
EGI
Annual Report
2020

Glossary

- **EGI:** Abbreviation of EGI Federation. *Note: if EGI is mentioned, this only refers to the EGI Federation.*
- **EGI Federation:** EGI Foundation, EGI Foundation Participants and Associated Participants, their linked organisations (e.g. service and resource providers) represented within EGI Foundation that contribute to the objectives of the foundation.
- **EGI Foundation:** The legal entity whose objective is to coordinate and develop, in collaboration with its Participants, the EGI infrastructure that provides long-term distributed compute and storage resources for performing research and innovation activities.
- **EOSC:** Initiative to offer researchers a virtual environment with open and seamless services for storage, management, analysis and re-use of research data, across borders and scientific disciplines.
- **HPC:** Abbreviation of High Performance Computing. A computing paradigm that focuses on the efficient execution of compute intensive, tightly-coupled tasks.
- **HTC:** Abbreviation of High-Throughput Compute. A computing paradigm that focuses on the efficient execution of a large number of loosely-coupled tasks.
- **NGI:** The national federation of shared computing, storage and data resources that delivers sustainable, integrated and secure distributed computing services to the national research communities and their international collaborators. The federation is coordinated by a National Coordinating Body providing a single point of contact at the national level and has official membership in the EGI Council through an NGI legal representative. *Note: the name comes from "National Grid Infrastructure", which is now deprecated.*

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Foreword: EGI Council Chair

With pride I present the 2020 Annual Report of the EGI Federation. This year has been marked by the COVID-19 pandemic. A year in which a large fraction of the population has been infected and healthcare systems have been strained to the max. A year in which public life came to a screeching halt and lockdown measures dominated our private lives. Despite these circumstances, the EGI Federation has managed to perform excellently, thanks to the dedication of all involved, under the fresh leadership of Tiziana Ferrari, Director of the EGI Foundation.

First of all, the federation is growing. We have welcomed new participants, among which national organizations (SZTAKI in Hungary), and research infrastructures (EMSO, IS-ENES, SeaDataNet and EISCAT), which means that more scientific collaboration voices will be heard at the EGI Council. Additionally, Germany has returned as a full participant of the Federation.

Secondly, EGI has been extremely successful in submitting EC proposals, with the awarding of the EGI-ACE flagship project as the absolute highlight.

Thirdly, there is growing interest in Europe around the concept of federation as the basis for the European Open Science Cloud (EOSC) and the European strategy for data and cloud. I know of no other organisation that has mastered the game of federating resources so successfully as EGI. To show its dedication to the EOSC cause, the EGI Federation became a member of the EOSC Association in November 2020.

Does this mean we can relax and enjoy? No, not at all. I see a few major interrelated uncertainties for EGI. The fundamental one being that we still do not know what the scope of the EOSC will be. Will it be just implementing a web of fair data with a focus on data standards? Or will it be an all-encompassing environment where data, computations, and services will float freely across borders, according to the requirements emerging from research infrastructures? The scope will definitely influence the strategy of the EGI Federation.

In the scientific computing domain, we see an increasing need for an integrated approach to HTC, HPC, data handling, processing and analysis, and thematic services, with yet to be sorted out roles for publicly funded e-infrastructures. The new landscape is opening opportunities to the EGI infrastructure to become a reference infrastructure for research data sharing and exploitation.

To address these challenges, it is very important that the national building blocks of the EGI Federation, the NGIs, are extremely well connected to and embedded in their national e-infrastructure contexts. This is where I expect this integration of interests will take place and can then be further worked out on the European level.

Let me finish by thanking Ludek Matyska and Pierre Etienne Macchi for serving EGI as members of the EGI Executive Board for many years. We have welcomed Miroslav Ruda and Isabel Campos as their successors.

Let's continue our journey into an exciting future!

Arjen van Rijn,
Chairperson EGI Council and Executive Board

Foreword: EGI Foundation Director

2020 was my first year as Director of the EGI Foundation. I am proud of leading a professional and dedicated organisation full of colleagues who are passionate about their work and about serving the research community. I am honored to work with the EGI community, of which the EGI Foundation is part, and it is my pleasure to introduce some of the highlights regarding its status and achievements.

Collaboration was the leitmotif of 2020. We engaged with an exceptional number of new scientific projects and communities and improved the collaboration among EGI participants. The support for Social Sciences and Humanities, Photon and Neutron Sciences, and Earth and Environmental Sciences significantly increased. Additionally we established new technical collaborations with partners from the energy and manufacturing sectors. This trend will continue in 2021, in partnership with research communities. We will have more scientific applications and data exploited in the cloud, and many data spaces will come to life bringing together research data and tools from various scientific domains.

Looking at the user communities, I am happy to see that Health and Medical Sciences, together with Earth and Environmental Sciences, have been expanding during 2020. Together, these two scientific domains account for more than 62% of today's users, a tremendous achievement in supporting multidisciplinary science. The EGI Federated Cloud adoption doubled in 2020 and we are looking forward to an even more positive trend in 2021, expanding the Federation beyond Europe. Today the EGI Federated Cloud is one of the most advanced and technically mature production infrastructures in Europe, delivering a secure and trustworthy federation of data and research cloud providers.

The EGI Federated Cloud and technical solutions for federated infrastructure management and orchestration, benefit from co-development and co-design.

I am particularly proud of the way co-creation with user communities is pushing innovation in the Federation: 27% of the scientific projects focus on customisation of technologies to specific community needs.

At the international level, the EGI Federation consolidated and expanded its partnerships with Africa, China, and the USA, with the purpose of improving the support for Astronomy, Space Science, and Biology. This was possible because of a more coordinated and standardised infrastructure provisioning. Europe, together with our Asia-Pacifc partners, is gradually expanding the already large portfolio of scientific collaborations that benefit from jointly provided advanced computing services.

2020 will be remembered as the year of the COVID-19 outbreak. I am proud of the international efforts made by the EGI Federation members and the WeNMR scientific community who together delivered HADDOCK. We increased the capacity available for molecular docking simulations enabled by its HADDOCK tool. This service platform has been extremely successful in achieving a worldwide impact with more than 13,500 new registered users across 123 countries and +100,000 simulation runs executed. HADDOCK is a bright example of how open science practices, and specifically in this case the sharing of research applications, can truly enable science without borders. We are grateful to the Federation members that made this possible by committing infrastructure capacity and technical support.

I am particularly proud to have new scientific collaborations of international relevance in our membership with CMCC/IS-ENES, MARIS/ SeaDataNet and EMOS ERIC. We look forward to increasing technical collaborations for distributed data processing and analysis targeting new user cases that will further advance our HTC and Cloud federation.

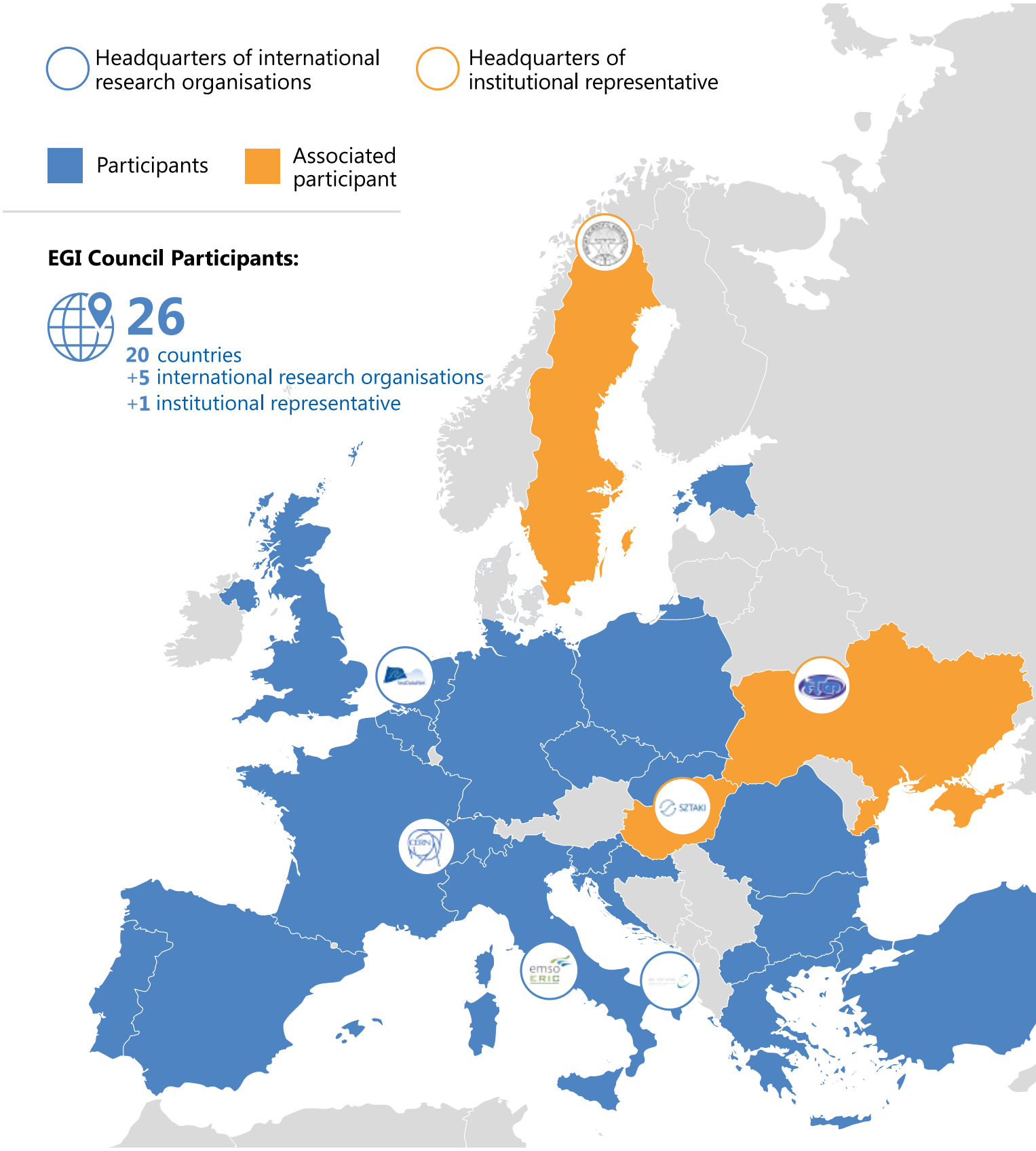
+5200 trained users, +200 training events, 18 interoperability guidelines, 5.6 Billion CPU hours/year... These are just some of the impact indicators of EOSC-hub, our flagship project that concluded in March 2021. With the new projects EGI-ACE and EOSC Future, our contribution to the EOSC is continuing through the provisioning of a dedicated cloud-based federated platform for research data exploitation, the development of the EOSC Portal and collaboration on other key components of the EOSC Core.

In 2021 and beyond, the EGI Federation continues its focus on facilitating scientific and technical collaboration between the NGIs, our national infrastructures, and international research organizations on a global scale. One of our priorities for 2021 is to coordinate these resources and ensure the shareability and accessibility of research data and computing facilities. I am looking forward to strengthening collaborations with partners in Europe and globally to further increase our impact on science!

"We engaged with an exceptional number of new scientific projects and communities and improved the collaboration among EGI participants."

Tiziana Ferrari
Director EGI Foundation

Participants of the EGI Council



New EGI Federation participants

2020 saw an influx of new applications for the Federation. We are delighted to welcome all new entities that have successfully joined us, and look forward to extending our support and offering to the newly added regions and scientific communities.

EGI Participant: EMSO ERIC
Representing: EMSO Members
website: emso.eu

The ocean plays an integral role in regulating Earth's climate and weather patterns, including the heat, freshwater and carbon cycles. Despite the ocean's recognised impact, it is still poorly understood. The European Multidisciplinary Seafloor and water column Observatory (EMSO) aims to explore the oceans and to explain their role in the broader Earth systems, focusing on climate change, risks for biodiversity and natural hazards. EMSO's observatories are platforms equipped with multiple sensors to measure chemical and physical parameters, for example ocean temperature or dissolved oxygen concentration.

Together with EMSO, EGI is addressing the requirements to run its DMP in full production mode. The fully operational system will provide accurate, long-term measurements of ocean parameters. This, in turn, will lead to increased interoperability of EMSO nodes and the consistent collection of ocean essential variables.

EGI Participant: EISCAT Scientific Association
Representing: EISCAT Council Members
website: eiscat.se

The European Incoherent Scatter Scientific Association (EISCAT) exists to provide scientists with access to incoherent scatter radar facilities of the highest technical standard. The association operates four radar antenna sites to enable research on the ionosphere and the upper atmosphere. EISCAT 3D is the new research radar of the collaboration and is a ESFRI Landmark since 2018, consisting of 10,000 antenna elements that are expected to start their observations in 2023 and remain in operation for at least 30 years. EISCAT 3D will require a large amount of computing and storage resources and the ability to federate data and run applications across multiple sites in Europe, China, Japan and South Korea.

