# Participating in EGI Impact Report: Romania

# 2023

egi.eu

# Table of Contents

# Infographic

**+200 service users**

In 2023, +200 researchers from Romanian institutions used the services provided by the EGI Federation
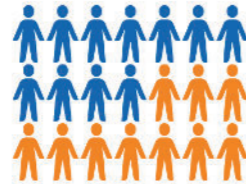
**+540 publications**

The research communities, projects and scientific collaborations from Romania supported by the EGI led to more than 540 peer-reviewed scientific publications
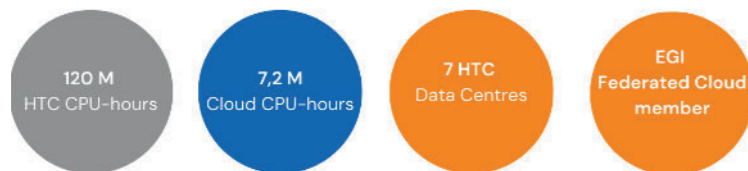
**16 Supported communities**

In 2023, the Romanian infrastructure supported 16 research communities in the following disciplines: Climate Research, Health and Medicine, Physics

**Projects**

Romanian partners participate in 4 collaboration projects + EGI-ACE

120 M HTC CPU-hours

7,2 M Cloud CPU-hours

7 HTC Data Centres

EGI Federated Cloud member

# Country overview

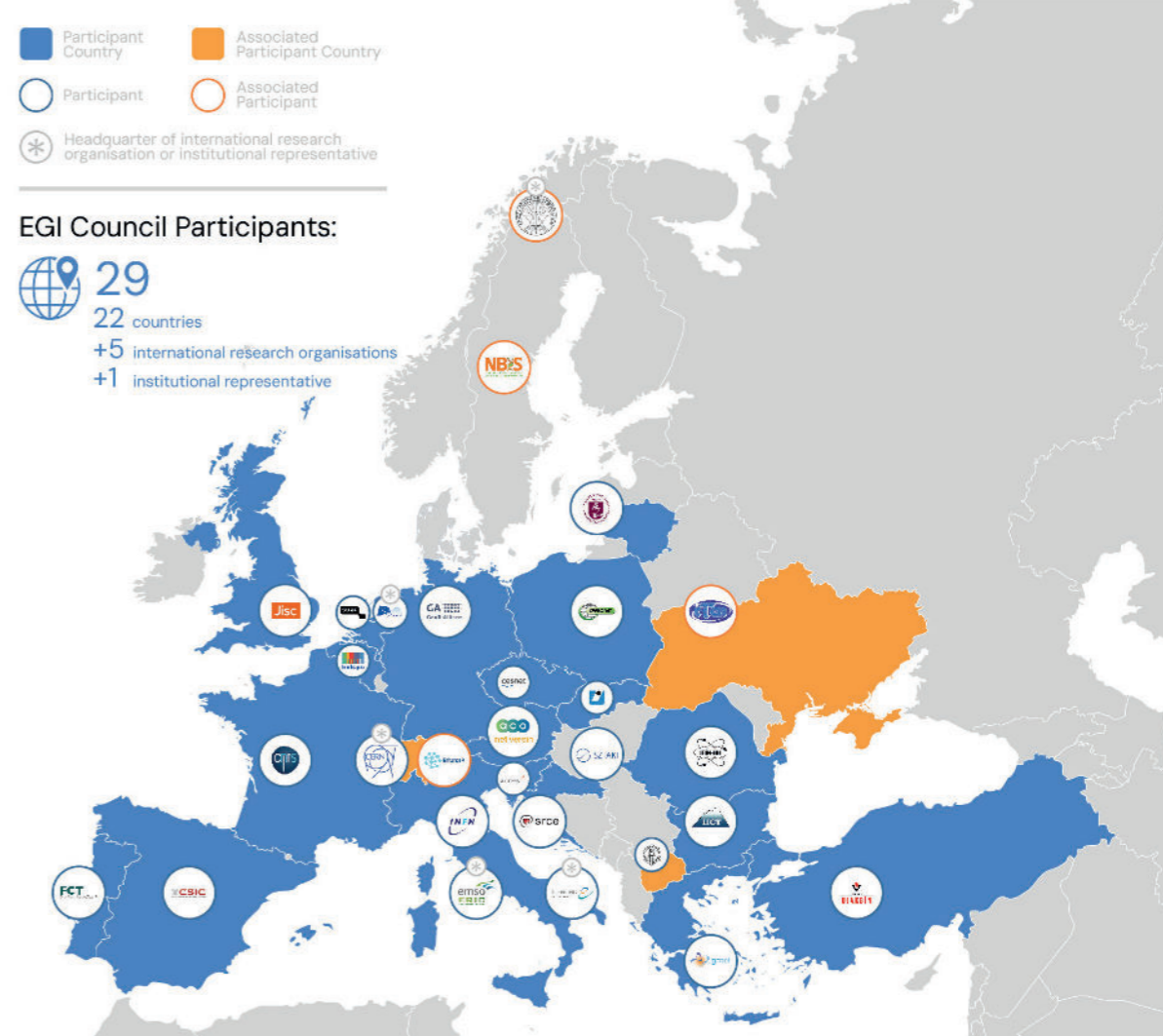| | |
|---|---|
| **Number of supported publications** | 540 |
| **Number of total service users** | 205 |
| **Scientific Communities supported** | 16 |
| **Data Centres contributing to the Federation** | 2 |
| **Collaboration projects** | 4 |
| **Total HTC CPU hours delivered** | 120,720,369 |
| **Total Cloud CPU hours delivered** | 7,235,351 |

