

European Grid Infrastructure

2012-13



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Why e-infrastructures?

EGI: an e-infrastructure for the European Research Area

E-infrastructures include geographically distributed computing resources and data storage facilities, and the high-performance networks that link them. They allow scientists to share information securely, analyse data efficiently and collaborate with colleagues worldwide. They are an essential part of modern scientific research and a driver for economic growth. By 2020, e-infrastructures need to be deployable on demand to provide a foundation for the digital European Research Area (ERA).

The European Grid Infrastructure (EGI) is the result of pioneering work that has, through the federation of national resource providers over the last decade, built a collaborative production infrastructure of uniform services, which supports multi-disciplinary science across Europe and around the world. Through this initiative an ecosystem of national and European funding agencies, research communities, technology providers, technology integrators, resource providers, operations centres, resource centres, coordinating bodies and other functions has emerged to serve over 22,000 researchers and their intensive data analysis.

The EGI ecosystem provides a common foundation upon which the digital ERA can be established by building upon the strengths that have been developed over the last decade.

Introduction



The EGI community, coordinated by EGI.eu, continues to mature and strengthen its position as a primary player in Europe's distributed e-infrastructure ecosystem.

To broaden the scope and further improve the collaboration with the European Strategy Forum on Research Infrastructures (ESFRI) projects, a series of virtual teams have been initiated and supported across several science disciplines. These teams complement existing EGI and EGI.eu structures and expand the EGI community's capabilities to react on changes in requirements coming from research communities, thereby providing for the implementation of the latest technologies and approaches to meet their evolving needs.

EGI.eu can proudly face the forthcoming transition from the FP7 project-based model into a fully established organisation that will continue to support and coordinate the EGI community into the Horizon 2020 era.

The results in the last year prove that a solid foundation is already built, guaranteeing a successful future.

Ludek Matyska
Chair, EGI.eu Executive Board and EGI Council



The third year of EGI.eu has seen our tentative baby steps develop into a confident and purposeful walk around three distinct strategic areas.

Through the new EGI Champions, the developing NGI International Liaisons and the established NGI Operations Managers, along with the leadership of the NGIs and other participants in the EGI Council, we provide the community and coordination needed across this human network to satisfy the diverse research communities that we serve.

The focus of this human network is the operation, support, outreach and use of the production infrastructure that uniformly and reliably federates and delivers these services across Europe. Over the last year, EGI's Federated Cloud infrastructure has started to emerge from being an isolated testbed to being fully integrated into the production infrastructure with adoption by a growing number of research communities.

The ability of individual research communities to establish their distinct Virtual Research Environments in partnership with EGI is at the heart of our science gateways and clouds initiative. Lowering the barriers to access and improving the flexibility of the infrastructure will allow us to grow our usage and sustain us in the years to come.

My thanks to the staff at EGI.eu and the continuing support we have been given by the NGIs at all levels across Europe.

Steven Newhouse
Director, EGI.eu

EGI is a federation of resource providers set up to deliver sustainable, integrated and secure computing resources to European researchers and their international partners.



EGI.EU PARTICIPANTS[†]

Armenia: NGI-AM, RA MESSCS

Austria: Institut für
Hochenergiephysik

Belgium: NGI-BE, BELNET

Bosnia and Herzegovina:
NGI-BA, ETFBL

Bulgaria: NGI-BG, IPP-BAS
CERN

Croatia: NGI-HR, SRCE

Cyprus: NGI-CY, CyGrid

Czech Republic:
NGI-CZ, CESNET

Denmark: NGI-DK, DCSC

EMBL

Estonia: NGI-EE, EENet

Finland: NGI-FI, CSC

France: NGI-FR, CNRS

Germany: NGI-DE, Gauß-Allianz

Greece: NGI-GR, GRNET

Hungary: NGI-HU, NIIF

Israel: NGI-IL, IUCC

Italy: NGI-IT, INFN

Latvia: NGI-LV, LUMII

Lithuania: NGI-LT, VU

Luxembourg: NGI-LU, RESTENA

FYR Macedonia: NGI-MK, MARGI

Moldova: NGI-MD, RENAM

Montenegro: NGI-ME, UoM

The Netherlands: NGI-NL, NCF

Norway: NGI-NO,
UNINETT Sigma AS

Poland: NGI-PL,
CYFRONET AGH

Portugal: NGI-PT, UMIC

Romania: NGI-RO, ICI

Russia: NGI-RU, e-ARENA

Serbia: NGI-RS, IPB

Slovakia: NGI-SK, SlovakGrid

Slovenia: NGI-SI, ARNES

Spain: NGI-ES, CSIC

Sweden: NGI-SE, SNIC

Switzerland: NGI-CH, SWITCH

Turkey: NGI-TR, ULAKBIM

United Kingdom: NGI-UK, JISC

[†] in alphabetical order by [country, if applicable]: [NGI code used in this document, see page 32], [short name of the lead organisation]

What does EGI do?

The European Grid Infrastructure (EGI) was established in 2010 as a European-wide federation of national computing and storage resources, to support cutting-edge research, innovation and knowledge transfer in Europe. Building on over a decade of investment by national governments and the European Commission, EGI supports more than 22,000 researchers across many scientific fields with a wide range of technical and infrastructure services. EGI's computing resources and services are distributed across Europe and beyond over more than 350 sites, supporting in excess of 2.2 million computing jobs per day, as well as data storage, transfer and open access.

EGI is coordinated by EGI.eu, a not-for-profit foundation supported by the EGI-InSPIRE project and governed by the national stakeholders and early-adopting international research communities.

EGI IN NUMBERS

- EGI Council participants: 40
- Resource providers: 40
- 22,067 users in 212 virtual organisations
- CPU cores (including integrated infrastructures): 372,584
- Computing capacity: 2.5 million HEP-SPEC 06
- Usage: 1.67 million (grid only) and 2.25 million (grid and local) jobs per day

VISION

To support the digital European Research Area through a pan-European research infrastructure, based on an open federation of reliable services, which provide uniform access to national computing, storage and data resources.

MISSION

To connect researchers from all disciplines with the reliable and innovative ICT services they need to undertake their collaborative, world-class and world-inclusive research.

CORE VALUES

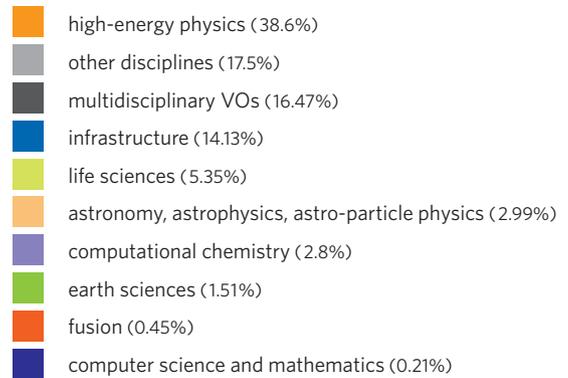
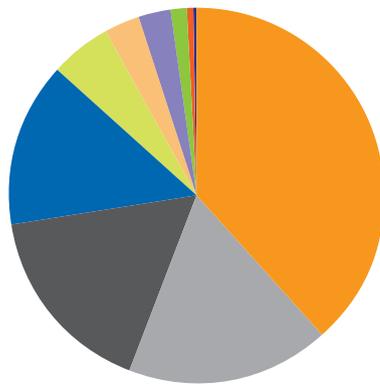
Leadership: EGI is a leading pan-European infrastructure, integrating worldwide computing, storage and data resources to support an ecosystem built on innovation and knowledge transfer.

Openness: EGI operates collaboratively with a transparent governance structure that integrates the views and the requirements of all stakeholders, from research communities to resource providers.

Reliability: EGI provides a reliable infrastructure that research communities can depend on in order to collaborate with their peers and deliver innovation.

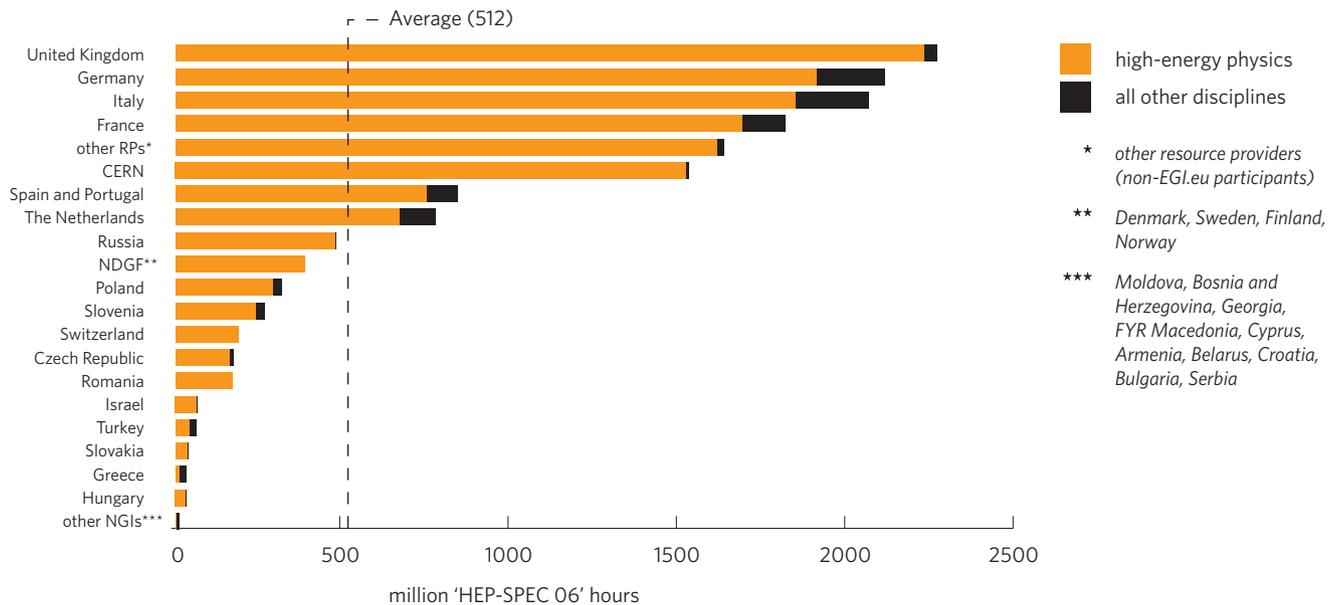
Innovation: EGI will continue to meet the needs of research communities operating at unparalleled geographic and technical scale by partnering to bring new technologies into production.

