



Advanced Computing  
for Research

# ANNUAL REPORT 2018





# EGI: Advanced Computing for Research

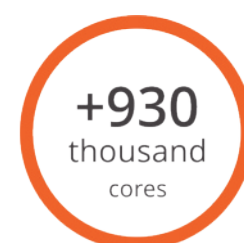
EGI is a federation of 237 compute centres and cloud providers united by a mission to support research activities, business and innovation with advanced computing services.

EGI provides technical and human services, from distributed high-throughput computing & cloud computing, storage and data resources to consultancy, support and co-development.

The federation is governed by the EGI Council and coordinated by the EGI Foundation, with headquarters in Amsterdam, the Netherlands.

Since its establishment in 2010, the EGI e-infrastructure has been delivering unprecedented data analysis capabilities to tens of thousands of researchers from over a hundred virtual research communities covering many scientific disciplines.

EGI is the first European-wide publicly-funded e-infrastructure to be certified against ISO standards, a sign of our dedication to continuously improve our service offering.



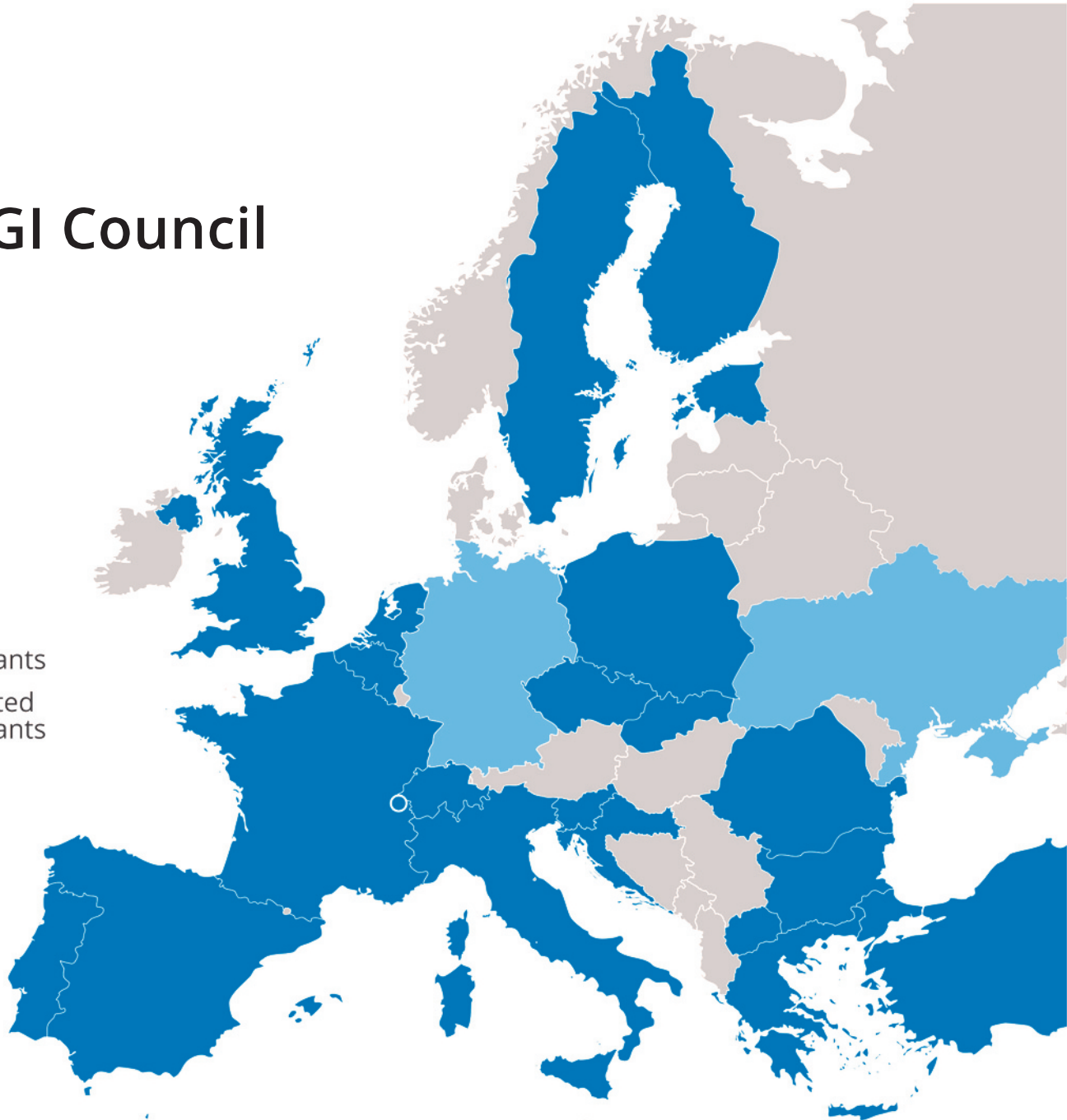
installed capacity  
(December 2018)



