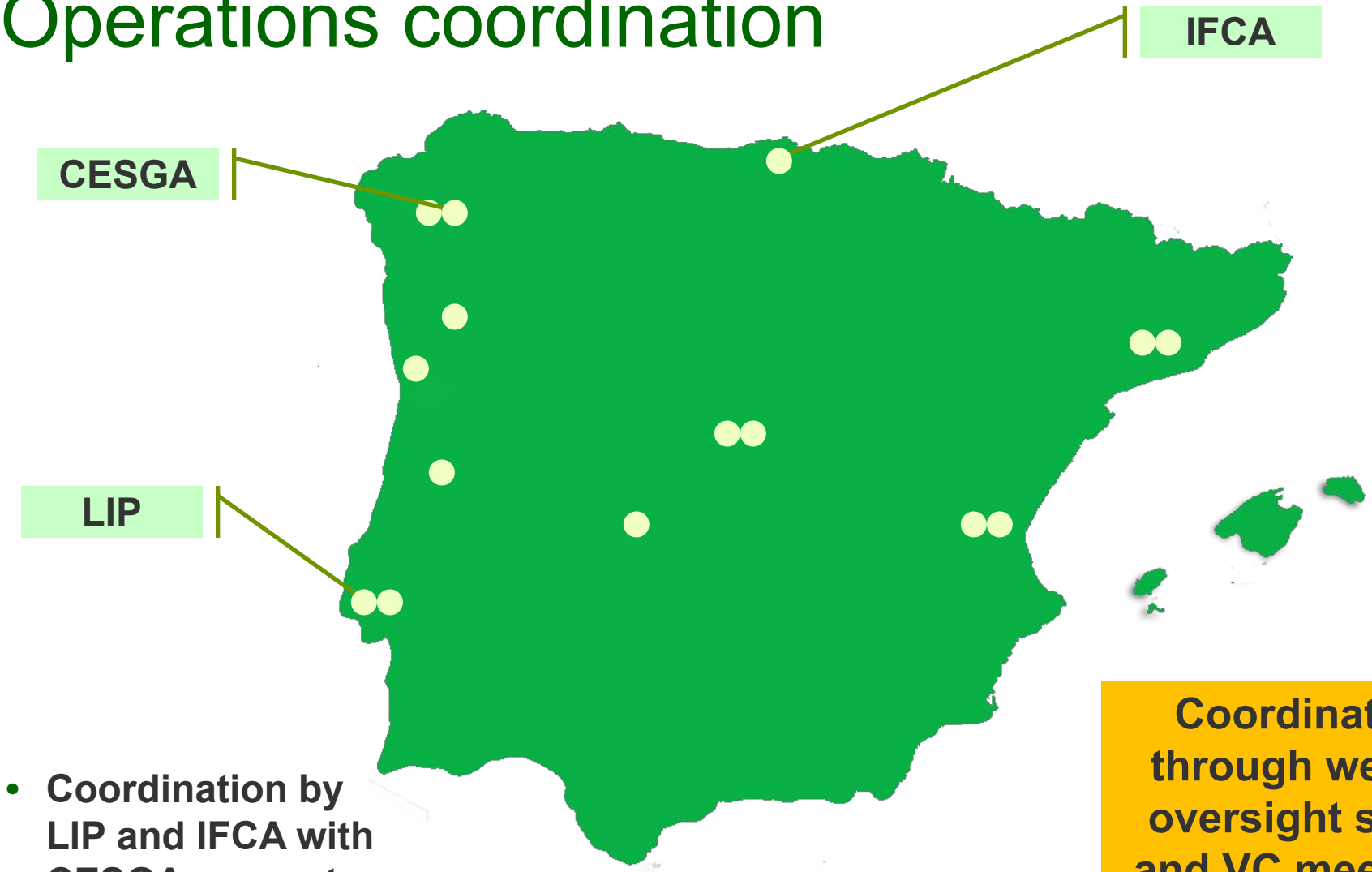
Core services

- Authentication Authorization and virtual organization membership



Replication for critical infrastructure services

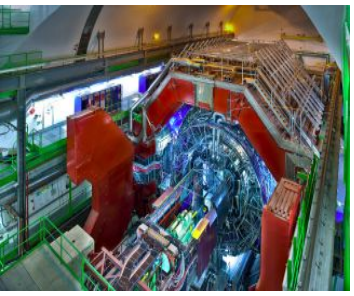
Operations coordination



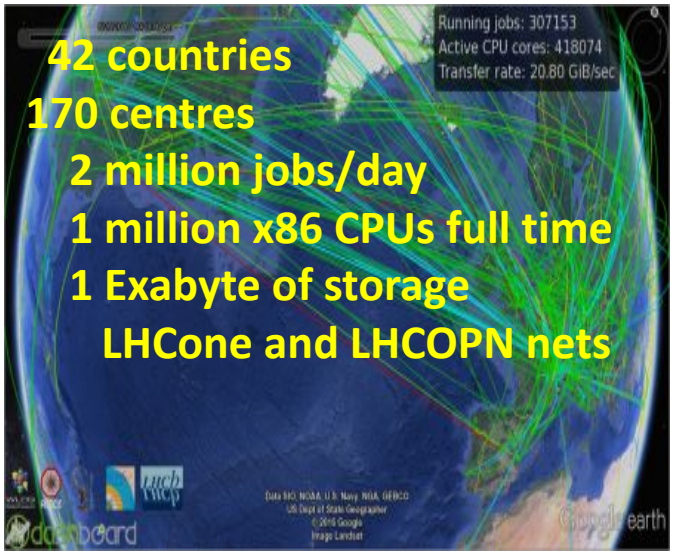
- Coordination by LIP and IFCA with CESGA support

Coordination through weekly oversight shifts and VC meetings

Supporting CERN LHC simulation and data analysis



Spain + Portugal > IBERGRID > EGI > WLCG > Experiments



42 countries
170 centres
2 million jobs/day
1 million x86 CPUs full time
1 Exabyte of storage
LHCone and LHCOPN nets

2027
900 PB/year
60x CPU

2016
80 PB/year

CERN

Data, CPU and network intensive

Contribution to the global simulation, reconstruction and analysis for the CERN **LHC computing MoU for Spain and Portugal**

AUGER

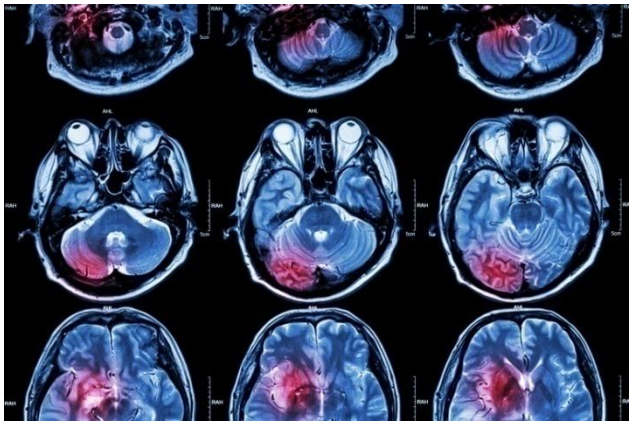
- On the vast Pampa Amarilla in western Argentina, the Pierre Auger Observatory is studying the highest-energy particles in the Universe, so-called cosmic rays.

- Cosmic rays with low to moderate energies are well understood, while those with extremely high energies remain highly mysterious. By detecting and studying these rare particles, the Pierre Auger Observatory is tackling the enigmas of their origin and existence.

12,714,524 hours in IBERGRID

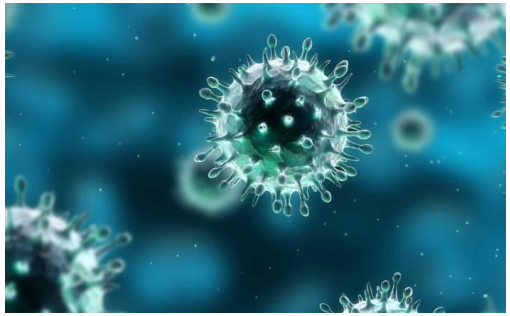
Biomedicine

- medical imaging
- bioinformatics
- drug discovery.



- virtual research platforms that provide the worldwide research community with both user-friendly tools, platforms for data analysis and exchange, and an underlying e-infrastructure.

- WeNMR provides an e-Infrastructure platform and Science Gateway for **structural biology**. WeNMR serves all relevant **INSTRUCT** communities in line with the **ESFRI roadmap**.



> 21,101,904 hours in IBERGRID (Biomed + ENMR)

Beyond High Throughput Computing

Expansion of the Computing Paradigms supported across the EGI Federation

	Cloud Compute	Cloud Container Compute	High Throughput Compute
What is it?	Distributed IaaS	Kubernetes on top of EGI Cloud Compute	The *grid,* a scalable batch system
What you run?	VMs	(Docker) Containers	Jobs
Typical workloads	Lift and shift existing applications Specific OS (kernel) requirements Long running servers	Cloud-native containerised applications.	Execution of parallel computing tasks to analyse large datasets.
Pros / Cons	[+] Complete control on resources, run (almost) anything you'd like [-] Complex operation	[+] Industry standard [+] Hides complexity of Kubernetes setup [-] Kubernetes steep learning curve	[+] No management of resources, just submit jobs [-] Legacy interfaces [-] Jobs may not match any computational need

Organized via the EGI Federated Cloud

- EGI FedCloud: standards-based open cloud system
- Extends the EGI computational offer beyond the traditional High Throughput Computing (Grid)
- New service models like long-lived services and on demand computation.
- Enables the **federation of institutional clouds** across multiple administrative locations

Beyond Europe

China, South Africa,...

EGI Cloud Compute

Run virtual machines on-demand with complete control over computing resources

EGI FedCloud well Positioned in SIMPL

https://digital-strategy.ec.europa.eu/en/news/simpl-cloud-edge-federations-and-data-spaces-made-simple

- **Middleware that will enable cloud-to-edge federations** and support all major data initiatives funded by the European Commission, such as common European data spaces or EOSC
- Ensure that data sets and their infrastructures can be seamlessly **interconnected** and made **interoperable**.
- **Open source, secure**: trust, confidence and compliance with EC regulations built into the system.
- **Sharing of resources** between participants, regardless of their data processing environment, across multiple providers and Member States.