By becoming a member of the EGI Federation, EISCAT will receive dedicated support and development effort to customise the EGI Workload Manager to its specific needs, and integrate additional services such as EGI notebooks, EGI Check-in and EGI Attribute Management.

The EISCAT membership follows a long term collaboration that started with the EGI-Engage project and is continuing thanks to the support of the EC Horizon Europe programme with the EOSC-hub and EGI-ACE projects.

EGI Participant: MARIS BV
Representing: SeaDataNet AISBL Members
website: seadatanet.org

SeaDataNet develops and promotes common standards for marine data management, which are widely adopted and used. SeaDataNet core partners are the national oceanographic data centres, mostly operated by major marine research institutes, together with national monitoring agencies.The pan-European infrastructure is represented by MARIS BV, one of the leaders in the strategic development and technical implementation for managing, indexing, and providing access to ocean and marine data and products.

As a Research Infrastructure (RI), SeaDataNet contributes to the ESFRI roadmap, as it provides marine data management standards and services which are adopted and used by several marine ESFRI RIs.

MARIS will also aim for, and facilitate, synergy and cooperation with EGI, in particular for wider adoption and innovative development of web-based science, cloud technology, and EOSC related projects of relevance for the marine data domain.

EGI Participant: CMCC
Representing: IS-ENES Consortium
website: is.enes.org

The Infrastructure for the European Network for Earth System modelling (IS-ENES) supports the European Earth system modelling community working on understanding and predicting climate variability and change. IS-ENES recently joined the EGI Federation represented by the Euro-Mediterranean Center on Climate Change (CMCC) Foundation in the EGI Council – expressing its interest to contribute to the strategic direction of the federation.

By joining the EGI Federation, the CMCC Foundation will represent specific interests of the climate modelling community. In addition, it will share reflections that relate to its scientific domain, with a specific focus on the data infrastructure.

The participation in the EGI Federation is expected to bring a mutual benefit and pave the way towards a closer collaboration between the climate modelling community and the Federation in the context of the EOSC. IS-ENES recognises the EGI Council participation as a key opportunity to further integrate its data services into the European e-infrastructure landscape, making them also available to a wider interdisciplinary user community.

EGI Participant: STAZKI
website: sztaki.hu

SZTAKI is one of the largest IT research institutes in the Central European region. Among its other achievements, the institute plays a key role in cyber-physical production systems research, development, and training as an EU Centre of Excellence in Information Technology and Automation. The institute has extensive experience in developing cloud systems and providing national cloud services. Together with Wigner Data Centre, SZTAKI established a national research cloud in 2016. Since that time more than 120 scientific projects have been initiated on the cloud among them high performance distributed mathematical computations and a wide range of modelling, simulation and machine learning.

In the context of the EGI Federation, SZTAKI will deliver e-infrastructure services and support the needs of Hungarian scientific communities to actively participate in EOSC-related projects. The services are focused, but not limited to coordinated offering of ELKH Cloud resources via EGI and EOSC, exchange applications and scientific datasets with e-infrastructures, and exchange information about the impact of e-infrastructure services.

EGI Participant: Gauß-Allianz
Representing: NGI-DE Members
website: gauss-allianz.de/en/network/NGI-DE

The National Grid Initiative for Germany is part of EGI and being maintained by Gauß-Allianz e.V. which is a non-profit association for the promotion of science and research. It supports the scientific community in Germany by creating conditions for sustainable and efficient use of supercomputing resources of the top performance classes.

The goal of NGI-DE is to provide a reliable and secure e-infrastructure for Germany. It will enable a carrier grade grid and cloud for academic communities. NGI-DE has a focus on research on grids and clouds for academic and industrial use.

The Gauß-Allianz coordinates NGI-DE to offer reliable and secure e-infrastructures for Germany. It will provide a production-quality grid and cloud infrastructure for scientific use.
NGI-DE's research focuses on grids and clouds for academic and industrial projects. academic and industrial projects.

EGI user communities

An overview

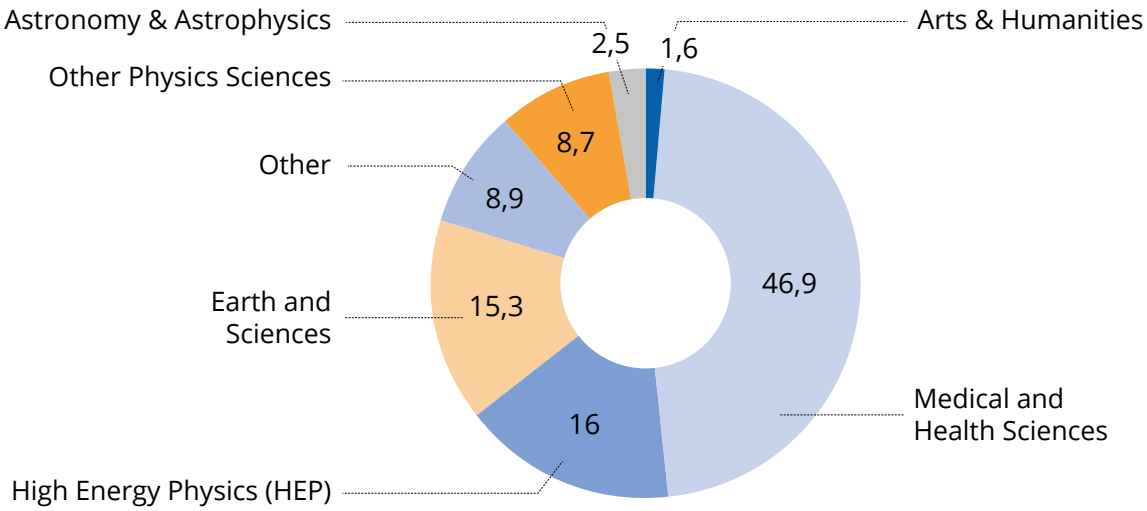
RIs and research collaborations are essential partners of the EGI community, and the largest adopters of the EGI services. They contribute with thematic services (e.g. scientific portals and tools) and operate community cloud/storage/HTC and data systems. The EGI Federation is currently working with over 30 RIs and runs more than 20 Service Level Agreements (SLAs) involving ESFRI research infrastructures in many different scientific domains - from Social Science and Humanities to Physics.

The EGI Federation delivers HTC and Cloud facilities funded by research performing organisations and ministries. Besides pooling these facilities, the EGI Federation provides added value services for federated management of trust and identity, distributed data and compute facilities, and orchestrations and workload management services.

The largest user community of the HTC Federation operates in the field of Structural Biology, with more than 22,600 registered users. High Energy Physics is the top user community in terms of consumed CPU hours. In the EGI Cloud Federation Environmental Science groups (e.g. LifeWatch, NextGEOSS, OpenCoastS), multi-disciplinary environments (e.g. DEEP Hybrid DataCloud) and platforms for application piloting, attract the highest number of users and consume the largest share of infrastructure capacity.

Spread of EGI users across disciplinary areas

numbers in percent



Users in numbers

During 2020, the overall EGI user community increased from 70,900 to 75,400 registered users (+6% from 2019) thanks to targeted support activities aimed at early adopters, research data integrators, and pan-European Research Infrastructures. Webinars and coordinated support by the EGI Federation members and partners are key to the successful increase of science projects that rely on federated resources.

The largest scientific communities in EGI are Medical and Health Sciences, High Energy Physics, and Earth and Environmental Sciences, together representing more than 75% of the total user base.

Number of users

75,400

Three largest scientific disciplines

Medical and Health Sciences

46,9%

High Energy Physics

16%

Earth and Environmental Sciences

15,3%

Number of SLAs

>20

Usage statistics

Thanks to its members, the EGI infrastructure is today the largest distributed computing platform for scientific computing in the world. The number of federated CPU cores from national and international data centres continued to increase at the annual rate of +14%, from 1,050,000 to 1,200,000.

The majority of this capacity is available in the HTC federation, and is dominantly used by the High Energy Physics, Astrophysics and Life Science communities, which collectively represent the major 'data crunching' scientific collaborations in EGI. More specifically, 500 million computational jobs were successfully supported by the EGI Federation, amounting to an overall capacity delivered of 5.6 billion CPU hours in 2020.

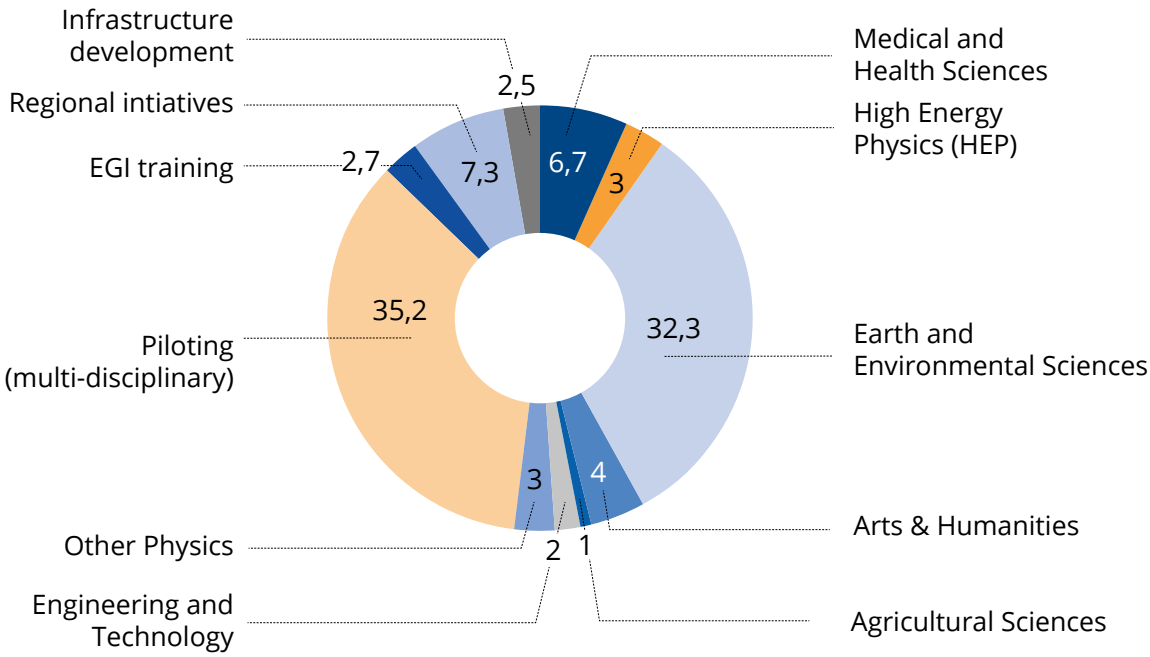
CERN, UK, Germany, followed by Italy, France, Russia and the Iberic Region, were the largest contributors of the HTC federation.
The development of cloud-based services from the Deep-Hybrid Data Cloud project for artificial intelligence (machine learning and deep learning) further enhanced the capabilities of the EGI Federated Cloud in 2020. Examples are the parallel post-processing of very large data, and the analysis of massive online data streams. The usage of the EGI Federated Cloud doubled during 2020, in response to an increasing user demand.

Besides providing machine learning and artificial intelligence services, the EGI Federated Cloud offers researchers a rich portfolio of data, simulation and data analytics tools addressing the specific needs of scientific projects.

The EGI Federated Cloud data spaces are a collaborative effort of the EGI Federation members and and major research infrastructures for environmental research (e.g. LifeWatch, GBIF, EMSO, OPENCoastS, MELOA, SeaDataNet and NextGeoss), demonstrating how cross-border access to research data and digital tools can accelerate science and evidence-based policy making. See the 'highlighted service' section for more on the EGI Federated Cloud.

Spread of EGI Cloud CPU-hour use across disciplinary areas

numbers in percent



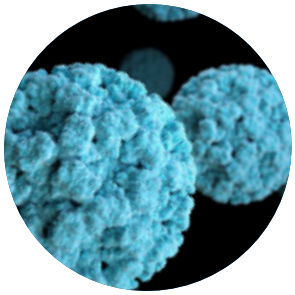
Use cases

WeNMR

WeNMR is the largest community of practice enabled by the EGI Federation thanks to distributed computing resources from its federation members. WeNMR supports more than 22,600 biologists from 125 countries worldwide. The success of WeNMR lies in its ability to provide simulation tools as a managed thematic service scaling up in-house compute capacity through the national capacity made available by national infrastructures of EGI such as JISC (United Kingdom), IberGrid (Portugal and Spain), IHEP (China), INFN (Italy), MetaCentrum (Czech Republic), PLGrid (Poland), SURF (Netherlands), the Ukrainian National Grid (Ukraine), and the National Center for High-Performance Computing (Taiwan). WeNMR also benefits from adding value technologies such as DIRAC for workload management and Check-In for trust and identity management.

