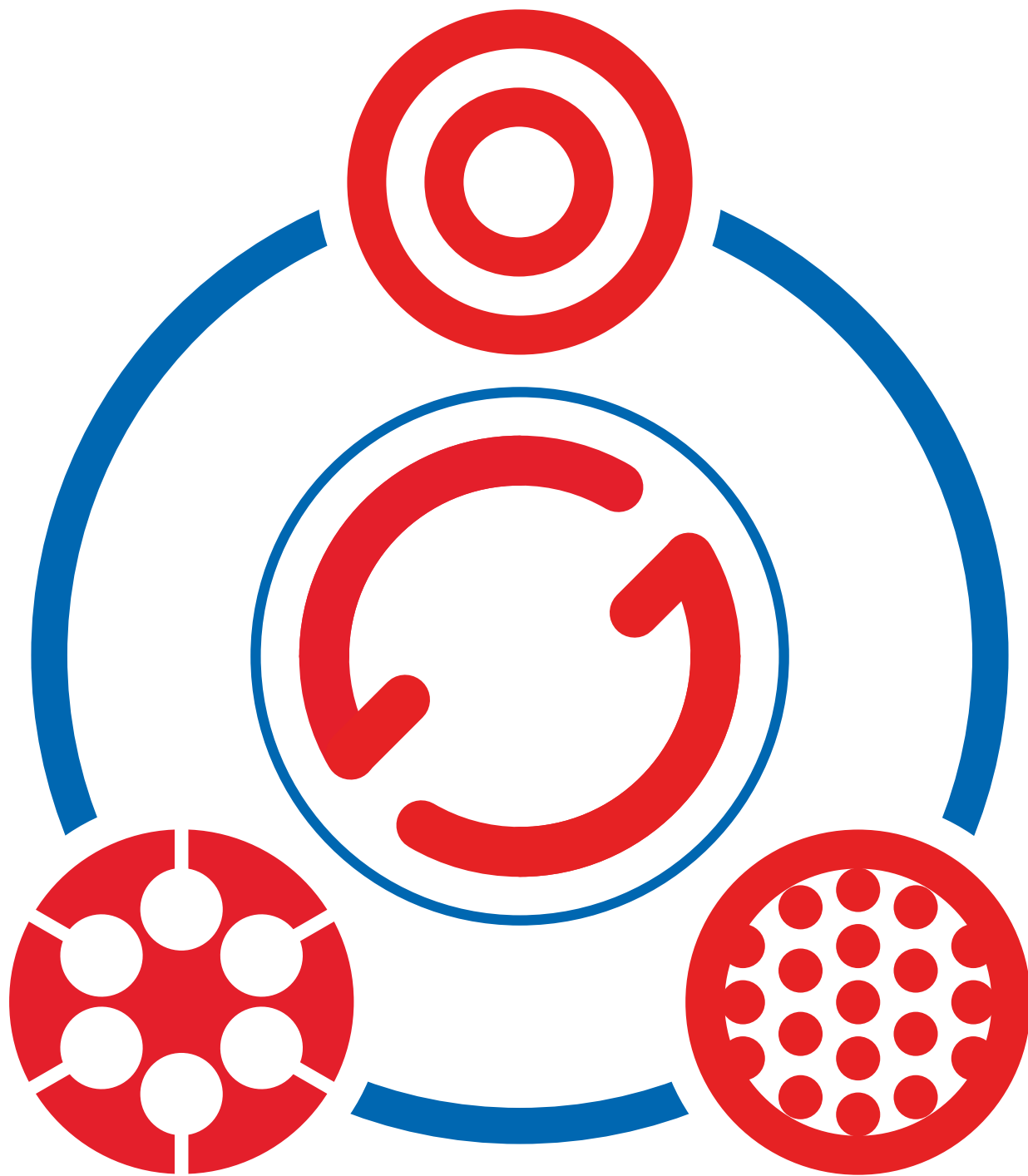


# EUROPEAN GRID INFRASTRUCTURE

EGI SOLUTIONS



- FEDERATED -  
**CLOUD**



[WWW.EGI.EU](http://WWW.EGI.EU)



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# Introduction

The Federated Cloud Solution is targeted at researchers and research communities that need to access digital resources on a flexible environment, using common standards to support their data- and computing intensive experiments.

The solution intends to solve specific compatibility problems that researchers have migrating between Resource Centres in search of larger capacity. Researchers are usually confronted with the decision of abandoning the migration or investing in the re-development of their application or interface for the new environment.