disk and tape storage  
(December 2018)

# The EGI Council

-  Council participants
-  Associated participants



+ Gauss Allianz, NAS Ukraine

# EGI Foundation activities in 2018

## Operations

The EGI Operations Team is a distributed group of experts consisting of:

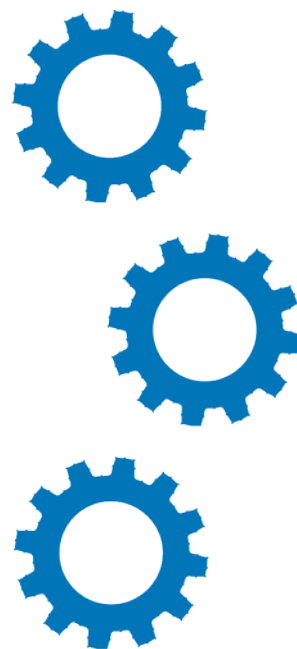
- > the **coordinating team** based at the EGI Foundation, and
- > **specialized teams** from the EGI partners taking care of security incident response, security policy management, technical support and ticket management in the EGI helpdesk, software staged rollout coordination, the operations and support of the accounting and monitoring infrastructures (for details see **Core Services section**).

Together with the Operations Management Board, Operations looks after the EGI Federation which in 2018 comprised sites in 42 countries worldwide. The team guarantees that services are delivered consistently, via the monitoring of OLA and SLA targets, following up on problems and maintaining a safe infrastructure thanks to security experts monitoring vulnerabilities and ensuring that they are dealt with.

In 2018, the Operation Team worked on the consolidation and expansion of the EGI Federated Cloud, and on the migration to ensure the native support of OpenNebula and OpenStack, as well as the native support of OpenID ConnectOAuth via Check-in for the authentication and authorization of access.

Following the announcement of the end of life of CREAM-CE, a compute element deployed in the federation, the operations team was active in planning for its decommission.

The Operations team also worked closely with EUDAT to align processes, policies and the related support tools used to operate the EGI Federation and the EUDAT CDI. In particular, the team led the definition of the operational infrastructure roadmap, which summarises the steps and the timeline for the implementation of the full operations framework of EGI in the context of the EOSC.



## User Community Support

During 2018, the EGI User Community Support Team (UCST) continued to work with the NGIs to engage with and support scientific communities in the uptake of services from the EGI portfolio.

Bi-monthly teleconference meetings, as well as the new 'NIL email news digests', helped us align national plans with EGI priorities and with the broader landscape, such as the European Open Science Cloud.

Together, the UCST and the NGIs supported over 50 communities, ranging from small research teams (e.g the agricultural science group at the University of Wageningen), international projects (e.g ERIC-CLL), to large research infrastructure with long-term needs (e.g EISCAT\_3D). These communities performed early assessment or piloting activities with EGI technical services (mostly cloud combined with online storage), and 14 of them reached agreements for service use in the form of Service Level Agreements.

The team helped the community to establish two new services in the EGI portfolio: Notebooks and workload manager and supported pilot user communities in fusion physics, mathematics (OpenDreamKit), environmental sciences (European Plate Observing System (EPOS) Research Infrastructure) and structural biology (WeNMR).