In 2020, during the COVID-19 pandemic, the EGI Federation teamed up with Open Science Grid (OSG) in the USA to increase the computing time available for modelling of various Sars-Cov2 human protein interactions. Thanks to this the HADDOCK simulation portal of WeNMR doubled its processing capacity, serving on average ~550 active users per month, running 11,000 simulations related to COVID-19 projects (the equivalent of ~1.5 million HTC jobs, ~2.7 million CPU hours).

With WeNMR we demonstrated the ability to respond with urgent computing needs, and the power of collaboration and open science bringing tangible benefits to scientists.



EMSO-ERIC

EMSO is an European Research Infrastructure Consortium (ERIC) since 2016, with the goal to explore the oceans, to gain a better understanding of phenomena happening within and below them, and to explain the critical role that these phenomena play in the broader Earth systems. In the context of the EOSC-hub project, with the support of EGI members RECAS-BARI and CESGA, EMSO-ERIC transitioned its data platform from prototype to production stage.

EGI cloud, integrated with Check-in for single sign-on, is an integrated solution which allows marine scientists to easily interact with EMSO data.

During 2020 the EMSO-ERIC Data Portal received 800 users from 85 countries, with approximately half of them from Europe. To satisfy this demand, EMSO significantly increased the use of compute capacity in the cloud during 2020.

Argo

Argo is a global array of 3,000 free-drifting profiling floats that measures the temperature and salinity of the upper 2000 m of the ocean. Argo data are being relayed and made publicly available within hours after collection. During 2019-2021, the Argo team developed a pipeline to push ocean observations from the research infrastructure to cloud compute platforms for data analytics. The scientific collaboration used EGI Cloud, with the contribution of LAL-IN2P3, to roll the service to production and offer it via open access to scientists via the EOSC Portal. The 'Argo floats data discovery' service can visualise Argo floats data, along with salinity objective analysis, GHRSST sea surface temperature and external satellite data.

EISCAT_3D

EISCAT is an international research infrastructure, using radar observations and the incoherent scatter technique for studies of the atmosphere and near-Earth space environment above the Fenno-Scandinavian Arctic. The EISCAT Scientific Association collaborates with EGI to build its EISCAT 3D data portal on EGI Workload Manager and Check-in services.

After several years of co-design and development the EISCAT 3D data portal reached pre-production level in 2020, and was opened for early adopter users via the EOSC Marketplace. Support from EGI for the finalisation of the setup is ensured in the new EGI-ACE project, by making it fully operational by the expected launch of the EISCAT 3D infrastructure in 2022.

Cherenkov Telescope Array (CTA)

The Cherenkov Telescope Array (CTA) is the next-generation instrument in the very-high energy gamma ray astronomy domain. It will consist of tens of Cherenkov telescopes deployed in 2 arrays at La Palma (Spain) and Paranal (ESO, Chile) respectively. Currently under construction, CTA will start operations around 2023 for a duration of about 30 years, producing about 2 PB of raw data, and 5-20 PB of Monte Carlo data annually. The associated processing needs are also very high, of the order of hundreds of millions of CPU HS06 hours per year.

CTA is currently in its construction phase with one of the key activities to run massive Monte Carlo productions to optimize the instrument design and to study its performances. The simulations run on the EGI grid infrastructure and were called 'prod5' in 2020. It focuses on producing updated instrument response functions and performance estimation with respect to the last large-scale production held in 2017/2018.

The setup in 2020 used about 100 million HTC CPU HS06 hours compute time from 14 sites that are federated with EGI internal services. Other main components of the stack are a CVMFS binary distribution service, a DIRAC-based workload manager & data catalogue, a MariaDB-based File Catalog, and an FTS file transfer service.

Innovation with user communities

Service co-design and continual improvement with user communities are key to ensure the EGI infrastructure evolves with the user needs. In the context of various innovation projects, new collaborations started with 18 new international research communities, research infrastructures, and SMEs.

The purpose of these partnerships is to customize existing services to the needs of specific targets groups. EGI also engaged in 8 Competence Centres and the EOSC Early Adopter Programme, which brought new technical requirements and user communities to the EGI Federation.

- DODAS (Dynamic On Demand Analysis Service Portal) is a new cloud enabler for scientists seeking to easily exploit distributed and heterogeneous clouds to process, manipulate or generate data. Following an initial integration phase, DODAS was adopted by five large scientific collaborations generating a workload of 4 Million CPU hours and 20 Million GPU hours.
- SoBigData, the Social Mining & Big Data Ecosystem research infrastructure, recently launched a new service empowering scientists to develop algorithms and methods with JupyterHub and SoBigData libraries, deploys methods in a cloud-based environment, and executes experiments interactively. EGI contributes to this service by customising the EGI Notebooks service with extensions and federated AAI capabilities.
- The SeaDataNet Marine Science and the Fusion Physics communities has helped to evolve the DataHub service, reaching a high technology readiness level in 2020 and making it available through the EGI and EOSC service catalogues.
- The OPERAS and TRIPLE collaborations in Social Sciences are widening the adoption of federated trust and identity management with EGI Check-in.
- The PaNOSC ESFRI cluster project supporting Photon and Neutron science, is integrating the EGI Cloud, Notebooks, Check-in and DataHub services into an interoperable setup for distributed data analytics.
- In the EOSC-Life ESFRI Cluster, in collaboration with GÉANT, the Check-in service with the PERUN technology is being evolved to deliver federated AAI managed service to the entire cluster of European research infrastructures for Life Science.
- We started a collaboration with MathWorks to enhance the EGI Notebooks service with MATLAB execution capability. The updated service, available in Q2 of 2021, enables scientists to run MATLAB simulations on federated EGI cloud resources using a combination of EGI licenses and the end users' licenses.

Services for research

Cloud Compute

- **Cloud Compute** provides the ability to deploy and scale virtual machines on-demand.
- 36 million CPU hours were consumed during 2020. The service currently runs on 22 cloud providers across Europe, realising a hyperscale facility for data-intensive applications that run 640,000 Virtual Machines.

Notebooks

- **Notebooks** serves as a browser-based tool for interactive analysis of data using EGI storage and compute services. This service is provided by CESGA and INFN-CATANIA.
- More than 300 registered users are currently benefiting from this service.

Applications on Demand

- **Applications on Demand** gives access to online applications and application-hosting frameworks for compute-intensive data analysis.
- About 80 users from 14 countries were supported, and 900 vCPU cores, 1.8TB of RAM, and 42 TB of storage from 11 different providers were leveraged in 2020.

Online Storage

- **Online Storage** allows the storage of data in reliable environments for HTC and cloud analytics, and for data sharing across distributed teams. This service is provided by 225 providers.
- 580 PB online storage capacity was reached from the HTC and Cloud storage providers in 2020 (+14% annual increase compared to 2019).

High-Throughput Compute

- **High-Throughput Compute** allows running computational jobs at scale on the EGI Federation infrastructure. This service is provided by 200+ compute centres.
- More than 500 million computation jobs were executed in 2020, consuming a total of 7 million HEPSPECT-06 years compute time.

Data Transfer

- **Data Transfer** enables moving any type of data files asynchronously between storage systems. The average monthly data transfer volume of the instances provided by CERN and STFC has been 3.1 PB and 2.5 M files.
- The service has been integrated in 2020 into the HIFIS Backbone Services Cluster, with the aim to support the handling of increasing volume of data at the Helmholtz Centers.

DataHub

- **DataHub** enables efficient access and exploitation of distributed data and the publishing of datasets to make them available for specific users or target communities across federated sites.

- There are currently 10 data providers deployed at 6 EGI Federated Cloud sites and a dedicated installation for the PaNOSC project running at 4 data centres.

Cloud Container Compute

- **Cloud Container Compute** offers the ability to deploy and scale Docker containers on demand using Kubernetes as orchestrator inside the EGI Cloud federation.

- More than 1 million CPU hours on containers were delivered using Docker, udocker and Singularity.

Workload Manager

- **Workload Manager** allows management and distribution of computing tasks in an efficient way while maximising the usage of computational resources. This service is provided by CNRS and CYFRONET.

- 1.7 million CPUh of workload was managed by the service in 2020 (+68% compared to 2019) with WeNMR (Structural Biology), LSGC (Life Sciences) and EISCAT 3D (Atmospheric Sciences) as the major user groups.

Check-in

- EGI **Check-in** enables single sign-in and is a proxy service that operates as a central hub to connect federated Identity Providers (IdPs) with EGI service providers. The service is supplied by GRNET and relies on technologies such as the PERUN for group management.

- It currently serves more than 100 connected service providers and 4000 identity providers in 2020, serving 2,500 average logins from 3,200 registered users per month.

FitSM Training

- **FitSM Training** teaches the fundamentals of IT service management and how to implement FitSM in your organisation through a combination of lessons and examples. This is a paid service provided by the EGI Foundation.

- 11 certification courses and hands-on workshops were organised in 2020, with more than 140 individual certifications issued across Foundation and Advanced levels.

Training infrastructure

- **The Training Infrastructure** is a cloud-based computing and storage resources for training events.

- 6 training courses were hosted with 140 attendees. Additionally, the PaNOSC/ExPaNDS Hercules school was provided with cloud and Notebooks systems in 2020, and offered support to the hands-on sections of the ENVRI-FAIR Winter school.

Highlighted service: EGI Federated Cloud

The EGI cloud federation integrates community, private and/or public IaaS clouds into a scalable computing platform that provides a flexible environment for running any kind of research-oriented workloads. The federation pools services from a heterogeneous set of partner cloud providers using a single authentication and authorisation framework to facilitate the portability of workloads across providers and enable bringing computing to data.

The EGI cloud is participating by a constantly growing number of providers that during 2020 engaged in service provisioning agreements with 26 research communities. Four new providers joined in 2020 and two additional ones entered the certification stage from 13 different countries:

- United Kingdom (100%IT)
- Czech Republic (CESNET)
- Germany (Deutsches Elektronen-Synchrotron - DESY, GWDG, Fraunhofer Institute of Algorithms and Scientific Computing)
- Croatia (SRCE)
- France (Institut Pluridisciplinaire Hubert Curien and Universite de Lille)
- Italy (Istituto di Fisica Nucleare - CATANIA and PADOVA, RECAS-BARI)
- Portugal (INCD - National Distributed Computing Infrastructure)
- Poland (CYFRONET)
- Romania (National Institute for Physics and Nuclear Engineering)
- Slovakia (IISAS)
- Spain (Centro de Supercomputacion de Galicia, Centro Extremeño de Tecnologías Avanzadas, Instituto de Fisica de Cantabria and Universidad Politecnica de Valencia)
- Turkey (TUBITAK ULAKBIM)
- Ukraine (Kharkov Institute of Physics and Technology and Bogolubov's Institute for Theoretical Physics)

Joining the federation allows these providers to easily support international communities in their distributed data processing and data analytics tasks, while keeping complete control of their services and resources.

The federation builds on a standard-based software stack capable of interoperating with a wide range of cloud-native tools and platforms, including Kubernetes for container execution and IaaS orchestrators (e.g. Infrastructure Manager and Terraform), to deploy and run their applications with minimal or no modifications. Besides the common IaaS features for managing computing resources as virtual machines, EGI cloud enables portability with features such as resource discovery to programmatically locate the best provider for the execution of users workloads and a central Virtual Machine catalogue and automated distribution of images so users can find their custom software ready to be used at the providers without worrying about the low level details.

In 2020, a set of features focused on improving the user friendliness of the infrastructure: native usage of web dashboards for the federated users, introduction of a CLI tool to perform federated operations, improved documentation, and enhanced support for industry tools like Kubernetes and Terraform.

Internal services for the Federation

Attribute Management

- **Attribute Management** provides a graphical tool that allows access groups to be created and maintained.
- The Graphical User Interface (GUI) has been designed to offer a better user experience and new requirements have been collected from the user communities (EISCAT 3D) for the management of subgroups and their administrators.

Configuration Database

- The **Configuration Database** is a central registry to record topology information about all the participating sites of an e-infrastructure. The service also provides different rules and grouping mechanisms for filtering and managing the information associated with resources.
- 3,100 people are registered in the database that is involved in the management of thousands of service end-points in the EGI infrastructure. The helpdesk is the central access point to distributed expert teams and infrastructure providers.

ITSM Coordination

- The EGI **IT Service Management (ITSM) Coordination** oversees the implementation and evolution of the IT service management system across EGI. The service designs and implements structured processes for the improvement of service delivery to its customers, and is based on FitSM.
- The system, which counts 19 processes, has been improved and it passed the annual audit to retain ISO 9001:2015 certification and upgrade to ISO/IEC 20000-1:2018 certification.

Security Coordination

- **Security Coordination** improves the capabilities of local security activities for a safer federated infrastructure environment.
- The Security Vulnerability Group assessed 37 vulnerability reports of which 16 were critical and handled. The CSIRT and IRTF team coordinated the response to 10 incidents, leading to 31 investigations.

Check-in

- EGI **Check-in** is a proxy service that operates as a central hub to connect federated IdPs with EGI service providers. It allows users to select their preferred IdP so that they can access and use EGI services in a uniform and easy way.
- The number of registered users of the service grew by 43%, the average number of logins per month was 2,500 and the number of integrated services grew by 25%.

