



EGI Council Participant: Gauß-Allianz

Participating in EGI Impact Report: Germany

2023

egi.eu

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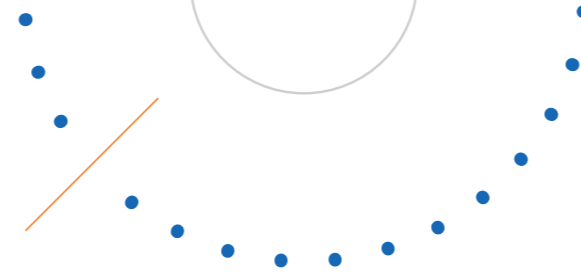
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35 National institutional members of
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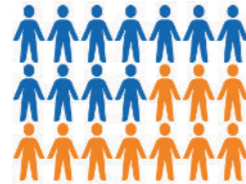
Infographic



Country overview

+11,400 service users

In 2023, +11,400 researchers from German institutions used the services provided by the EGI Federation



+890 publications

The research communities, projects and scientific collaborations from Germany supported by the EGI led to more than 890 peer-reviewed scientific publications

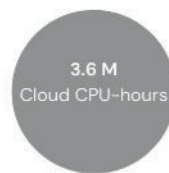
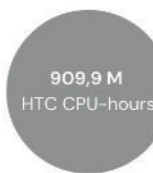
33 Supported communities

In 2023, the German infrastructure supported 33 research communities in the following disciplines: Agriculture, Climate Research, Health and Medicine, Linguistics, Physics



Projects

German partners participate in 27 collaboration projects + EGI-ACE, iMagine and interTwin



Number of supported publications 897

Number of total service users 11404

Scientific Communities supported 33

Data Centres contributing to the Federation 18

Collaboration projects 27

Total HTC CPU hours delivered 909,914,798

Total Cloud CPU hours delivered 3,684,720

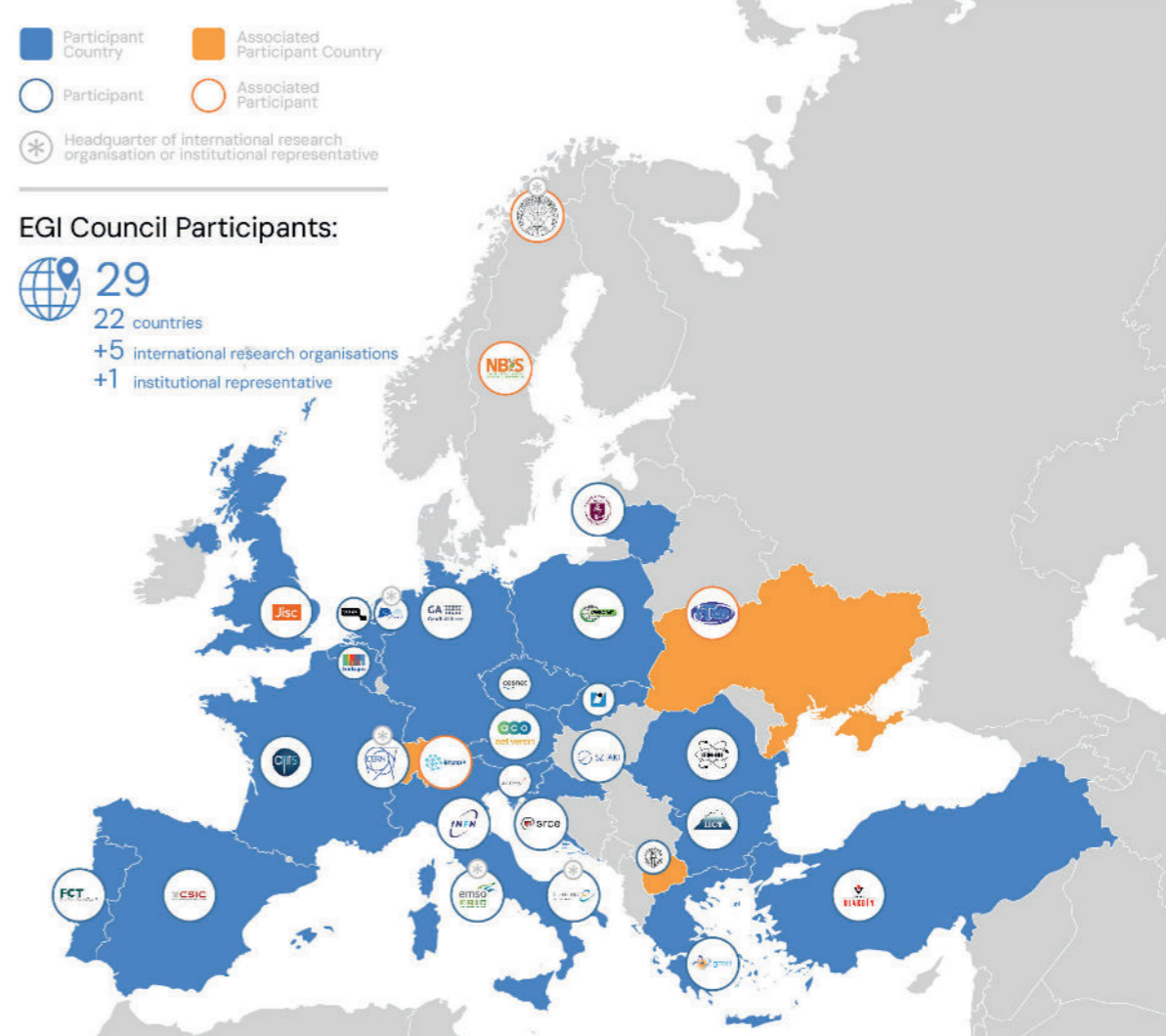
About EGI

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.