Registered grid users by research discipline:



Total number of users = 22,067 (March 2013)

Usage of NGI grid computing resources:



* other resource providers (non-EGI.eu participants)
 ** Denmark, Sweden, Finland, Norway
 *** Moldova, Bosnia and Herzegovina, Georgia, FYR Macedonia, Cyprus, Armenia, Belarus, Croatia, Bulgaria, Serbia

EGI's European impact

EGI's vision, mission and core values ensure that it continues to build on its added value, supporting world-class research and innovation in the European Research Area. The overarching goal is to tackle today's societal challenges with innovative solutions developed by talented researchers supported by an e-infrastructure. Some examples of EGI's impact on science and society are presented here.

SOCIETAL CHALLENGES

(prioritised within the Horizon 2020 framework)

- Health, demographic change and wellbeing
- Food security, sustainable agriculture, marine and maritime research and the bio-economy
- Secure, clean and efficient energy
- Smart, green and integrated transport
- Climate action, resource efficiency and raw materials
- Inclusive, innovative and secure societies

IN SCIENCE AND SOCIETY

HEALTH, DEMOGRAPHIC CHANGE AND WELLBEING

DESIGNING BETTER ANTIBIOTICS

How grid computing is helping to develop antibiotics with fewer side effects but equally powerful against fungi.

Pneumonias and meningitis caused by fungi are a real risk for people burdened with weak immune systems after, for example, organ transplants or chemotherapy treatments.

The antibiotic Amphotericin B (AmB) has been the drug of choice against fungal infections for the past 50 years. It's brutally efficient, killing a broad spectrum of fungal agents including all known multidrug resistant strains. The catch is that AmB is toxic to the human body and it can cause organ damage in patients, especially in the kidneys.

Scientists from Poland used advanced simulations to learn more about how AmB interacts with cell membranes. The research was possible thanks to grid computing resources provided by the Polish National Grid Initiative. For this project, the team consumed an equivalent of five million CPU hours.

They found that AmB's affinity for fungal or human cells is controlled by energy levels. These conclusions will allow the team to propose new ways to make AmB more likely to attach itself to fungal cells. The result? A stronger antibiotic, with fewer side effects.

<http://go.egi.eu/antib>

COULD MUSIC BE THE KEY TO TREATING EPILEPSY?

How grid computing and the high-speed GÉANT network help scientists to study epilepsy with melody analysis and learn the signs of upcoming seizures.

Epilepsy is a chronic neurological disorder that cripples the lives of millions of people worldwide. Now an international collaboration of computer and neuroscientists set up a project to see if musical patterns can be used to understand the brain activity of epilepsy patients. The idea is to analyse the medical data with sonification – a computational technique to examine melodies.

The team first translated brain activity recordings into melodies using different sets of audio parameters. Then, the researchers used sonification to identify the markers of epileptic activity. Knowing these markers will shed a new light on the interpretation of brain activity and may help to forecast seizures far in advance.

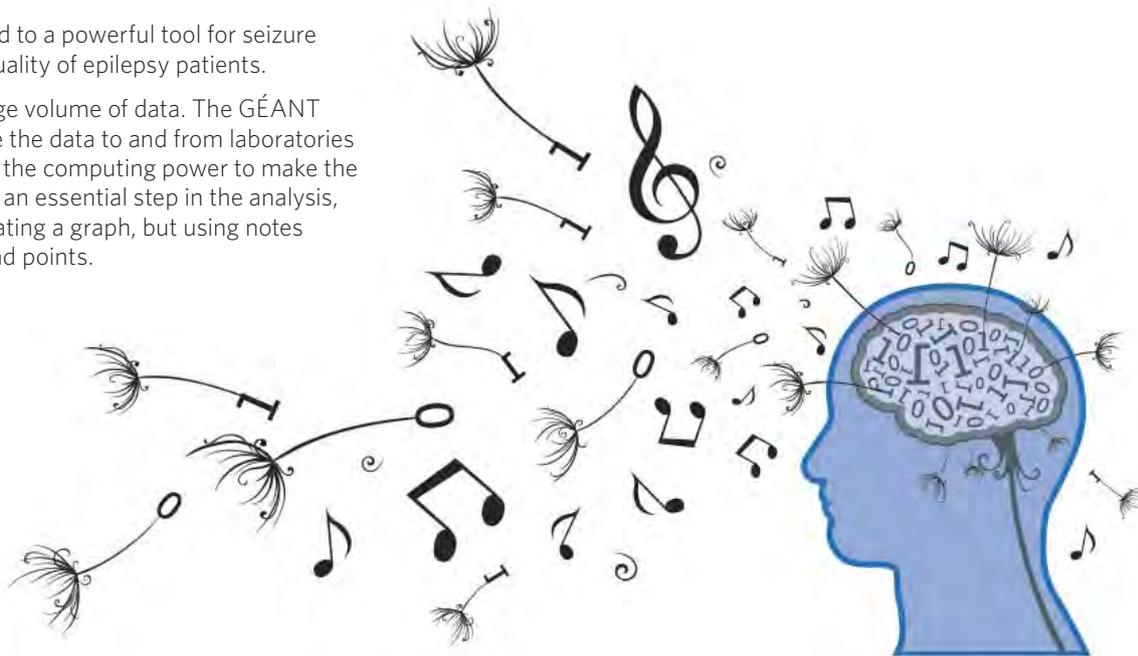
This breakthrough could lead to a powerful tool for seizure prevention, improving the quality of epilepsy patients.

The method generates a huge volume of data. The GÉANT network is essential to move the data to and from laboratories across Europe. EGI provides the computing power to make the sonification possible. This is an essential step in the analysis, similar to the process of creating a graph, but using notes and tones instead of lines and points.

<http://go.egi.eu/epilepsy>

ELSEWHERE IN EGI...

- In Ukraine, a PhD student uses grid computing to reconstruct the gene regulatory networks that controls pre-eclampsia, a serious condition that affects pregnant women and may lead to life-threatening seizures. (<http://go.egi.eu/grn>)
- The Critical Assessment of Automated Structure Determination of proteins from NMR data (CASD-NMR) has demonstrated that it is possible to automate the calculation of protein structures from NMR data at the levels of quality and reliability required to deposit new structures into the Protein Data Bank. (<http://go.egi.eu/casd>)



CLIMATE ACTION, RESOURCE EFFICIENCY AND RAW MATERIALS

CLIMATE CHANGE AND OZONE

How grid computing is helping scientists to predict how ozone concentrations will change in a changing climate.

High up in the atmosphere, ozone protects life on Earth by absorbing almost 99 per cent of the Sun's deadly ultraviolet light. At ground level, ozone is a pollutant capable of causing health problems even at the lowest concentrations.

Scientists know that ozone concentrations depend largely on temperature, wind and other weather parameters and so it's likely that they will be affected by climate change. But how?

Eleni Katragkou, a climate scientist based at the Aristotle University of Thessaloniki in Greece, accepted the challenge and used grid computing to simulate the effect of climate change on ozone concentrations in Europe over the next 100 years.

The work, published in the *Journal of Geophysical Research*, suggests that the concentration of ground level ozone is likely to increase towards the end of the century, especially in south-west Europe.

<http://go.egi.eu/ozone>

PREDICTING THE RISK OF DAM FAILURE

How grid computing helps to predict the effects of a toxic spill in a copper mine's tailing dam.

The Żelazny Most tailing dam was built in the late 1970s as a final resting place for the contaminated wastes produced by three copper mines in south-west Poland. As of 2012, the dam spreads across 14km² of countryside and receives about 80,000 tonnes of clay waste material per day, growing more than a meter in height every year.

Dam failure at this point would mean 10 million cubic meters of contaminated waste flooding the valley, with tragic consequences for the environment and for the health of local people. The key to preventing disaster is to understand what could happen in the event of a toxic spill.