Collaboration Tools

- **Collaboration Tools** support the activities of the EGI community by providing shared capabilities such as issue and action tracking, joint work spaces for working groups, task forces and projects, online agendas, document deposition, and, mailing lists.
- From 2020 onwards, EGI Foundation has been directly responsible for the delivery of these tools.

Strategy and Policy Development

- **Strategy and Policy Development** supports the EGI Federation to plan strategic activities and monitor execution.
- The service established a collaborative process in 2020 for the EGI Foundation annual planning in alignment with the new organogram and the EGI Federation Strategy. Additionally, it established annual reviews with EGI Council representatives.

Validated Software and Repository

- The **Validated Software and Repository** is an important enabler of the EGI infrastructure as it provides validated software for data centres participating in the Federation that need to upgrade their infrastructure.
- In 2020 the repository provided 14 total new software releases and 32 updates across 17 software products.

Service Monitoring

- **Service Monitoring** keeps an eye on the performance of IT services and quickly detects and resolves any issues.
- About 1,000 hosts are currently checked by the ARGO Monitoring service. ARGO makes use of more than 100 probes in order to periodically produce reliability reports with an hourly granularity.

Helpdesk

- The **EGI Helpdesk** provides support to users and operators through a distributed helpdesk with central coordination.
- During 2020 the EGI Helpdesk (GGUS) managed about 5,000 tickets that were triaged and handled by EGI Federation experts.

Accounting

- Information is gathered in the EGI **Accounting** repository based on the APEL technology, and visualised by a central portal. The accounting infrastructure is maintained and operated by STFC in the UK and CESGA in Spain.

- Almost 500 million HTC jobs were accounted for as well as over 36 million hours of cloud jobs.

Community Coordination

- **Community Coordination** helps the EGI Council members to build sustainable user communities for their e-infrastructure services, managing the engagement process, onboarding and technical support throughout the entire lifecycle.

- Representatives of 10 new communities that arranged EGI SLAs in 2020 have been added to the User Community Board, growing the board to 70 representatives.

Operations Coordination and Support

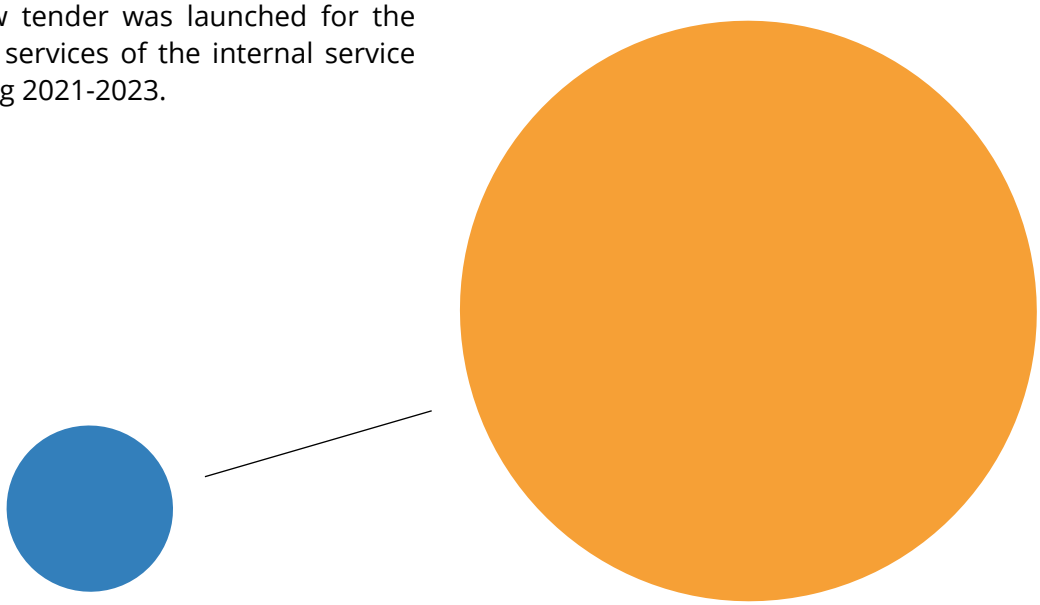
- **Operations Coordination and Support** guarantees that a set of management and coordinating activities are in place to ensure that operational activities run smoothly across the e-infrastructure. It also guarantees compliance with GDPR regulations by establishing Data Processing Agreements with relevant suppliers.

- The first batch of agreements was finalized in 2020. The service was also responsible for adopting a new set of security policies in concertation with all relevant stakeholders. In addition, a new tender was launched for the provisioning of services of the internal service catalogue during 2021-2023.

Project Management and Planning

- **Project Management and Planning** provides the coordination necessary to run common activities across the EGI federation efficiently.

- In 2020, 1 EGI coordinated project (EOSC-hub) and 16 participated projects were supported. EGI was involved in the development of 21 proposals from which 14 have been accepted for funding.



Impact

The impact of the EGI Federation has been wide and diverse. It reached many different scientific disciplines and at all scales, from individual researchers to large research communities and Research Infrastructures. The most tangible indicator of the EGI Federation contribution to excellent science is the annual scientific production enabled by the infrastructure and support services, which in 2020 exceeded 1,100 open access publications. Our impact is presented in 4 areas below: on research, on innovation, on collaboration and on skills & expertise.

On Research

Our large-scale computing and data analytics services are helping scientists to accelerate the process leading to research outputs.

More capacity - faster results

- EGI joined forces with the OSG and various high energy physics sites to commit HTC resources and specialised technical support, and to accelerate COVID-19 research. The structural biology community was able to double its processing capacity with this support, serving on average ~550 active users per month. The EOSC Synergy project operated a Galaxy-based compute environment with this resource pool.

Diverse services

- Support for research platforms and portals
- Different computing architectures
- Storage and data management

High quality - High impact

- Published more than 1,100 peer reviewed open access scientific papers in 2020
- Supported 23 Competence Centres and Early Adopters in EOSC-hub
- Worked with more than 60 research infrastructures, communities, and projects
- Supported tens of SMEs in service uptake

On Innovation

We continuously innovate our services and technology to meet the needs of researchers worldwide.

Cloud container service - package and run anywhere

- Improved support for the automated deployment of Kubernetes to run container based applications

Federated authentication - more options to access services

- 4,000 identity providers supported
- Access to more than 100 services

Improved Service Level Agreements - clear guarantees

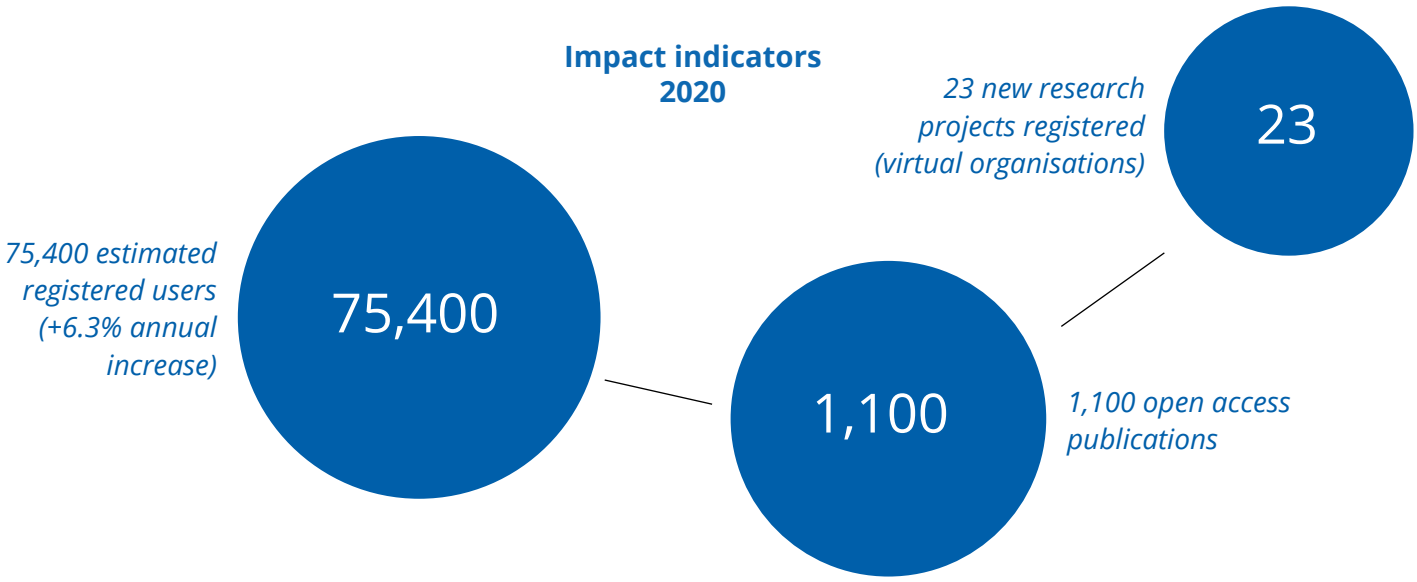
- 10 new SLAs for research communities

Improved Notebooks platform - for reproducible science

- Binder extension for the Notebooks service to support reproducible analysis in the PaNOSC project and in data science training

New EGI DataHub service - federate data

- New DataHub service was developed (offered in 2021) to make distributed data available for computational analysis



On skills and expertise

We create opportunities for professional development and acquiring know-how.

Increased outreach

- The training events of the EOSC-hub project had over 5,000 attendees during 2018-2020.

Increased operational expertise

- Ran online courses and webinars for site managers to increase the operational capacity

EGI Webinar Programme

- To mitigate the restrictions introduced by the COVID-19 crisis, the EGI community launched a webinar programme in 2020
- The programme included 16 events and attracted more than 420 participants from 30 different countries worldwide, and an additional 700 views on Youtube

Service management expertise

- In 2020 140 FitSM training attendees achieved certifications, increasing the service management expertise
  certifications

On collaboration

We foster international collaborations and knowledge sharing.

Memoranda of understanding

- 10 new MoUs have been signed in 2020 (see next section for full details)

Accelerating co-creation and development

- Working with more than 40 research infrastructures
- Supporting more than 15 Competence Centres (in EOSC-hub)

Creating a space for ideas

- Annual conference and thematic workshops with hundreds of international participants

Promoting innovation

- Active business engagement program
  Tens of SMEs supported in service uptake

Virtual conference

- Annual conference held online with hundreds of international participants collaborating and discussion the latest trends and technologies

New collaborations

A great number of Memoranda of Understanding (MoU) were signed in 2020. The majority of these are related to activities in the scope of the EGI-ACE project, where the proposal has served as the main source. In this section you will find an overview of all MoUs signed in 2020.

The following MoUs are with providers of national research cloud or public cloud infrastructures. The joint activities plans of these parties and EGI all include a similar set of actions, which are the following:

- Connect with the user access services of EGI and EOSC
- Connect with the distribution services of the EGI Cloud
- Connect with their Customer Relationship Management (CMS) processes

This applies to the following partners:

- **Georgian Research and Educational Networking (GRENA)**
- **University of Latvia - Institute of Mathematics and Computer Science (IMCS UL)**
- **National Research and Educational Network of Moldova (RENAM)**
- **CloudFerro**
- **T-Systems**

Open Science Grid - OSG, USA

The OSG and EGI have joined forces to provide international support to research communities, establish technical working groups, organise an annual joint open call to expand the group of jointly supported research collaborations, and harmonise and align operational activities.

Additionally, the Open Science Grid (OSG) and EGI have joined forces to commit specialised technical support, specialised simulation tools, and compute and storage resources, to accelerate progress on COVID-19 research, through a call for COVID-19 research projects.

Computer Network Information Center - CNIC, China

CNIC and EGI will establish a joint permanent working group to analyse the feasibility of a joint compute and storage integration testbed, identify use cases from relevant research communities, maintain a technical and governance framework, and promote the results of the collaboration during events.

OPERAS AISBL

OPERAS stands for Open Access in the European Area through Scholarly Communication, and is the Research Infrastructure supporting open scholarly communication in the field of Social Sciences and Humanities. EGI offers generic cloud compute, cloud platform, and data management services for OPERAS. The joint activity plan includes identification of research groups and communities that can be potential users of the collaboration, and share user feedback about the e-infrastructure services.

IDIA

The Inter-university Institute for Data Intensive Astronomy is a partnership of three South African universities, the Universities of Cape Town, of the Western Cape, and of Pretoria, as well as the South African Radio Astronomy Observatory. The overarching goal of IDIA is to build within the South African university research community the capacity and expertise in data intensive research to enable global leadership on MeerKAT large survey science projects and large projects on other SKA pathfinder telescopes. EGI will support IDIA in federating its Ilifu (cloud) resources and make the tools required to analyse the data from the MeerKAT telescope available on EGI cloud resources. Both parties will also exchange information on the impact of the services developed and deployed.