Approved EGI Council map from 2023



About Gauß-Allianz

The Gauß-Allianz was funded to promote research and development in the field of HPC and to coordinate the HPC related activities in Germany. A further important goal is to increase the visibility on an international level by bundling the expertise of the participating centres. Gauß-Allianz coordinates the NGI-DE, the national grid initiative for Germany, whose goal is to provide reliable and secure e-infrastructures for Germany.

Overall EGI impact

Gauß-Allianz coordinates the German participation to the EGI Federation, representing the NGI-DE (National grid initiative for Germany). Gauß-Allianz promotes research and development in the field of HPC, and coordinates the HPC related activities, in Germany.

This report provides an overview of the activities of NGI-DE in EGI, and the impact that was achieved thanks to this participation. The annual membership fee contributed by Gauß-Allianz to the EGI Foundation in 2023 was 90,000 EUR.

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's contribution to German excellence in science

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.

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 11,404 researchers from Germany in 2023. The estimated annual scientific output in 2023 produced by research communities, projects and scientific collaborations from Germany and supported by the EGI Federation is estimated to amount to almost 900 peer reviewed scientific publications.

The EGI Federation is currently working with over 40 Research Infrastructures, 33 of which include German partners. These EGI-enabled research infrastructures, their German members and their 2023 scientific output (publications) are detailed in the following pages of the report

German research collaborations in EGI

AMS-02 (Particle Physics)

- I. Physics Institute and JARA-FAME, RWTH Aachen University
- KIT, Karlsruhe Institute of Technology
- University of Kiel

ALICE (High-Energy Physics)

- Bonn, Helmholtz-Institut für Strahlen und Kernphysik, Rheinische Friedrich-Wilhelms-Universität, Bonn
- Darmstadt, Institut für Kernphysik, Technische Universität Darmstadt
- Darmstadt, Research Division and ExtreMe Matter Institut EMMI, GSI Helmholtzzentrum für Schwerionenforschung
- Frankfurt, Frankfurt Institute for Advanced Studies, Johann-Wolfgang-Goethe Universität
- Frankfurt, Institut für Informatik, Johann-Wolfgang-Goethe Universität
- Frankfurt, Institut für Kernphysik, Johann-Wolfgang-Goethe Universität
- Heidelberg, Physikalisches Institut, Ruprecht-Karls-Universität
- Köln, Fachhochschule Köln
- München, Physik Department, Technische Universität München
- Münster, Institut für Kernphysik, Westfälische Wilhelms-Universität
- Tübingen, Eberhard-Karls-Universität Tübingen
- Worms, Zentrum für Technologietransfer und Telekommunikation (ZTT), Fachhochschule Worms

EGI supported activities and services

The AMS-02 experiment on the International Space Station has been using compute resources from EGI for more than a decade. The services from the EGI federation that AMS-02 uses include:

- EGI HTC services from sites in Italy and CERN
- 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)

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)

Number of scientific papers published in 2023

1

65

German research collaborations in EGI

ATLAS (High-Energy Physics)

- Institut für Physik, Humboldt Universität zu Berlin, Berlin
- Physikalisches Institut, Universität Bonn, Bonn
- Lehrstuhl für Experimentelle Physik IV, Technische Universität Dortmund, Dortmund
- Institut für Kern- und Teilchenphysik, Technische Universität Dresden, Dresden
- Physikalisches Institut, Albert-Ludwigs-Universität Freiburg, Freiburg
- II. Physikalisches Institut, Justus-Liebig-Universität Giessen, Giessen
- II. Physikalisches Institut, Georg-August-Universität Göttingen, Göttingen
- Deutsches Elektronen-Synchrotron DESY, Hamburg and Zeuthen
- Kirchhoff-Institut für Physik, Ruprecht-Karls-Universität Heidelberg, Heidelberg
- Physikalisches Institut, Ruprecht-Karls-Universität Heidelberg, Heidelberg
- Institut für Physik, Universität Mainz, Mainz
- Fakultät für Physik, Ludwig-Maximilians-Universität München, München
- Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), München
- Department Physik, Universität Siegen, Siegen
- Fakultät für Mathematik und Naturwissenschaften, Fachgruppe Physik, Bergische Universität Wuppertal, Wuppertal
- Fakultät für Physik und Astronomie, Julius-Maximilians-Universität Würzburg, Würzburg

EGI supported activities and services

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)

Number of scientific papers published in 2023

111

German research collaborations in EGI

AUGER (Astronomy)

- Bergische Universität Wuppertal, Fachbereich C Physik
- Karlsruhe Institute of Technology, Institut für Experimentelle Teilchenphysik (ETP)
- Karlsruhe Institute of Technology, Institut für Kernphysik (IKP)
- Karlsruhe Institute of Technology, Institut für Prozessdatenverarbeitung und Elektronik (IPE)
- RWTH Aachen University, III. Physikalisches Institut A
- Universität Hamburg, II. Institut für Theoretische Physik
- Universität Siegen, Fachbereich 7 Physik Experimentelle Teilchenphysik