The capabilities of the Applications on Demand service were expanded with a credit-based system that enables extra resources from commercial cloud providers to be available for data analysis.

### *Cloud-AAI integration*

EGI Check-in was successfully integrated with the Cloud Compute service.

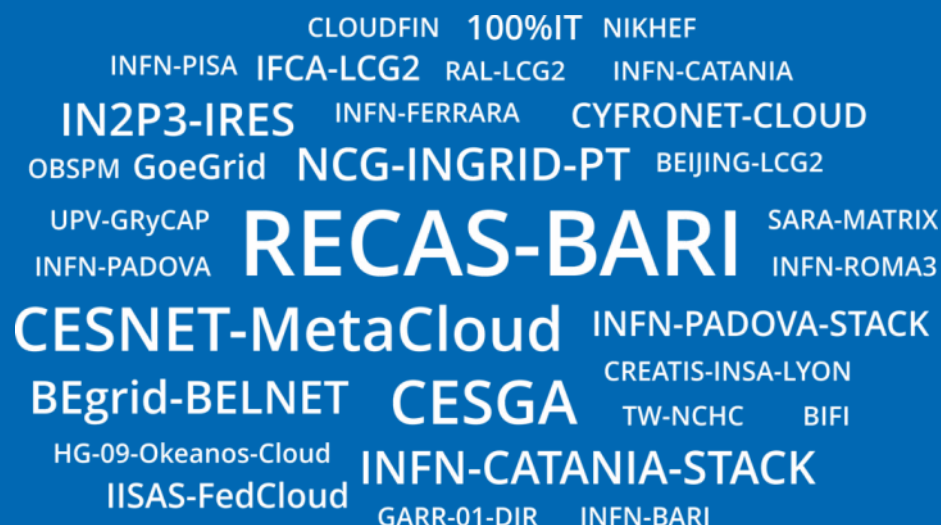
In practice, this means that EGI cloud sites can now provide access through federated login.

Researchers can now use their own credentials and there is no need for them to obtain personal X.509 certificates.



## Service Level Agreements in 2018

In 2018, the EGI Foundation brokered 14 SLAs, connecting a diverse set of research communities with 31 EGI Federation data centres and cloud sites.



*The RECAS-BARI site was the most prolific provider, contributing to six SLAs, followed by CESNET-MetaCloud and CESGA with five each.*

*Thank you to all EGI Federation resource providers!*

## Strategy and Policy

The EGI Strategic and Innovation Fund was established to stimulate projects with a lifetime of maximum 12 months to improve existing EGI services or for concept validation. The projects approved in the first round focussed on expanding the capabilities of the cloud services with serverless technology, elastic kubernetes support and a more flexible authentication mechanism based on OpenID.

In the area of policy development, the team represented EGI at the Open Science Policy Platform and contributed to the paper "Open Science Policy Platform Recommendations" ([doi.org/10.2777/958647](https://doi.org/10.2777/958647)).

The team coordinated the evolution of the EGI Service portfolio: in 2018, two new services were moved to production (ISO 27001 training and EGI Notebooks) and another moved to beta (EGI Workload Manager).

In the context of the Big Data Value Association (BDVA), the team contributed inputs to their strategy and also demonstrated the increased maturity and potential impact of the EGI Federation as a BDVA i-Space, i.e., able to accelerate take up of data-driven innovation in commercial sectors thanks to our services and tools, training events and the dedicated business engagement program. In 2018, the EGI i-Space label was upgraded from bronze to silver.

The team also progressed on the analysis to update the EGI Federation strategy that is expected to complete in 2019.



## Quality Management

The **EGI Integrated Management System (IMS)** is the framework of policies, processes and procedures used by EGI Foundation to ensure that we can deliver coordination to the EGI Council participants.

In 2018, we continued to run an IMS with 19 processes to plan, implement, monitor and continually improve all tasks under the responsibility of the EGI Foundation. The EGI IMS also covers 28 services delivered to external customers as well as services targeted at the members of the EGI Federation.