Terradue

Terradue's mission is to innovate services in Earth Science, tailored for data-intensive applications. EGI and Terradue will integrate federated authentication mechanisms in the TEP platforms based on the EGI AA Check in service. EGI Federated Cloud APIs will be assessed when perform from Terradue Cloud Platform and a SLA between both parties will be established to specify the services to be provided to support Terradue activities.

Innovating our services

Authentication-authorisation:

- Improved Check-in user experience.
- Created new Service Registration and Configuration/Management dashboard, called 'Federated Registry' for service providers.
- Established integration with the EGI Accounting portal (Cloud restricted view), ARGO monitoring (admin view), GOCDB (refined access), GGUS Helpdesk, EGI cloud providers, AppDB, Data Transfer service.
- Adopted the "WISE baseline Acceptable Use Policy and Conditions of Use" to simplify the use of resources from multiple e-infrastructures without the need for users to confirm the acceptance of additional policies.
- Configured new dashboard to view data about registered users, supported communities, logins made by users to the services connected to EGI Check-in.
- Completed successful assessment of Keycloak technology to build the next version of the EGI Check-in service. The Keycloak based Check-in is expected in 2023.

Compute:

- Created a Cloud Container Compute integration with EC3 to perform automatic deployment of Kubernetes clusters, simplifying user access to container orchestration tools.
- Updated the Cloud Compute discovery to use GlueSchema 2.1 and transition from BDII to the Argo Messaging System. The operation of the discovery component was automated and migrated to use service accounts.
- Introduced a new command line interface tool to simplify the management of federated operations in the EGI Cloud infrastructure.
- Developed new dashboards in AppDB for better management of security in the EGI Cloud infrastructure.

Analytics:

- Moved the EGI Notebooks service to full production and deployed new community instances for the PaNOSC ESFRI cluster.
- Configured provisioning of dedicated instances for the PaNOSC research infrastructures.
- Started collaboration with MathWorks to enable the execution of MATLAB applications from the Notebooks service on EGI Federated Cloud sites.

Storage and data:

- Increased technology readiness of the EGI DataHub Service (reaching Beta) and setup of a DataHub community installation for the PaNOSC ESFRI cluster project.
- Initiated EGI Data Transfer service integration with EGI Check-in.
- Finalised collaboration with CERN to include EOS as storage solution for the EGI Online Storage service and distribute it via the EGI UMD (Unified Middleware Distribution).

Business engagement

The EGI Federation has continued its business engagement programme dedicated to collaborating with and supporting private entities, which has been recently rebranded as a Digital Innovation Hub (EGI DIH).

The EGI DIH is a virtual space where companies and technical service providers meet to test solutions before investing, offering different services on advanced computing to help companies in digitalization and improving productivity. The main focus over the last year was on the coordination and development of both human and technical support for business oriented pilots and collaborations, resulting in the direct distribution of funds to EGI Federation providers who delivered services for those pilots or providing a foundation for the implementation of future business models.

EGI has continued to be an active member of the Big Data Value Association (BDVA) also serving on the BDVA Board of Directors. 2020 saw EGI's recognition as an innovative iSpace upgraded from Silver to the highest, Gold, label. As an iSpace, EGI is participating in a successfully funded project that kicked-off in Sept 2020, EUHubs4Data, which in addition to supporting several project activities, it also has the potential for EGI federation members to participate in business experiments via a reserved budget.

EGI became a Day 1" member of Gaia-X, which is a joint undertaking for developing the next generation of a data infrastructure for Europe, and fostering digital sovereignty of European users of cloud services. It is being driven by several large commercial companies along with public institutions.

EGI was a founding member and overall coordinator of the EOSC Digital Innovation Hub, responsible for driving the digitization of industry through the European Open Science cloud, which was created and evolved during the EOSC-hub project. In addition to continuing its leadership in the follow-up project, EOSC Future, EGI Federation Members directly supported 10 of the 18 business pilots with both technical services and expert consultancy.

MathWorks and EGI have partnered to offer a web-based version of MATLAB via EGI's Notebooks environment, making the familiar MATLAB desktop environment accessible via a web browser. The pilot enables MATLAB users to run on EGI infrastructure to analyse and visualize data, develop algorithms, and share research output with others. Longer-term business agreements are being explored as part of the pilot.

SixSq is a Swiss SME, provides open-source edge-to-cloud management software, which allows companies and institutions to deploy a secure and comprehensive edge and cloud strategy, while avoiding lock-in. Given its vendor neutral position, this pilot is exploring both technical and business integration options between SixSq and EGI existing service offerings and for potential inclusion in the EGI Marketplace.

Expriva and EGI renewed its commercial relationship for supporting DIAS benchmarking across multiple providers/countries with 4 EGI Cloud Providers selected. 2020 marked the 2nd successful contract awarded.

Terradue, an Italian SME, continued its long running relationship with EGI for engaging with the Earth Observation community and operational support for the Geohazards Exploitation Platform (GEP). EGI supports Terradue with matchmaking services between ICT consumers and appropriate providers across the EGI Federation and beyond.

Peachnote, a German SME, renewed its SLA with EGI for offering its search engine and analysis platform for music scores that relies on EGI Federated Cloud services.

The NextGEOSS project developed the next generation centralised hub for Earth Observation data, where users can connect to access data and deploy EO-based applications. EGI supported all 12 of the pilots and redistributed ~€100,000 to the EGI service providers. In addition, EGI federation members have ensured project sustainability of several core services beyond the project. NextGEOSS played a fundamental role in maturing key aspects of EGI's pay-for-use business model.

EGI support to EOSC

The European Open Science Cloud (EOSC) initiative aims to deliver a 'federated infrastructure 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'.

Through EOSC-hub and other participating EOSC projects, EGI supports the implementation of European Open Science Cloud (EOSC) by:

- Delivering the computing platform that serves as federated secure and trustworthy hosting environment for European core research data exploitation across organizations, projects and national boundaries.
- Providing key components of the EOSC Core such as the EOSC Marketplace and the EOSC Portal AAI infrastructure, service availability monitoring, usage accounting, the helpdesk, and policies and processes for the provisioning of the EOSC federated 'web of data and services'
- Coordinating the EOSC service portfolio and the service provider onboarding process
- Coordinating dedicated user support actions such as the EOSC Digital Innovation Hub and the EOSC
- Early Adopter Programme

Key projects

EOSC-hub
1 Jan 2018 - 31 Mar 2021
Coordinator: EGI Foundation
Project budget: 33M
EGI budget: 6M EUR
Website: eosc-hub.eu

EGI-ACE
1 Jan 2021 - 30 Jun 2023
Coordinator: EGI Foundation
Project budget: 12M
EGI budget: 2.5M EUR
Website: egi.eu/egi-ace

The EOSC-hub project started on January 1st 2018, bringing together an extensive group of national and international service providers to create the Hub: a central contact point for European researchers and innovators to discover, access, use and reuse a broad spectrum of resources for advanced data-driven research. The EGI Foundation has coordinated the project, with numerous key results that contributed to the development of the EOSC initiative as a whole, and, in particular, the establishment of the EOSC Portal.

Building on the distributed computing integration in the EOSC-hub project, EGI-ACE will deliver the EOSC Compute Platform and will contribute to the EOSC Data Commons through a federation of cloud compute and storage facilities, PaaS services and data spaces with analytics tools and federated access services.

More on the impact and details of both projects will be described in the following subsections of this chapter.

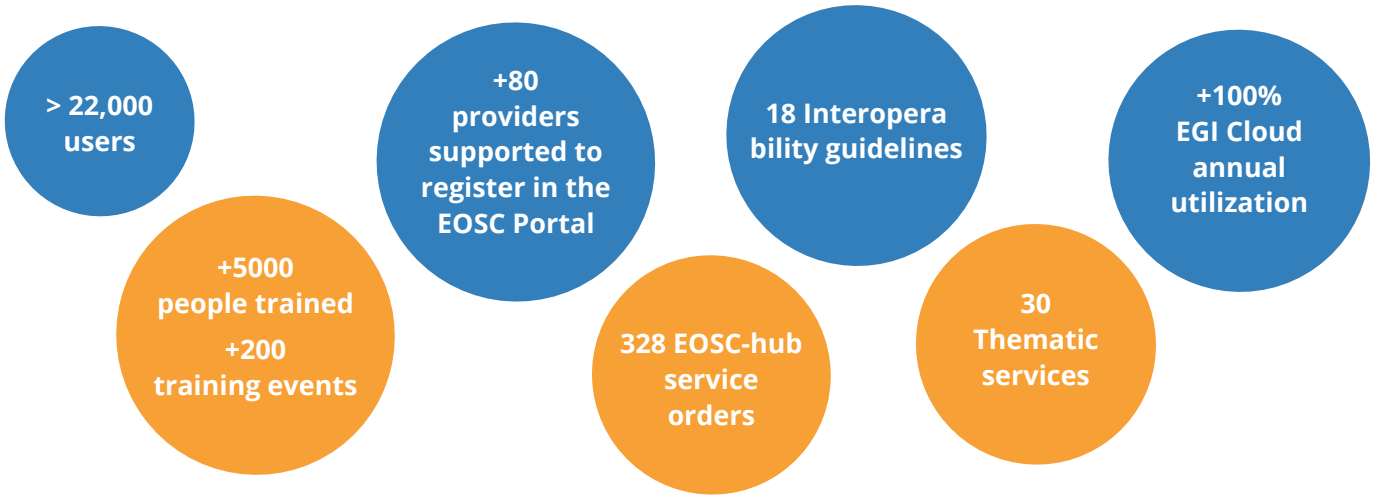
EOSC-hub

EOSC-hub was the first, and one of the major, implementation projects building the EOSC. It significantly contributed to the shaping of the portfolio, the technical architecture, the interoperability standards, the modelling of the Minimum Viable EOSC, and the Rules of Participation. It also dedicated significant efforts to support the EOSC demand side focusing on multiple target groups: research communities, industry and SMEs.

The project was one of the most significant contributors to the definition of the EOSC Portal concept and its implementation, evolving it into a European-level common discovery and access channel, which currently comprises more than 300 services. It defined the functional capabilities of the EOSC Core and significantly contributed to the definition of the EOSC technical implementation.

The service catalogue model defined in the project with the internal catalogue (the 'Hub') and the external catalogue with user-facing data and services, was eventually adopted by the Sustainability working group of EOSC.

The new services in the project integrated the data and applications of 14 new research infrastructures that have already supported more than 20,000 new researchers, carrying out millions of operations and computational jobs monthly. More than 5,200 people were trained. From a technical point of view, the project produced 18 interoperability guidelines, and integrated more than 80 service providers into the EOSC portfolio.



Contribution to the EOSC implementation

EOSC-hub delivered 9 key exploitable results that contribute to the main 4 EOSC implementation areas: support, interoperability, EOSC Core and EOSC Exchange.

Area 1. Support actions

- The **EOSC Digital Innovation Hub** provides a clear interface for commercial innovation that can be supported by EOSC as part of the broader European Digital Innovation Hub landscape (e.g. free access trials). Additional user support actions include the **EOSC Early Adopter Programme** which aims at offering integrated consultancy services to enable active use of EOSC services.
- The **Training Courses and Materials** encompass a large variety of project results such as common and federated services for supporting the whole research life cycle, domain-specific training to target the needs of data providers and data scientists and advanced training on higher-level composable and PaaS services to consultancy building on training events aiming to stimulate the knowledge transfer, foster the use of digital infrastructures and promote the uptake of Open Science paradigm.
- The **Business and Sustainability** models are crucial for long-term planning of EOSC. In addition to grounding the discussions about finances, they also provide foundations for ensuring the trust of users and user communities on the continued delivery of services. EOSC-hub provides a definition for the planned "EOSC Federating Core", including a cost assessment and a business plan.

Area 2. Interoperability guidelines

- Interoperability and Integration Guidelines piloted the definition of the high-level architecture for basic EOSC technical functions and promoting EOSC standards and APIs. The result, if implemented in the EOSC, will facilitate access to services, lower barriers to integrating and composing services and promote the usage of services between adjacent communities.

Area 3. EOSC Core

- The **EOSC Portal and Marketplace** support the service discovery and access in EOSC. This key exploitable result includes technical components, intangible assets and contractual arrangements that make it possible to provide the service that facilitates the access and use of the EOSC assets.
- The **Internal Services** provide the basic enabling services proposed for accessing and operating the EOSC. Some examples of these internal services include access control or accounting as well as common and standard interfaces to shared tools for basic services that need to be aligned in order to provide consistent user experiences. Internal services in the Hub Portfolio are one of the key elements foreseen for the EOSC federating core.
- EOSC-hub defined and piloted an **IT Service Management System** (ITSM) for EOSC. This system will allow service providers to plan, deliver, operate, and control services offered to customers or the future EOSC users.
- To be able to create a market with providers and users, EOSC-hub developed a comprehensive and coherent set of **rules and policies** for service providers to onboard services and make them discoverable and accessible through the EOSC Portal.