EGI supported activities and services

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:

- EGI HTC services from 9 EGI participant countries (CZ, DE, IT, FR, ES, NL, RO, PT, SI)
- 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

8

BELLE (High-Energy Physics)

- DESY

The BELLE experiment has been using compute resources from EGI partners since 2016. The services from the EGI federation that BELLE benefits from include:

- EGI HTC services from 9 EGI participant countries (CZ, DE, IT, FR, ES, NL, RO, PT, SI)
- 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)

21

CLARIN (Linguistics)

- CLARIN-D Uni of Tuebingen

CLARIN thematic services has been supported by EGI since 2018. CLARIN has a Service Level Agreement with EGI, using the following services:

EGI services:

- EGI Cloud (Compute + Online Storage) for hosting the Virtual Language Observatory (VLO)
- Technical support
- Service integration

38



German research collaborations in EGI

CMS (High-Energy Physics)

- University of Hamburg
- Deutsches Elektronen-Synchrotron
- RWTH Aachen University, III. Physikalisches Institut B
- Institut für Experimentelle Teilchenphysik

EGI supported activities and services

CMS 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)

Number of scientific papers published in 2023

117

CTA (Astronomy)

- Department of Physics, Humboldt University Berlin
- Department of Physics, TU Dortmund University
- Deutsches Elektronen-Synchrotron
- Institut für Astronomie und Astrophysik, Universität Tübingen
- Institut für Theoretische Physik, Ruhr-Universität Bochum
- Institute for Theoretical Physics and Astrophysics, Universität Würzburg
- Institut für Physik & Astronomie, Universität Potsdam
- Landessternwarte, Universität Heidelberg
- Max-Planck-Institut für Kernphysik
- Max-Planck-Institut für Physik
- Universität Erlangen-Nürnberg, Physikalisches Institut
- Universität Hamburg, Institut für Experimentalphysik

The CTA experiment has been using compute resources from EGI partners for more than a decade. The services from the EGI federation that CTA uses include:

- EGI HTC services from 9 EGI participant countries (CZ, DE, IT, FR, ES, NL, RO, PT, SI)
- 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)

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German research collaborations in EGI

Comet.j-parc.jp (Physical Sciences)

- Technical University Dresden, Dresden, Germany

EGI supported activities and services

The collaboration with EGI started back in 2015. The services from the EGI federation that the experiment uses include:

- EGI HTC services from 7 EGI federated sites from FR and 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

2

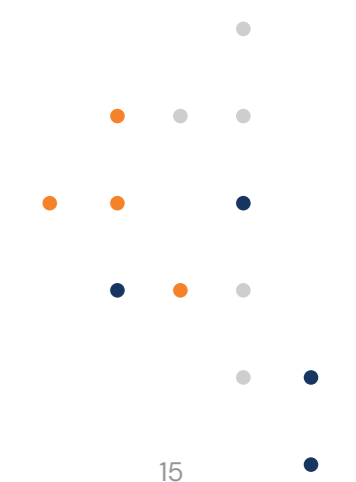
COMPASS (Physical Sciences)

- Institut für Experimentalphysik I, Bochum
- University of Bonn,
- University Freiburg
- Universität Manz
- Technical university of Munich

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)
- 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)

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German research collaborations in EGI

EGI supported activities and services

Number of scientific papers published in 2023

ELI-BEAM (Physical Sciences)

- Helmholtz-Zentrum Dresden-Rossendorf e. V. (HZDR)
- Institut für Optik und Quantenelektronik (IOQ) Jena
- University Hamburg – Germany;
- DESY/CFEL
- Max Planck Institut für Quantenoptik (MPQ)

ELI works with EGI since 2016 on exploring and validating approaches for off-site computing and data management. ELI-Beams setup a High Throughput Compute Service on EGI resources and works with EGI providers on

- Refining the user requirements and translating these to e-infrastructure requirements, and
- Identifying and validating services from EGI that can be relevant for ELI (besides HTC and compute).
- Mobilising already existing HTC compute, cloud compute and storage resources from EGI for ELI piloting and demonstration activities.

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ELI-NP (Nuclear Physics)

- Research Cluster "Matter and Radiation Science" Technische Universität Darmstadt
- Institute of Nuclear Physics, University of Cologne
- Friedrich Schiller University, Jena
- "Il. Physikalisches Institut" of Justus-Liebig University, Giessen
- GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt
- Helmholtz-Zentrum Dresden-Rossendorf
- Technische Universität München
- Technische Universität Darmstadt

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:

- Refining the user requirements and translating these to e-infrastructure requirements, and
- Identifying and validating services from EGI that can be relevant for ELI (besides HTC and compute).
- Mobilising already existing HTC compute, cloud compute and storage resources from EGI for ELI piloting and demonstration activities

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EMPHASIS (Agriculture)

- FZJ (Forschungszentrum Jülich)
- Plant Sciences (IBG-2),
- IPK (Leibniz Institute of Plant Genetics and Crop Plant Research),
- HMGU (Helmholtzzentrum München, German Research Center for Environmental Health)

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

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FUSION (Fusion)