A partnership between Greek civil engineers and the mine's owners assessed the risk of a spillage by determining the total area of contamination for each possible failure mode. The team used grid computing resources provided by Hellasgrid to model the contamination spill in three dimensions, covering an extensive area in high-resolution.

The conclusions highlight the importance of risk assessment and will be helpful to plan disaster responses and minimise damage in case of dam failure.

<http://go.egi.eu/dam>

CHEAPER BIODEGRADABLE PLASTICS

How grid computing is helping scientists to design cheaper and greener plastics for everyday use.

Plastics are everywhere, in food packaging and clothing, in fridges, ovens and laptops, in hospital equipment and cars. Plastics make our lives easy and we are addicted to them. But this dependence of ours comes with serious environmental consequences and creates a global waste disposal problem. The solution is biodegradable plastics.

Poly lactide plastics (PLA) are a promising alternative to the PET-plastics used, for example, in soft drink bottles. PLAs are not a by-product of the petrochemical industry and they can be made from inexpensive raw materials such as corn, beets or agricultural waste. They can be produced in normal industrial facilities, have many applications and are biodegradable. Their production, however, is relatively expensive and has relegated PLAs to niche markets.

A team of chemists from Germany used the Molecular Simulation Grid (MoSGrid) portal to virtually test alternative catalysts for the production of PLA plastics. They found that zinc guanidine complexes are a good, non-toxic candidate able to polymerise PLA at high temperatures and without purification.

The conclusion opens the way to turn biodegradable PLA plastics into competitive alternatives to petrochemical-based PET plastics.

<http://go.egi.eu/pla>

SECURE, CLEAN AND EFFICIENT ENERGY

BUILDING A SUN ON EARTH

How grid computing helps to look for alternative energies.

One of the problems facing the planet is energy, and between dwindling fossil fuel reserves and a desire to move to clean sources of power, a solution is needed soon. One technology is based on the process that powers our Sun – fusion. The ITER Organization aims to demonstrate the feasibility of fusion power.

Currently, fusion research is an expanding community within EGI, supported by grid computing resources provided by IBERGRID and France Grilles and with twelve ported applications registered in the Applications Database.

<http://go.egi.eu/fusion>

INSPIRING SCIENCE

CRACKING GOLDBACH'S CONJECTURE

How grid computing is helping mathematicians to tackle a 200-year old puzzle.

Goldbach's Conjecture says that every even number larger than four is the sum of two odd prime numbers, for example $60 = 7 + 53$.

It sounds easy enough to understand – unfortunately it's not easy to prove and despite all attempts since the 1800s, a definite proof is still elusive. But even though scientists can't prove it, they have been busy verifying if it holds for every case tested, or if there is a counter-example.

Completing the task by hand is a fantasy, with a laptop it would take generations of scientists and even with supercomputers we are looking to a timescale of years.

It was only when a team of Portuguese and Italian enthusiasts embraced the power of grid computing provided by the Italian Grid Initiative that the verification process gained momentum. To put it into context, with access to HPC facilities the team was able to check an average of 1×10^{14} numbers per day. With grid computing, this could be completed in minutes. The verification limit of 4×10^{18} was reached on 4 April 2012, well ahead of the initial schedule.

<http://go.egi.eu/gold>

ARE COMETS BORN IN ASTEROID COLLISIONS?

How grid computing helps astronomers to explain the origins of main-belt comets.

P/2006 VW139 was just another asteroid orbiting the Sun between Mars and Jupiter until 2011, when astronomers from Hawaii spotted its comet-like tail. This was unexpected: the orbit of main-belt asteroids keeps them closer to the Sun at

all times, which means that any ice they might originally have had to form a tail should have evaporated a long time ago.

So how do you explain the tail of these so-called main-belt comets? One theory suggests that they could be the remnants of a larger body smashed to pieces by a recent impact. And the way to prove it is to look for examples of an asteroid family that shares their origin with a main-belt comet.

A Serbian astronomer with colleagues from the US and Italy did just that, with the help of grid computing. Using resources provided by AEGIS, the Serbian NGI, the team was able to identify the asteroid family related to P/2006 VW139 and prove that they are the products of a recent impact.

This case study was featured in the fourth episode of the 'Stories from the grid' series of videos: <http://go.egi.eu/mbc>
<http://go.egi.eu/comets>

ELSEWHERE IN EGI...

- In July 2012, CERN announced the discovery of the Higgs boson, the elusive particle that completes the Standard Model of Physics. The results are the crowning achievement of thousands of scientists working together to collect and analyse the data produced by the LHC. The collaboration was possible thanks to the grid computing infrastructure that supported data analysis, transfer and storage across multiple research groups. (<http://go.egi.eu/higgs>)
- The Pierre Auger collaboration, involving 490 scientists from 18 countries, scans the skies looking for super-rare ultra-high energy cosmic rays. Storing and analysing the data collected by the detectors of the Pierre Auger Observatory requires immense computing power, and EGI provides the perfect solution for their computing requirements. The collaboration has already made important contributions: five of the Top 10 hottest articles in Astroparticle Physics published by Elsevier in 2012 describe their achievements. (<http://go.egi.eu/auger>)



Screen shots from 'Stories from the Grid - Main Belt Comets'. The fourth episode features astronomer Bojan Novakovic from Serbian, who explains how grid computing helps to shed light on the origins of main belt comets.

IN EUROPEAN INNOVATION

The next generation of European research innovation will increasingly rely on both geographical and intellectual collaboration across multiple disciplines. Recognising this opportunity, the European Commission has unveiled Europe 2020 - a strategy to develop a smart, sustainable and inclusive economy based on innovation and knowledge transfer.

The driving force behind this vision is the digital European Research Area (ERA) - a transnational effort combining research centres with ongoing programmes and projects aimed at building multidisciplinary collaborations and enabling rapid knowledge transfer across borders.

The full implementation of the digital ERA depends heavily on the development of e-infrastructures that will enable researchers to tackle today's societal challenges with the best tools ICT can offer.

EGI AND THE DIGITAL AGENDA FOR EUROPE

In support of the Digital Agenda for Europe, EGI will:

- Provide a single uniform market for accessing distributed computing resources and connected data in Europe through EGI's federation of national resource providers.
- Promote competitiveness and interoperability for e-infrastructures through open standards within the European Interoperability Framework (EIF).
- Reduce inefficient research spending and stimulate innovation across Europe by maximising the use of national resources and knowledge within a common federated infrastructure and community.
- Offer large-scale ICT facilities that enable the exploration of new computing and data processing models that address scientific grand challenges facing society.

EGI policy papers

- EGI Position Paper on ERA Framework
http://go.egi.eu/EGI_ERA
- EGI Strategy Paper
<http://go.egi.eu/EGI2020>

EGI AND THE INNOVATION UNION

In the context of the Innovation Union, EGI can:

- Position itself as a key enabler of the digital ERA that will allow for the free circulation of researchers, knowledge and technology.
- Promote excellence in education and skills development by simplifying multi-disciplinary cooperation.
- Bridge geographical boundaries beyond Europe thanks to the many collaborations and integration with world-wide e-infrastructures.

ADDED VALUE FOR EUROPE

In the wider context of Europe 2020 and funded in future through the Horizon 2020 programme, EGI offers a range of added value for Europe:

- EGI ensures that researchers have access to uniform and reliable computing resources, enabling faster scientific results and avenues of multi-disciplinary research otherwise not possible.
- EGI allows researchers to focus on their research rather than managing their e-infrastructures needs.
- EGI's monitoring and operational services guarantee an integrated, reliable and uniform service provided across organisational and national boundaries.
- EGI's transnational integration provides effective use of resources and ensures the most effective return on Europe's e-infrastructure investments.
- EGI enables knowledge transfer and sharing of solutions through community events, an application database and a training marketplace.
- EGI promotes open science through the availability, accessibility and reuse of scientific data and results, the provision of web-based tools that facilitate scientific collaboration and by ensuring public access to research.

Supporting the EGI ecosystem

The EGI ecosystem is a thriving community of independent technology providers, platform integrators and operators, resource infrastructure providers and their operations teams, research communities, as well as national (NGIs) and European (EGI.eu) coordination bodies. Together, these actors work towards a common goal of giving scientists the computing resources necessary to face the big research questions of today.

Just as for real biological communities, the health of the EGI ecosystem depends heavily on the delicate balance between its components: no single unit is viable without the support of the rest of the community.

EGI.eu's mission is to nurture the EGI ecosystem and develop it into a sustainable environment, where consistent and reliable levels of ICT services are available for European researchers and their colleagues. To do this, EGI.eu coordinates the work of different sub-sets of the ecosystem to maximise efficiency and guarantee a productive environment for the community to grow and pursue its mission.

This chapter summarises the achievements of the EGI.eu teams dedicated to support different parts of the EGI ecosystem.