EC independent study on details on the background, vision, and possible implementation of SIMPL

https://ec.europa.eu/newsroom/dae/redirection/document/87359

Product coverage of Simpl building blocks

Selection made according to building block mapping within the Open-Source market possibilities as well as EU community usage

	Infra. Layer (10 blocks)	Data layer (18 blocks)	Admin. Layer (23 blocks)
EGI	**7/10** fully covered	**7/18** fully covered	**10/23** fully covered
OpenStack	**8/10** fully covered	**4/18** fully covered	**18/23** fully covered
VanillaStack	**8/10** fully covered	**Doesn´t apply to this layer**	**19/23** fully covered
Linux Foundation	**10/10** fully covered	**14/18** fully covered	**15/23** fully covered
X - Road	**Doesn´t apply to this layer**	**5/18** fully covered	**10/23** fully covered
Apache	**Doesn´t apply to this layer**	**16/18** fully covered	**Doesn´t apply to this layer**

Blocks not entirely covered by products

- Infrastructure layer weak building block (BB) coverage:
  - Serverless computing
  - PaaS services
- Data layer weak BB coverage:
  - Software, apps
  - Anonymisation
  - Streaming
  - Quality rules
- Administration layer weak BB coverage:
  - License asset management
  - Usage contracts
  - SLA management

Not covered by the tool

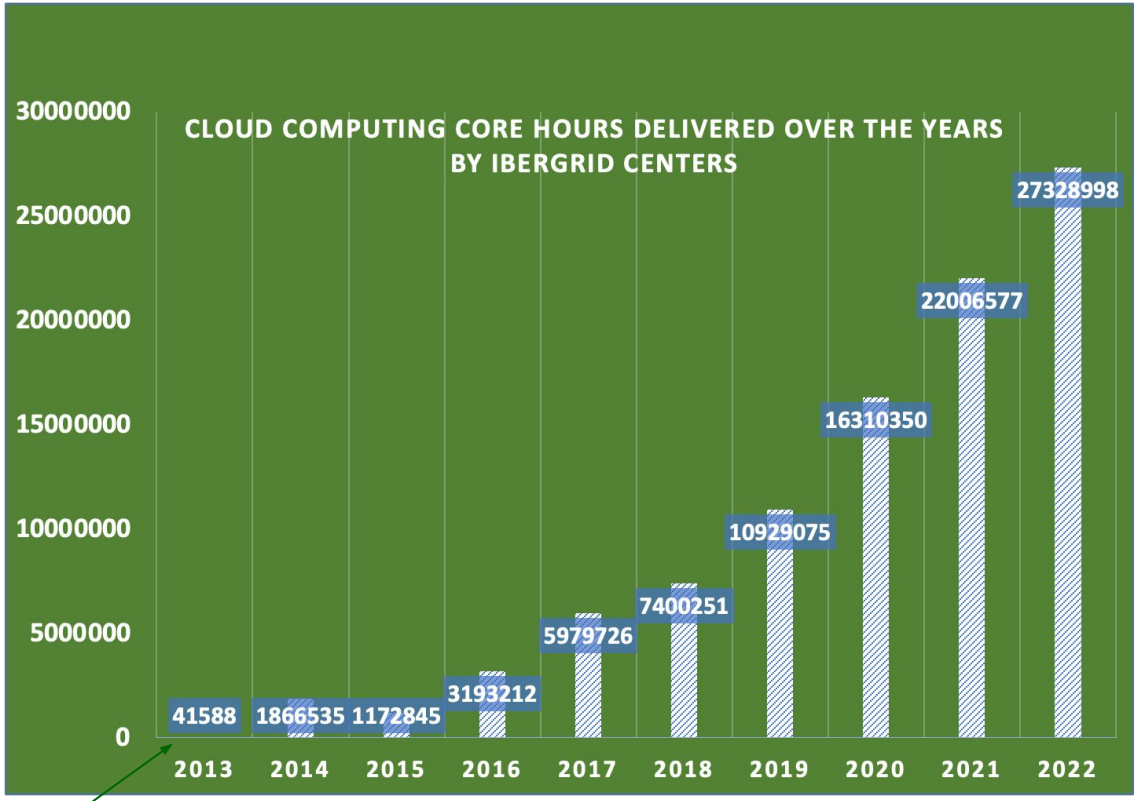
Partially covered by the tool

Fully covered by the tool

CLOUD COMPUTING

Since 2013
~ 100 million CPU hours
> 1,1 million Virtual Machines instantiated

Last year:
~ 28 million CPU hours
~ 145 thousand VMs instantiated



CESGA

"pioneer" Cloud CPU hours

IBERGRID is the EGI Federated Cloud largest provider: ~100M CPU hours since 2013, and also with more Cloud resource centers

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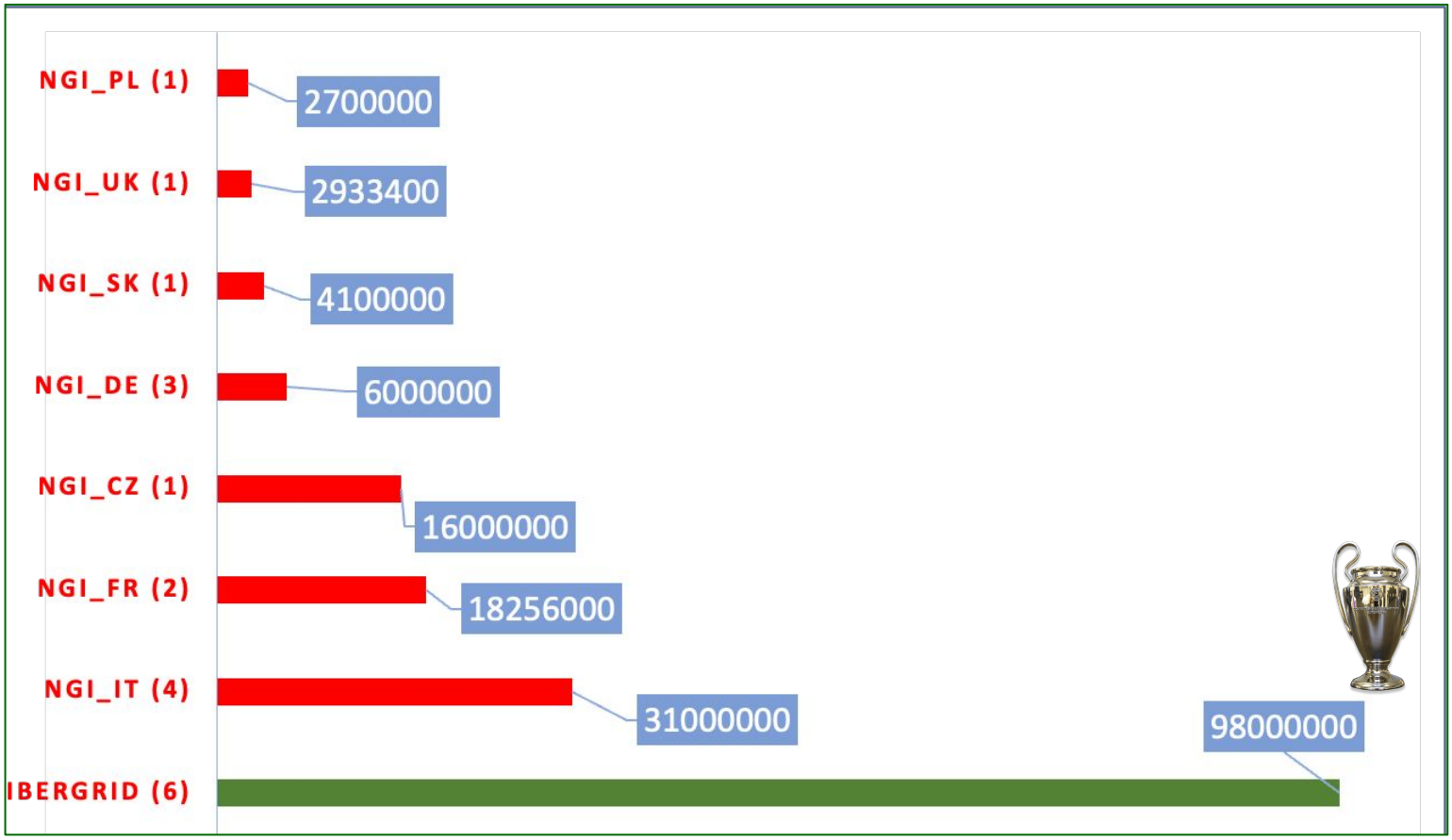
CESGA

INCD Infraestrutura Nacional de Computação Distribuída

bifi

CETA Ciemat

Universitat Politècnica de València

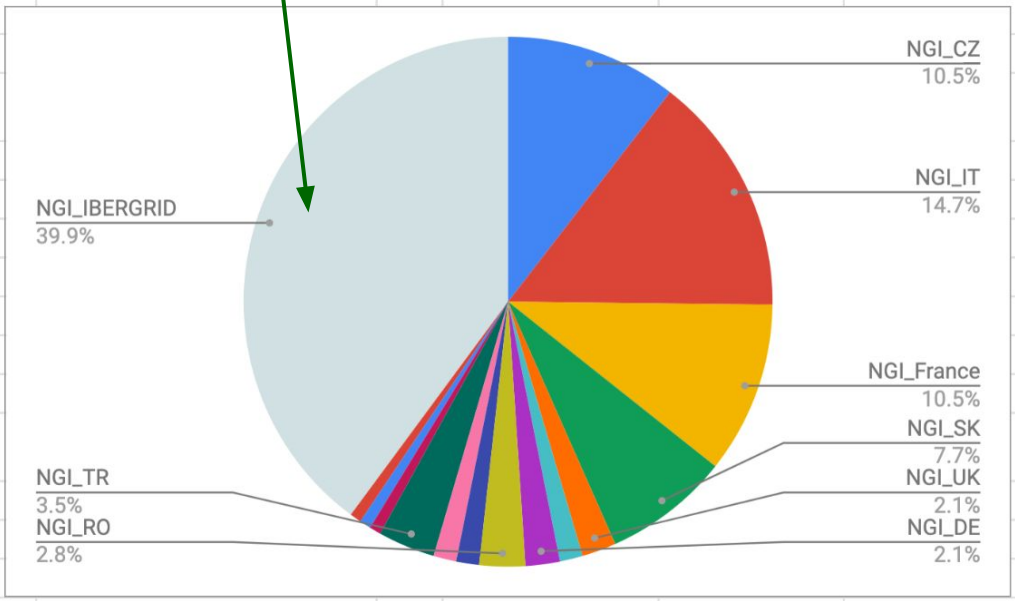


Leading in diversity of users: # of Service Level Agreements: 40%

Tab	
SLAs	List of ACTIVE SLAs
OLAs	List of APPROVED OLAs
Projects	H2020 projects with a budget for resource provisioning
Pay-per-use	List of P4U providers
Statistics	Statistics of the resources allocated