# About EGI

EGI is the federation of computing and storage resource providers united by a mission of delivering advanced computing and data analytics services for research and innovation.

The EGI Federation believes that all researchers should have seamless access to services, resources and expertise to collaborate and conduct world-class research and innovation. The EGI Federation is coordinated by EGI Foundation, an organisation with headquarters in Amsterdam. The Foundation offers a service federation and management platform, enabling the data centres to harmonise and integrate their services by connecting to a common hub. Moreover, it engages with international research communities using these services in order to understand and satisfy their demands for advanced computing for research.

The mission of EGI is pursued by coordinating and provisioning an international federated infrastructure that pools together service providers from both the public and private sectors in Europe to develop, integrate and deliver digital services for compute and data-intensive research and innovation. As an open initiative with a global outlook, the EGI Federation also connects service providers beyond Europe, following the collaboration needs of the served communities.

The latest Annual Report provides an extensive overview of the results that have been achieved through our collaborative efforts in 2023.



Participant Country
Associated Participant Country
Participant
Associated Participant
Headquarter of international research organisation or institutional representative

## EGI Council Participants:

**29**
22 countries
+5 international research organisations
+1 institutional representative

Approved EGI Council map from 2023

# About IFIN–HH

With a contribution of almost 10% of the national scientific output, IFIN-HH is one of the most important public R&D organizations in Romania. The institute is dedicated to the research and development in physical and natural sciences, mainly Nuclear Physics and Nuclear Engineering, and in related areas including Astrophysics and Particle Physics, Field Theory, Mathematical and Computational Physics, Atomic Physics and Physics of Condensed Matter, Life and Environmental Physics. In all these fi elds, IFIN–HH conducts theoretical and experimental research.

# Overall EGI impact

The EGI Federation is composed of e-infrastructure providers from national and community initiatives, forming one of the largest distributed computing infrastructures for researchers in the world, integrating about 1,243,400 CPU cores and over 1,4 Exabyte of storage space from hundreds of data centres.

In 2023, the EGI Federation served around 95,000 users (+12%) from over 260 research communities. EGI users consumed 7 Billion HTC CPU hours (−1.04%), 12 Million Cloud CPU hours +17%), ran over 372 M computational jobs (+13.4%) and published over 2,900 open access publications.

As of the previous year, the research community with the largest number of users is Medical and Health Sciences (+43% annual increase in 2023), while the community with most extensive HTC CPU/h consumption is WLCG.

From the scientific communities engaged in 2023, the one with most extensive Cloud CPU/h consumption is Pangeo (+2959% annual increase in 2023).

Moreover, EGI engaged with a total of 265 scientific communities (10 new communities); 19 SMEs and business pilots, and 1 additional Research Infrastructure included in the ESFRI Roadmap, raising the total of number of ESFRI partners/users of EGI to 23.