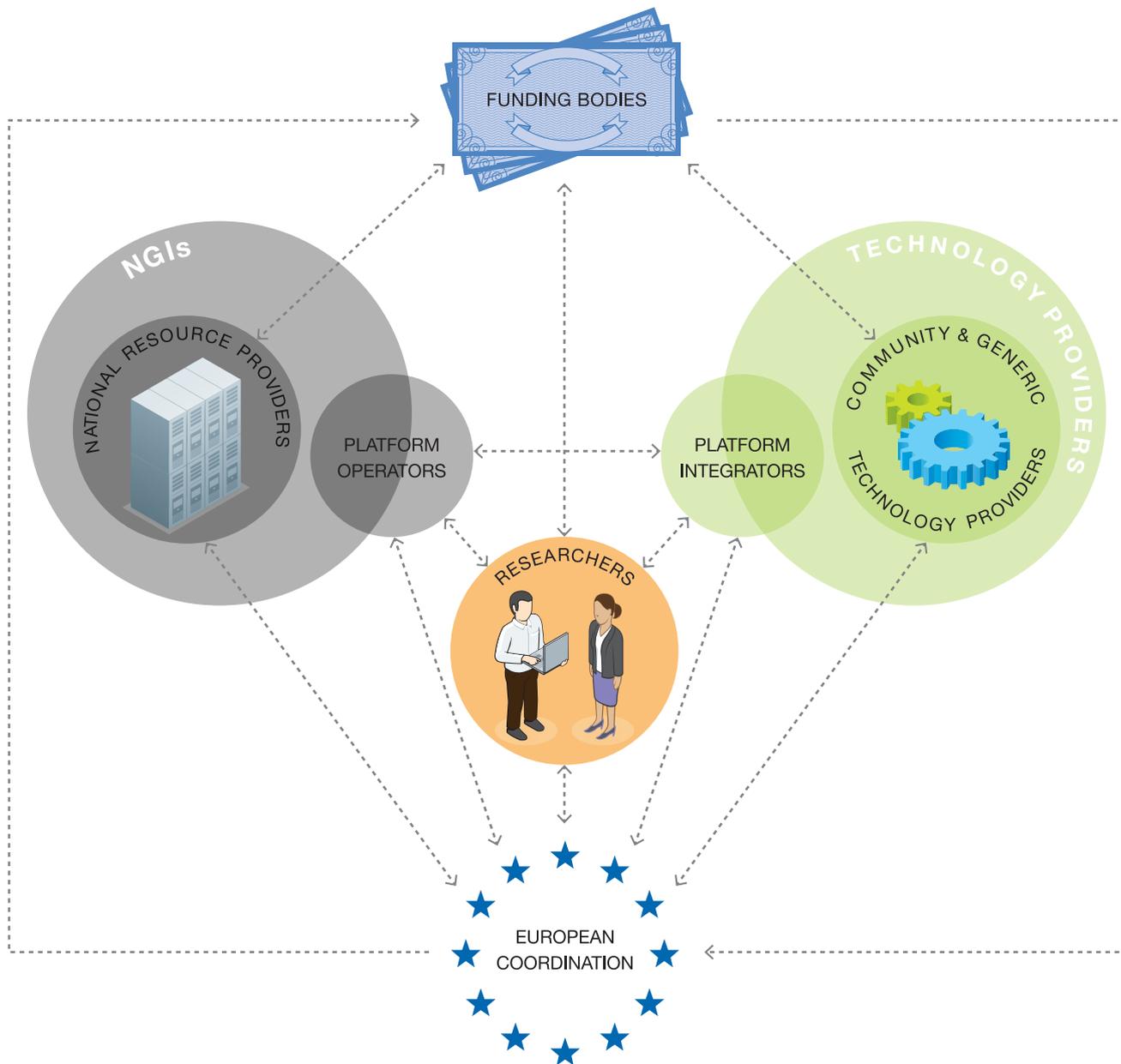
TECHNOLOGY PROVISION

The last year saw the development of the EGI Platform Architecture, which will consolidate EGI as a flexible, sustainable e-infrastructure able to support diverse communities with diverse requirements as part of EGI's strategy for Horizon 2020. The EGI Platform Architecture partitions the production infrastructure into three key EGI platforms, and an open-ended number of Community Platforms. In this model, EGI's e-infrastructure will be structured as:

1. the EGI Core Infrastructure Platform, a set of operational services necessary for the management of federated distributed computing and data infrastructures (DCDIs),
2. the EGI Cloud Infrastructure Platform, which provides a federated IaaS Cloud infrastructure (at the same time a reference DCDI integrated with the EGI Core Infrastructure Platform), and
3. the EGI Collaboration Platform, a set of tools and services enabling cross-community collaboration.

Additionally, research communities across Europe may deploy any number of customised Community Platforms satisfying their own individual needs. A key component of this tier in the EGI Collaboration Platform is the Community Software Repository, an extension of the Applications Database, where research communities will be able to publish their software releases directly.

The EGI ecosystem:



OPERATIONS

The EGI.eu Operations Team coordinates the delivery of services across Europe to meet the needs of NGI operations teams, platform operators or applied researchers. The Operations Team is also responsible for the ongoing management of technology deployment, including releases developed by independent platform integrators and technology providers.

The EGI Core Infrastructure Platform has evolved over the last year to provide the operational tools needed to manage a federated infrastructure. A new Availability and Reliability reporting framework was introduced that provides greater reporting flexibility for our different stakeholders. The monitoring framework was selected to monitor EGI's Cloud Infrastructure Platform, and to support the decommissioning of unsupported software. The Service Level Management framework was updated to include service level targets of the EGI.eu central technical services and the service level reporting was automated.

A new streamlined version of the EGI service registry was released and the accounting infrastructure was migrated to a new publication protocol that will be able to account for cloud and storage resources when these are supported in production next year. The Accounting Portal was extended to provide inter-NGI accounting reports following a specification established by a virtual team.

The EGI security team completed the first security threat risk assessment and contributed to the extension of the policy framework providing guidelines on software deployment in EGI. Software verification activities expanded to encompass a variety of distributions; this was possible thanks to an increasing commitment of the community.

A promising collaboration with EUDAT and PRACE was started to develop synergies in operations and support of users accessing multiple infrastructures.

COMMUNICATIONS AND COMMUNITY ENGAGEMENT

EGI.eu oversaw a number of initiatives to strengthen the network of human added value that is core to EGI's strength. These human networks, covering user communities and non-operational national activities, have an incredible potential as bi-directional communication channels that can complement other mechanisms such as events, publications, social media and a vibrant web presence and can be brought together to tackle community wide issues through virtual teams.



Call-out cards to recruit applicants to the EGI Champion scheme, aimed at early career researchers already familiar with the grid (left: card front, right: card back).

THE EGI CHAMPION NETWORK

Welcoming new users to the grid

One of the key goals of EGI is to expand the number and scientific diversity of its user base. While continuing to pursue more traditional routes of engaging with user communities, EGI.eu has established an initiative to get closer to new users – the EGI Champion network – developed as a result of a virtual team that brought together the best practices and defined the necessary support procedures.

EGI Champions are enthusiastic scientists who use distributed computing in their daily research. They will travel to conferences and events as ambassadors for EGI and their use of distributed computing. They will connect with other researchers in their field to publicise the benefits of working with EGI. The Champions will complement EGI's outreach efforts by talking to new users from a user perspective and with a user language.

THE NIL NETWORK

The NGI International Liaisons (NILs) have a key role in the EGI community. Working together with teams in EGI.eu, the NILs link the strategic non-operational activities taking place in their own NGIs (e.g. outreach, marketing, communication, training, new community engagement) with the rest of the community.

With the NIL acting as a spearhead, each country is able to demonstrate their added value at a European level and to share their skills with the whole community.

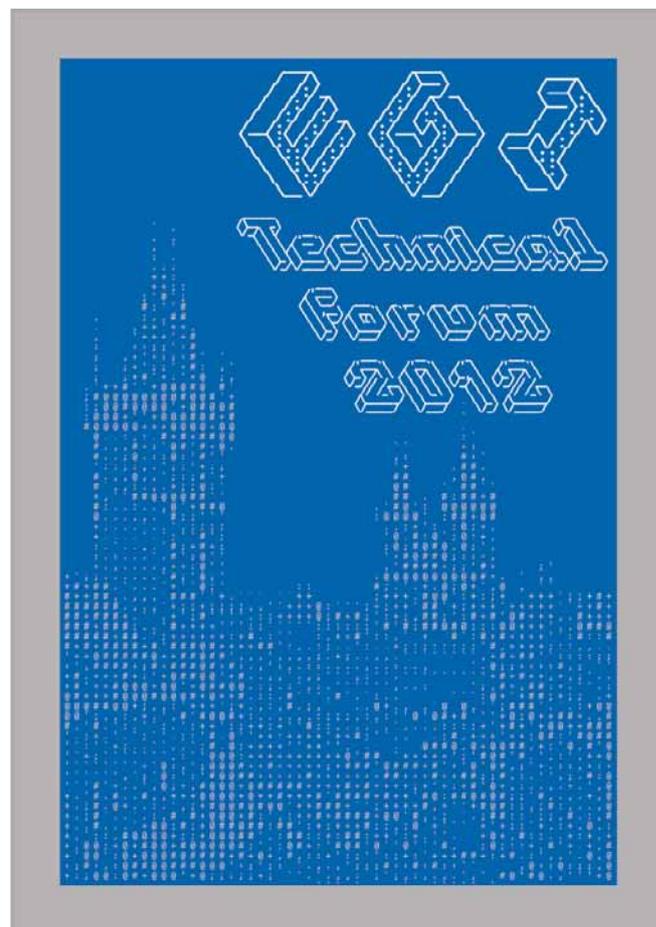
EVENTS FOR THE COMMUNITY

TECHNICAL FORUM 2012

The EGI Technical Forum was held from 17-21 September 2012 in Prague, Czech Republic, to reflect on the progress made so far by the collaboration and to look forwards to the challenges of public availability, reusability and transparency of scientific methods and data in Open Science. The event was organised by EGI.eu in partnership with CESNET, the consortium of Czech universities and the Czech Academy of Sciences that represents the country in the EGI Council.