SLA statuses	
FINALIZED	SLA is agreed and in operation
STARTED	SLA negotiation has been started
DRAFT/ON HOLD	SLA in on hold/negotiation
DEPRECATED	SLA expired and it is now deprecated
CLOSED	SLA is not in operation any more

Contact: In case of questions, please contact: sla@mailman.egi.eu



Reports (view metrics in 'Statistics' tab for more details)					
FINALIZED' SLAs	44	97.78%	CLOSED' SLAs	5	11.11%
STARTED' SLAs	1	2.22%	DEPRECATED' SLAs	7	15.56%
DRAFT/ON HOLD' SLAs	0	n/a			
TOTALs	45	100.00%			

IBERGRID software development plays a key role in making the provision of Cloud Services possible

1. Jobs in the EGI HTC with:
   - udocker - runs containers without any privileges
   - Apptainer/Singularity - available at most sites

2. User managed docker/kubernetes on EGI Cloud

3. EC3 automated deployment of kubernetes
   - Elastic cluster management

Developed and maintained at LIP

Developed and maintained at the U. Politecnica de Valencia

Running containers in user space: a Global success

UDOCKER

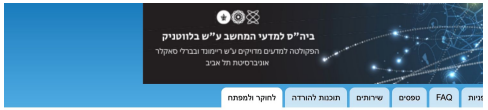
https://github.com/indigo-dc/udocker

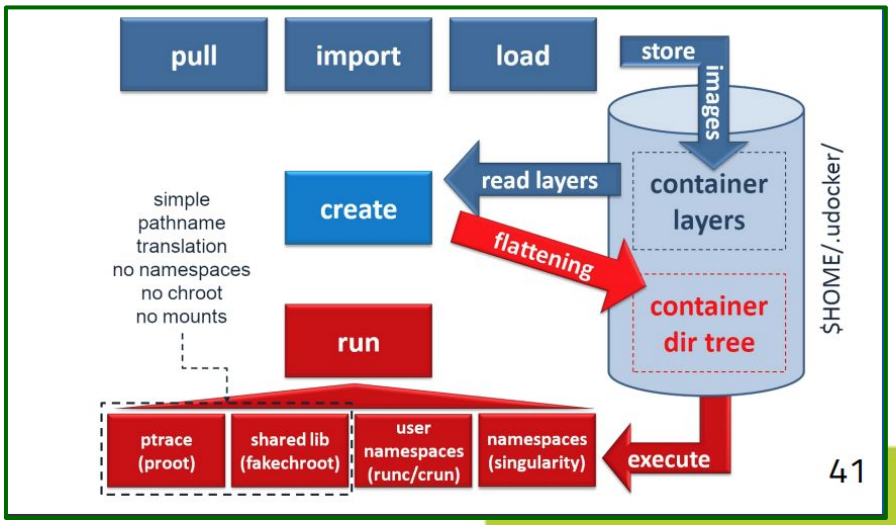
[HTML] Enabling rootless Linux Containers in multi-user environments: the **udocker** tool

J Gomes, E Bagnaschi, I Campos, M David… - Computer Physics …, 2018 - Elsevier

Containers are increasingly used as means to distribute and run Linux services and applications. In this paper we describe the architectural design and implementation of **udocker**, a …

☆ Save 99 Cite Cited by 55 Related articles All 15 versions Web of Science: 27





udocker

Fusion Group

Barcelona Supercomputing Center

THE UNIVERSITY OF UTAH

CHPC - Research Computing and Data Support

ABOUT US RESOURCES DOCUMENTATION USER SERVI

Home › Documentation › Software › Container-based Virtualization

udocker

udocker allows to execute Docker containers comple

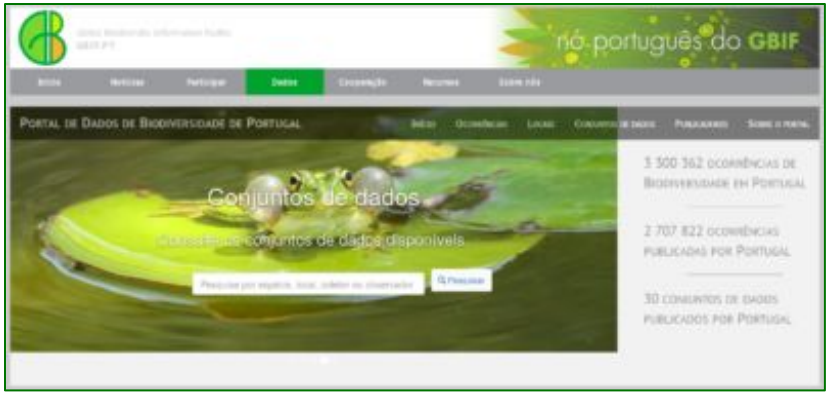
severly limited, but, that is not a problem for most H

INDIGO-DC Session this afternoon

Users & scientific projects using our Cloud services

GBIF

- The Global Biodiversity Information Facility (GBIF) is an international network and research infrastructure funded by the world's governments and aimed at providing anyone, anywhere, open access to data about all types of life on Earth.

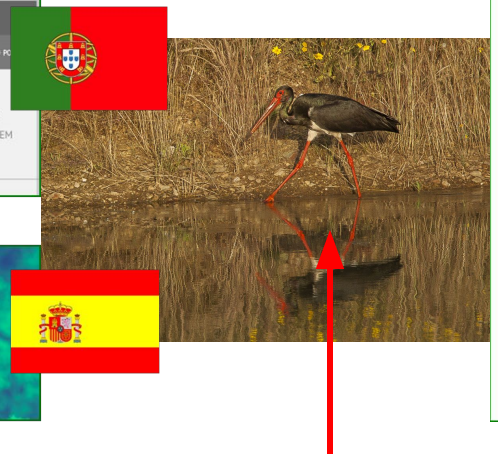


- GBIF nodes in Portugal and Spain are maintained in the scope of **LifeWatch** and **IberLife** and these activities are supported by **IBERGRID**.
  - dados.gbif.pt
  - datos.gbif.es

Supported by IBERGRID Cloud resources on the LifeWatch VO

Global Biodiversity Information Facility: GBIF.org

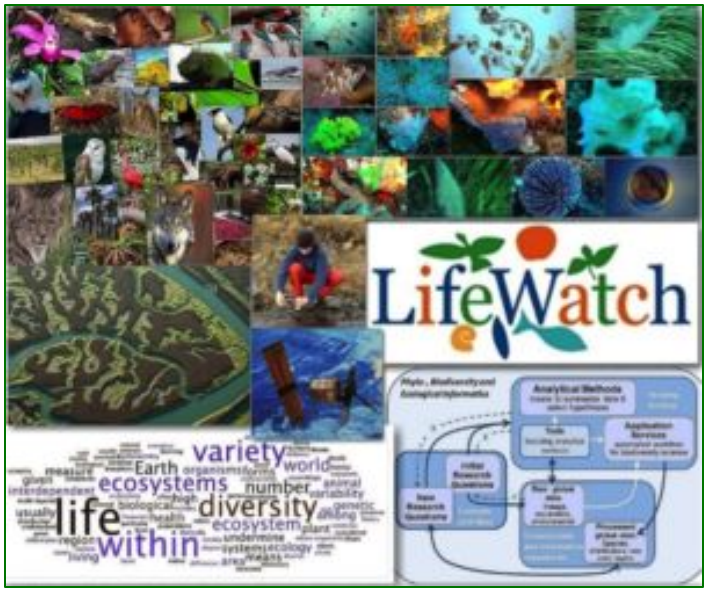
- GBIF Nodes in Portugal and Spain are key components of the **LifeWatch ERIC.**
- These activities are supported by **IBERGRID**
- Housing facilities, technologies, integration: https://dados.gbif.pt & https://datos.gbif.es
- **GBIF Data Space for the Iberian Peninsula is co-funded by EGI-ACE, as a pilot for integration of biodiversity and environment data in territories with shared characteristics**



Distribution of Black Storks in the Iberian Peninsula

Black Stork crossing Extremadura, direction Alentejo

LifeWatch ERIC



- LifeWatch ERIC, is a distributed Research e-Infrastructure to advance biodiversity research and to address the big environmental challenges

- Support knowledge-based strategic solutions to environmental preservation.

- The services currently available for the biodiversity community are also available for wider re-use by other scientific communities.
- In the Iberian area the activity of Lifewatch ERIC is articulated via **IberLife**, which in turn relies on the support of **Ibergrid** for the deployment and operation of core services.

22,733,691 hours on IBERGRID cloud resources until Sept. 2022

LifeWatch ERIC

- LifeWatch ERIC, is a distributed Research e-Infrastructure to advance biodiversity research and to address the big environmental challenges and support knowledge-based [illegible] solutions to [illegible]

LIFEWATCH ERIC sessions:
Tuesday afternoon & Thursday morning

[illegible]diversity community are [illegible] by other scientific communities.

[illegible] the activity of Lifewatch ERIC is articulated via [illegible], which in turn relies on the support of **Ibergrid** for the deployment and operation of core services.

22,733,691 hours on IBERGRID cloud resources until Sept. 2022

OPENCoastS / WorSICA

- OPENCoastS – On-demand Operational Coastal Circulation Forecast Services
- Provides on-demand circulation forecast systems as-a-service for the European Atlantic coasts.
- OPENCoastS generates forecasts of water levels, 2D velocities and wave parameters over the spatial region of interest for periods of 72 hours, based on numerical simulations of all relevant physical processes.