To support continual improvement of the system, we conducted:

- > **2 management reviews**,
- > **1 annual process review** (covering all 19 processes), and
- > **2 audits** (1 internal and 1 external surveillance audit).

As a result of these activities, we once again confirmed our compliance to ISO 9001 and ISO/IEC 20000-1 standards, which was validated via an external surveillance audit conducted by TÜV SÜD. The certifications demonstrate that EGI delivers systematic and professional operations of all services.



## Training

The two EGI Training Services continued to be the only EGI activity offered commercially.

- > **FitSM Training in 2018:** a total of 18 trainings were offered (+40% from 2017), resulting in 224 certificates awarded across the EGI Community. The majority of trainings were delivered as in-house courses for EGI partners (e.g. SURFsara, ELIXIR, STFC). Two FitSM webinars were also organised for communities CORBEL and ENVRI+.
- > **ISO/IEC 27001 Training (Information Security):** This is a new service, added to the EGI catalogue in 2018, and in its first year 4 ISO/IEC 27001 training courses were held, covering both Foundation and Professional levels as well as an in-house course delivered to Swiss partner, SwING. 37 ISO/IEC 27001 certificates were awarded.



# EGI Foundation contribution to projects

Participation to projects is essential to support the implementation of the EGI Strategy, as adopted by the members of the EGI Council. The projects that concern the majority, if not all, of the members of the EGI Council are usually led by the EGI Foundation on behalf of the Council.

The EGI Foundation also serves as a catalyst to stimulate the participation of its members in projects to support activities at national / institutional level or to support the adoption of EGI services by Scientific or Thematic communities. Members can also participate in projects as Linked Third Parties of the EGI Foundation. This mechanism has the advantage of presenting EGI as an integrated e-infrastructure with a single interface to the consortium rather than a multitude of service providers.



## **EOSC-hub**

<https://www.eosc-hub.eu/>

1 Jan 2018 - 31 Dec 2020

Coordinator: EGI Foundation (100 partners)

EGI Foundation effort: 518 PMs

EGI Linked Third Parties: IFIN-HH, IICT-BAS, EENet, UKIM, ARNES, SWING, Tubitak Ulakbim

EOSC-hub brings together national and international service providers to create **the Hub**: a central contact point for European researchers to discover, access, use and reuse a broad spectrum of resources for advanced data-driven research. EOSC-hub aims to reduce the fragmentation of the IT facilities and digital tools in Europe.

The EGI Foundation is responsible for the overall project coordination, innovation management, quality management and business models & procurement, and contributes to a number of critical activities for the future operations of the European Open Science Cloud, including:

- > **The EOSC federated AAI**, allowing EOSC users to login through single sign on.
- > **The Hub**: a service integration and management system for all EOSC service providers.

- > **The EOSC Marketplace**, a core EGI Federation service and a component of the EOSC Portal.

- > **EOSC service portfolio management**, i.e. the processes for the EOSC catalogue of live resources and its portfolio, which comprise Common & Thematic services and the related business models for individual services.

- > **EOSC federated monitoring and accounting** and the maintenance of key grid and cloud middleware, enabling service interoperability across the federated fabric.

- > **The EOSC Competence Centres and training**, taking care of piloting, user experience and the collection of technical requirements.

- > **The Digital Innovation Hub**, a platform that facilitates engagement between private industry and public institutions participating in the EOSC.





#### ENVRI+

<http://www.envriplus.eu/>

1 May 2015 - 31 Jul 2019

Coordinator: ICOS ERIC (37 partners)

EGI Foundation effort: 40.5 PM

ENVRIplus brings together scientists and technical specialists to create an interdisciplinary and interoperable cluster of Environmental & Earth Systems Research Infrastructures.

The EGI Foundation contributes towards technical training activities, provides support for data solutions, and participates in dissemination and community building actions.