In total, 415 participants registered for the forum, which featured 305 contributions and 203 speakers. The Technical Forum website (<http://tf2012.egi.eu>) was viewed by 2,417 unique visitors that led to 21,027 page views. The two (iPhone and android) free applications developed for the event were downloaded-updated by 190 users.

The Technical Forum hosted two co-located events: the 2nd GlobusEUROPE conference (17 September) and the EC Workshop: Distributed Computing Infrastructures for e-Science: Future Perspectives (18 September).





COMMUNITY FORUM 2013

The EGI Community Forum was held from 8-12 April in Manchester, United Kingdom. With the theme of International Collaboration, the event brought together researchers, engineers and IT people from around the world to discuss the use of distributed computing and storage infrastructures – grids and clouds.

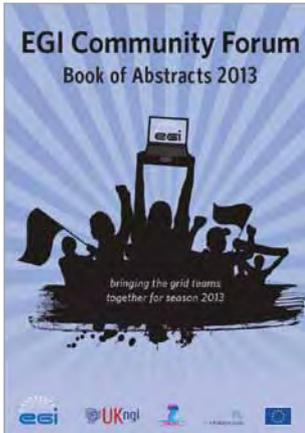
In total, 381 registered for the event that featured 116 presentations, workshops and training sessions. The Community Forum website (<http://cf2013.egi.eu>) received over 18,500 unique pageviews. Two (iPhone and android) free applications were also developed for the event.

The Community Forum was held in conjunction with the 3rd EMI Technical Conference and was co-located with the third annual meeting of the European Globus Community Forum (8 April).

EVOLVING EGI WORKSHOP

The Evolving EGI workshop was held from 28-30 January 2013 in Amsterdam, Netherlands. The ecosystem-oriented event was attended by about 80 representatives of the whole EGI community, including technology providers, research communities, resource providers and NILs from many NGIs. The wide range of participants created the right brain-storming environment for discussions around the EGI publications repository, peer-reviewed resource allocation, pay-per-use models, and the EGI Service Portfolio and the criticality of the different EGI Global Tasks.

Postcard (left) and poster (right) to promote the EGI Technical and Community Forums.



PUBLICATIONS

During 2012–2013, the EGI.eu communications team produced several publications designed to convey the goals and achievements of the EGI community to wider audiences. These included:

- four issues of the *Inspired* newsletter
- 68 news items, on community announcements, milestones, events, agreements, use cases and success stories
- the EGI-Public Service Review brochure, explaining the goals of EGI to an audience of 140,000 decision makers
- the EGI brochure, aimed at introducing EGI to a general audience
- the *EGI Community Forum 2013 Book of Abstracts* (ISBN 978 90 816927 2 4), with an overview of the talks presented at the event
- EGI posters created for specific events (e.g. EUDAT, ICRI) or to publicise a specific EGI activity (e.g. GAP, AppDB, Training marketplace)
- a leaflet highlighting the benefits of the EGI Federated Cloud to user communities



EGI and the work done on the infrastructure featured in a wide range of articles and press cuttings including *Discover* magazine, *Panorama*, *Discovery News*, *Wired*, *CERN Bulletin*, *International Innovation*, *Digital Meets Culture*, *HPC in the Cloud*, *Pan-European Networks*, *Public Service Review*, *e-IRG newsletter* and *CONNECT*.

Top row, left to right: the 'EGI Community Forum 2013 Book of Abstracts'; an issue of the 'Inspired' newsletter. Bottom row, left to right: posters introducing the EGI Training Marketplace and the Applications Database.

VIRTUAL TEAMS

The Virtual Team framework has now been running for over a year and has been proven to be a flexible and dynamic mechanism for bringing together members of the community to meet a specific, well-defined goal. The focus of the Virtual Teams is to increase the number of EGI users, either directly (e.g. through integrating a new application, providing new capabilities) or indirectly (e.g. by raising the profile of EGI).

VIRTUAL TEAM HIGHLIGHTS

The impact from the various Virtual Teams over the last year is reported elsewhere in this report and more details including an overview of all Virtual Teams, with links to their final reports is available online (<http://go.egi.eu/vts>).

A number of Virtual Teams are directly engaged in community building and technical outreach in EGI by:

- consolidating the resources and expertise in Chemistry, Molecular and Materials Science and Technology for the benefit of existing and new users;
- investigating, identifying and assessing the portal and access models that could be used by Cherenkov Telescope Array to undertake their data analysis;
- establishing a network of ELIXIR liaisons in the NGIs to serve as a basis for collaboration at both technical and organisational levels to propose how EGI could support ELIXIR;
- compiling an overview of Environmental and Biodiversity research within EGI and to prepare the creation of a dedicated virtual research community in this area.

Selected highlights from other virtual teams are listed below:

Federated Identity Providers Assessment – a report detailing the state of the art of authentication solutions across the different NGIs.

MPI within EGI – a report identifying six areas of work to improve MPI within EGI: documentation, monitoring probes, information system, accounting, batch system integration and the establishment of a dedicated VO.

Fire Simulation – the VT collected information about fire and smoke simulation applications from across the community and looked into their integration in EGI.

Scientific Publications Repository – a set of six recommendations to liaise with the OpenAire project and develop tools and processes to collect, store and curate the scientific output of EGI's users.

GPGPU – a list of user and resource provider requirements to make General-Purpose computation on Graphics Processing Units available on EGI.

Scientific Discipline Classification – a coherent, legacy-free hierarchy of scientific disciplines that will help the EGI community to categorise research fields across its multiple tools .

Inter-Usage Report – the first report on the inter-usage of EGI resources, new Accounting Portal functionalities that allowed data collection, a list of caveats and accounting restrictions that merit improvement.

Science Gateway Primer – a comprehensive document collecting information about EGI technologies, policies and solutions for science gateway developers, and a set of recommendations on how to support them.

TECHNICAL OUTREACH TO NEW COMMUNITIES

The technical outreach to new communities team has been established over the last year to streamline the efforts of converting a potential new user community into an active user community within the EGI ecosystem. Working closely with NGI International Liaisons (NILs), the team liaises with research communities, identifies their requirements and provides the technical support needed for their integration with EGI (e.g. applications porting, service deployment, training).

The team also supported the development and deployment of community-specific Virtual Research Environments (VREs) which are frequently used to simplify access by user communities to EGI's production infrastructure. VREs are an essential feature to allow research communities new to distributed computing to benefit from its added value. VREs and related components, such as reusable portal frameworks and tools, were entered into the EGI Applications Database following technology evaluations and their potential usage scenarios recorded in the EGI Science Gateway Primer. This work was undertaken through a virtual team by staff at EGI.eu in cooperation with experts from the NGIs and EC-funded projects.

The team also worked to improve several community services, such as the EGI Applications Database, the EGI Training Marketplace, the EGI Client Relationship Management and the EGI Requirements Tracker.

STRATEGY, POLICY AND COLLABORATIONS

The first edition of the EGI Compendium had been published, a reference publication providing an authoritative summary of national activities across Europe. The compendium will be used to track the evolution of the NGIs, as the EGI Strategy endorsed in June 2012 by the EGI Council is followed in subsequent years. A balanced scorecard system has been established, to measure this evolution in more detail.

As part of EGI's strategic plan, the EGI Council approved policy papers relating to federated resource allocation, pay-for-use of NGI resources, and a working paper discussing EGI's transition to a European Research Infrastructure Consortium (ERIC), a different legal entity. The EGI.eu Service Portfolio was established following IT industry best practices, to support sustainability discussions and to analyse the costs and impact of EGI's Global Services in the context of a discussion on prioritisation.

Virtual teams were used to produce a policy recommendations to establish an EGI scientific publications repository. This will lead to a strategic collaboration with the OpenAIRE project and a better understanding of the scientific output of EGI users. Complementing this work, a second virtual team proposed a uniform classification of scientific disciplines to be adopted across all EGI tools. This new classification is a scalable solution that covers existing communities and allows for the integration of new ones.

Strategy for the future

EGI today is the result of pioneering work that has, over the last decade, built a pan-European production infrastructure through the federation of national resource providers, to support multi-disciplinary science across Europe and around the world. With thousands of users across many fields of science, EGI is already making a positive impact on European research and innovation.

But EGI is not a static resource. The community is already looking forward to the future, to identify opportunities, expand its service offering and anticipate future challenges.

EGI is committed to the European Commission's goals outlined in the Europe 2020 vision. With this in mind, EGI's strategy for the future is to develop its activities in order to be a key enabling foundation of the digital European Research Area (ERA), supported by continued investment from national and European funding bodies.