- Forschungszentrum Karlsruhe (FZK)
- Max Planck Institute for Plasma Physics (IPP)

The Fusion community has been using compute resources from EGI partners since 2018. The services from the EGI Federation used by the community include:

- EGI Cloud Compute
- EGI Online Storage

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German research collaborations in EGI

EGI supported activities and services

Number of scientific papers published in 2023

HESS (Astroparticle Physics)

- Max-Planck-Institut für Kernphysik, Heidelberg
- Universität Hamburg, Institut für Experimentalphysik, Hamburg
- Institut für Physik, Humboldt-Universität zu Berlin, Berlin
- ECAP, Universität Erlangen-Nürnberg, Erlangen
- DESY, Zeuthen
- Institut für Physik und Astronomie, Universität Potsdam, Potsdam
- Landessternwarte, Universität Heidelberg, Heidelberg
- Institut für Astronomie und Astrophysik, Universität Tübingen, Tübingen

The HESS experiment has been using compute resources from EGI partners for more than a decade. The services from the EGI federation that HESS uses include:

- EGI HTC services from 3 EGI participant countries (DE, FR, 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)

8

IceCube (Neutrino Observatory)

- Deutsches Elektronen-Synchrotron, Zeuthen
- Friedrich Alexander Universität Erlangen-Nürnberg, Erlangen
- Humboldt Universität zu Berlin, Berlin
- Karlsruhe Institute of Technology, Karlsruhe
- Ruhr-Universität Bochum, Bochum
- RWTH Aachen, Aachen
- Technische Universität Dortmund, Dortmund
- Technische Universität München, Munich
- Universität Münster, Münster
- Universität Mainz, Mainz
- Universität Wuppertal, Wuppertal

The IceCube experiment has been using compute resources from EGI partners for more than a decade. The services from the EGI federation that IceCube uses include:

- EGI HTC services from 8 sites of 4 EGI participant countries (Belgium, Denmark, Germany and 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)
- EGI is currently expanding its resource pledge to IceCube with an increase of GPU capacity.

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ILC (High-Energy Physics)

- DESY
- Univ. of Hamburg
- MPP – MPG
- + many others

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)

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German research collaborations in EGI

EGI supported activities and services

Number of scientific papers published in 2023

JUNO (Neutrino Observatory)

- Eberhard Karls Universität Tübingen, Physikalisches Institut, Tübingen
- Nuclear Physics Institute IKP-2 Forschungszentrum Jülich, Jülich
- Forschungszentrum Jülich GmbH, Central Institute of Engineering, Electronics and Analytics Electronic Systems(ZEA-2), Jülich
- Institute of Experimental Physics, University of Hamburg, Hamburg
- Institute of Physics and EC PRISMA, Johannes-Gutenberg University Mainz, Mainz
- Physikalisches Institut B, RWTH Aachen University, Aachen
- Technical University of Munich, Garching

The JUNO experiment has been using compute resources from EGI partners for more than a decade. The services from the EGI federation that JUNO uses include:

- EGI HTC services from 4 EGI federated data centres from France, Italy, Russia and China.
- 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)

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KM3NET (Neutrino Observatory)

- Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen Centre for Astroparticle Physics (ECAP)
- University Würzburg
- University of Erlangen, Remeis Sternwarte
- University of Münster, Institute of Nuclear Physics

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)

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German research collaborations in EGI

EGI supported activities and services

Number of scientific papers published in 2023

LHcB (High-Energy Physics)

- Aachen, I. Physikalisches Institute, RWTH
- Dortmund Univ.
- Heidelberg, Max-Planck-Institut für Kernphysik
- Heidelberg, Physics Inst.

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)

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LOFAR (Astronomy)

- University of Bielefeld
- University of Bochum
- University of Bonn
- University of Cologne
- University of Dortmund
- Max-Planck-Institut für Radioastronomie Bonn
- Jacobs University Bremen
- Max-Planck-Institut für Astrophysik Garching
- Sternwarte Hamburg
- Forschungszentrum Jülich
- Astrophysikalisches Institut Potsdam
- The Cluster of Excellence for Fundamental Physics
- Thüringer Landessternwarte Tautenburg
- Faculty of Physics and Astronomy, University of Würzburg
- Lehrstuhl für Experimentelle Physik Vb, Dortmund Technical University
- Physikalisches Institute, University of Köln

LOFAR has been supported by EGI partners in the EOSChub project in the setup and validation of a data access and transformation workflow on High Throughput Compute (HTC) resources. Since 2021 LOFAR (represented by ASTRON) participates in the EGI-ACE Horizon 2020 project where SURF (EGI member from NL) supports the setup, operation and promotion of the LOFAR Data Space, an online service that produces and make 'LOFAR science ready data' available in EOSC for broad uptake. The setup will rely on EGI HTC, Check-in, Helpdesk and consultancy/ technical support services.