# EGI contribution to Romania excellence in science

IFIN–HH coordinates the Romanian participation to the EGI Federation, representing the NGI-RO (National grid initiative for Romania). NGI-RO promotes the building and operation of a multidisciplinary national Distributed Computing Infrastructure open to all sciences and to developing countries in Romania. This report provides an overview of the activities of IFIN–HH in EGI, and the impact that was achieved thanks to this participation. The annual membership fee contributed by IFIN–HH to the EGI Foundation in 2023 was 40,000 EUR.

EGI federates hundreds of resource centres that are located at participant countries, organizations and at collaborating e-Infrastructures worldwide. This federated infrastructure supports data- and compute-intensive research across Europe and the world. In 2023, our federation was used by over 260 scientific communities, and has been accessed by around 95,000 users.

Research Infrastructures and multi-national research collaborations are the largest adopters of EGI Services, the main contributors of thematic portals, and operate community-specific compute, storage and data systems based on EGI federation capabilities.

The services of the EGI federation have been used by 205 researchers from Romania in 2023. The estimated annual scientific output in 2023 produced by research communities, projects and scientific collaborations from Romania and supported by the EGI Federation is estimated to amount to over 540 peer reviewed scientific publications. The EGI Federation is currently working with over 40 Research Infrastructures, 16 of which include Romanian partners. These EGI-enabled research infrastructures, their Romanian members and their 2023 scientific output (publications) are detailed in the following pages of the report.

## Romanian research collaborations in EGI

## EGI supported activities and services

## Number of scientific papers published in 2023

### ALICE (High-Energy Physics)
- Institute for Space Science (ISS)
- National Institute for Physics and Nuclear Engineering

ALICE has been supported since 2012 as part of the EGI WLCG collaboration, formally agreed in an MoU. Federated services delivered in the context of the WLCG MoU, including:

- Software support (consultancy to users and system administrators, (software maintenance and validation) Infrastructure and operations Services (infrastructure catalogue, accounting repository and portal, helpdesk, monitoring, operations portal, AAI)
- Software distribution services (UMC, CMD, operations documentation)
- Operations coordination (middleware deployment campaigns, procedures, innovation of tools)
- Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution)

**65**

### ATLAS (High-Energy Physics)
- Transilvania University of Brasov
- Horia Hulubei National Institute of Physics and Nuclear Engineering
- National Institute for Research and Development of Isotopic and Molecular Technologies
- Alexandru Ioan Cuza University of Iasi
- University Politehnica Bucharest
- West University in Timisoara

ATLAS has been supported since 2012 as part of the EGI WLCG collaboration, formally agreed in an MoU. Federated services delivered in the context of the WLCG MoU, including:

- Software support (consultancy to users and system administrators, (software maintenance and validation)
- Infrastructure and operations Services (infrastructure catalogue, accounting repository and portal, helpdesk, monitoring, operations portal, AAI)
- Software distribution services (UMC, CMD, operations documentation)
- Operations coordination (middleware deployment campaigns, procedures, innovation of tools)
- Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution)

**111**

| Romanian research collaborations in EGI | EGI supported activities and services | Number of scientific papers published in 2023 |
|---|---|---|
| **AUGER (Astronomy)**<br>• "Horia Hulubei" National Institute for Physics and Nuclear Engineering<br>• Institute of Space Science, Bucharest-Magurele<br>• University Politehnica of Bucharest | The Pierre Auger Observatory has been using compute resources from EGI partners for more than a decade. The services of the EGI federation that the Auger observatory benefits from include:<br><br>• EGI HTC services from 9 EGI participant countries (CZ, DE, IT, FR, ES, NL, RO, PT, SI)<br>• Software distribution services (UMC, CMD, operations documentation)<br>• Operations coordination (middleware deployment campaigns, procedures, innovation of tools)<br>• Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution) | **8** |
| **vo.compass.cern.ch (Physical Sciences)**<br>• Tomsk Polytechnic University | COMPASS has been supported since 2017 as part of the EGI – WLCG collaboration, formally agreed in an MoU. Federated services delivered in the context of the WLCG MoU, including: >Software support (consultancy to users and system administrators, (software maintenance and validation)<br><br>• Infrastructure and operations Services (infrastructure catalogue, accounting repository and portal, helpdesk, monitoring, operations portal, AAI)<br>• Software distribution services (UMC, CMD, operations documentation)<br>• Operations coordination (middleware deployment campaigns, procedures, innovation of tools)<br>• > Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution) | **0** |