Integrated into IBERGRID and EGI as an EOSC thematic service
Collaboration LIP, LNEC, INCD, UNICAN, CNRS, CSIC

> 5 million Cloud CPU hours since 2020

WORSICA: **High-resolution mapping of the topography of the Amazon River estuary**

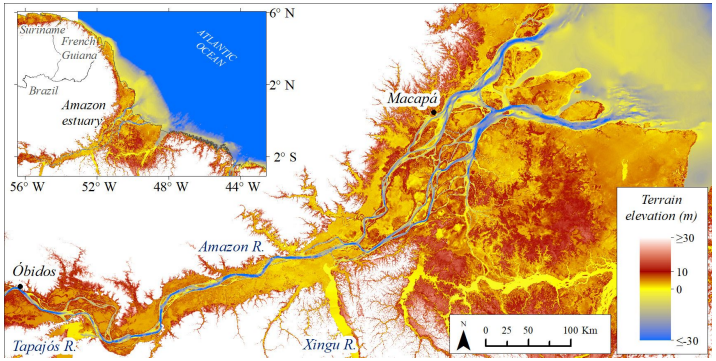
A high resolution (30 m) **mapping of the topography of the Amazon River estuary** using satellite images and nautical charts can be downloaded at:

https://data.mendeley.com/datasets/3g6b5ynrdb/2

"Comprehensive bathymetry and intertidal topography of the Amazon estuary"

Earth Syst. Sci. Data, 13, 2275–2291, 2021

https://essd.copernicus.org/articles/13/2275/2021/

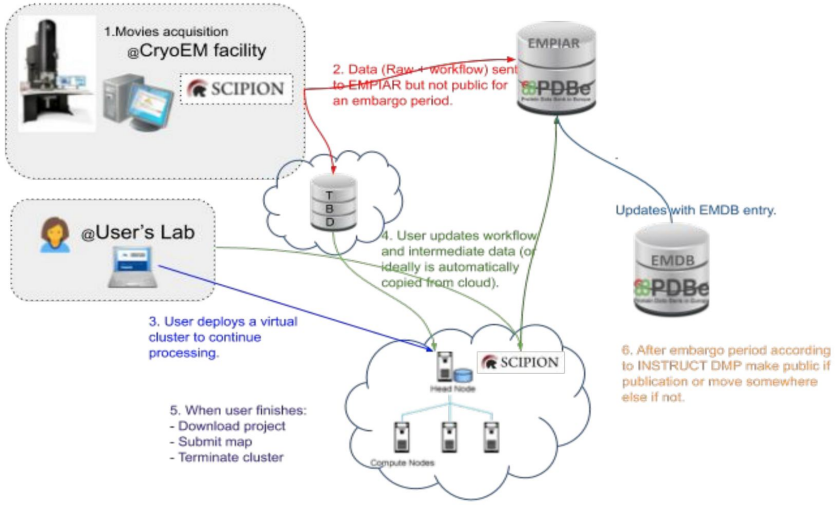


Structural Biology in EOSC-Synergy and EOSC-Life

EOSC-Life demonstrator:

CryoEM workflows

→ FAIRification of data produced and image processing workflow in SPA CryoEM processing.



instruct Integrating Biology

instruct image Processing Center

EOSC SYNERGY

EOSC-Life

EOSC Synergy thematic service: **Scipion in the Cloud**

→ Automatic deployment of Scipion cluster in the cloud.

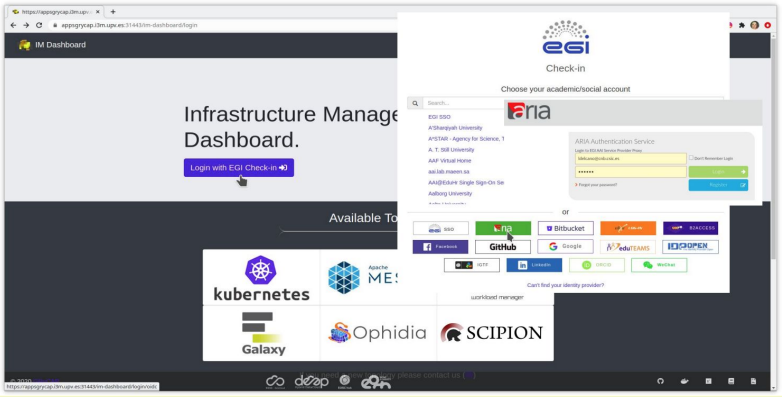
→ Elasticity based on workload.

→ EOSC services integration.

→ Scipion VO setup

→ Cloud resources (SLA).

→ Service quality check (SQaaS)



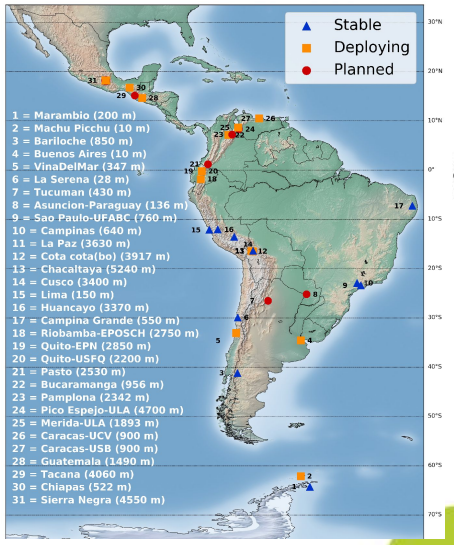
Communities on-boarding

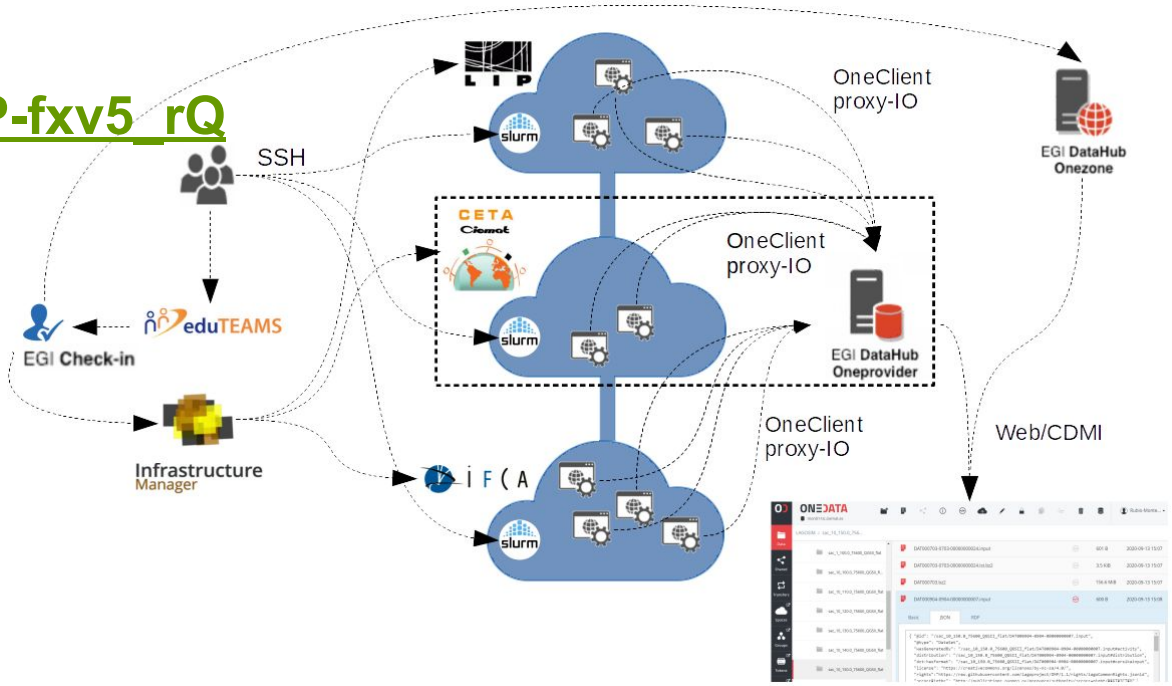
- **EMSO** is a large-scale research infrastructure of seafloor & water-column observatories, set up to monitor long-term environmental processes and their interactions.
- **MELOA** (Multi-purpose/Multi-sensor Extra Light Oceanography Apparatus) project that is developing, WAVY drifter units, for in-situ measurements of marine environments.
- **BIOISI** understand and address biological questions using integrative – Systems – approaches, joining biology, physics and computational sciences.

Cooperation with Latin America: LAGO

- **LAGO** (*Latin American Giant Observatory*) network of water-Cherenkov detectors (WCD)
- **Objective**: to enable the long-term curation and re-use of data

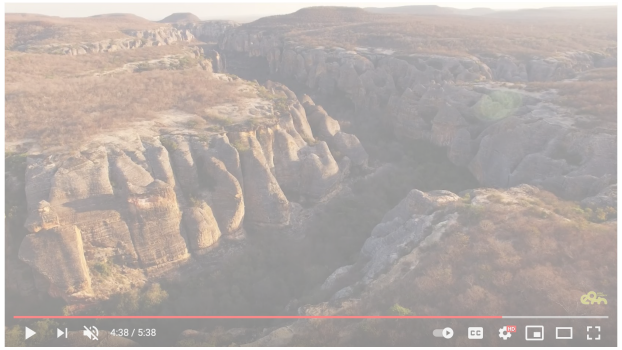
https://youtu.be/LjP-fxv5_rQ





Cooperation with Latin America: SAPS

- **SAPS (*SEB Automated Processing Service*)** is a service to estimate Evapotranspiration (ET) and other environmental data that can be applied on water management and the analysis of the evolution of forest masses and crops.
- **Objective**: to provide wider access to knowledge on the impact of human and environmental actions on vegetations, leading better forest management and analysis of risks.



https://www.youtube.com/watch?v=mM6xJJRS3Cs

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

UFCG

The European Grid Infrastructure

Vision:

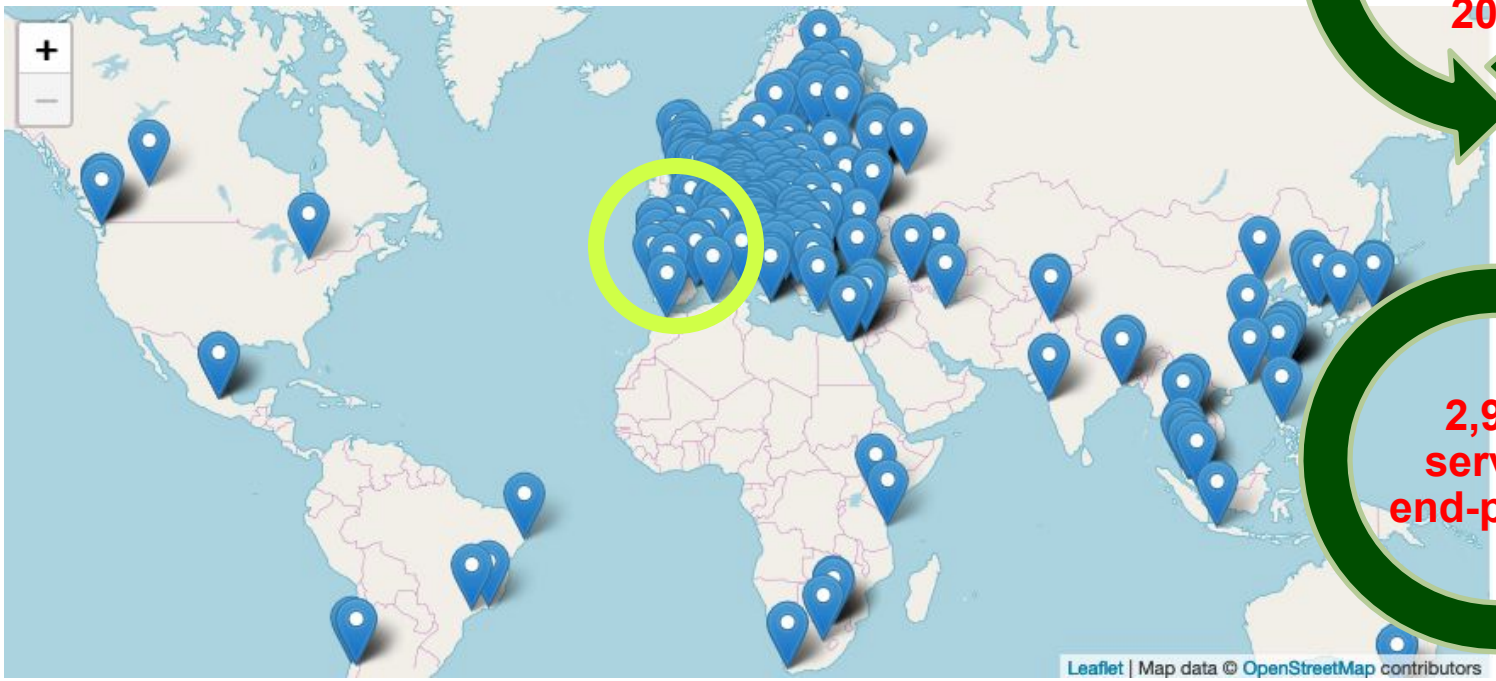
all researchers have seamless access to services, resources and expertise to collaborate and conduct world-class research and innovation

Mission:

deliver open solutions for advanced computing and data analytics in research and innovation

EGI

- Federated e-infrastructure
- IBERGRID is a regional infrastructure in EGI
  - Shares services and capacity through EGI
  - Uses EGI services for integration and support



> 6 Billion CPU core wall time (2022)

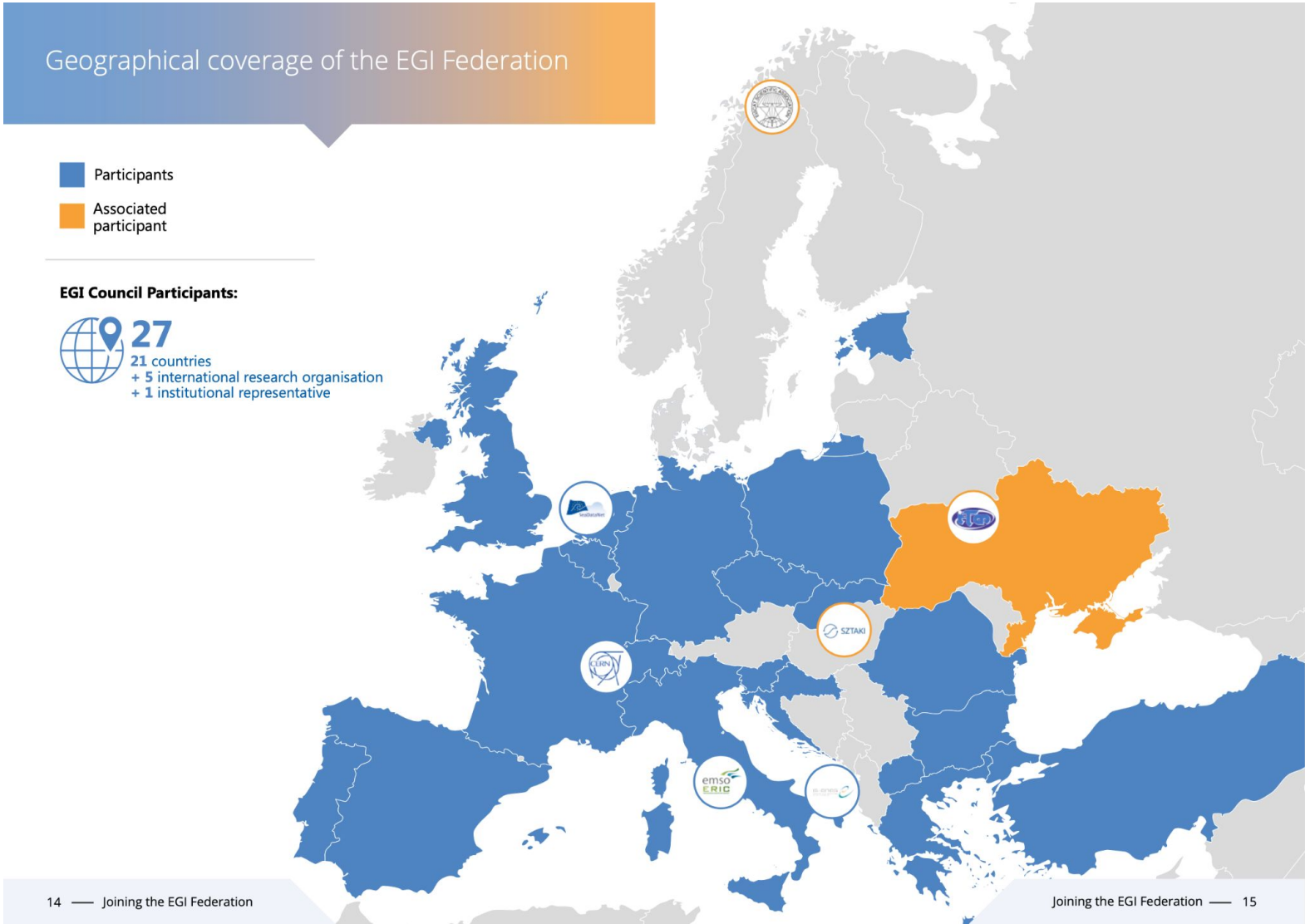
> 1,5 Million computing cores in 2022

> 1 Exabyte disk & tape

2,915 service end-points

The EGI Federation Members

https://www.egi.eu/egi-federation/



iBERGRID

High-Throughput Compute

>200 providers

Cloud Compute

22 providers

Supported research initiatives

170

Supported Users

>75,000

Supported scientific publications in 2020

> 1,100

The Nobel Prize in Physics 2013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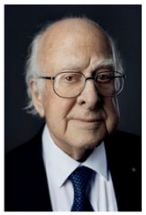
François Englert
Prize share: 1/2


© Nobel Media AB. Photo: A. Mahmoud
Peter W. Higgs
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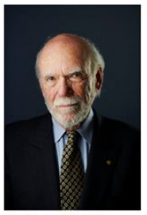
The Nobel Prize in Physics 2017


© 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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Kip S. Thorne
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Services delivered by the EGI Federation

Services delivered to the EGI Federation by selected EGI participants (expertise)

Security

Check-in — Login with your own credentials

Attribute Management — Manage memberships and groups in communities and virtual organisations

Coordination

Operations Coordination and support — Coordinate activities to ensure seamless operations

Community Coordination — A joint approach to user engagement

ITSM Coordination — Ensures professional service management for EGI IT services

Technical Coordination — Progress and innovation through collaboration

Strategy and Policy Development — One federation, one vision, one strategy

Project Managment and Planning — A joint approach to planning and management

Security Coordination — Enhance local security for a safer global infrastructure

Communications — Share your successes at a larger scale

Operations

Marketplace — Expose your services to a broader audience

Accounting — Track and report the usage of your services

Collaboration Tools — IT tools for better coordination

Configuration Database — Manage the configuration information of federated e-infrastructure assets and their functional relations

Operational Tools — Integrate resources and operations in a federated ecosystem

Validated Software and Repository — Benefit from a repository of high-quality software validated for the EGI infrastructure

Service Monitoring — Monitor the performance of IT services

Helpdesk — Your point of contact to

Note: the internal services are supported by the EGI contribution fees and EC-funded projects

IBERGRID

Operations

Marketplace

Expose your services to a broader audience

Accounting

Track and report the usage of your services

Operational Tools

Integrate resources and operations in a federated ecosystem

Validated Software and Repository

Benefit from a repository of high-quality software validated for the EGI infrastructure

Provided by IBERGRID partners to the whole EGI Federation

LIP, CSIC, UPV and CESGA

EGI Foundation

UMD and CMD quality assurance

OPERATIONAL LEVEL AGREEMENT

Service Provider	EGI Foundation
Service Supplier	IBERGRID (CSIC, LIP)
Start Date	1st January 2021
End Date	30th June 2023
Status	FINAL
Agreement date	21st January 2021
OLA Link	https://documents.egi.eu/document/3672

EGI Foundation

UMD and CMD software provisioning infrastructure

OPERATIONAL LEVEL AGREEMENT

Service Provider	EGI Foundation
Service Suppliers	IBERGRID (CSIC, LIP)
Start Date	1st January 2021
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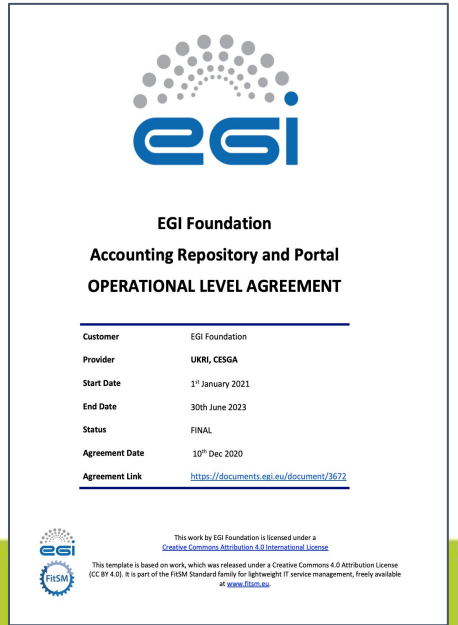
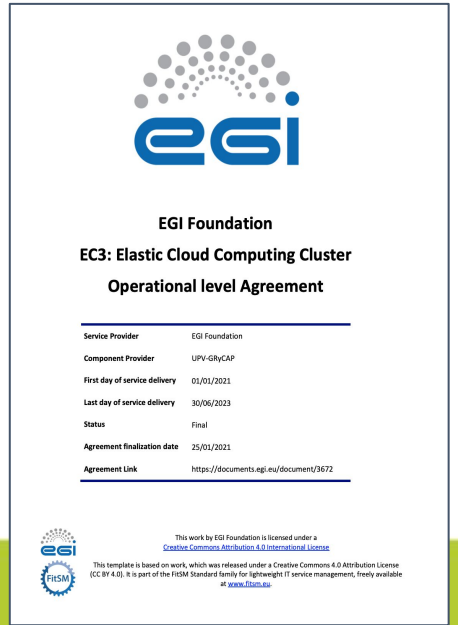