Area 4. EOSC Exchange

- The EOSC is envisioned to provide a "one-stop-shop" for services and solutions to speed up the research process of the disciplines and enable cross-disciplinary collaboration and reuse of tools and results. To this end, EOSC-hub has gathered a number of diverse services in the EOSC Service Portfolio. Independently of the service characteristics, the **EOSC Service Portfolio** supports them by making the discovery of the services easier and reducing the effort needed to adopt them.
- The **EGI Federation** provides compute, storage facilities, federated data and compute management, and federated AAI services as horizontal platforms for the hosting of data and data exploitation services.

EGI-ACE

EGI-ACE delivers high-end capabilities for multi-Petabyte scale data processing and analysis, scientific workflow management, orchestration, data transfer for staging of data into the EOSC Compute Platform, federated AAI, and federated data access. It is a project that starts in 2021, but had a great deal of preparation in 2020.

The project expands the EGI Federation with EOSC dedicated capacity, federate data spaces and cloud based tools from a large range of research communities and infrastructures, and share software appliances for reproducibility of science.

The EOSC Compute Platform will include:

1. A Resource Tier (IaaS) offering of 82 million CPU hours.
2. A Platform Tier (PaaS) including a service to develop and train artificial intelligence, machine learning and deep learning applications, providing transparent access to e-infrastructures, supporting access to GPU accelerators.
3. A Federated Access Tier for accessing distributed storage, compute facilities and data.
4. The data spaces and analytics contributing to the EU Common data spaces for the Green Deal, Health, and fundamental research.
5. Services that rely on demonstrated solutions scaling at the level of 500 million compute jobs/year, tens of millions of files, and tens of PBs in data volume.

The project contributes to the EOSC Data Commons through data spaces focused on Health and the Green Deal for multi-disciplinary research e.g. drug discovery, containment of infectious diseases, biodiversity conservation, and water quality. The data spaces are delivered by:

- 16 Cloud Hosting nodes from the EGI Federation
- 3 international e-Infrastructures
- 7 international research communities and data providers (LSGC, WeNMR, IS-ENES, SeaDataNet, Galaxy.eu, DMCC)
- 10 research infrastructures (LOFAR, MeerKAT, EMSO, GBIF, ITER, EISCAT, VIRGO, e-RIHS, PHIRI)

Projects

PolicyCLOUD
1 Jan 2021 - 30 Jun 2023
Coordinator: ATOS Spain
Project budget: 3M

EGI budget: 244K EUR
Type of project: Policy
Website: policycloud.eu

Key Exploitable Results (KERs)

- Set-up a cloud-based infrastructure for data-driven policy management
- Register services in the EOSC portal

Importance of KERs for EGI

Contribute to better positioning of EGI in the public domain sector.

EGI Contribution

The main contribution of EGI to the project will be the cloud provisioning and the operation of the computing capabilities for the PolicyCLOUD. Moreover, EGI will also participate in the dissemination and exploitation tasks, in the activities related to the market analysis and exploitation, communication and stakeholder engagement, as well as to the road-mapping and impact on adoption.

DIGITbrain
1 Jul 2020 - 31 Dec 2023
Coordinator: PNO Consultans
Project budget: 8M

EGI budget: 279K EUR
Type of project: SMEs/industry
Website: digitbrain.eu

Key Exploitable Results (KERs)

- Set-up and operate a HPC/Cloud testbed for the project for helping manufacturing companies to facilitate cost-effective distributed and localized production for manufacturing SMEs
- Establish collaborations and synergies with DIH

Importance of KERs for EGI

Reinforce collaboration with SMEs (in the manufacturing domain) and create synergies with the DIHs across Europe to attract national and regional funding, evangelise the manufacturing stakeholders, and enable manufacturing SMEs to co-create and experiment with digital innovations before investing.

EGI Contribution

EGI will offer technical advice and consultancy to identify the best solutions to get industrial applications up and running on an integrated HPC and cloud platform, with dedicated support mechanisms tailored to users' needs. This includes serving as a matchmaker for users and the appropriate service provider(s) across the EGI Federation and beyond.

EUHubs4Data
1 Sep 2020 - 31 Aug 2023
Coordinator: Instituto Tecnológico de Informática (Spain)

Project budget: 12M
EGI budget: 598K EUR
Type of project: Digital Innovation Hubs/Big Data
Website: euhubs4date.eu

Key Exploitable Results (KERs)

- Catalogue of data sources and data driven services
- Federation of data driven DIHs
- Data driven innovative experiments
- Models/strategies for the federation evolution
- Impact and dissemination plans
- Cooperation framework
- Common training programme
- Ethical and level framework

Importance of KERs for EGI

The EGI DIH is part of the DIH federation and the EGI technical services part of the catalogue.

EGI Contribution

EGI leads the WP on "Federation of data sources and datasets" as well as a task within it "Data federation, data sharing and data platforms" and also leads the dissemination and communication task. In addition, EGI is actively part of several activities across the project such as federation model development, DIH and private sector community building, cross-border experiments and training programme as well as driving the project online presence.

EOSC Synergy
1 Sep 2019 - 28 Feb 2022
Coordinator: CSIC (Spain)
Project budget: 5.6M

EGI budget: 372K EUR
Type of project: EOSC support
Website: eosc-synenry.eu

Key Exploitable Results (KERs)

- COVID VO-Cloud Computing Service based on Galaxy to support researchers on COVID-19
- First prototype of 9 thematic services with EGI services (compute, storage, check-in)
- National landscape analysis and recommendations

Importance of KERs for EGI

The support to the COVID VO represents the successful response from EGI to the COVID research community. The technical support to the thematic services with the EGI services contributes to the main mission of EGI, to provide solutions for advanced computing and data analytics to the research community and at the same time contributes to the adoption of EOSC services into research communities at national level (capacity building). The contribution to the landscape analysis and recommendations will provide the overview of gaps on the different national roadmaps. EGI is a key partner to provide harmonisation recommendations for the EOSC implementation.

EGI Contribution

In addition to the support provided with the provision of EGI services (computing, storage, Check-in) for the thematic services, EGI leads the communication and dissemination activities, the landscaping analysis, and the national and international liaisons with a relevant role in innovation management and exploitation.

H-CLOUD
1 Jan 2020 - 31 Dec 2021
Coordinator: Martel Innovate
Project budget: 2M

EGI budget: 267K EUR
Type of project: Policy
Website: h-cloud.eu

Key Exploitable Results (KERs)

- Coherent strategy for EU cloud computing industry, with actions agreed by the European Cloud Community
- Specific recommendations for EC policy and support actions (especially through Horizon Europe and Digital Europe)

Importance of KERs for EGI

EGI developed an in-depth understanding of the EU commercial cloud market and challenges for EU customers, which is shaping development of research-oriented advanced computing and data management solutions. H-Cloud highlighted EGI's expertise both in data sharing and data management and in cloud federation in the context of the EU Strategy for Data (February 2020) and allowed EGI to develop its relationship with GAIA-X from both a policy and technical perspective.

EGI Contribution

EGI leads work package 3 (H-Cloud Strategy) developing an assessment of the competitive landscape for EU cloud providers, pain points and aspirations of users/demand sectors, challenges and recommendations for the sector, and comprehensive SRIDA to prioritize actions in Horizon Europe and Digital Europe.

OPERAS-P
1 Jul 2019 - 30 Jun 2021
Coordinator: Centre National De La Recherche Scientifique (France)
Project budget: 2M

EGI budget: 98K EUR
Type of project: Research community
Website: operas.hypotheses.org

Key Exploitable Results (KERs)

- OPERAS ESFRI application
- OPERAS digital infrastructure services
- Connect with EOSC and Onboard OPERAS services with the EOSC portal

Importance of KERs for EGI

EGI supports the OPERAS community with the ESFRI application, mainly responses for the E-Needs analysis part.

EGI Contribution

EGI contributes to the development of community AAI services by integrating Check-In and supports the community to connect with EOSC and the onboarding of OPERAS services with the EOSC portal and EOSC Marketplace. EGI also contributes by enabling the single-sign on service for the OPERAS digital infrastructure, supporting the OPERAS ESFRI application (lead the E-Need analysis), and facilitating the connection with the EOSC.

TRIPLE
1 Oct 2019 - 31 Mar 2023
Coordinator: CNRS (France)
Project budget: 5.6M

EGI budget: 259K EUR
Type of project: Research community
Website: operas.hypotheses.org/projects/triple

Key Exploitable Results (KERs)

- TRIPLE core services and innovation services for SSH scholar and research
- Connect the community with EOSC, and onboard the TRIPLE services with the EOSC portal
- Training of EOSC technology and services
- TRIPLE business model and sustainability plan

Importance of KERs for EGI

EGI supports the SSH community to create core services and innovation services by integration of EGI Check-in services. This is important for EGI to promote services to the SSH community. EGI also contributes to the connection with EOSC, delivery of training, and analysis of the business model with EGI expertise ties and knowledge.

EGI Contribution

EGI enables the single-sign on service for TRIPLE services, facilitating the connection with the EOSC, delivering training, and creation of the TRIPLE business models and sustainability plan.

EOSC Enhance
1 Dec 2019 - 30 Nov 2021
Coordinator: University of Athens (Greece)
Project budget: 2M

EGI budget: 101K EUR
Type of project: Research community
Website: eosc-portal.eu/enhance

Key Exploitable Results (KERs)

- EOSC Provider & Resource Profiles
- EOSC Onboarding process
- Provider Portal and registry (database) of providers and resources
- Marketplace
- Changes to EOSC Portal website

Importance of KERs for EGI

EOSC Enhance evolves the key EOSC components around the portal and resource catalogues from the initial versions into a coherent release, and then passes them on to EOSC Future and the EOSC Association. As a result it defines many of the structures and processes which EGI will have to interact with in the coming EOSC era.

EGI Contribution

EGI manages the EOSC Portal Onboarding Team and plays a leading role in defining the onboarding process of the provider and resource profiles which will underlie the EOSC catalogue and relationships with community resource catalogues.

EOSC life
1 Jul 2019 - 30 Jun 2021
Coordinator: European Molecular Biology Laboratory
Project budget: 23K

Type of project: Research community
EGI budget: 35K EUR
Website: eosc-life.eu

Key Exploitable Results (KERs)

- Complex implementation of Life Science Authentication and Authorization Infrastructure (LS AAI)
- Management and operation of LS AAI service
- Policy definition

Importance of KERs for EGI

To make the whole access and user management system fully interoperable with the EOSC ecosystem, connecting it into the forthcoming EOSC AAI. Additionally, EGI contributes to the study and recommendation of an operational, governance and funding model for Life Science AAI in a longer term to guarantee the sustainability and thus reliability of the Life Science AAI. EGI also contributes to the development of necessary policies, including care of GDPR compliance (e.g. the data processor/controller responsibilities and proper relationship as expressed in policies and agreement).

EGI Contribution

EGI contributes in specifying/defining a convergent access and user management system to enable multi-RI applications and workflows that build on existing approaches and support access to sensitive data with their specific requirements. EGI also contributes in the implementation of federated Life Science AAI and access proposal/control system supporting access through different user entry points, managing user life cycle and controlling and providing fine grained access control to the resources. EGI also offers support to management and operation of this access and user management system including its connection to life science RIs service providers (e.g. cloud, data resources and other RI services)

EIT Digital Project Covid-19 #gosafe
1 Jul 2020 - 31 Dec 2020
Coordinator: Engineering Ingegneria Informatica Spa (Italy)

Project budget: 784K
EGI budget: 60K EUR
Type of project: COVID-19
Website: gosafe-europa.com

Key Exploitable Results (KERs)

- Proof of concept application for early adopters aimed to support assurances and safe travelling of COVID-19 free passengers and contact tracing

Importance of KERs for EGI

Showcase that EGI can be used for enabling new commercial products or services to be developed and tested prior to moving to market.

EGI Contribution

EGI hosted the platform as well as the infrastructure for the required development of it, including technical support required for the service delivery. Additional expertise was also provided in the area of authentication and authorization infrastructures (AAI).

ExPaNDS
1 Sep 2019 - 31 Aug 2022
Coordinator: DESY (Germany)
Project budget: 6M

EGI budget: 382K EUR
Type of project: Research community
Website: expands.eu

Key Exploitable Results (KERs)

- EOSC data catalogue services for PaN national RIs
- EOSC data analysis services for PaN national RIs
- Training activities through EOSC platforms

Importance of KERs for EGI

Collect inputs from the Photon and Neutron (PaN) community to better drive the evolution of EGI service and support the data analysis capabilities of the PaN community using resources provided by EGI. EGI will provide technical support and tools to integrate ExPaNDS service and data providers into the EOSC, the service integration and access management framework, ensuring that services in EOSC can be seamlessly managed and operated.

EGI Contribution

ExPaNDS will rely on a cloud computing infrastructure leveraging the federated services offered by EGI. EGI will participate in work package 1 focusing on EOSC integration, work package 3 which enables data catalogue services with the EOSC, work package 4 enabling the provision of data analysis services within the EOSC, and work package 5 which supports the development of training events through EOSC platforms.