| Romanian research collaborations in EGI | EGI supported activities and services | Number of scientific papers published in 2023 |
|---|---|---|
| **DUNE (Astroparticle Physics)**<br>• University of Bucharest | The DUNE experiment has been using compute resources from EGI partners for more than a decade. The services from the EGI federation that DUNE uses include:<br><br>• EGI HTC services from 6 EGI participant countries (CH, CZ, ES, FR, NL, UK)<br>• Software distribution services (UMC, CMD, operations documentation)<br>• Operations coordination (middleware deployment campaigns, procedures, innovation of tools)<br>• Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution) | **20** |
| **ELI-NP (Nuclear Physics)**<br>• ELI-NP (Nuclear Physics)<br>• National Institute for Laser, Plasma & Radiation Physics (INFLPR)<br>• National Communications Research Institute (INSCC)<br>• National Institute of Material Physics (INFM)<br>• National Research and Development Institute for Cryogenics and Isotopic Technologies (ICIT)<br>• Optoelectronica-2001 SA<br>• Technical University of Civil Engineering<br>• National Research and Development Institute in Electrical Engineering (ICPE-CA)<br>• "Victor Babes" National Institute of Pathology<br>• University "Politehnica" of Bucharest<br>• Accent Pro 2000<br>• National Institute for Research and Development of Isotopic and Molecular Technologies (INCDTIM)<br>• National Institute for Research and Development in Microtechnologies (IMT)<br>• Politehnica University of Timisoara (UPT)<br>• Institute of Cellular Biology and Pathology "Nicolae Simionescu"<br>• Military Equipment and Technologies Research Agency<br>• Technical University for Civil Engineering of Bucharest (UTCB) | ELI has been working with EGI since 2016 on exploring and validating approaches for off-site computing and data management. ELI-NP setup a High Throughput Compute Service on EGI resources and works with EGI providers on:<br><br>• Refining the user requirements and translating these to<br>• e-infrastructure requirements, and<br>• Identifying and validating services from EGI that can be<br>• relevant for ELI (besides HTC and compute).<br>• Mobilising already existing HTC compute, cloud compute<br>• and storage resources from EGI for ELI piloting and<br>• demonstration activities | **48** |

## Romanian research collaborations in EGI

### EMPHASIS (Agriculture)
- Biological Research Center Jibou
- Babes–Bolyai University Cluj-Napoca

### EMSO (Oceanography)
- GeoEcoMar

### ILC (High-Energy Physics)
- IFIN–HH

## EGI supported activities and services

EMPHASIS has been supported through the establishment of a Data Space in the EGI-ACE project. Since 2017 EMPHASIS using the following services from EGI:

- EGI Check-in
- EGI Cloud Compute
- EGI Online Storage
- EGI DataHub
- Technical support
- Software integration and piloting

The collaboration with EGI started back in 2017 when 4 cloud providers of the EGI Federation agreed to support the EMSODEV project during the design and implementation of the EMSODEV Data Portal.

EMSO–ERIC setup the EMSO ERIC Data Management Platform on the EGI providers in order to harmonize the data sets following Oceansites specifications, FAIR principles, and EOSC guidelines.

The ILC experiment has been using compute resources from EGI partners since 2004. The services from the EGI federation that ILC experiments uses include:

- EGI HTC services from 27 EGI federated sites from IL, DE, FR, ES, NL, PL, UK
- Software distribution services (UMC, CMD, operations documentation)
- Operations coordination (middleware deployment campaigns, procedures, innovation of tools)
- Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution)

## Number of scientific papers published in 2023

**0**

**0**

**43**

## Romanian research collaborations in EGI

### KM3NET (Neutrino Observatory)
- Institute for Space Sciences (ISS)

### LHcB (High-Energy Physics)
- IFIN–HH

## EGI supported activities and services

The Km3Net experiment has been using compute resources from EGI partners since 2013. The services from the EGI federation that Km3Net uses include:

- EGI HTC services from 2 EGI federated sites from IT and PL
- Software distribution services (UMC, CMD, operations documentation)
- Operations coordination (middleware deployment campaigns, procedures, innovation of tools)
- Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution)

LHcb has been supported since 2012 as part of the EGI WLCG collaboration, formally agreed in an MoU. Federating services delivered in the context of the WLCG MoU, including:

- Software support (consultancy to users and system administrators, (software maintenance and validation)
- Infrastructure and operations Services (infrastructure catalogue, accounting repository and portal, helpdesk, monitoring, operations portal, AAI)
- Software distribution services (UMC, CMD, operations documentation)
- Operations coordination (middleware deployment campaigns, procedures, innovation of tools)
- Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution)

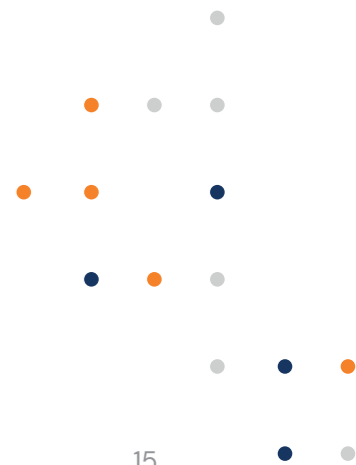## Number of scientific papers published in 2023

**58**

**44**

| Romanian research collaborations in EGI | EGI supported activities and services | Number of scientific papers published in 2023 |
|---|---|---|
| **LZ (Physical Sciences)**<br>• Institute for Space Sciences (ISS) | The LZ survey federates High Throughput Compute (HTC) resources from UK. The LZ compute federation benefited from the following EGI services:<br><br>• Software support (consultancy to users and system administrators, (software maintenance and validation)<br>• Infrastructure and operations Services (infrastructure catalogue, accounting repository and portal, helpdesk, monitoring, operations portal, AAI)<br>• Software distribution services (UMC, CMD, operations documentation)<br>• Operations coordination (middleware deployment campaigns, procedures, innovation of tools)<br>• Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution) | 1 |
| **NA62 (High-Energy Physics)**<br>• Horia Hulubei National Institute of Physics and Nuclear Engineering | The NA62 experiment has been using compute resources from EGI partners since 2012. The services from the EGI federation that NA62 uses include:<br><br>• EGI HTC services from sites in the UK, Italy, Belgium and CERN<br>• Software distribution services (UMC, CMD, operations documentation)<br>• Operations coordination (middleware deployment campaigns, procedures, innovation of tools)<br>• Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution) | 5 |
| **perla.pv (Physical Sciences)**<br>• NIMP<br>• IFIN–HH<br>• Wattrom | • PERLA-PV has been using compute resources from EGI partners since 2021. The services from the EGI federation that PERLA-PV uses include:<br>• EGI Cloud services from 1 EGI federated site from RO<br>• EGI Online Storage<br>• EGI AAI Check-in | 4 |

| Romanian research collaborations in EGI | EGI supported activities and services | Number of scientific papers published in 2023 |
|---|---|---|
| **SeaDataNet (Oceanography)**<br>• NIMRD National Institute for Marine Research and Development "Grigore Antipa"h | SeaDataNet has been supported by EGI partners in the EOSC-hub project in the setup and validation of a data access service on federated cloud resources. Since 2021 the SeaDataNet community is represented in the EGI Council by MARIS, and works with several EGI members in the EGI-ACE Horizon 2020 project. In EGI-ACE, SeaDataNet and EGI partners from Spain are setting up and operating a WebOcean Data Analysis service in the EGI cloud federation, and deliver the service in EOSC. | 1 |
| **WeNMR (Structural Biology)**<br>• UNIVERSITY OF BUCHAREST<br>• INCDSB<br>• INSTITUTE OF BIOCHEMISTRY OF THE ROMANIAN ACADEMY<br>• WEST UNIVERSITY OF TIMISOARA<br>• ŞTEFAN CEL MARE UNIVERSITY OF SUCEAVA | WeNMR is supported by EGI since 2011 and has a Service Level Agreement since 2016. The EGI Services used by the community include:<br><br>• High-Throughput, Cloud + Online Storage services from 23 EGI federated sites from the Netherlands, Italy, France, Romania, UK, Poland, the Asia Pacific region, IberGrid (Spain and Portugal), Italy, the Latin America region.<br>• EGI Workload Manager<br>• Trust and identity management with Check-in<br>• Technical support: WeNMR benefited from continual support through dedicated support activities in various EGI flagship projects: EGI-Engage, EOSC-hub and EGI-ACE. | 136 |