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German research collaborations in EGI

LSST (Astronomy)

- Astronomisches Rechen-Institut, Zentrum für Astronomie der Universität Heidelberg (ARI/ZAH)
- Deutsches Elektronen-Synchrotron (DESY)
- Leibniz-Institut für Astrophysik Potsdam (AIP)
- Ludwig-Maximilians-Universität (LMU)
- Max Planck Institute for Astrophysics (MPA)
- Max Planck Institute for Astronomy (MPIA)
- Max Planck Institute for Extraterrestrial Physics (MPE)

EGI supported activities and services

The LSST survey federates High Throughput Compute (HTC) resources from France and the UK and run an analysis campaign in 2020 to prepare for the opening of the Vera C. Rubin Observatory. The campaign consumed over 11 million CPU-hour in 2020 to analyse generated images, imitating the telescope images that are expected to become available from 2023. The LSST compute federation benefited from the following EGI services:

- 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

11

MINKE (Oceanography)

- PHYSIKALISCH-TECHNISCHE BUNDESANSTALT
- 52°NORTH SPATIAL INFORMATION RESEARCH GmbH

The collaboration with EGI started back in 2021. The services from the EGI federation that the experiment uses include:

- EGI HTC services from 1 EGI federated site from ES
- 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)

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NA62 (High-Energy Physics)

- Johannes Gutenberg
- Universität Mainz

The NA62 experiment has been using compute resources from EGI partners since 2012. The services from the EGI federation that NA62 uses include:

- EGI HTC services from sites in the UK, Italy, Belgium and CERN
- 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)

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German research collaborations in EGI

PANOSC (Photon and Neutron)

- European XFEL

EGI supported activities and services

PaNOSC has been using compute resources from EGI partners since 2018. The services from the EGI federation that OPENCoastS uses include:

- EGI Cloud services from 2 EGI federated data centres from CZ and DE
- EGI AAI Check-in
- EGI Notebooks
- EGI DataHub

Number of scientific papers published in 2023

5

SeaDataNet

- (Oceanography)
- Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research

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

SKA (Radioastronomy)

- As for LOFAR, German effort in SKA is coordinated by GLOW and is formed by German university departments and research institutes.

The Square Kilometre Array (SKA) is an intergovernmental radio telescope project being planned to be built in Australia and South Africa. 8 countries that participate in SKA are also represented in the EGI Council (France, Germany, Italy, Portugal, Spain, Switzerland, The Netherlands and the United Kingdom). Between 2017-2019 SKA worked with the EGI federation in the AENEAS Horizon 2020 project. The collaboration resulted in recommendations on how to:

- Organise federated service management within the SKA European Science Data Centre (ESDC) and across multiple SKA Regional Centres to address the management of the SKA community-specific services.
- Federate the ESDC services with existing e-Infrastructure federated services (Identity Provisioning, Authentication and Authorization, tools for federated service management)
- Collect SKA and e-Infrastructures requirements to federate and eventually enhance existing federation services.

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German research collaborations in EGI

SNO+ (High-Energy Physics)

- TU Dresden, Institut für Kernund Teilchenphysik

EGI supported activities and services

The Snoplus experiment has been using compute resources from EGI partners since 2011. The services from the EGI federation that the Snoplus experiment uses include:

- EGI HTC services from 3 EGI federated sites from DE, ES and 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

1

VIRGO (Astrophysics)

- Institut für Kernphysik, Theoriezentrum
- Max Planck Institute for Gravitationalphysik (Albert Einstein Institute)
- Theoretisch-Physikalisches Institut, Friedrich-Schiller-Universität Jena

The Virgo experiment has been using compute resources from EGI partners for more than a decade. The services from the EGI federation that VIRGO uses include:

- EGI HTC services from 8 data centres from France, Italy, The Netherlands, Spain and 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)
- Since 2021 Virgo works with EGI in the EGI-ACE Horizon 2020 project to evaluate and adopt data analysis, federated authentication-authorisation and data management services for thematic applications.

5

German research collaborations in EGI

WeNMR (Structural Biology)

- TU BERLIN
- MDC BERLIN
- FRAUNHOFER IZI-BB
- UNIVERSITY OF FREIBURG BIO
- HAMBURG ADVANCED RESEARCH CENTRE FOR BIOORGANIC CHEMISTRY
- EMBL
- UNI MÜNSTER
- INSTITUT FÜR BIOLOGIE UND BIOTECHNOLOGIE DER PFLANZEN
- MARTIN LUTHER UNIVERSITY
- KIT
- INSTITUTE OF STRUCTURAL BIOLOGY, HELMHOLTZ CENTER MUNICH
- HUMBOLDT UNIVERSITY OF BERLIN
- UNIVERSITY OF BONN
- GOETHE UNIVERSITY FRANKFURT
- UNIVERSITY OF WUPPERTAL
- UNIVERSITY OF MARBURG
- BMLS
- and many others

EGI supported activities and services

WeNMR is supported by EGI since 2011 and has a Service Level Agreement since 2016. The EGI Services used by the community include:

- High-Throughput, Cloud + Online Storage services from 23 EGI federated sites from the Netherlands, Italy, France, Germany, UK, Poland, the Asia Pacific region, IberGrid (Spain and Portugal), Italy, the Latin America region.
- EGI Workload Manager
- Trust and identity management with Check-in
- Technical support: WeNMR benefited from continual support through dedicated support activities in various EGI flagship projects: EGI-Engage, EOSC-hub and EGI-ACE.

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XENON (Dark Matter Physics)

- University of Freiburg
- Johannes Gutenberg University, Mainz
- Max-Planck-Institut für Kernphysik, Heidelberg
- University of Münster
- Karlsruhe Institute of Technology

The XENON experiment has been using compute resources from EGI partners for more than a decade. The services from the EGI federation that XENON uses include:

- EGI HTC services from 4 EGI federated data centres from France, Italy, the Netherlands and Israel
- 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)

7

Service Level Agreements

During 2023, German providers including GSI-LCG2 and DESY supported 2 Service Level Agreements for international scientific communities via EGI, delivering Authentication and Authorisation, Cloud Computing and Online Storage services.