#### EOSCpilot

<https://eoscipilot.eu/>

1 Jan 2017 - 31 Dec 2018

Coordinator: STFC (33 partners)

EGI Foundation effort: 37.4 PMs

EGI Linked Third Parties: CYFRONET, CESNET

EOSCpilot supported the first phase of the EOSC by contributing to policy and best practices. The project deployed pilots to demonstrate how interoperability between services and e-infrastructures can be applied to diverse scientific fields. The EGI Foundation coordinated and contributed with its partners (CESNET and CYFRONET) to service pilot activities involving the major pan-European initiatives, and contributed to service architecture, service portfolio and federated service management activities.



#### AARC2

<https://aarc-project.eu/>

1 May 2017 - 30 Apr 2019

Coordinator: GÉANT (25 partners)

EGI Foundation effort: 25 PMs

AARC2 was set up to address the need for federated access and for authentication and authorisation mechanisms.

The EGI Foundation contributed to the analysis of technical requirements, the definition of the AARC Blueprint Architecture and supported the dissemination effort.

CESNET, CYFRONET and CERN provided key contributions in the policy development area and to the AARC pilot programme.



#### AENEAS

<https://www.aeneas2020.eu/>

1 Jan 2017 - 31 Dec 2019

Coordinator: ASTRON (28 partners)

EGI Foundation effort: 22 PMs

AENEAS is developing a distributed, federated European Science Data Centre (ESDC) to support the Square Kilometre Array (SKA).

The EGI Foundation contributes to the piloting of solutions for federated AAI in SKA, distributed HTC and cloud and computing, and federated service management.

The participation in AENEAS is key to reinforce the collaboration with the astronomy and astrophysics research community and with e-Infrastructures in South Africa and Australia, expanding on the existing collaborations in place to support High Energy Physics.



### AGINFRAplus

<http://www.plus.aginfra.eu/>

1 Jan 2017 - 31 Dec 2019

Coordinator: Agroknow (8 partners)

EGI Foundation effort: 20 PMs

This project is developing the services of the AGINFRA data e-infrastructure for agriculture and food research.

The EGI Foundation supports the uptake of e-infrastructures in the agriculture domain via three use cases: food security, agro-climatic & economic modelling, food safety risk assessment.



### XDC

<http://www.extreme-datacloud.eu/>

1 Nov 2017 - 1 Feb 2020

Coordinator: INFN (8 partners)

EGI Foundation effort: 14 PMs

XDC was set up to develop scalable technologies for federating storage resources and managing data in highly-distributed computing environments, as required by data-intensive research experiments. XDC also supports several key technologies, including dCache, onedata and FTS.

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



### NextGEOSS

<https://nextgeoss.eu/>

1 Jan 2016 - 31 Dec 2020

Coordinator: DEIMOS (27 partners)

EGI Foundation effort: 10 PMs

NextGEOSS is developing a next generation centralised hub for Earth Observation data, where researchers can connect to access data and deploy Earth Observation applications. The EGI Foundation contributes 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.

100,000 euros are reserved to grant access to EGI Federated Cloud members.



### RISCAPE

<https://riscape.eu/>

1 Jan 2017 - 31 Dec 2019

Coordinator: Univ. of Helsinki (10 partners)

EGI Foundation effort: 9 PMs

RISCAPE will produce a report on the position and complementarities of European research infrastructures.

The EGI Foundation liaises with international e-infrastructures to examine their common technical features and identify the societal challenges that they focus on.



### Helix Nebula Science Cloud

<http://www.helix-nebula.eu/>

1 Jan 2016 - 28 Feb 2019

Coordinator: CERN (10 partners)

EGI Foundation effort: 8.5 PMs

HNSciCloud was set up to create a hybrid cloud platform linking commercial providers and publicly-funded research organisations. The EGI Foundation contributed to the evaluation of pilot use cases, collected feedback from the Buyers Group on pilots deployment, analysed best practices and drafted recommendations for future activities.

CYFRONET contributed to the development of a European hybrid cloud platform with Onedata, the open-source data management solutions built around shared “volume spaces” and GlusterFS/S3.