XDC
1 Nov 2017 - 30 Apr 2020
Coordinator: Instituto Nazionale Di Fisica Nucleare (Italy)

Project budget: 12M
EGI budget: 147K EUR
Type of project: Technical
Website:extreme-datacloud.eu

Key Exploitable Results (KERs)

- Quality Assurance
- Exploitation
- Dissemination
- Training

Importance of KERs for EGI

A number of products that are used by EGI federation have been further developed as part of the project (e.g. dCache) and some services based on some XDC components are already in the EGI portfolio (like EGI DataHub built on Onedata) or are new services joining as part of EGI ACE and leveraging components from INDIGO-DataCloud and further developed as part of XDC and DEEP.

EGI Contribution

The EGI Foundation contributed to XDC quality assurance and exploitation, to ensure that the software outputs of XDC can be easily used on e- infrastructures. The EGI Foundation team also supported dissemination, training and technical exploitation activities.

PaNoSC
1 Dec 2018 - 30 Nov 2022
Coordinator: ESRF
Project budget: 640K

EGI budget: 640K EUR
Type of project: Research community
Website: panosc.eu

Key Exploitable Results (KERs)

- Integrate the PaNOSC PaN community in EOSC
- Perform data transfer pilot in EOSC

Importance of KERs for EGI

EGI supports the PaNOSC cluster in bringing data, application and services to the Hub service catalog. This will help to evolve the EGI services offer and improve the level of support tailored to users' needs.

EGI Contribution

EGI offers cloud, storage and high-level compute platforms together with technical advice and consultancy to identify the best solutions to get scientific and/or commercial applications up and running on an integrated cloud platform, with dedicated support mechanisms tailored to users' needs.

NextGEOSS
1 Jan 2016 - 31 Dec 2020
Coordinator: DEIMOS Engenharia S.A. (Portugal)
Project budget: 10M

EGI budget: 230K EUR
Type of project: Earth Observation Community
Website: nextgeoss.eu

Key Exploitable Results (KERs)

- Support all 12 pilots with infrastructure services and support
- First implementation of a pay-for-use style redistribution mechanism between the EGI Foundation and its federation member service providers
- Help refine the processes and procedures Pave the way for the model to be re-used in several other projects and initiatives
- Ensuring a fundamental aspect of post-project sustainability

Importance of KERs for EGI

EGI contributed to NextGEOSS with computing resources made available through the EGI FedCloud directly supporting 12 pilots, both scientific and business oriented pilots along with technical advice and consultancy to identify the best solutions to get the applications up and running on an integrated cloud platform.

EGI Contribution

In addition, EGI Cloud providers supported a number of core services that enabled the project KERs and pledged continued support post-project directly ensuring sustainability planning and bridging to future initiatives.

SoBigData++
1 Jan 2020 - 31 Dec 2023
Coordinator: CNR (Italy)
Project budget: 9M

EGI budget: 440K EUR
Type of project: Research community
Website: plusplus.sobigdata.eu

Key Exploitable Results (KERs)

- Transform the nascent SoBigData research infrastructure, to create the most comprehensive research infrastructure in large-scale social data mining
- Enhance SoBigData SaaS offer with new workflow language and editor
- Efficient access to SoBigData++ through new cloud- and HPC- based components and services, with sustainability and uptake enhanced further through alignment with EOSC

Importance of KERs for EGI

SoBigData++ allows for improvement of the Software-as-a-Service (SaaS) offer in the EGI portfolio. The Notebooks service will expand its user base and will be enhanced to meet new requirements coming from users of big social data analytics platforms. Workflow management tools is incorporated into the EGI offer as well as a result of SoBigData++.

EGI Contribution

EGI contributes by expanding the SoBigData++ platform with new features: an environment for interactive computations based on the EGI Notebooks service and a workflow design system based on Galaxy scientific workflow system. Notebooks enables users to create live documents with code, text and visualisations that capture the whole research process: developing, documenting, and executing code, as well as communicating the results. Galaxy allows users to combine seamlessly SoBigData++ Social Mining Processes capabilities as workflows building blocks.

ESA ITT Open Earth Engine
1 Sep 2020 - 1 Sep 2021
Coordinator: EODC (Austria)
budget: 899K

EGI budget: 5 PMs in kind contribution
Type of project: Research community
Website: openeo.org

Key Exploitable Results (KERs)

- Creation of an integrated platforms for EO data exploitation

Importance of KERs for EGI

Extending the federation with new capabilities to support EO data analytics.

EGI Contribution

EGI contributes by ensring integration of the OpenEO platform with EGI Check-in.

Successful proposals in 2020 (projects starting in 2021)

DECIDO
2021
Coordinator: Engineering - Ingegneria Informatica S.p.A.
Project budget: 3M
EGI budget: 428K EUR
Type of project: Research community

EGI Contribution

EGI contributes to the project with a selection of its services (most notably cloud and Notebooks) in a way that can address the specific needs of public authorities. EGI also acts as a proxy towards EOSC, identifying relevant services, tools and data from from EOSC for the DECIDO pilots, and advising the pilots on suitable ways to achieve interoperability with EOSC. EGI led the consortium towards an EOSC competence centre for the support of data-driven evidence-based policy making.

PITHIA-NRF
2021
Coordinator: NOA
Project budget: 5M
EGI budget: 492K EUR
Type of project: Research community

EGI Contribution

EGI supports the project in defining interoperability standards among the participating Plasmasphere Ionosphere Thermosphere research facilities, and with the broader landscape, including EOSC. The work also covers designing and delivering sustainable data exploitation services that can serve the facilities and will last beyond the project.

LABPLAS
2021
Coordinator: UVIGO
Project budget: 5M
EGI budget: 9M EUR
Type of project: Research community

EGI Contribution

Deployment and operation of a FAIR federated data repository, promoting enhanced exploitation of project outputs (data and results). Providing expertise in order to formulate a strategy regarding data preservation.

LETHE
2021
Coordinator: FH Joanneum (Austria)
Project budget: 6M
EGI budget: 339K EUR
Type of project: AI platform

EGI Contribution

EGI provides the LETHE project infrastructure provisioning (hosting of data catalogue), expertise for the definition of a federated data/cloud blueprint and link with EOSC governance.

HealthyCloud
2021
Coordinator: IACS
Project budget: 2M
EGI budget: 71K EUR
Type of project: Policy

EGI Contribution
EGI leads the task on the analysis of the existing computation infrastructures with special view on health research, and will propose a reference architecture for computational services to serve the health research and innovation cloud ecosystem.

StairwAI
2021
Coordinator: Engineering - Ingegneria Informatica S.p.A.
Project budget: 5M
EGI budget: 298K EUR
Type of project: AI platform

EGI Contribution
EGI provides supprt and leadership for technical requirements definition, service layer design and integrations, deployment and verification of Low-Power Deep Neural Network (LPDNN) benchmarking framework on hardware platforms and generation of benchmarking results, and support for open call management.

C-SCALE
2021
Coordinator: EODC (Austria)
Project budget: 1M
EGI budget: 356K EUR
Category: EOSC service delivery

EGI Contribution
EGI is supporting EODC in the project coordination and is leading the activity to set up the C-SCALE Compute Federation, leveraging on its extensive experience on setup and managing large distributed infrastructures. EGI is also taking care of the interactions with other EOSC initiatives and projects and has a leading role on defining C-SCALE business and sustainability plans.

BD4NRG
2021
Coordinator: ENG Engineering Ingegneria Informatica Spa IT
Project budget: 10M
EGI budget: 271K EUR
Type of project: Technical

EGI Contribution
EGI foundation will be mainly involved in heterogeneous data management activities and in the parallelisation of data stream and pipelining taks. It will also offer access to Cloud resources from the EGI Federation for the Pilot integration tasks.

Strategy

In December 2019, the EGI Council adopted the new 5-year strategy for the EGI Federation. The strategy is rooted in the belief that all researchers should have seamless access to services, resources and expertise to conduct world-class research and innovation. Within this vision, our core mission is to deliver open solutions for advanced computing and data analytics primarily serving research communities and research infrastructures. We also support small international groups, individual researchers and SMEs. The priorities for the federation are captured in six strategic goals for which we report on the initial implementation results:

The following six strategic goals will guide the future activities of the EGI Federation:

1. **Be a trusted service & technology partner for research and innovation**
   The usage of cloud computing almost doubled, while the usage of high-throughput computing services increased by 25%; 4 new major providers joined in both HTC and Cloud services; the scientific discipline with a major growth is medical and health science with a 45% increase.
2. **Evolve the service offering to meet the needs of researchers**
   Several co-design activities and new communities onboarded, the EGI DataHub moved to beta; the cloud-badging moved to production, defined plans for hybrid access to HPC and cloud; new PaaS solutions added to the pipeline in the area of data management, AI and data analytics.
3. **Improve skills of users/operators in service providers: deliver training and consultancy to increase the their knowledge and quality of work**
   EGI webinar program launched with more than 400 participants from 30 countries, a training catalogue was created and the documentation of EGI services went for a major reorganisation; the FitSM training moved to the online format.
4. **Align business models to better support service provisioning:**
   Established a Council task force on EGI Governance and Business Models to develop options for aligning with the changing environment; analysed possible business models for evolving cross-border service provision in the EOSC; designed on-demand compute platform with dedicated funding and single entry point for EOSC that led to the flagship EGI-ACE project.
5. **Strengthen the governance and broaden European coverage**
   Published the brochure “Joining the EGI Federation”; major revision of the EGI Federation Annual Report; established bilateral annual review with EGI Participants; 5 new Council Participants joined; the EGI Federation obtained the ‘gold’ level i-Space label from BDVA.
6. **Be a recognised foundation of the EOSC**
   Co-created the EOSC-Future project to develop the EOSC-Core based on EOSC-hub results; successfully developed the EGI-ACE project to establish the compute platform for EOSC; active contribution to the EOSC Architecture WG and to the development of the EOSC SRIA; EGI Foundation applied to be a member of the EOSC Association to represent the EGI Federation.

The EGI Foundation will continue to act as a key engine enabling its members to support international research and innovation together by operating and evolving a federation and management platform. This platform, on one side, enables service providers to harmonise interfaces and connect to a common hub, on the other side, aggregates demand and simplifies the access. Research is a global endeavor, therefore we will seek to consolidate and broaden key strategic partnerships to better achieve our mission and strategic goals. Together, we can advance research in Europe and beyond for the benefits of the society, the economy and the environment.

Security activities

One key aspect of the security activities is incident prevention. The EGI Software Vulnerability Group (SVG) together with the Computer Security and Incident Response Team (CSIRT), and distributed operations team, work to constantly evaluate new threats that become known, monitor and respond to vulnerabilities.

The response includes preparing and issuing vulnerabilities, notification of affected sites, monitoring the upgrading of affected software and ultimately acting to suspend sites who fail to react to deal with vulnerabilities. This activity mainly covers the compute clusters accessed through grid technologies.

Due to the very different usage models of EGI's cloud and more traditional compute infrastructure, a different approach regarding security needs to be considered for the services running on EGI cloud infrastructure. This work is currently under active development, drawing on extensive experience gained from past security activities in order to obtain a better understanding of the risks attached to new technologies and approaches.

