EGI Council Participant: CERN

Participating in EGI Impact Report: CERN

2024

egi.eu

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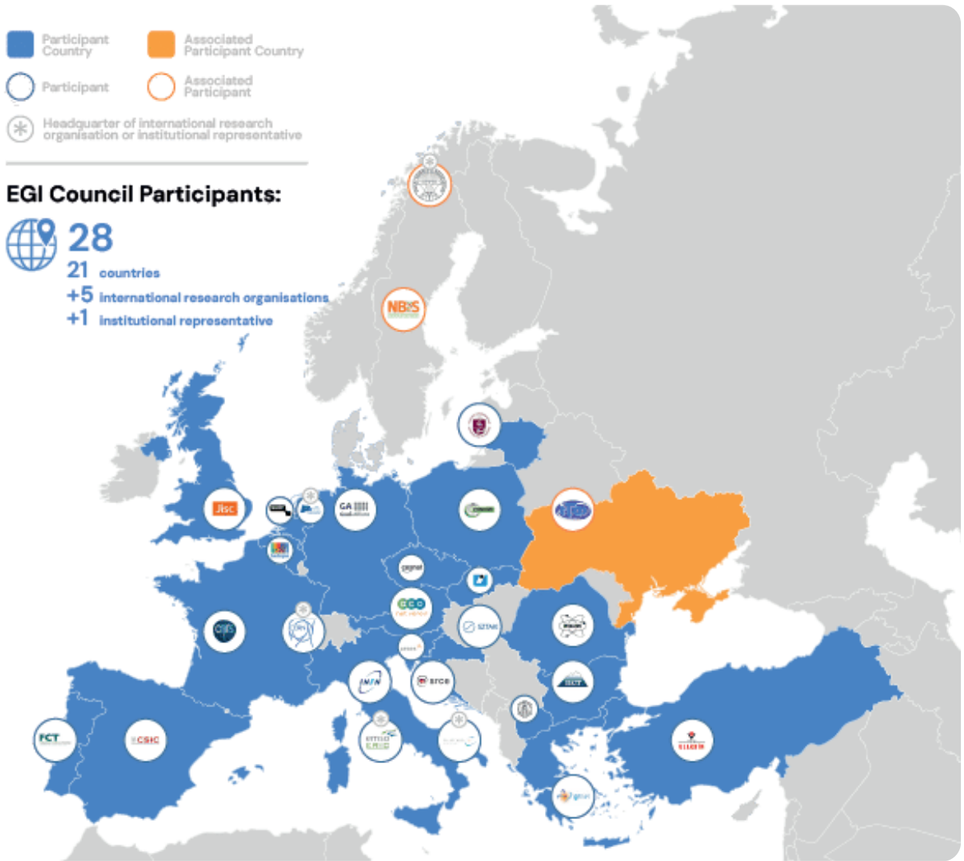
About EGI

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 2024

About CERN

The European Organization for Nuclear Research, known as CERN, is a European research organization that operates the largest particle physics laboratory in the world.

Established in 1954, the organization is based in a northwest suburb of Geneva on the Franco–Swiss border and has 23 member states. Israel is the only non-European country granted full membership. CERN is an official United Nations Observer.

Overall EGI impact

CERN, the European Organization for Nuclear Research, is a founding member of the EGI Federation. This report provides an overview of the activities of CERN in EGI, and the impact that was achieved thanks to this participation. The annual membership fee contributed by CERN to the EGI Foundation in 2023 was 75,000 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 2024, the EGI Federation served around 116,000 users (+23%). EGI users consumed 7,4 Billion HTC CPU hours (+5.7%), 62,7 Million Cloud CPU hours (-23,5%), ran over 402 M computational jobs (+8%) and published over 2,560 open access publications.

As of the previous year, the research community with the largest number of users is Medical and Health Sciences, while the community with most extensive HTC CPU/h consumption is CMS.

From the scientific communities engaged in 2024, the one with most extensive Cloud CPU/h consumption is WeNMR.

Moreover, EGI engaged with a total of 249 scientific communities; 11 SMEs and business pilots, and 2 additional Research Infrastructure included in the ESFRI Roadmap, raising the total of number of ESFRI partners/users of EGI to 25.

EGI's contribution to CERN excellence in science

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 estimated annual scientific output in 2024 produced by research communities, projects and scientific collaborations from CERN and supported by the EGI Federation is estimated to amount to more than 450 peer reviewed scientific publications.