### eInfraCentral

<http://einfracentral.eu/>

1 Jan 2017 - 30 Jun 2019

Coordinator: EFIS Centre (9 partners)

EGI Foundation effort: 7.5 PMs

eInfraCentral’s mission is to help users discover and access Europe's e-Infrastructure services. The EGI Foundation contributes to the collection of requirements and best practices for an harmonised service classification and with advice on the specifications of the eInfraCentral service catalogue.



### ELI-trans

<https://eli-trans.eu/>

1 Sep 2015 - 28 Feb 2019

Coordinator: ELI-DC AISBL (10 partners)

EGI Foundation effort: 7 PMs

During the 42 months of the project’s lifetime ELI-trans worked on supporting and complementing the activities of ELI in its transition from construction phase to initial operations.

The EGI Foundation contributed to help ELI pillars to conceptualise and plan ELI-wide data management service layer that integrates Big Data, Cloud, HTC and HPC services and enables efficient experimental data processing, numerical simulation and data curation.



# EGI Federation core services

The core services are provided by the EGI Federation sites and by the EGI Foundation for the benefit of the entire community. These services are included in the service catalogues of EGI and/or of the EOSC-hub project and cover two areas:

- > services that help national e-Infrastructures to support their user communities
- > services that would be too expensive to run locally and are more efficient if provided by the community for the community (e.g. Accounting or Monitoring)

## Accounting repositories and Accounting Portal

The **accounting repositories** store computing (serial and parallel jobs), storage, and cloud resources accounting data collected from the data centres of the EGI Federation.

The local accounting information is gathered from distributed sensors into a central accounting repository where it is processed to generate summaries that are available through the **EGI Accounting Portal**.

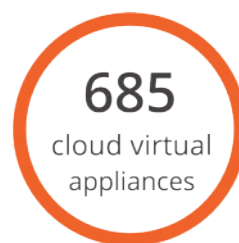
The Accounting Repository, based on the APEL software, has a MySQL database backend and ensures the exchange of accounting information with peer e-Infrastructures.



## Applications Database

The **Applications Database (AppDB)** is a library for native software products and virtual appliances, linking programmers and scientists. Virtual appliances are pre-configured virtual machine images packaged with an operating system and software applications appropriate for a specific use.

AppDB can also be used as a dashboard to operate virtual machines in EGI Federated Cloud sites.



requested through  
AppDB in 2018

## Collaboration tools

The back-office of the EGI Foundation is supported by a number of collaboration tools, essential to keep processes and day-to-day operations going. These include, for example, the EGI Single Sign-On, Confluence and Jira for project management, the INDICO conference management tool, the EGI wiki, mailing list client and document database, among others.



organised through the  
EGI Federation INDICO

## Configuration Database (GOCDDB)

GOCDDB is a central registry to record topology information about all the participating sites of the EGI e-infrastructure. GOCDDB also provides different rules and grouping mechanisms for filtering and managing the information associated to resources. This can include entities such as operations and resource centres, service endpoints and their downtimes, contact information and roles of staff responsible for operations at different levels.



servers (virtual or real)  
registered in GOCDDB

## EGI Check-in and RCAuth

The EGI Check-in service is the Authentication and Authorisation Infrastructure for the EGI Federation. Check-in provides the following capabilities:

- > Integration of Identity Providers (from eduGAIN and individual institutions) with the EGI services through an IdP/SP proxy
- > Credential translation service, including SAML2 to SAML2; SAML2 to OIDC and SAML2/OICD to X.509 certificates through the RCAuth online Certification Authority.
- > Attribute harmonization and policy enforcing

In addition, Check-in supports legacy services for the authorization and authentication of users in EGI, including classic catch-all CA and catch-all and for dteam VO VOMS.

RCAuth is a IGTF-accredited online Certification Authority. The service provides PKIX certificates for end-users through pre-validated credential management services. End-users can obtain certificates or delegations from RCAuth.eu, through a trusted request portal and credential repository, which they can get from EGI.