EGI Foundation

Accounting Repository and Portal

OPERATIONAL LEVEL AGREEMENT

Customer	EGI Foundation
Provider	UKRI, CESGA
Start Date	1st January 2021
End Date	30th June 2023
Status	FINAL
Agreement Date	10th Dec 2020
Agreement Link	https://documents.egi.eu/document/3672



EGI Foundation

EC3: Elastic Cloud Computing Cluster

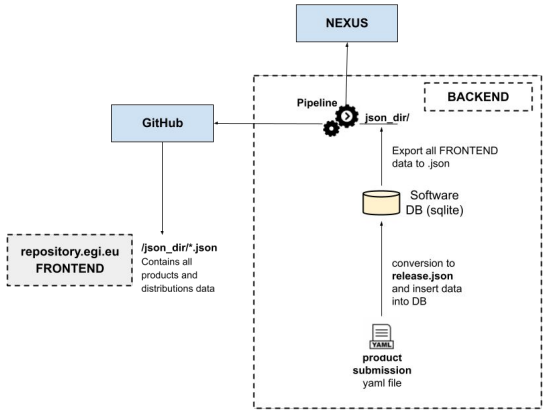
Operational level Agreement

Service Provider	EGI Foundation
Component Provider	UPV-GRyCAP
First day of service delivery	01/01/2021
Last day of service delivery	30/06/2023
Status	Final
Agreement finalization date	25/01/2021
Agreement Link	https://documents.egi.eu/document/3672

Software Quality Assurance for EGI and repositories

Quality assurance for the EGI middleware distributions for Grid (UMD) and Cloud (CMD)

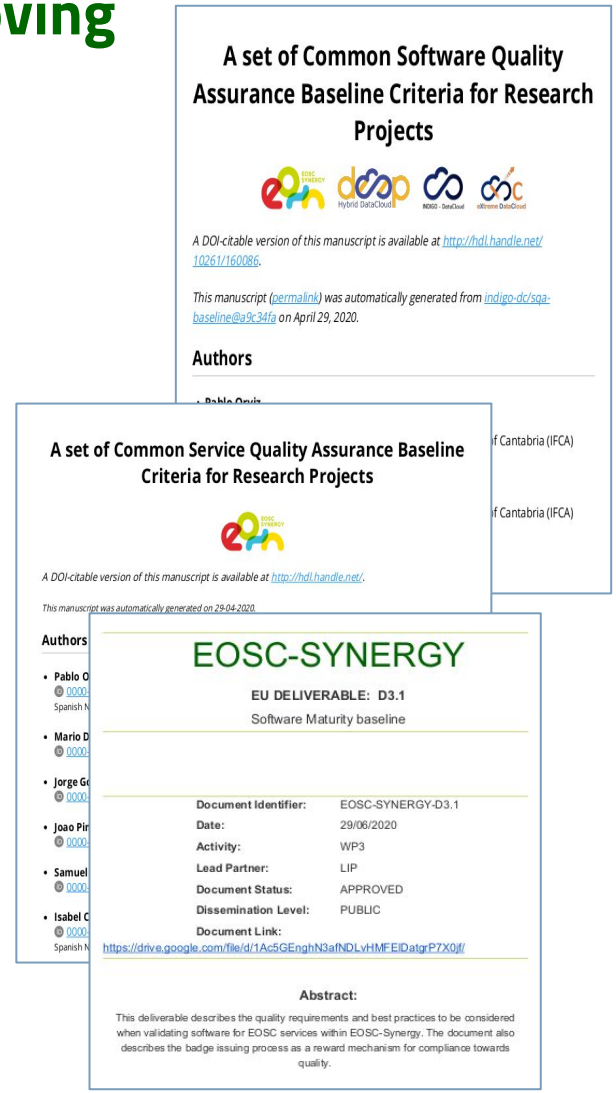
- **Production**
  - Manage the EGI software validation process.
  - Software validation of products to be released as part of CMD and UMD distributions.
  - Automated validation in isolation environments and piloting at selected sites.
- **Innovation**
  - New streamlined validation process.
  - New repositories with added capabilities.
  - New frontend.



28. Repositories for EGI
Mário David (LIP)
12/10/2022, 14:30
Development of innovati... | Lightning Talk (8' + 2' for... | IBERGRID Contributions

Long standing activity and expertise in improving research software and services

- Software baseline
  - Criteria meant to enhance the visibility, accessibility and distribution of source code.
  - Encouraging good coding practices to improve quality, reliability and security.
- Services baseline
  - Minimum set of principles for reliable and fit-for-purpose services
  - Provides common coherent quality attributes aimed to strengthening of the services reliability and stability.



The **baseline documents are openly developed** on github and open to contributions.

Software perspective incorporated to EOSC as a key enabler

https://ec.europa.eu/info/sites/default/files/prompting_an_eosc_in_practice.pdf

Members: Silvana Muscella (Chair), Isabel Campos Plasencia, George A. Komatsoulis, Andreas Mortensen, Räim, François Robida, Linda Strick, Klaus Tochtermann, Žiga Turk, Ross Wilkinson

3.2 Identification of those involved, roles, and results of their work

SOFTWARE DEVELOPERS/SERVICE PROVIDERS

Interoperable services and open data rely on the principles of software openness. The software used in EOSC services should guarantee interoperability and comply with standards, be they de facto or by right (de Jure). Data produced and handled with EOSC software services should respect the FAIR principles; services within EOSC should be secure and comply with the European authorisation and authentication policies; as a general policy, the software elements are provided upstream to open source projects, to guarantee the required level of sustainability; to provide persistent identifiers, identification scheme and machine-readable metadata about the resources.

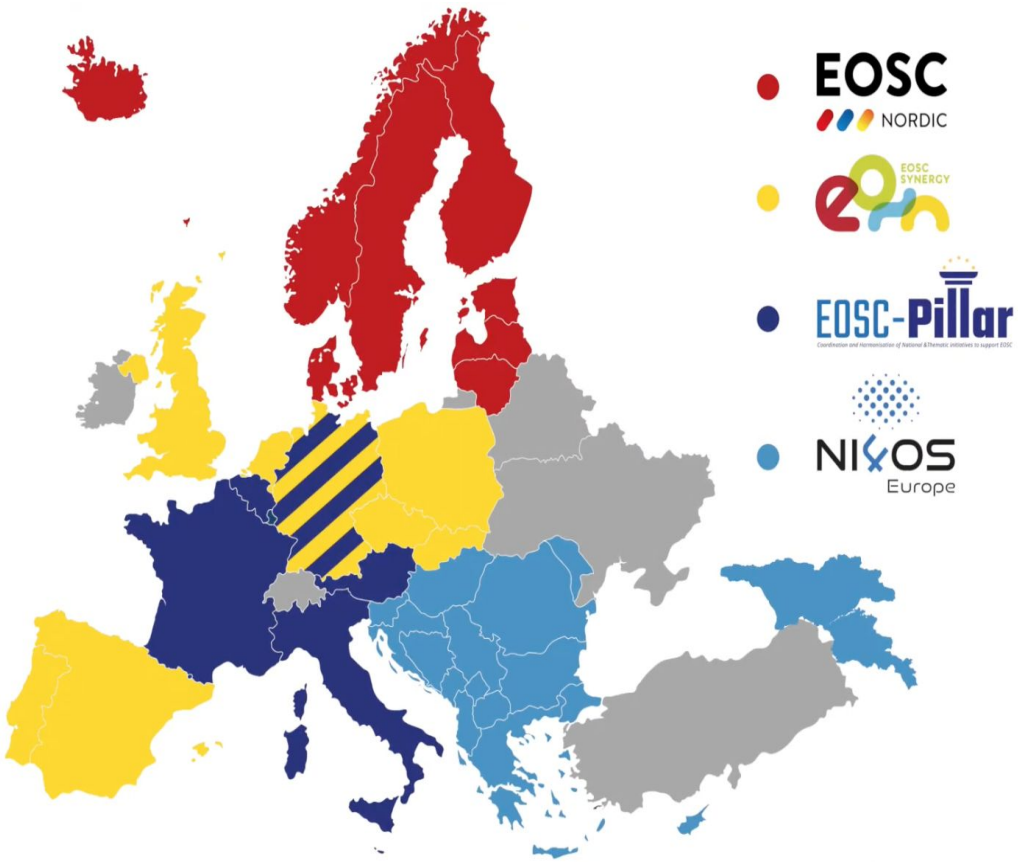
For this key activity to be successful in terms of engaging human talent, breakthrough ideas leading to innovation need to be awarded with the proper recognition. Putting in place transparent mechanisms to recognise successful software development, such as creating an ***'EOSC-Ready'* certification for software** products, would have a positive impact on the software development ecosystem in Europe. The successful development of an *'EOSC-Ready'* branded software product, would improve the reputation of researchers and technologists and dynamically harness the potential of European developers, across academia and industry.

Software could have different levels of service management integration. Highly integrated services are operated according to the EOSC service management system. Medium integrated services run with a more mature service management framework. Low integrated run with a less mature service management framework.