The EGI Federation is currently working with over 40 Research Infrastructures, 12 of which include CERN. These EGI-enabled research infrastructures, CERN and their 2024 scientific output (publications) are detailed in the following pages of the report

CERN research collaborations in EGI	EGI supported activities and services	Number of scientific papers published in 2024
AMS-02 (Particle Physics) • CERN	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)	1
ALICE (High-Energy Physics) • CERN	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)	47

CERN research collaborations in EGI	EGI supported activities and services	Number of scientific papers published in 2024
ATLAS (High-Energy Physics) • CERN Tier-0	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)	126
CMS (High-Enery Physics) • CERN	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)	109

CERN research collaborations in EGI	EGI supported activities and services	Number of scientific papers published in 2024
DUNE (Astroparticle Physics) • CERN	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: • EGI HTC services from 6 EGI participant countries (CH, CZ, ES, FR, NL, 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)	37
ELI-BEAM (Physical Sciences) • CERN	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.	3

CERN research collaborations in EGI	EGI supported activities and services	Number of scientific papers published in 2024
Icarus-exp.org (Physical Sciences) • CERN	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.	1
ILC (High-Energy Physics) • CERN	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)	75

CERN research collaborations in EGI	EGI supported activities and services	Number of scientific papers published in 2024
LHcB (High-Energy Physics) • CERN	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)	49
LZ (Physical Sciences) • CERN	The LZ survey federates High Throughput Compute (HTC) resources from UK. The LZ 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)	6

Participated projects

The EGI Foundation leads five Horizon Europe Projects, three of which started in 2024:

- iMagine (September 2022-December 2025)
- interTwin (September 2022-August 2025)
- ENVRI-Hub NEXT (February 2024-January 2027)
- EOSC Beyond (April 2024-March 2027)
- SPECTRUM (January 2024-June 2026)

Furthermore, the EGI Federation was involved in 3 additional projects, increasing the innovation potential of its participants.

The EGI Federation participates in Horizon 2020 and Horizon Europe projects together with Austrian 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
AARC	EGI leads the activities on Communication Dissemination and Exploitation Management and significantly contributes to the technical guidance and architecture definition, trust policy harmonisation and interoperability, validation activities, and to the preparation of the Compendium and recommendations.	• CERN
EOSC Future	EGI contributed to the design, operation and interoperability of EOSC Core services, to running the EOSC Digital Innovation Hub, as well as to resource strategy and the processes for onboarding new groups to EOSC. EGI was responsible for requirements collection and analysis for both the EOSC Back Office and Front Office. It also leads all operational aspects of the EOSC Portal. Finally, EGI played a leading role in developing the EOSC SMS.	• CERN

Infrastructure contributions

The EGI Federation offers two complementary compute capabilities: the High-Throughput Compute (HTC) federation and the Cloud federation. 1 Swiss data centre contributes to the HTC Federation: CERN-PROD.

The data centres provided 1 service endpoints and delivered 2,025,564,164 HTC CPUhours in total to EGI communities in 2024. The data centres responded to 92 support tickets through the EGI Helpdesk.

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

- CMS 32.61%
- ALICE 32.51%
- ATLAS 21.32%
- LHcB 13.55%

Methodology

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

Users

EGI uses the following methodology to capture the number of EGI users who rely on EGI services

- EGI serves users in the form of 'communities', called 'Virtual Organisations' (VO in short). A VO's members can range from one to tens of thousands. Members of a VO benefit from and use EGI services in different ways (e.g., by using Services for Federation or Services for Research).
- EGI establishes knowledge about its VOs as part of the user community support lifecycle; therefore, baseline information about VOs is collected through the Customer Relationship Management process (CRM).

At the end of 2024, there were 135 VOs in EGI.

EGI Virtual Organisations (VOs) can rely on different technical and non-technical mechanisms to manage their own members. Depending on their choice, the EGI Federation coordinator (EGI Foundation) has to follow different, corresponding approaches to know the number of members in a given VO, and to obtain additional information about these members (e.g. their 'country'). The EGI Foundation uses the following mechanisms to obtain information about the VO users:

- Obtain user number statistics from the EGI Operations Portal for VOs, where the members register personally in a 'VO membership management' system that is either operated by EGI or can be accessed by EGI.
- Obtain user number statistics from Community VRE REST APIs for VOs that operate Virtual Research Environments (VREs) on top of EGI resources. Those VREs implement a specific API to report users (e.g., WeNMR, Virtual Imaging Platform (VIP), NBIS).
- Obtain user number statistics from interviews with VO coordinators for VOs coordinated by one person.

Publications

Publications are collected from each community's public repository, if existing. Additional details are checked with the VO coordinators during the interviews to complement this information. EGI also consults OpenAIRE services to countercheck the data. You can check the list of repositories for each VO here (requires login): https://operations-portal.egi.eu/vo/#collapseVoListOther.

Institutional members supporting research communities

EGI relies on the information on each community's website to list institutions supporting research communities at the national level. Additionally, EGI appreciates the feedback from its national representatives to refine and improve those lists.

EGI Membership Impact Report

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