Participated projects

The EGI Foundation coordinated one Horizon 2020 project, 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 German 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
	<p>EGI contributes with the services Cloud computing, Notebooks and Applications on demand, FTS, data archiving. It participates to the EOSC Integration processes and the sustainability business plan.</p>	<ul style="list-style-type: none"> • EMBL • ALFRED-WEGENER-INSTITUT • HELMHOLTZ-ZENTRUM FUR POLAR- UND MEERESFORSCHUNG
	<p>EGI contributes to the project activities related to innovation management, policy development, and project activities and results communications and dissemination.</p>	<ul style="list-style-type: none"> • KIT
	<p>EGI is involved in the work ensuring the integration of the TRIPLE solution into the EOSC; also, it collaborates to the sustainability and innovation activities by setting up the processes to prepare maturity assessment and innovative agile management. Last but not least, it guides the implementation of the EGI AAI service in TRIPLE.</p>	<ul style="list-style-type: none"> • EMBL • FRIEDRICH-ALEXANDER-UNIVERSITAET ERLANGEN-NUERNBERG • GEORG-AUGUST-UNIVERSITAT GOTTINGEN STIFTUNG OFFENTLICHEN RECHTS • KARLSRUHER INSTITUT FUER TECHNOLOGIE • DEUTSCHES ELEKTRONEN-SYNCHROTRON DESY • EU-OPENSOURCE ERIC
	<p>EGI is one of the main contributors to the design and definition of the EOSC architecture and the federated service management framework, and coordinates service pilots participates by the scientific demonstrators. EGI also contributed to the definition of the governance framework and to the works on Rules of Participation. In the project EGI will enhance the SoBigData platform with two services: Jupyter Notebooks and the Workflow manager Galaxy</p>	<ul style="list-style-type: none"> • Fraunhofer IAIS and IGD – Fraunhofer Gesellschaft Zur Foerderung Der Angewandten Forschung E.V. • Gottfried Wilhelm Leibniz Universität Hannover
	<p>EGI leads the work on Services Provision, which collects information about the services that the RI can provide and creates a plan for a unified single access point RI, including access policies for the distributed resources. EGI also contributes to the development of the financial aspect of the future RI, defines the business cases and the cost book, supports the strategy and enhance the impact of the RI, contributes to the Dissemination and Communication plans (WP5), and to the creation of the Italian central Hub for the preparation phase.</p>	<ul style="list-style-type: none"> • Fraunhofer IAIS and IGD – Fraunhofer Gesellschaft Zur Foerderung Der Angewandten Forschung E.V. • Gottfried Wilhelm Leibniz Universität Hannover

Project title	Scope of collaboration	Participating beneficiaries from the country
	<p>EGI contributes to the project with the AAI service and Marketplace integration. Moreover, it collaborates to the project's outreach activities.</p>	<ul style="list-style-type: none"> • WWO
	<p>EGI contributes to the Federation sustainability model and the expansion of the DIH ecosystem. Moreover, it collaborates to the development and maintenance of the service catalogue, to the training programme, and to the dissemination and outreach of the project activities and results.</p>	<ul style="list-style-type: none"> • KIT • IDSA
	<p>The EGI Foundation supports the project in defining interoperability standards among the participating facilities, and with the broader landscape, including EOSC, and leads the design of sustainable services and activities that will last beyond the project. EGI members deliver a federated cloud environment with a cloud-based 'EGI Notebooks' service for the PITHIA e-science centre to offer a scalable and customisable web environment for writing workflows, exchanging workflows, accessing, analysis and sharing of data.</p>	<ul style="list-style-type: none"> • Deutsches Zentrum Fuer Luft – Und Raumfahrt Ev • Helmholtz Zentrum Potsdam • Deutschesgeoforschungszentrum Gfz
	<p>EGI Foundation is leading the design of LETHE system architecture and building a data collection and big data framework, including set-up of the LETHE big data infrastructure, set-up the authentication scheme for the LETHE project and registration of the LETHE infrastructure and services in EOSC.</p>	<ul style="list-style-type: none"> • Kaasa Solution Gmbh
	<p>EGI works on the deployment and operation of a FAIR federated data repository, promoting enhanced exploitation of project outputs (data and results). It also provides expertise in order to formulate a strategy regarding data preservation. In particular, EGI will implement a DataHub and a Data preservation service for the project.</p>	<ul style="list-style-type: none"> • Bundesanstalt Fuer Gewaesserkunde • Helmholtz-zentrum Fur Ozeanforschung Kiel (Geomar) • Leibniz-institut Fur Ostseeforschung Warnemunde • BASF Se

Project title **Scope of collaboration** **Participating beneficiaries from the country**



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.

- Rwth Aachen University
- IDSA International Data Space
- FIWARE Foundation



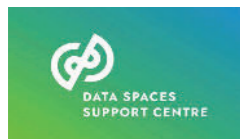
EGI Foundation leads the task on the analysis of the existing computation infrastructures with a special view on health research and will propose a reference architecture for computational services to serve the Health Research and Innovation Cloud ecosystem.