Final report and recommendations of the Commission 2nd High Level Expert Group [2017-2018] on the European Open Science Cloud (EOSC)

EOSC integration model

Regional EOSC implementation projects



- **EOSC-Nordic:** www.eosc-nordic.eu
- **EOSC-Synergy:** www.eosc-synergy.eu
- **EOSC-Pillar:** www.eosc-pillar.eu
- **NI4OS:** www.ni4os.eu

Funded by the European Commission to work on:

- Harmonization of integration procedures
- Expansion of National Thematic services to EOSC
- Development of skills
- Raise awareness on EOSC at national level
- Work with Policy makers

Duration: Sept. 2019 - Oct. 2022

EOSC-synergy widely exploitable results

- Handbook on EOSC Infrastructure Integrations
  https://handbook.eosc-synergy.eu/

- EOSC Software and Service Quality Assurance "as a Service"
  https://www.eosc-synergy.eu/for-developers

- Methodology to integrate Thematic Services in EOSC
  https://www.eosc-synergy.eu/for-researchers

- Skills Development : training courses and best practices to train the trainers
  https://learn..eosc-synergy.eu/

Looking to Horizon Europe

Three main lines of activity

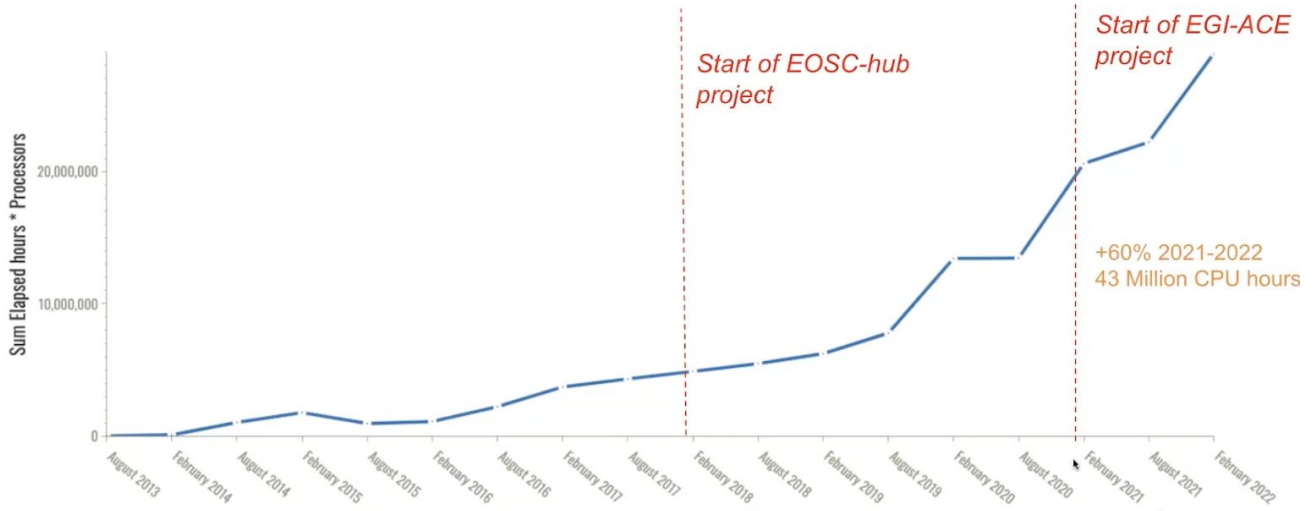
→ New research lines in the area of **Digital Twins**

→ **Software and Service Quality**: evolution of EOSC-Synergy.

Role of IBERGRID/EGI as part of the **EOSC Compute platform**

→ Provision of advanced services and Virtual Access support in EGI-ACE
→ Provisioning IaaS level
→ Procurement of Services for EOSC

EOSC Compute



https://www.egi.eu/project/egi-ace

EGI-ACE

Jan. 2021 - Sep. 2023

Advanced Computing for EOSC

EGI-ACE is a 30-month project coordinated by the EGI Foundation with a mission to empower researchers from all disciplines to collaborate in data- and compute-intensive research through free-at-point-of-use services.
EGI-ACE receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101017567.

Apply for EGI-ACE sponsored services

Jan 2018 - Mar. 2021

EOSC-hub

Services for the European Open Science Cloud

EOSC-hub brought together multiple service providers to create the Hub: a single contact point for European researchers and innovators to discover, access, use and reuse a broad spectrum of resources for advanced data-driven research.

Website

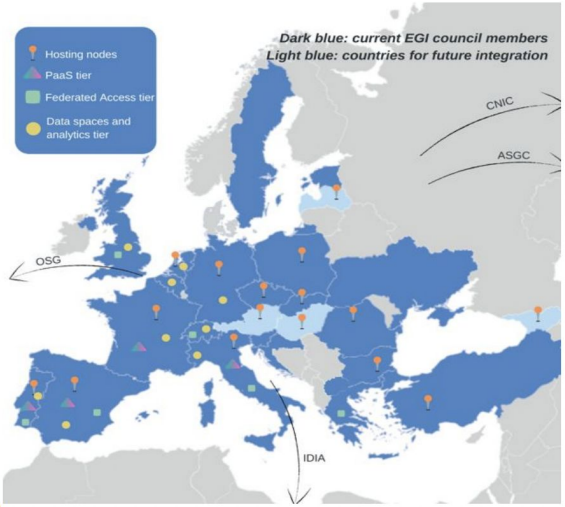
IBERGRID

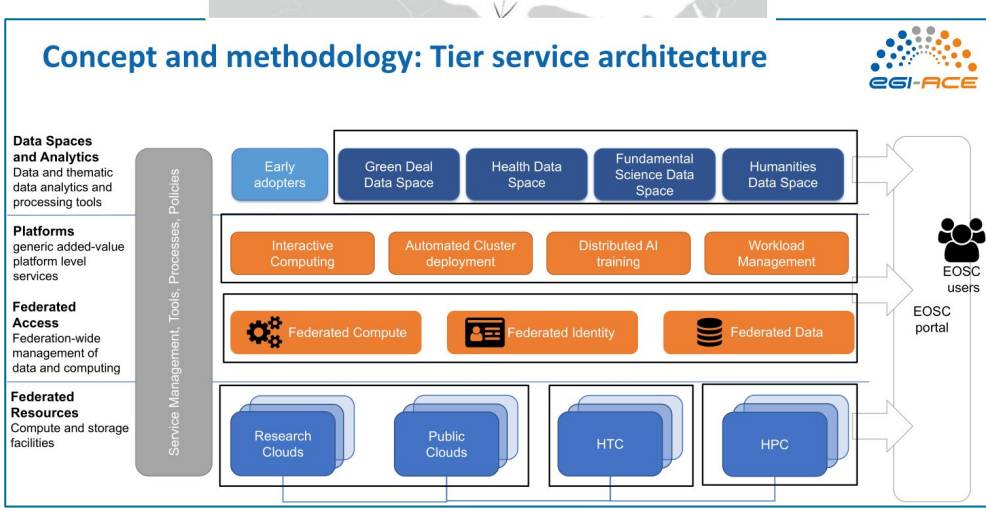
EGI-ACE

Piloted with the EGI Federated Cloud

EGI-ACE (2021-2023) **Advanced Computing for EOSC**, with IBERGRID work focused on:

- Software management, thematic services.
- HPC integration
- Provisioning and support of cloud services based on Virtual Access costs
- Software management for EGI.
- Implement EGI software repositories
- Implement new Data Spaces





Digital Twins

Digital Twin:
Digital replica of a living or a non-living physical entity.

→ Develop IT frameworks (Software + Infrastructures+Data Spaces) that provide advanced modelling, simulation and prediction capabilities to Research Infrastructures and their research communities

→ Promoting a convergent use of advanced digital technologies such as high performance computing, software, AI methods and big data analytics.

But… we have been doing this for a long time isn´t it?

To some extent: we have the building blocks, but there is integration ahead….

Digital Twins: we saw this one coming…

- Integrating computing resources that are geographically distributed
- Integration and use case engineering
- Collaboration across different scientific domains
- Robust framework enabling Researchers to ensure the quality, reliability, verifiability of their outputs

Quality

Reliability

Complex use cases combining:

Simulations & Observations &

Diverse data from various and distributed sources.