### EGI Check-in metrics as of December 2018

- **1,800**  
logins per month
- **~1,000**  
registered users
- **48**  
integrated services



## EOSC Marketplace

The EOSC Marketplace (<http://marketplace.eosc-portal.eu>) is a tool for researchers to discover and access the services they need for their work and a key component of the **European Open Science Cloud Portal**, launched in November 2018. As of the end of 2018, the marketplace featured 50 services.

The EOSC Marketplace is developed by CYFRONET and operated in collaboration with the Vrije Universiteit Brussel. Authentication and authorization in the Marketplace are made possible through a federated AAI solution based on the Check-in technology, operated by GRNET.

This work was supported 70% by the European Commission (through the EOSC-hub project), 15% directly by EGI Council participation fees and 15% by CYFRONET.



### Marketplace metrics as of December 2018

→ **325** registered users

→ **+12** new services registered

detailed metrics:  
[go.egi.eu/MarkMet](http://go.egi.eu/MarkMet)

## Helpdesk and support

The EGI Federation provides support to researchers and resource providers through a centrally-coordinated, distributed helpdesk - GGUS (developed by KIT). GGUS interfaces with the ticketing systems operated at the national NGI level to allow bi-directional exchange of tickets. A team of experts based on CESNET provides first and second level support to GGUS tickets.



### 1st level support

→ **572** tickets  
**0.36 days** average response time

### 2nd level support

→ **195** tickets  
**0.46 days** average

## Message brokers

The ARGO messaging service is a fundamental part of the operations infrastructure. It ensures that the ~1200 endpoints of the EGI Federation exchange the information required for the e-infrastructure monitoring systems, accounting repositories.

The message brokers also connect all EGI Federated Cloud sites with the cloud information system ran centrally by the EGI Foundation in Amsterdam.



**12.1**  
million  
messages

exchanged monthly  
between endpoints



## Operations Portal

The Operations Portal is a critical component of the EGI e-infrastructure, essential for the day-to-day work of the distributed Operations Teams. The portal offers a number of different capabilities, for example, the broadcast tool, VO management facilities, a security dashboard and a dashboard used to display information about failing monitoring probes and to open tickets to the affected sites. The dashboard also supports the central infrastructure oversight activities and is fully interfaced with the EGI Helpdesk and the monitoring system through message brokers. In 2018, the Operations Portal included registries for 268 VOs (including 41 new ones) and logged a global availability of 99.8%. Just over 700 tickets were opened from the Operations Dashboard and about 120 broadcasts were sent to an estimated 500 recipients each.



registered in the  
Operations Portal

## Security Coordination

The EGI Computer Security Incident Response Team (EGI-CSIRT) coordinates operational security activities within the EGI e-Infrastructure to deliver a secure and stable infrastructure, giving researchers the confidence they require to carry out their research. In a nutshell, the EGI-CSIRT:

- > Coordinates the response to security incidents
- > Monitors the EGI Federation for potential security issues
- > Develops and maintains the EGI security policy and procedures
- > Monitors software vulnerability and issues advisories when needed, in conjunction with the Software Vulnerability Group
- > Delivers trainings to the EGI Community to ensure knowledge transfer

Day-to-day security operations are handled by the Incident Response Task Force (IRTF). IRTF is a small team of approximately half a dozen security experts distributed over several countries and multiple organisations who, taking part in an on-duty rota, act as first responders to reports of security incidents within EGI.

The seven incidents handled by the team in 2018 were the result of operational glitches, weak configurations and passwords, and only one was caused by unpatched software.



of which 15 were  
assessed as critical



only 1 incident recorded  
due to unpatched software



## Service monitoring

The ARGO service monitoring system oversees the performance of the EGI e-infrastructure. ARGO monitors the infrastructure by collecting the monitoring data generated by functional probes targeted at the e-Infrastructure's endpoints.

The raw monitoring data is used to generate service availability and reliability reports. The ARGO data is also useful to monitor the EGI Federation operational tools.