- TMF – Technologie Und Methodenplattform Fur Die Vernetzte Medizinische Forschung Ev
- EMBL
- Charite – Universitaetsmedizin Berlin



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.

- DEUTSCHES FORSCHUNGSZENTRUM FUR KUNSTLICHE INTELLIGENZ GMBH
- FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV



EGI, as a very active player in the Data Space landscape in Europe, joined the project as Associated and collaboration Partner and participates in the Strategic Stakeholder Group (SSG) that will act as a think-and-do-tank to support the project in delivering to the policy objectives.

- FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV
- FIWARE
- IDSA
- ACATECH



EGI leads the development of new functionality to bring support for new computing and storage systems and to deliver meta scheduling of computing jobs in a distributed infrastructure delivered by EOSC providers and beyond. EGI also leads the activities for the development of a sustainability model to maximize the project and collaborates in the activities to integrate EuroScienceGateway in EOSC.

- ALBERT-LUDWIGS-UNIVERSITAET FREIBURG

Project title **Scope of collaboration** **Participating beneficiaries from the country**



EGI coordinates the task dedicated to the Single Sign-On access with the EGI Check-in service.

- GEORG-AUGUST-UNIVERSITAT GOTTINGEN STIFTUNG OFFENTLICHEN RECHTS
- MAX WEBER STIFTUNG DEUTSCHE GEISTESWISSENSCHAFTLICHE INSTITUTE IM AUSLAND
- TECHNISCHE INFORMATIONSBIbliOTHEK (TIB)
- FREIE UND HANSESTADT HAMBURG



EGI contributes supporting HPC, Cloud and Edge, and to the strategic engagement with the European AI Ecosystem and connected communities.

- VDI/VDE INNOVATION + TECHNIK GMBH



TANGO EGI contributes to the GAP analysis, User needs and requirements, Definition of System Requirements and Technical Specifications, and Security, in addition to the Self-sovereign Identity Management and Dissemination and Communication. EGI coordinates the task dedicated to Policy recommendations on Distributed Infrastructures, Secure Data Exchange & Data Spaces.

- Fraunhofer
- IDSA
- ECO VERBAND DER INTERNETWIRTSCHAFTEV
- VISARIGHT GmbH



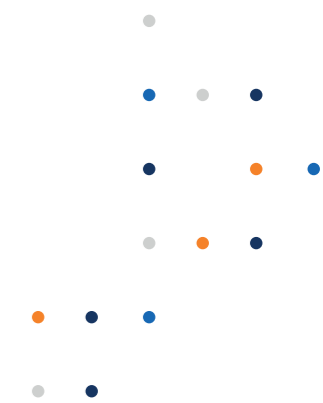
In the project, EGI co-designs and deploys AI models on edge resources, enhancing capacity through its federation's computational and storage resources. EGI expands resource allocations, provides a two-tier e-infrastructure for validation and large-scale data processing, and ensures sustainable setups by coordinating national funding. EGI addresses data management challenges, integrates distributed storage solutions, and connects PHENET with the European Open Science Cloud.

- FORSCHUNGSZENTRUM JULICH GMBH
- RHEINISCHE FRIEDRICH-WILHELMS-UNIVERSITAT BONN
- HELMHOLTZ-ZENTRUM FUR UMWELTFORSCHUNG GMBH – UFZ



Within EUCAIM, EGI works on the development of the platform core services in addition to supporting the creation of the platform central storage and infrastructure. Moreover, EGI leads the activities around the design and implementation of a federated learning and data analysis infrastructure, and ensures access to HPC/Cloud resources across Europe.

- Charité
- German Electron Synchrotron DESY
- German Cancer Research Center
- Technical University of Munich
- University Hospital Aachen
- ELIXIR



Project title **Scope of collaboration** **Participating beneficiaries from the country**



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.

- DWF Germany Rechtsanwaltsgesellschaft Mbh



EGI is involved in developing a detailed roadmap, analyzing state-of-the-art technology, and designing a modular architecture framework. Moreover, It works to improve data monetization strategies for EU companies and define KPIs for fair dataset valuation. EGI will help develop business cases for data sharing platforms, explore non-monetary data value dimensions, and prepare pilots for framework deployment. Demonstration and validation tests will be conducted at pilot sites. Additionally, EGI contributes to disseminating results, managing innovation and sustainability, participating in standardization activities, and coordinating with the Data Spaces Support Centre.

- Fraunhofer-Gesellschaft
- FIR (Verein)
- INTERNATIONAL DATA SPACES e.V.
- ECLIPSE Foundation Europe GmbH
- DIN - Deutsche Institut für Normung e.V.



Unlock the potential for accelerating the deployment of the Cloud-to-Edge-IoT (CEI) computing continuum in Europe by focusing on the demand-side drivers and challenges to identify technology-driven innovation and business opportunities driving demand value chains.

- VDI/VDE INNOVATION + TECHNIK GMBH



The EGI Foundation is leading the technical requirements, service layer design and integration with the platform defining and describing. Additionally, EGI Foundation participates to build Vertical Matchmaking and hardware marketplace and to Open Call Management.

- Huawei Technologies Duesseldorf GmbH



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..