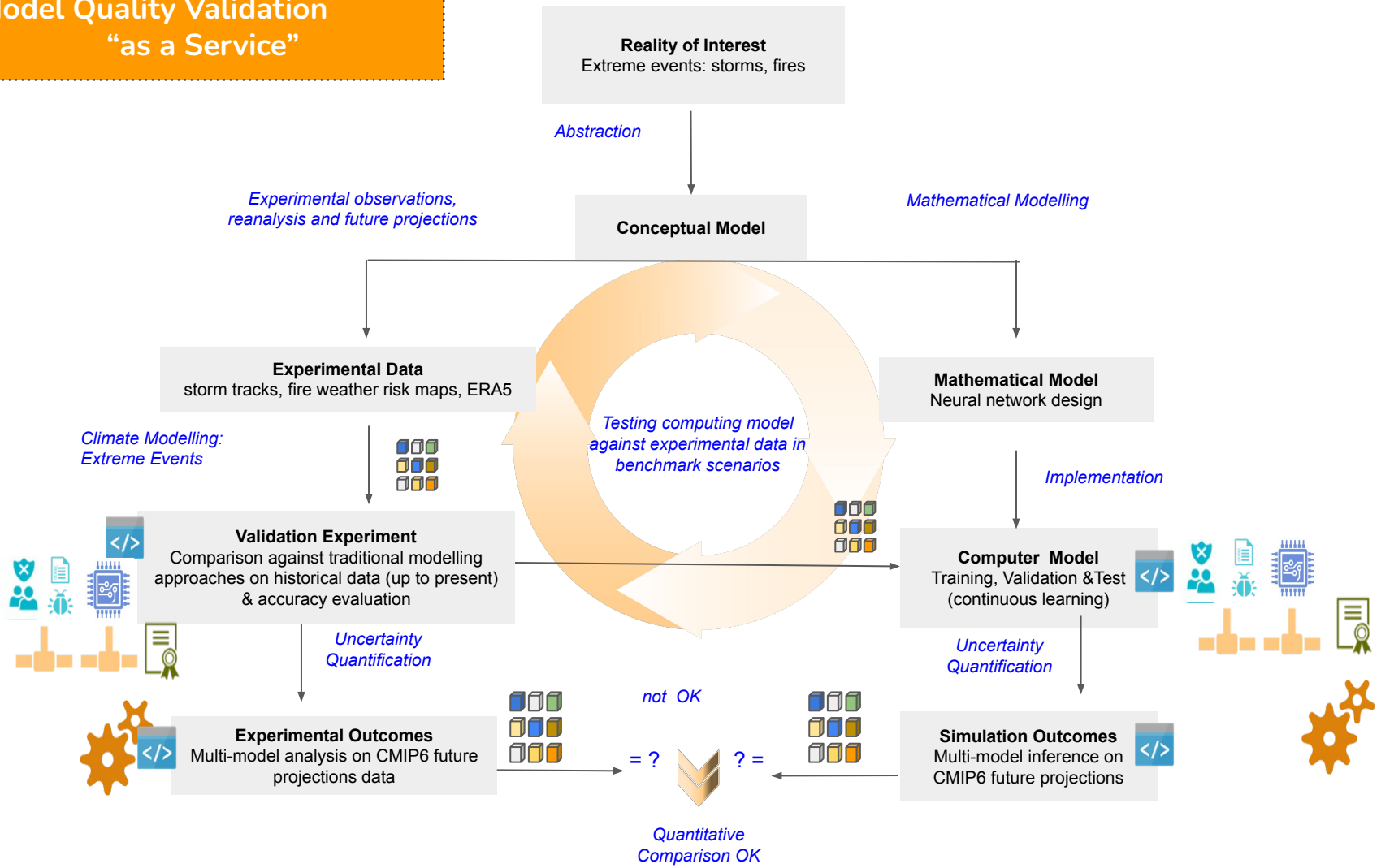
Software

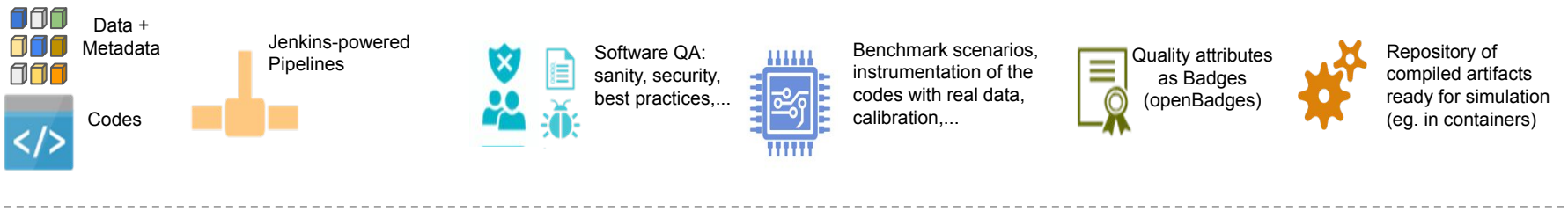
Data

Verifiability

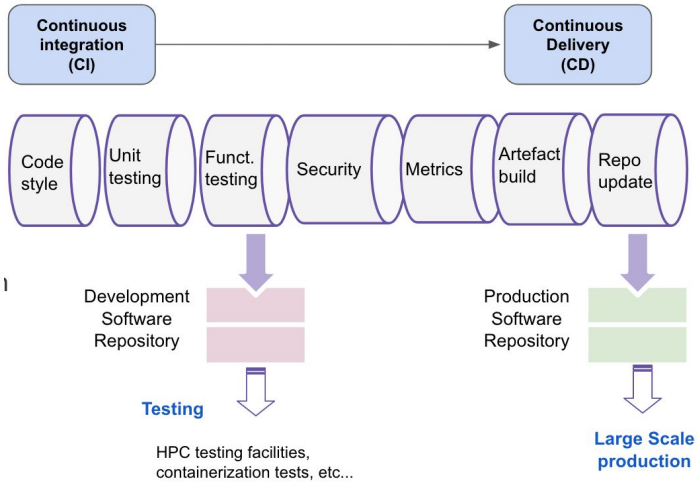
Outputs

Model Quality Validation "as a Service"





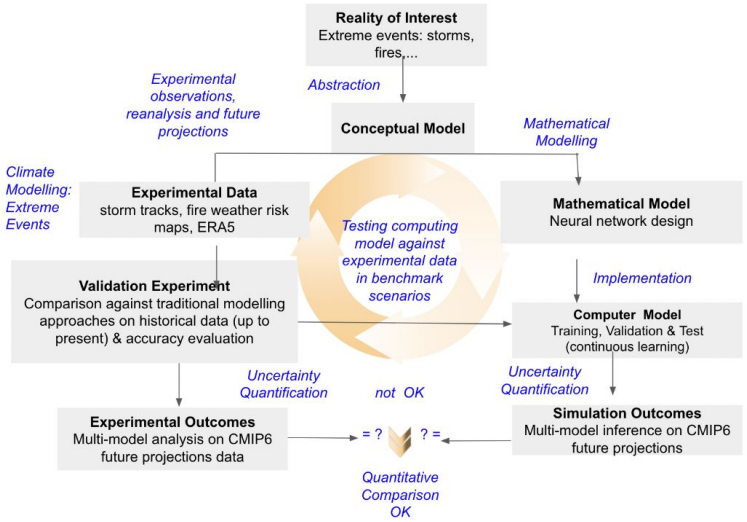
- Applying our background to the implementation of Digital Twins
- Extend the quality work done for software, services and data to models when possible (automation permitting)



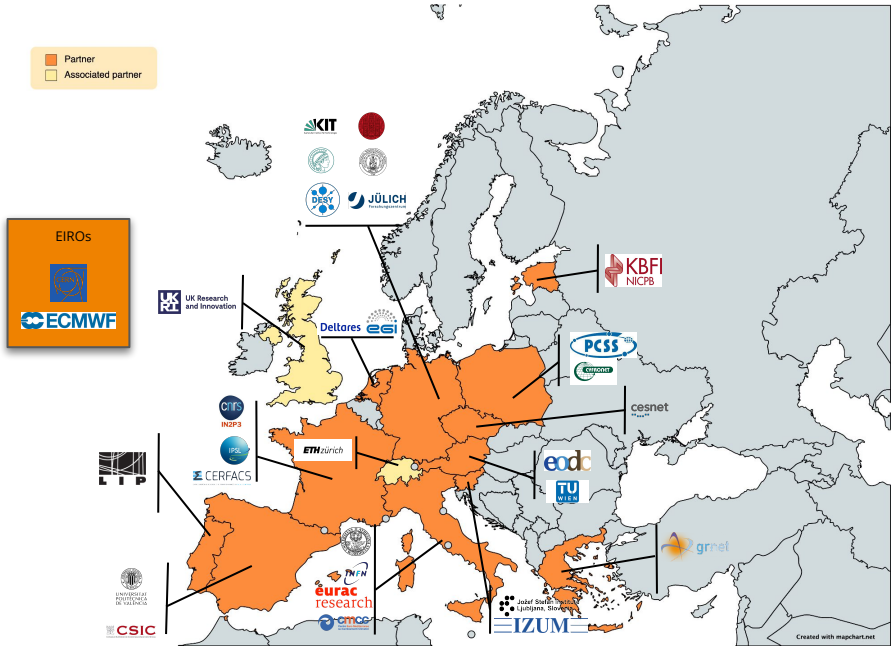
Model Validation

- Highly problem dependent, and high level of expertise required
- Sources of experimental data to compare with,
- Which level of automation can be applied

CHALLENGING !



interTwin



Co-design and **implement** the prototype of an **interdisciplinary Digital Twin Engine**

An open source platform based on open standards that offers the capability to integrate with application-specific Digital Twins

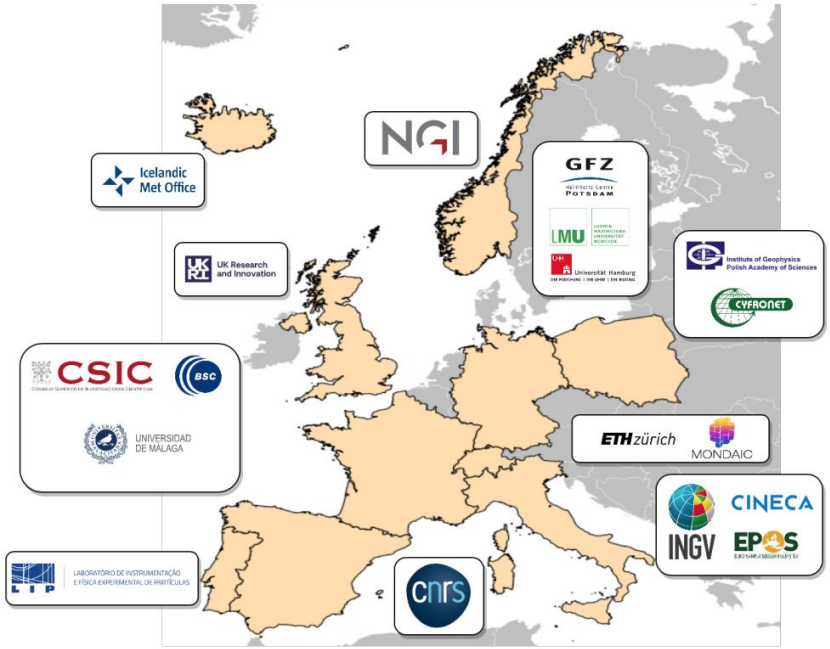
High Energy Physics, Radio Astronomy, Climate Change, Extreme weather...

(Plenary Session on Digital Twins on Thursday)

DT-GEO

The Digital Twin of the Geophysical Extremes

Hazard	Name	Target TRL (KPI)	Site Demonstrator (SD)
Volcano (WP5)	Volcanic unrest dynamics	6	
	Volcanic ash clouds and deposition	7	
	Lava flows	6	
	Volcanic gas dispersal and deposition	7	
Tsunami (WP6)	Probabilistic Tsunami Forecasting (PTF)	7	
Earthquake (WP7)	Probabilistic Seismic Hazard and Risk Assessment	7	
	Earthquake short-term forecasting	7	
	Tomography and Ground Motion Models (GMM)	7	
	Fault rupture forecasting	7	
	Tomography and shaking simulation	6	
	Rapid event and shaking characterization	7	
Anthropogenic (WP8)	Anthropogenic geophysical extreme forecasting (AGEF)	6	



(Plenary Session on Digital Twins on Thursday)

Looking ahead

The scale of our challenge is great and the road will be long

We might appear (sometimes) like people of improbable hope, but….

- We know about technology and its applications to science
- We have the resolve to move forward,
- … and a vision into the future of computing technology and science applications

We are the heirs of visionary persons who paved the road to strength cooperation at the Iberian level

Continue supporting excellent research in the Iberian area