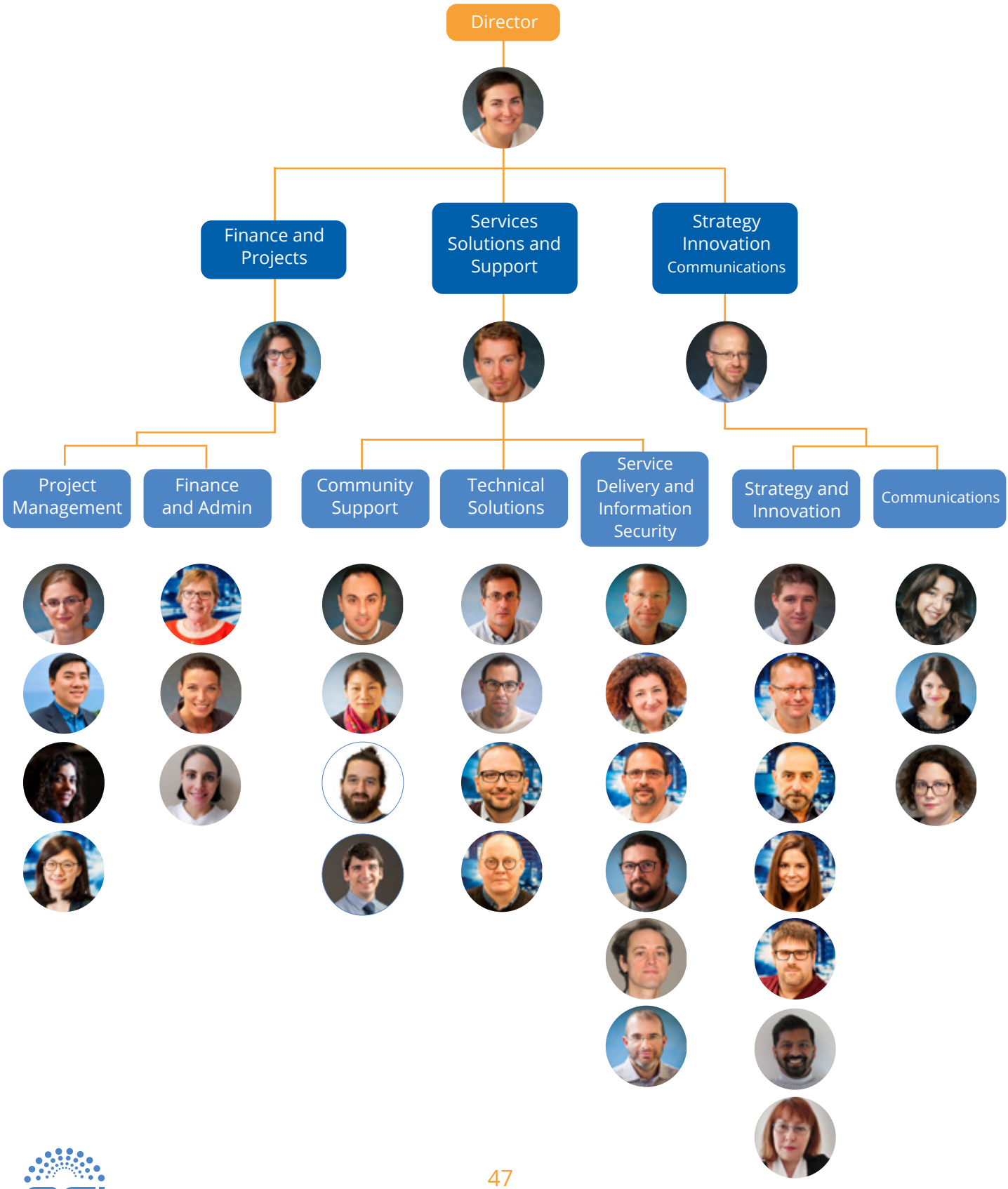
The CSIRT and its members are embedded in global security communities like FIRST and GEANT TF-CSIRT, a community of over 300 security teams from different sectors. After the periodic external assessment by TF-CSIRT In December 2020 CSIRT got re-certified by TF-CSIRT, and as such maintains the Certified status it received in 2014

The Response Team coordinates operational security activities within the EGI infrastructure to deliver a secure and stable infrastructure. The infrastructure coordinated by EGI has now evolved to multi purpose clusters used in other contexts as well. A negative consequence of this is that it allows incidents to cross-infect user communities. EGI CSIRT's unique position by having security contacts at all EGI Resource Centers enabled it to be involved in the management of high level incidents in 2020, affecting multiple HPC centers.

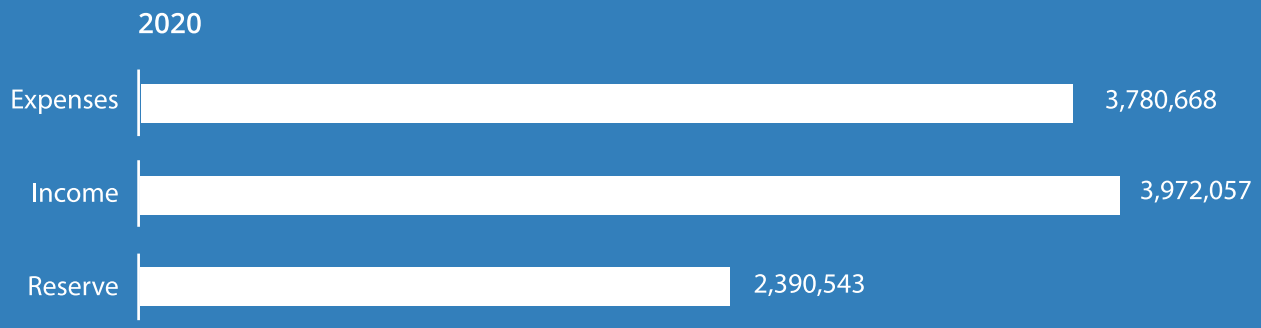
Although only systems in close vicinity to EGI resources were affected, the EGI CSIRT supported the local teams with technical expertise and provided information on indicators of compromise. These incidents received some international media attention.

Organogram

In 2020 the EGI Foundation adopted a new organogram to better support its mission and to improve its efficiency and effectiveness in delivering its coordination function. The new organogram comprises three departments with seven teams.



Finance



INCOME	
Projects income	2,827,301
Other income (Pay4Use and FitSM trainings)	29,756
EGI participants	1,115,000
TOTAL	**3,972,057**

EXPENDITURE	
Personnel	2,795,650
Staff development	9,489
Operating costs	
Core activities grant to Council	411,405
Strategic innovation funds	-44,390
ICT (inc depreciation costs)	78.644
Facilities (inc the expenses for the FitSM courses)	144,435
Non Project travels	24,829
Project travels	13,836
General expenses	87,956
Project central budget	216,605
VAT	*42,209*
TOTAL	**3,780,668**

COUNCIL PARTICIPANTS CONTRIBUTIONS

COUNTY	PARTICIPANT	BUDGETED
Italy	INFN	90,000
France	CNRS	90,000
UK	JISC	90,000
Netherlands	SURF	75,000
Spain	CSIC	75,000
Turkey	TUBITAK ULAKBIM	75,000
EIRO	CERN	75,000
Belgium	BELSPO	55,000
Poland	Akademia Górniczo-Hutnicza w Krakowie	55,000
Sweden	SNIC (Dept. for IT, Uppsala University)	55,000
Switzerland	EnhanceR	55,000
Czech Republic	CESNET	40,000
Greece	GRNET	40,000
Portugal	FCT - Department of Information Society	40,000
Romania	IFIN-HH	40,000
Bulgaria	IICT-BAS	25,000
Croatia	SRCE	25,000
Slovakia	Ustav informatiky SAV	25,000
Slovenia	ARNES	25,000
Estonia	Hariduse infotehnoloogia Sihtasutus (HITSA)	10,000
Germany	Gauß-Allianz e.V. (Associated participant)	45,000
CMCC	Euro Mediterranean Center on Climate Change (CMCC Foundation)	5,000
Ukraine	Bogolyubov Institute for Theoretical Physics (Affiliated participant)	5,000

TOTAL	1,115,000

Credits

This publication was prepared by
the EGI Foundation team.

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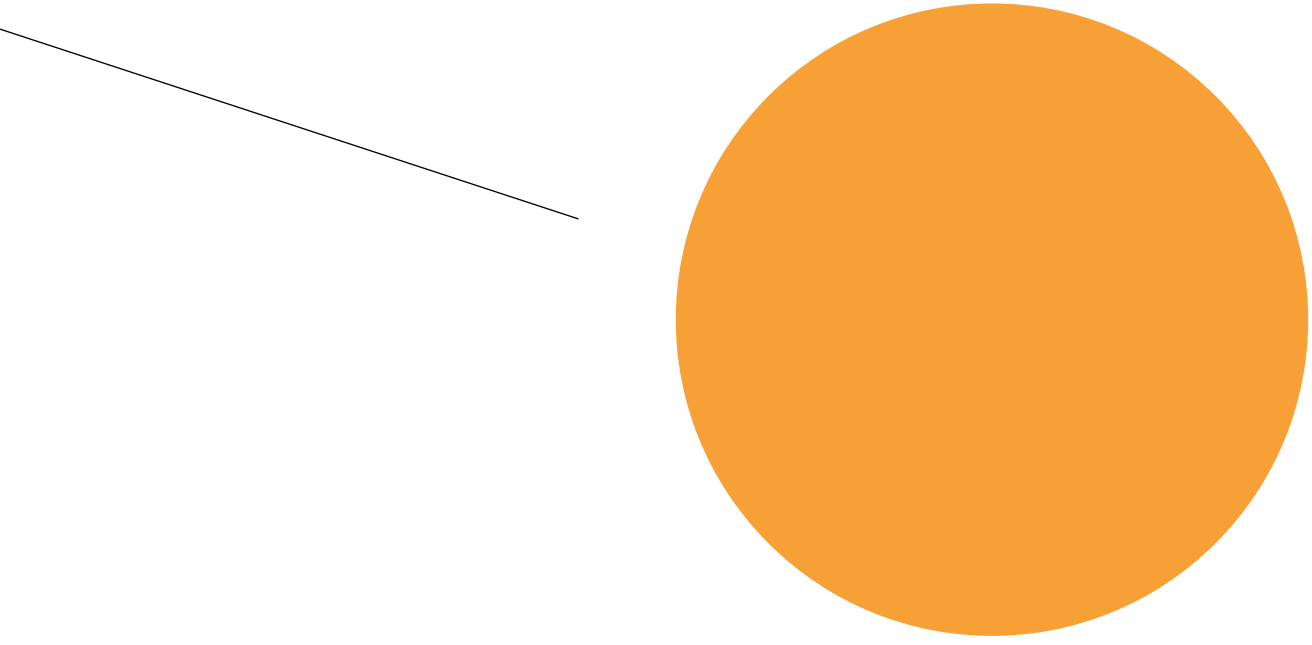

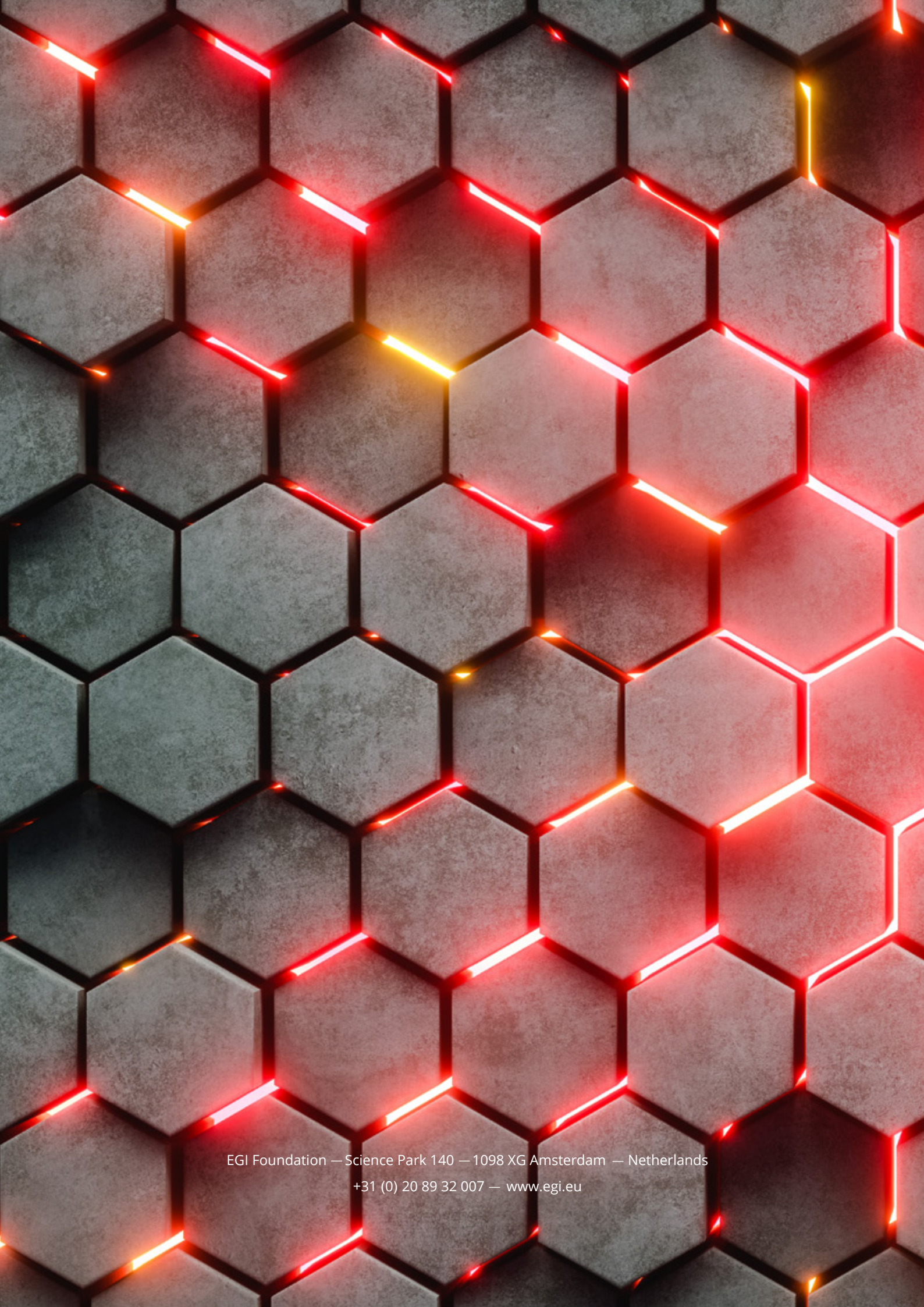

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