## Software quality assurance

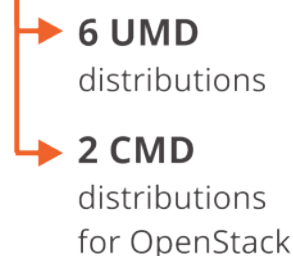
All software products released in the Unified and Cloud Middleware Distribution need to meet checked against functional and nonfunctional requirements according to the quality criteria. After a product is certified, it is moved to the Staged Rollout procedure where they are first tested by Early Adopter sites before being made available to all sites through the production repositories.

During 2018, the software quality assurance team managed six Unified Middleware Distributions and two Cloud Middleware Distributions for OpenStack.



(LIP, IFCA/CSIC, CESGA, and UPV)

Released in 2018



## Workload Manager

The Workload Manager service is based on DIRAC technology used to optimize the distribution of computing tasks among the available resources both High-Throughput Compute and Cloud. The service has a user-friendly interface and also allows easy extensions for the needs of specific applications via APIs.

The Workload Manager was added to the EGI service catalogue in 2018. A number of EGI communities have already adopted the Workload Manager service, including WeNMR, OPENCoastS, EISCAT-3D and VIRGO. For example, the WeNMR community uses Workload Manager for a number of their tools, and reported an improvement from previous 70% to 99% with DIRAC job submission.



# Financial information: 2018

INCOME		€
Contributions from council participants		1,131,500
Participation in projects		2,209,406
Training activities		47,368
<b>Total</b>		<b>3,388,274</b>
EXPENDITURE		€
Staff salaries		1,945,219
Staff development		22,776
Operating costs	<i>Core activities grants to council members</i>	368,155
	<i>Strategic Innovation Fund</i>	134,579
IT equipment (inc. depreciation)		48,266
EGI Foundation facilities		136,804
Travel expenses	<i>Project-related</i>	146,280
	<i>Non-project</i>	32,083
General expenses		109,013
Project central budget		128,695
VAT		36,414
<b>Total</b>		<b>3,108,244</b>
RESERVE		€
<b>Total</b>		<b>1,821,713</b>



## Contributions from council participants

Country (or EIRO) - Organisation	€
France - CNRS ; Italy - INFN ; United Kingdom - Jisc	3 x 90,000
CERN ; Netherlands - SURFsara ; Spain - CSIC ; Turkey - Tubitak Ulakbim	4 x 75,000
Belgium - BELSPO ; Poland - Akademia Górniczo-Hutnicza ; Sweden - SNIC / University of Uppsala ; Switzerland - Swiss National Grid Association	4 x 55,000
Czech Republic - CESNET ; Finland - CSC IT Centre for Science ; Greece - GRNET ; Portugal - FCT ; Romania - IFIN-HH	5 x 40,000
Croatia - SRCE ; Slovakia - Ustav informatiky SAV ; Slovenia - ARNES	3 x 25,000
Estonia - HITSA ; Rep. of North Macedonia - MARGI	2 x 10,000
Germany, Associated participant	45,000
Ukraine, Associatiated participant (affiliation programme)	1,500
Debtors in 2018	1 x -25,000
<b>Total</b>	<b>1,131,500</b>

## Income per project

Project	€
AARC2	106,007
AENEAS	63,547
AGINFRAplus	56,323
eInfraCentral	45,220
ELITRANS	36,198
ENVRI+	97,732
EOSC-hub	1,394,259
EOSCpilot	229,059
HNSciCloud	27,494
NextGEOSS	74,889
RISCAPE	39,629
XDC	39,602
EGI-Engage 2017 correction	-553
<b>Total</b>	<b>2,209,406</b>



EGI Foundation  
Science Park 140  
1098 XG Amsterdam  
The Netherlands

## May 2019

This publication was prepared by the EGI Communications Team with support from our colleagues at the EGI Foundation and the technical teams behind the EGI Core Services.

The content of this Annual Report is correct to the best of our knowledge as of May 2019. Except otherwise noted, all metrics quoted in this report reflect the status at the end of 2018.

More information about the services provided by the EGI Foundation and the EGI Community is available on our website:

*<https://www.egi.eu/internal-services/>*

Design: EGI Communications Team

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