- Fraunhofer-Gesellschaft
- Clesgo GmbH
- Deutsches Forschungszentrum für Künstliche Intelligenz GmbH
- Atos Information Technology GmbH
- Consenses GmbH
- CloudSME Ug

Infrastructure contributions

The EGI Federation offers two complementary compute capabilities: the High-Throughput Compute (HTC) federation and the Cloud federation. 18 German data centres contribute to these federations:

HTC Federation:

- DESY-HH (Deutsches Elektronen-Synchrotron)
- DESY-ZN (Deutsches Elektronen-Synchrotron, Standort Zeuthen)
- GSI-LCG2 (GSI Helmholtzgesellschaft für Schwerionenforschung GmbH, Darmstadt, Germany)
- FZJ (Forschungszentrum Juelich GmbH)
- FZK-LCG2 (KIT, Karlsruhe, Germany)
- GoeGrid (University Goettingen)
- LRZ-LMU (LMU LCG Tier-2)
- mainz (German HEP ATLAS Tier3, University of Mainz, Germany)
- MPPMU (Rechenzentrum der Max-Planck-Gesellschaft am Max-Planck-Institut für Plasmaphysik)
- RWTH-Aachen (RWTH Aachen University)
- UNI-BONN (Rheinische Friedrich-Wilhelms-Universitaet Bonn)
- UNI-FREIBURG (Department of Physics and Computing Center of University of Freiburg)
- UNI-SIEGEN-HEP (Experimentelle Teilchenphysik; Department Physik; Naturwissenschaftlich-Technische Fakultät; Universitaet Siegen)
- wuppertalprod (Bergische Universitaet Wuppertal Fachbereich C - Physik)

Cloud Federation:

- DESY-CC (Deutsches Elektronen-Synchrotron),
- GSI-LCG2 (GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany),
- GoeGrid (University Göttingen),
- SCAI (SCAI - Fraunhofer Institute of Algorithms and Scientific Computing)

The data centres provided 103 service endpoints and delivered 909,914,798 CPUhours in total to EGI communities in 2023. The data centres responded to 191 support tickets through the EGI Helpdesk. The most active international user groups of the German compute resources were:

- ATLAS 50.99%,
- CMS 23.46%,
- LHCB 9.34%,
- ALICE 11.79%,
- BELLE 2.98%,
- ICECUBE 0.82%,
- ENMR.eu 0.53%

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)

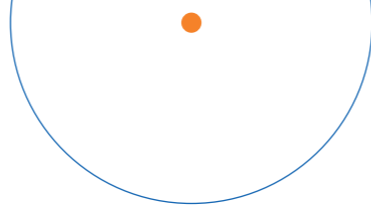
AMS-02 https://ams02.space/publications	ILC https://inspirehep.net/literature?sort=mostrecent&size=25&page=1&q=international%20Linear%20Collider%20&earliest_date=2021--2021
ALICE https://alice-publications.web.cern.ch/publications	INSTRUCT https://instruct-eric.eu/content/publications-list
ATLAS https://cds.cern.ch/collection/ATLAS%20Papers?ln=en	JUNO https://inspirehep.net/
AUGER https://www.auger.org/science/publications/journal-articles	KM3NET https://www.km3net.org/about-km3net/publications/publication/ ; 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:(%22LSST%22+OR+%22Vera+C.+Rubin%22)+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/

National institutional members of supported research communities (table 2)

ELI-BEAM https://www.eli-beams.eu/publikace/	SeaDataNet https://www.seadatanet.org/Publications/Scientific-publications
ELI-NP https://www.eli-np.ro/scientific_papers.php	SKA https://ui.adsabs.harvard.edu/search/fq=%7B!type%3D%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
EMSO-ERIC from the community representative; SLA https://documents.egi.eu/document/3539	SNO+ https://snoplus.phy.queensu.ca/results/collaboration-papers.html
FUSION https://documents.egi.eu/public/ShowDocument?docid=3484	VIRGO https://pnp.ligo.org/ppcomm/Papers.html
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&scioldt=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&scioldt=0.5&cites=10578718345045994565&scipsc= ; Citations of the DISVIS/POWERFIT web portals publication: https://scholar.google.com/scholar?as_ylo=2021&hl=en&as_sdt=2005&cites=6482114501244947208&scipsc= ; Citations of the SpotON web portal: https://scholar.google.com/scholar?as_ylo=2021&hl=en&as_
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/
ALICE https://alice-collaboration.web.cern.ch/General/Members/List_Institutes.html	INSTRUCT https://instruct-eric.eu/countries
ATLAS https://atlas.cern/discover/collaboration	JUNO https://juno.ihep.ac.cn/collaboration.php
AUGER https://www.auger.org/collaboration/institutions , https://www.auger.org/collaboration/funding-agencies	KM3NET https://www.km3net.org/about-km3net/collaboration/members/
BELLE https://belle.kek.jp/bdocs/collaboration.html	LifeWatch https://www.lifewatch.eu/organisation-governance/
BIOMED https://vip.creatis.insa-lyon.fr/	LOFAR https://www.astron.nl/telescopes/
CTA https://www.cta-observatory.org/about/cta-consortium/	LCHb https://lhcb-public.web.cern.ch/en/collaboration/Collaboration-en.html
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://bnf-dune.fnal.gov/about/countries-and-institutions-participating-in-dune/>

OPENCOASTS

http://opencoasts.inec.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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