# Service Level Agreements

**During 2023, CLOUDIFIN supported 2 Service Level Agreements for international scientific communities via EGI, delivering Cloud Computing, Online Storage and HTC services**
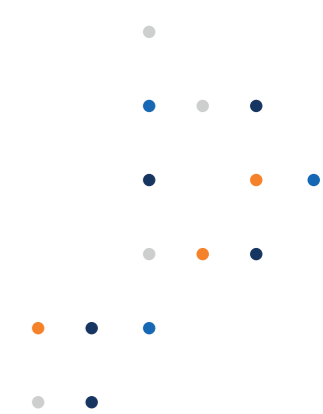
# Participated projects

The EGI Foundation coordinated one Horizon 2020 projects, EGI ACE (January 2021–June 2023). Moreover, it leads two Horizon Europe Projects, iMagine (September 2022–December 2025) and interTwin (September 2022–August 2025).

Furthermore, the EGI Federation was involved in 8 additional projects, increasing the innovation potential of its participants.

The EGI Federation participates in Horizon 2020 and Horizon Europe projects together with Romanian institutions to facilitate the uptake and use of e-infrastructure services for science. A summary of these projects, the involved institutes and the scope of the collaboration is provided in the next table.
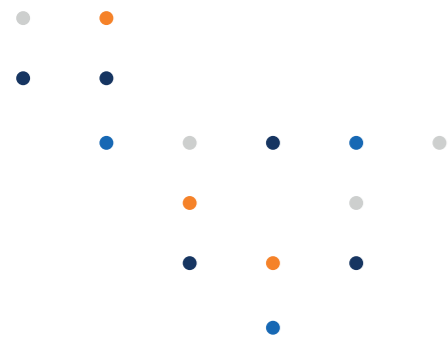
| Project title | Scope of collaboration | Participating beneficiaries from the country |
|---|---|---|
| AI4EUROPE Supporting AIOD 2022-2025 | EGI is contributing to the architectural design and implementation of open distributed software to ensure that AI4Europe evolves as a distributed ecosystem. EGI is also providing its expertise on physical resources, usability, development of systems, distributed systems and new technologies to develop mechanisms for the AI tools to deploy/make use of private/public Cloud and HPC resources. | • INSTITUTUL E-AUSTRIA TIMISOARA |
| BD4NRG Big Data for Next Generation Energy | The EGI Foundation delivers a reference architecture for Smart Energy and extend COSMAG specification to enable B2B multi-party data exchange, while providing full interoperability of leading-edge big data technologies with smart grid standards and operational frameworks; evolve and upscale a number of TRL 5–6 technology enablers; delivers a TRL8 open modular big data analytic toolbox as front-end for one-stop-shop analytics services development by orchestrating legacy and/or third party assets (data, computing resources, models, algorithms); validates such framework through the delivery of predictive and prescriptive edge AI-based big data analytics on 13 large scale pilots, deployed by different energy stakeholders. | • Terrasigna |
| DIGITBRAIN | EGI leads the processes related to setup and operate of testbed infrastructure, the Edge/cloud/HPC orchestration, to secure resource access and user management. It also works on the commercial exploitation and sustainability plan and on dissemination activities.. | • Universitatea Lucian Blaga Din Sibiu |
| Policy Cloud | PolicyCLOUD aims at delivering an integrated cloud-based environment for data-driven policy management. EGI leads the activities on Cloud Infrastructures Utilization & Data Governance, collaborates to the Use cases Adaptation, Integration & Experimentation and to the project's communication and dissemination activities. | • Singular Logic |

# Infrastructure contributions

The EGI Federation offers two complementary compute capabilities: the High-Throughput Compute (HTC) federation and the Cloud federation. 8 Romanian data centres contribute to these federations:

## HTC Federation:

- GRIDIFIN (NIPNE, National Institute for Physics and Nuclear Engineering),
- NIHAM (NUCLEAR INTERACTIONS AND HADRONIC MATTER),
- RO-03-UPB (Politehnica University of Bucharest),
- RO-07-NIPNE (NIPNE, National Institute for Physics and Nuclear Engineering),
- RO-13-ISS (Institute of Space Science),
- RO-14-ITIM (National Institute for Research and Development of Isotopic and Molecular Technologies),
- RO-16-UAIC (Alexandru Ioan Cuza University of Iasi)

## Cloud Federation:

- CLOUDIFIN (NIPNE, National Institute for Physics and Nuclear Engineering)

The data centres provided 23 service endpoints and delivered 120,720,369 CPU hours in total to EGI communities in 2023. The data centres responded to 46 support tickets through the EGI Helpdesk.

The most active international user groups of the Romanian compute resources were:

- ALICE 50.34%
- ATLAS 43.38%,
- LHCB 6.27%

# Methodology

Data for this impact report has been collected from the following sources.

- Infrastructure contributions, infrastructure usage by research communities: EGI Accounting System
- List of research publications by supported research communities (table 1)

**AMS-02**
https://ams02.space/publications

**ILC**
https://inspirehep.net/literature?sort=mostrecent&size=25&page=1&q=international%20Linear%20Collider%20&earliest_date=2021--2021

**ALICE**
https://alice-publications.web.cern.ch/publications

**INSTRUCT**
https://instruct-eric.eu/content/publications-list

**ATLAS**
https://cds.cern.ch/collection/ATLAS%20Papers?ln=en

**JUNO**
https://inspirehep.net/

**AUGER**
https://www.auger.org/science/publications/journal-articles

**KM3NET**
https://www.km3net.org/about-km3net/publications/pubblication/; https://inspirehep.net/literature?q=collaboration:KM3NeT year:2021

**BELLE**
https://belle.kek.jp/belle/publications.html; https://inspirehep.net/literature?q=collaboration:belle year:2021

**LifeWatch**
https://www.lifewatch.eu/catalogue-of-virtual-labs/medobis/publications/

**BIOMED**
https://vip.creatis.insa-lyon.fr/documentation/

**LOFAR**
http://old.astron.nl/radio-observatory/lofar-science/lofar-papers/lofar-papers; https://lofar-surveys.org/publications.html, or https://ui.adsabs.harvard.edu/search/q=full%3A(%22designed%20and%20constructed%20by%20ASTRON%22)%20OR%20title%3A%22LOFAR%22%20year%3A2021-2021%20property%3Arefereed%20-bibstem%3A(%22AN%22%20OR%20%22MNRAS.tmp%22)&sort=date%20desc%2C%20bibcode%20desc&p_=0

**CTA**
https://www.cta-observatory.org/science/library/

**LCHb**
https://cds.cern.ch/collection/LHCb%20Papers?ln=en

**CLARIN**
https://beta.clarin.openaire.eu/search/advanced/research-outcomes?sortBy=resultdateofacceptance,descending&type=publications&year=range2021:2021

**LSST**
https://ui.adsabs.harvard.edu/ with year:2021 author:("LSST*" OR "Vera C. Rubin*") collection:astronomy property:refereed

**CMS**
http://cms-results.web.cern.ch/cms-results/public-results/publications/CMS/index.html

**NA62**
https://cds.cern.ch/collection/NA62%20Papers?ln=en

**DUNE**
https://inspirehep.net/literature?q=collaboration:DUNE year:2021

**OPENCOASTS**
http://opencoasts.lnec.pt/index_en.php

**EISCAT_3D**
https://eiscat.se/scientist/publications/

**PANOSC**
https://www.panosc.eu/publications/

**ELI-BEAM**
https://www.eli-beams.eu/publikace/

**SeaDataNet**
https://www.seadatanet.org/Publications/Scientific-publications

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**ELI-NP**
https://www.eli-np.ro/scientific_papers.php

**SKA**
https://ui.adsabs.harvard.edu/search/fq=%7B!type%3Daqp%20v%3D%24fq_database%7D&fq_database=database%3A%20astronomy&q=pubdate%3A%5B2021-01%20TO%202021-12%5D%20title%3A(SKA)&sort=date%20desc%2C%20bibcode%20desc&p_=0

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**EMSO-ERIC**
from the community representative; SLA https://documents.egi.eu/document/3539