In practice, this means developing EGI's strengths in three key areas: community building and coordination, operational infrastructure, and virtual research environments.

COMMUNITY BUILDING AND COORDINATION

Community building and coordination experience help to guarantee integration and deliver uniform and open access to computing resources.

Over ten years, EGI has developed from a domain-specific activity focused on a handful of resource centres to a multi-disciplinary infrastructure with usage across many different disciplines. This growth, and future expansion, is critically dependent on the human network and its coordination that has been established within the EGI Community covering operations, research communities, specific technologies and non-operational activities. Expanding and growing the human network in non-operational areas through the NGI International Liaisons (NILs), and in the research communities through the EGI Champions, is part of EGI's strategy to develop its links across Europe.

This international human network is essential to EGI, a truly pan-European infrastructure. This means that EGI federates resources from dozens of European countries, each with its own strengths, structures, priorities and procedures. The quality of service offered to scientists today is the result of a decade of cooperation and consensus-building around many non-technical issues, including privacy, governance and strategy that needs to be maintained and refined through this human network.

As a result, individual researchers can expect uniform access to reliable services anywhere within EGI's federated network of national resource providers, regardless of location. The value of such widespread integration has been amply demonstrated (e.g. the data collection runs of the Large Hadron Collider in 2010-12 were analysed using EGI services).

Therefore, EGI's main governing body - the EGI Council - is ideally placed to build on these achievements and lead the network of NGIs and EIROs to the next level. With the coordination provided by EGI.eu, EGI will continue to develop as an infrastructure and, as importantly, as a community through communication, marketing, outreach, support and public events.

OPERATIONAL INFRASTRUCTURE

Developing the tools and services to support existing communities and to offer virtualised resources through a federated cloud.

EGI's success in providing reliable services to research communities depends on a sophisticated, infrastructure-wide network of services. These operational services allow for the monitoring of individual resource centres, the collection of accounting records nationally and across the whole

infrastructure, the resolution of technical issues across different organisational structures, and the compilation of availability and reliability statistics.

EGI's mature monitoring, accounting and service offer was not born in a day - it is the fruit of the knowledge and expertise built up and shared by individual resource centres within their NGIs and brought together within the community. EGI's decade-long experience in managing a federated infrastructure is a key asset and a service that can be offered to any research community seeking to build a European-wide operational infrastructure.

This experience will now be used to support services being run in other data centres, for other research communities, and to create a federated cloud infrastructure that will complement the EGI service offering with virtualised resources.

Virtualisation technologies are already being adopted by many resource centres through private clouds (accessible only to internal users) that improve management and give greater flexibility to local users. Up to now, no clear model has emerged on how to maximise private cloud infrastructures through federation and integration so as to benefit non-local users. EGI provides a perfect environment to tackle this problem by developing a federated cloud infrastructure built around open standards.

VIRTUAL RESEARCH ENVIRONMENTS

Customising and deploying Virtual Research Environments to support world-class science.

Virtual Research Environments (VREs) are made up of the applications, services and tools that are deployed across Europe between the researcher and the e-infrastructure. Initially, VREs were developed as command-line interfaces, that were simple to use only with the right training.

Over the years, the EGI community of users expanded to include less IT-oriented researchers with diverse backgrounds and interests. The diversification of EGI led to the development of higher-level generic tools and domain-specific VREs to simplify the data analysis process. As the democratisation of the infrastructure continues, research communities using EGI in the future will have divergent needs and a requirement to deploy the VRE that they need, where they need it. The only scalable solution is to allow customisation.

Science gateways (or portals) are VREs designed to reduce the technical barriers to accessing remote computing resources. This is an area ripe for innovation opportunities and already supported by EC and national investment initiatives, alongside an active open-source community and standards activity around generic portal frameworks.

EGI is committed to coordinating VRE development, collecting requirements and organising domain-specific workshops and sessions at the EGI Technical and Community Forums. The use of the web as a route to accessing the e-infrastructure (ranging from desktops, to tablet applications or mobile phone browsers) provides an unprecedented opportunity to meet and anticipate the demand coming from young researchers to access e-infrastructures with the tools available to them during their daily activities.

SUSTAINABILITY

As EGI comes to the end of its initial start-up phase supported by the EGI-InSPIRE project, it has established a long-term sustainability strategy of supporting the community's core activities and services through the recurring EGI.eu participation fee, and of seeking short-term project funds (from European and national sources) to support new service innovation and development, and policy development and outreach at a European level.

European projects

EGI-INSPIRE

EGI-InSPIRE (EGI-Integrated Sustainable Pan-European Infrastructure for Research in Europe) is a four-year project helping to establish a sustainable, reliable e-infrastructure that can support researchers' needs for large-scale data analysis. EGI-InSPIRE is a collaborative effort involving 50 beneficiaries and over 130 partners in over 40 countries.

The project is co-funded by the European Commission's 7th Framework Programme (contract number: RI-261323) to help lay down the EGI operational and support processes, as well as to build a sustainable e-infrastructure, independent from project cycles.

By the time EGI-InSPIRE finishes in 2014, EGI will have moved towards being a sustainable and dependable provider of computing resources for European scientists and researchers.

The third year of the EGI-InSPIRE project has been focused around the three strategic areas of community and coordination, the operational infrastructure and the inclusion of cloud resources, and facilitating the establishment of virtual research environments able to support the diverse research communities requiring access to distributed computing and data infrastructures. The support provided by the EGI-InSPIRE project across these areas is critical to many of the activities and the achievements recorded elsewhere in this report.

KEY RESULTS

Project Overview

- EGI-InSPIRE presentation <http://go.egi.eu/1145>
- EGI-InSPIRE paper <http://go.egi.eu/1258>

Community

- EGI 2012 Technical Forum, Prague <http://tf2012.egi.eu>
- EGI 2013 Community Forum, Manchester <http://cf2013.egi.eu>
- EGI 2013 Community Forum Book of Abstracts <http://go.egi.eu/CF13BoA> (PDF file 8.9MB)
<http://go.egi.eu/cf13ebook> (eBook file 2.2MB)

Technical Architecture

- EGI Technical Roadmap <http://go.egi.eu/1094>
- EGI Operations Architecture <http://go.egi.eu/1309>
- EGI Platform Roadmap <http://go.egi.eu/162>

EGI-InSPIRE Annual Activity Reports

- External Relations (D2.21)
- Production Infrastructure (D4.8)
- Software Provisioning activity and the work of DMSU (D5.9)
- Heavy User Communities Tools and Services (D6.9)
- Operational Tool Maintenance and Development (D7.3)

E-SCIENCETALK

The e-ScienceTalk project started on 1 September 2010 with the mission of bringing the success stories of Europe's e-infrastructure to a wider audience. The project coordinates the dissemination outputs of EGI and other European e-infrastructure projects, ensuring their results and influence are reported in print and online. The outputs of the project are:

- e-ScienceBriefings, key reports for policy-makers
- e-ScienceCity an introduction to e-science for a general audience, including the award winning GridCafé
- International Science Grid This Week (iSGTW), an online weekly newsletter about e-Science
- GridGuide, an atlas of grid computing sites around the world
- GridCast, a blog that goes behind the scenes of e-Science events
- Real Time Monitor, which shows traffic on the grid in near real time

In the third year of e-ScienceTalk, three policy briefings have been published about transferring technology, big data and security. The e-ScienceCity website has expanded to include new areas about cloud computing, volunteer computing, supercomputing and data. The website is supported by an associated 3D virtual world with in-world events and collaborations. Subscribers to iSGTW have grown to 8,700, with 3,700 followers on social media. A dedicated desk editor now reports from the US and articles have been picked up by publications such as Symmetry, Discovery News and Wired Italy, and re-tweeted by CERN to 700,000 followers on Twitter. GridGuide has expanded to include 100 sites in Europe, the US, Africa and Asia. GridCast has reported from more than a dozen events worldwide and GridCast videos have been viewed over 230,000 times in YouTube. The Real Time Monitor now includes data traffic on the GÉANT network.

OTHER PROJECTS

BIOMEDBRIDGES

BioMedBridges will construct an e-infrastructure to allow interoperability between data and services in the biological, medical, translational and clinical domains and thus strengthen biomedical resources in Europe.

EGI.eu contributes to BioMedBridges' Technical Watch work package, which brings together experts to monitor technical developments. EGI.eu also provides advice on how the project can interact with other e-infrastructures, and on how current developments can be adopted to catalyse progresses. (RI-284209, ends December 2015)

www.biomedbridges.eu

BIOVEL

BioVeL is a virtual e-laboratory that supports biodiversity research using large amounts of data from cross-disciplinary sources. BioVeL offers researchers the possibility of using computerised 'workflows' (series of data analysis steps) to process data, be that from one's own research and/or from existing sources.

EGI.eu contributes to the sustainability discussions by providing input about its own sustainability plans and an understanding of which components within BioVeL need to be sustained. EGI.eu also provides technical support and consultancy to partners in the project, from porting their existing applications exposed through a web service on a single host, to running their applications on the e-infrastructure. (RI-283359, ends August 2014)

www.biovel.eu

DCH-RP

Digital Cultural Heritage – Roadmap for Preservation (DCH-RP) is a coordination project created to harmonise data storage and preservation policies in the DCH sector at European and international level and to progress with the dialogue among DCH institutions, e-infrastructures, research and private organisations.

EGI.eu coordinates the development of a proof-of-concept solution using cloud resources such as EGI's Federated Cloud testbed to access archives and catalogues through gateways and portals. EGI.eu will also liaise with end-users to evaluate the benefit of such solutions. (RI-312274, ends September 2014)

www.dch-rp.eu

FEDSM

The FedSM project was set up with a mission to increase maturity and effectiveness of IT Service Management in Federated e-infrastructures by applying suitable good practices. The main objectives are to formalise ITSM and introduce industry-standards-based ITSM processes in Federated e-infrastructures through ITIL, ISO/IEC 20000 and COBIT best practice approaches.

EGI.eu contributes to the development of service management conceptual frameworks, the definition of business models, gathering of service management requirements, the development of a generic implementation plan, a good practice guide and an implementation roadmap. EGI.eu also advises and supports the implementation of service management processes and tools. (RI-312851, ends August 2015)

www.fedsm.eu

E-FISCAL

The overall goal of the e-Fiscal was to contribute to an accurate understanding of the costs of HTC and HPC services, both at a national and European level.

EGL.eu provided an essential link to a large group of resource centers who are the targets of this study. As the coordination body of the largest e-infrastructure in Europe, EGL.eu also provided extensive experience in guiding the project's goals. (RI-283449, ended January 2013)

<http://efiscal.eu>

HELIX NEBULA

Helix Nebula aims to pave the way for the development and exploitation of a cloud computing Infrastructure, initially based on the needs of European IT-intense scientific research organisations, while also allowing for other stakeholders' needs (governments, businesses and citizens).

EGL.eu is a key part of Helix Nebula through its coordinating role across the grid community and its strong links to the networking and supercomputing communities in Europe. As part of one of the project's work packages, EGL.eu is developing the integration and interoperation roadmap between public e-infrastructures and commercial cloud computing. Activities include identifying the interoperation and integration issues for both technology and policy, organising supplier and technical workshops, gathering interoperability requirements and producing the final roadmap. (RI-312301, ends May 2014)

www.helix-nebula.eu

ENVRI

The ENVRI project, 'Common Operations of Environmental Research Infrastructures' is a collaboration in the ESFRI Environment Cluster, with support from ICT experts, to develop common e-science components and services for their facilities. The results will speed up the construction of these infrastructures and will allow scientists to use the data and software from each facility to enable multi-disciplinary science.

EGL.eu offers strategic insight and experience and works working within the project towards data integration, harmonisation and publication facilities, dissemination and training, sustainability plans and liaison with external stakeholders outside of ESFRI environmental research infrastructures. (RI-283465, ends October 2014)

<http://envri.eu>

ER-FLOW

The ER-flow project aims to build a European Research Community through interoperable workflows and data sharing. The project targets major research communities that use workflows to run their experiments on a regular basis, especially Astrophysics, Computation Chemistry, Heliophysics and Life Sciences.

EGL.eu participates in ER-flow dissemination, organising events, workshops, and communications and training materials. EGL.eu also facilitates the analysis of workflow-based data interoperability by providing a categorisation of software capabilities from the UMD roadmap, and streamlines ER-flow requirements into the established EGL mechanisms. (RI-312579, ends August 2014)

www.erflow.eu

EGL.eu financial statement 2012

The following EGL.eu accounts relate from 1 January 2012 to 31 December 2012. The complete financial accounts and accompanying statement are available online (<http://go.egi.eu/1146>). The accounts were adopted by the EGL Council in April 2013.

BALANCE SHEET

ASSETS		€
Trade and other receivables ¹	431,805	
Cash and cash equivalents ²	1,718,974	
	2,150,779	
LIABILITIES		€
Appropriated reserves ³	1,233,688	
Current liabilities ⁴	917,091	
	2,150,779	

¹ Debtors (€2,696), interest (€47,280), receivables from employees (€388), insurance (€13,537), pre-payments (€19,301), project pre-financing (€348,603)

² EGL.eu current account (€322,207), EGL.eu savings account (€1,380,617), deposits (€16,150)

³ Reserve for E-tasks that have not yet been undertaken (EGL.eu: €35,092 and partners €9,324) and reserves for EGL.eu (€1,189,272)

⁴ Taxes and social securities (€66,484), project pre-financing (€200,698), advance payments received (€85,418), accounts payable (€30,314), accountant (€5,000), administration (€6,199), accrued staff pay (€358,724), interests on pre-financing (€48,682) and Global tasks (€115,572).

INCOME

INCOME 2012		€
EGL InSPIRE, 2012 ⁵	1,225,571	
EGL.eu participants	1,523,637	
Helix Nebula	45,204	
eScienceTalk	43,466	
e-Fiscal	30,079	
ENVRI	18,782	
FedSM	7,300	
ER-Flow	5,554	
BioVel	5,210	
DCH-RP	2,722	
BioMedBridges	1,011	
Other	3,000	
Interest	52,730	
TOTAL	2,964,266	

EXPENDITURE

EXPENDITURE 2012	€
Staff salaries ⁵	1,801,576
Subsidy for EGI global tasks	554,010
Office costs ⁶	208,824
Direct project costs ⁷	160,659
TOTAL	2,725,069

⁵ EGI.eu has 21 FTEs[‡] at the end of 2012, from 12 countries.

⁶ Includes travel costs, fully or partially granted by project.

⁷ Expenditure incurred by EGI.eu on behalf of an EC project that can be reclaimed in full from the EC apart from any VAT paid.

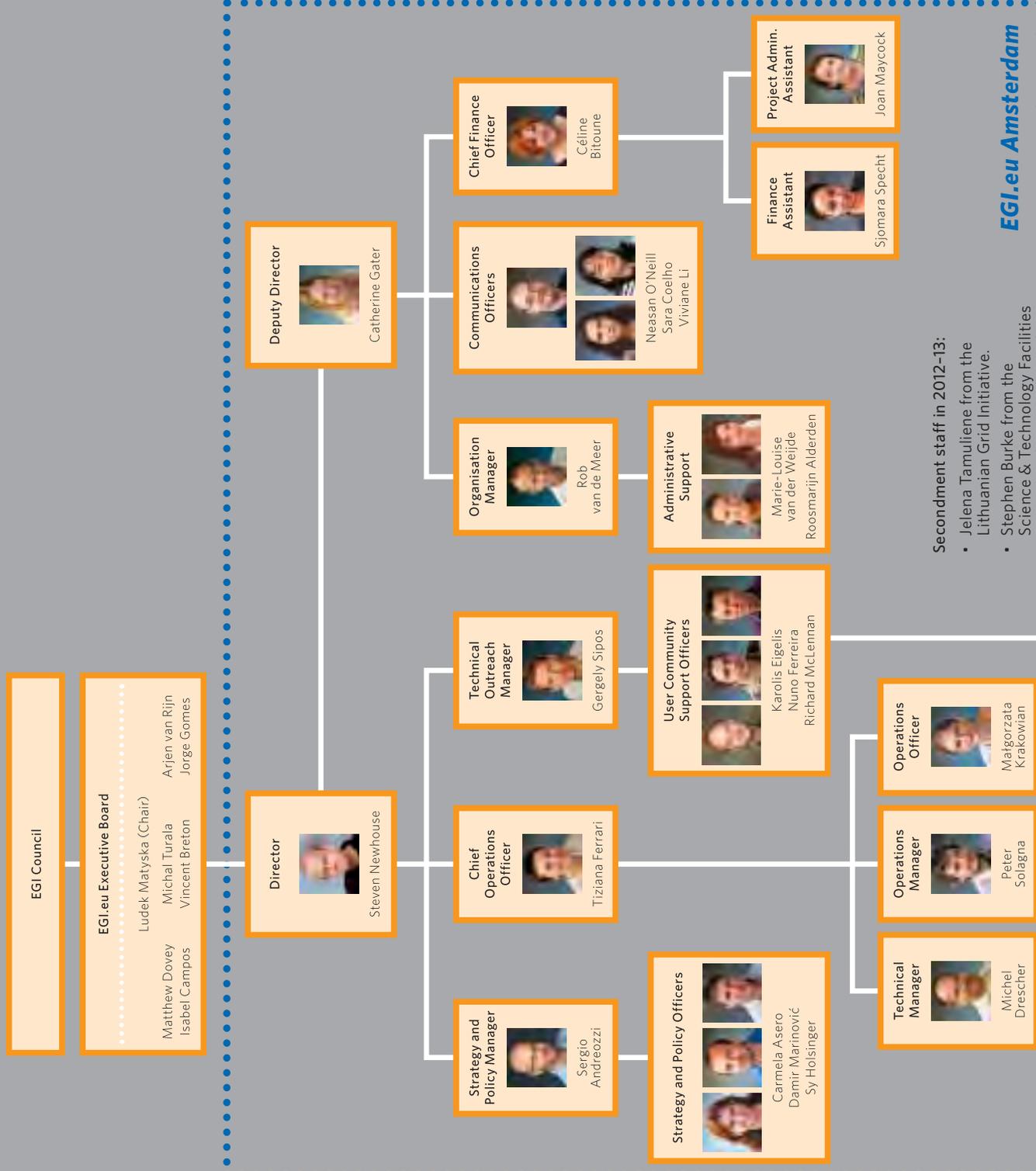
[‡] Full Time Equivalent

Table showing EGI.eu participation fees for 2012:

PARTICIPANTS	INCOME €	PARTICIPANTS	INCOME €
NGI-DE	173,630	NGI-IL	21,704
NGI-FR	173,630	NGI-RO	21,704
NGI-UK	173,630	NGI-SI	10,852
NGI-IT	86,815	NGI-SK	10,852
NGI-NL	86,815	NGI-HR	8,681
NGI-NO	86,815	NGI-RU	8,681
NGI-SE	86,815	CERN	4,341
NGI-DK	65,111	NGI-BG	4,341
NGI-ES	65,111	NGI-CY	4,341
NGI-FI	65,111	NGI-EE	4,341
NGI-BE	43,407	NGI-LU	4,341
NGI-CH	43,407	NGI-RS	4,341
NGI-CZ	43,407	NGI-BA	3,256
NGI-PL	43,407	NGI-LT	3,256
NGI-TR	43,407	NGI-LV	3,256
NGI-GR	32,651	NGI-ME	1,633
NGI-IE	32,651	NGI-MK	1,633
NGI-PT	32,651	NGI-AM	1,225
NGI-HU	21,704	NGI-MD	1,225
TOTAL			1,523,637

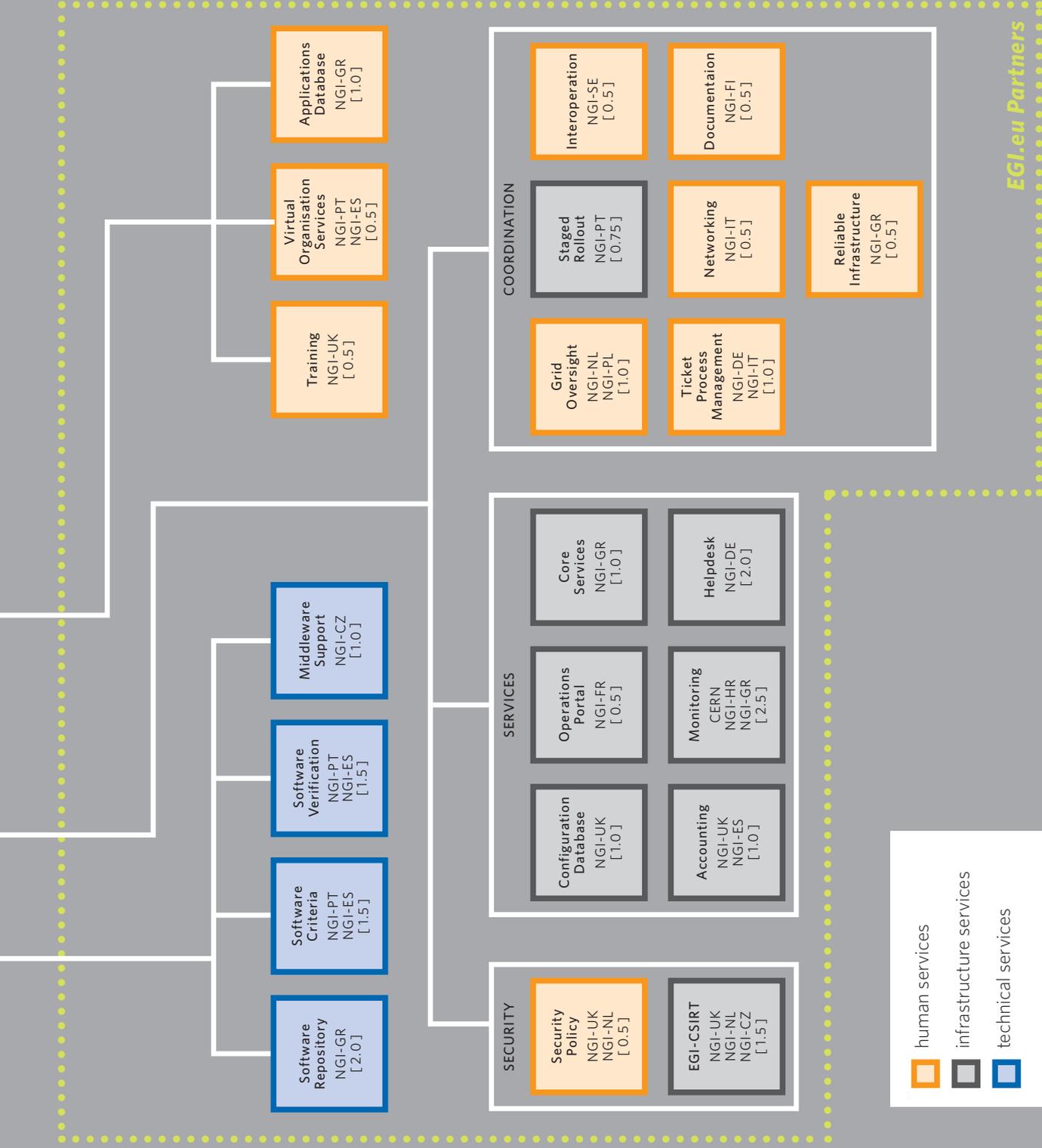
Country-based participants pay a participation fee and receive votes based upon their national Gross Domestic Product. Associated participants select their own fee and voting level, subject to the approval of the EGI Council.

EGI.EU MANAGEMENT STRUCTURE



Secondment staff in 2012-13:

- Jelena Tamuliene from the Lithuanian Grid Initiative.
- Stephen Burke from the Science & Technology Facilities Council in the United Kingdom.



EGI.eu Partners

[numbers in square brackets indicate the amount of work effort, shown as full-time equivalent]

CSIRT = computer security incident response team

Glossary

Definitions of key terms are given on this page, together with a list of acronyms and abbreviations used in this document on the opposite page.

NGI codes used in this document:

each National Grid Initiative is represented by 'NGI-XX', where XX is the two-letter top-level internet domain code for a country.

European Grid Infrastructure (EGI) is a federation of resource providers set up to deliver sustainable, integrated and secure computing services to European researchers and their international partners.

EGI.eu is an organisation based in Amsterdam established to coordinate and manage the infrastructure (EGI) on behalf of its participants: National Grid Initiatives (NGIs) and European Intergovernmental Research Organisations (EIROs).

EGI-InSPIRE (EGI-Integrated Sustainable Pan-European Infrastructure for Research in Europe) is a four-year project, co-funded by the European Commission's 7th Framework Programme (contract number: RI-261323), helping to establish a sustainable, reliable e-infrastructure that can support researchers' needs for large-scale data analysis.

National Grid Initiatives (NGIs) are organisations set up by individual countries to manage the computing resources they provide to the European e-infrastructure (EGI). NGIs are EGI's main stakeholders, together with two European Intergovernmental Research Organisations (EIROs): CERN and EMBL.

Virtual Organisations (VOs) are groups of people (e.g. scientists, researchers) with common interests and requirements, who need to work collaboratively and/or share resources (e.g. data, software, expertise, CPU, storage space) regardless of geographical location. They join a VO in order to access resources to meet these needs, after agreeing to a set of rules and policies that govern their access and security rights to users, resources and data.

Virtual Research Communities (VRCs) are groups of large-scale research collaborations, or a number of separate VOs grouped according to research domain or computational technique. The group shares information and experience in achieving their goals through the usage of an e-infrastructure (e.g. best practices, applications, training material).

Unified Middleware Distribution (UMD) is the integrated set of software components contributed by technology providers and packaged for deployment as production-quality services in EGI.

C

CERN	European Organization for Nuclear Research
CPU	Central Processing Unit
CSIRT	Computer Security and Incident Response Team

D

DCDI	Distributed Computing and Data Infrastructures
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E

EC	European Commission
EGI	European Grid Infrastructure
EGI-InSPIRE	EGI-Integrated Sustainable Pan-European Infrastructure for Research in Europe
EIRO	European Intergovernmental Research Organisation
EMBL	European Molecular Biology Laboratory
EMI	European Middleware Initiative
ENVRI	Common Operations of Environmental Research Infrastructures

ERA	European Research Area
ERIC	European Research Infrastructure Consortium
ESFRI	European Strategy Forum on Research Infrastructures
EUDAT	European Data infrastructure

G

GÉANT	pan-European data network dedicated to the research and education community
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H

HEP-SPEC	a benchmark for measuring computer processing power in high energy physics
HPC	High-Performance Computing
HTC	High-Throughput Computing

I

ICT	Information and Communication Technologies
iSGTW	International Science Grid This Week

IT	Information Technology
ITSM	IT Service Management

L

LHC	Large Hadron Collider
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N

NGI	National Grid Initiatives or Infrastructures
NIL	NGI International Liaison
NMR	Nuclear Magnetic Resonance

P

PRACE	Partnership for Advanced Computing in Europe
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U

UMD	Unified Middleware Distribution
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V

VAT	Value Added Tax
VO	Virtual Organisation
VRC	Virtual Research Communities
VRE	Virtual Research Environment
VT	Virtual Team



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social media:
<http://go.egi.eu/smc>