**SNO+**
https://snoplus.phy.queensu.ca/results/collaboration-papers.html

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**FUSION**
https://documents.egi.eu/public/ShowDocument?docid=3484

**VIRGO**
https://pnp.ligo.org/ppcomm/Papers.html

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**HESS**
https://www.mpi-hd.mpg.de/hfm/HESS/pages/publications/

**WeNMR**
https://explore.openaire.eu/ advanced search project outcomes. field to search "project" enter project name; Citation of HADDOCK web server: https://scholar.google.nl/scholar?hl=en&as_sdt=2005&cites=10355645612647046441&scipsc=&as_ylo=2021&as_yhi=2021; Citations of the AMBER web portal publication: https://scholar.google.com/scholar?as_ylo=2021&hl=en&as_sdt=0,5&sciodt=0,5&cites=6696812766870837905&scipsc=; Citations of the FANTEN web portal publication: https://scholar.google.com/scholar?as_ylo=2021&hl=en&as_sdt=0,5&sciodt=0,5&cites=10578718345045994565&scipsc=; Citations of the DISVIS/POWERFIT web portals publication: https://scholar.google.com/scholar?as_ylo=2005&cites=6482114501244947208&scipsc='; Citations of the SpotON web portal: https://scholar.google.com/scholar?as_ylo=2021&hl=en&as_

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**Ice-Cube**
https://icecube.wisc.edu/science/publications/

**XENON**
https://inspirehep.net/literature?q=collaboration:XENON year:2021

**AMS-02**
https://ams02.space/collaboration/institute

**ILC**
https://linearcollider.org/team/

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**ALICE**
https://alice-collaboration.web.cern.ch/General/Members/List_Institutes.html

**INSTRUCT**
https://instruct-eric.eu/countries

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**ATLAS**
https://atlas.cern/discover/collaboration

**JUNO**
https://juno.ihep.ac.cn/collaboration.php

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**AUGER**
https://www.auger.org/collaboration/institutions, https://www.auger.org/collaboration/funding-agencies

**KM3NET**
https://www.km3net.org/about-km3net/collaboration/members/

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**BELLE**
https://belle.kek.jp/bdocs/collaboration.html

**LifeWatch**
https://www.lifewatch.eu/organisation-governance/

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**BIOMED**
https://vip.creatis.insa-lyon.fr/

**LOFAR**
https://www.astron.nl/telescopes/

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**CTA**
https://www.cta-observatory.org/about/cta-consortium/

**LCHb**
https://lhcb-public.web.cern.ch/en/collaboration/Collaboration-en.html

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**CLARIN**
https://www.clarin.eu/content/participating-consortia

**LSST**
https://www.lsstcorporation.org/international-contributors

**CMS**
https://cms.cern/collaboration/cms-institutes

**NA62**
https://greybook.cern.ch/experiment/detail?id=NA62

**DUNE**
https://lbnf-dune.fnal.gov/about/countries-and-institutions-participating-in-dune/

**OPENCOASTS**
http://opencoasts.lnec.pt/index_en.php

**EISCAT_3D**
https://eiscat.se/wp-content/uploads/2016/12/EISCAT-Organogram-202x.jpg; https://eiscat.se/scientist/document/information/

**PANOSC**
https://www.panosc.eu/partners/

**ELI-BEAM**
https://www.eli-beams.eu/about/cooperation/science/

**SeaDataNet**
https://www.seadatanet.org/About-us/SeaDataNet-AISBL/Members

**ELI-NP**
https://www.eli-np.ro/scientific_collaborations.php

**SKA**
https://www.skatelescope.org/participating-countries/

**EMSO-ERIC**
http://emso.eu/organization/

**SNO+**
https://snoplus.phy.queensu.ca/collaboration.html

**FUSION**
https://documents.egi.eu/public/ShowDocument?docid=3484

**VIRGO**
https://apps.virgo-gw.eu/vmd/public/institutions

**HESS**
https://www.mpi-hd.mpg.de/hfm/HESS/pages/collaboration/

**WeNMR**
https://documents.egi.eu/document/2751

**Ice-Cube**
https://icecube.wisc.edu/collaboration/institutions/

**XENON**
https://science.purdue.edu/xenon1t/?page_id=27

# EGI Membership Impact Report

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