With this solution, researchers can expand their access to computing capacity without modifying the applications they already use and trust. Researchers will be able to migrate from one service provider to another with minimum effort and resource usage.

Resource Centres also benefit from this solution, as they can offer their computing resources to a broader base of research-users. Ultimately, a more effective usage of the available resources benefits not only research community but also European society as a whole.

The solution is built on a combination of services already provided by the EGI.eu organisation, such as operational methods and tools, standards-based technologies, security coordination, helpdesk facilities, technical consultancy among others. It also uses the computational resources of the European Grid Infrastructure.

# 1. Target Groups And Specific Challenges

## 1.1. Target Groups

The Federated Cloud solution is aimed at individual researchers and larger research communities or groups. They are offered an Infrastructure as a Service (IaaS) cloud service in which they can freely choose from a wide range of service providers using the same standards. They can use their existing applications or have the confidence that any new applications can be used with any other service provider within the EGI cloud federation.

## 1.2. Specific Challenges

Most researchers have two major computing needs. The first is access to a large-scale computing and/or data analysis services. The second is to be able to deploy existing, trusted, applications and interfaces on these resources.

Many e-Infrastructures in Europe already provide the access to computational resources. However migrating applications from an existing provider to these can require a considerable amount of resources and effort. In a worse case scenario the deployment of some applications may not be possible due to technology choices made by an infrastructure. There is also limited interoperability between some infrastructures. This prevents maximising the public investment in e-Infrastructures and a loss in effectiveness.

## 2. EGI solution

### 2.1. Objectives

EGI offers a set of independent cloud services presented coherently as a single system using common standards. This allows the prospective user to choose freely among a broader range of service providers, and obtain the capacity they need for their research.

The flexibility of a cloud-based solution is that researchers use their own applications already developed by people within their own community whom they trust. The flexibility of the EGI Federated Cloud is that users have the confidence that they can use the same application any other service provider in the federation.

The ultimate purpose is facilitating the computational aspect of the research process so that it is seamless and produces results in a shorter span of time.

### 2.2. Accessing the Solution

Access to the Federated Cloud is offered to researchers within Europe with computational-intensive needs. They may contact EGI directly , their national contact or the Distributed Competence Centre (DCC ). Alternatively EGI or one of its partners may approach a community or researcher.

The mechanism to help users with possible problems in accessing and using computational services provided by EGI is fully described in the "Community-Driven Innovation and Support solution white paper.

## 2.3. Building the Solution

The solution is enabled by combining and delivering services, which are already provided by EGI.eu in collaboration with the Operation Centres and/or National Grid Initiatives (NGIs). The full catalogue can be found on EGI.eu Website .

Although other services or new approaches can be created, the Federated Clouds solution mainly combines following services:

1. Operations Coordination is a set of management and coordinating activities ensuring that operational activities across the federated infrastructure work seamlessly, without fragmentation. The coordination binds the infrastructure so that the services are delivered at the agreed service level.
2. Technology Coordination ensures continuous technological innovation through sourcing of software components from technology providers to meet the current and emerging needs of both researchers and resource centres.
3. Security Coordination ensures a secure and stable infrastructure to mitigate threats, enhance services, and give users the protection and confidence they demand from a service. A secure infrastructure federation is naturally a top priority.
4. Federated Operation Services brings together the operational tools, processes and people necessary to guarantee standard operation of heterogeneous infrastructures from multiple independent providers, with lightweight central coordination (monitoring, accounting, configuration and so on).

5. Helpdesk Support provides professional, reliable and efficient technical support to guarantee a well-run infrastructure with improved productivity and usability for the customers. It requires certification so it is only provided to Resource Centres already federated within EGI.

6. Specialized Consultancy offers tailored technical and management advice to help partners and clients make the most out of e-Infrastructure technologies.

### 3. Value Proposition

A single cloud system, providing resources targeted at the research community, able to scale to user requirements, and incorporating multiple different providers to give resilience and prevent single vendor lock-in. The user-researchers can focus on their core work and obtain new, innovative approaches to their work.

<b>PROBLEM</b>	<b>PROVIDED SOLUTION</b>	<b>ADDED VALUE</b>
<p>Researchers need resources for their data- and computing-intensive investigation but they do not want to learn how to use generic e-infrastructures. They would rather use personalised services deployed by people within their own community whom they trust.</p>	<p>Clouds insulate everyday users from the underlying infrastructure            Allow community experts to provision and manage deployed resources            Provides a common cloud system where new and legacy applications are deployed as virtual machines.</p>	<ul style="list-style-type: none"> <li>- Enhanced access to computational infrastructure,</li> <li>- Freedom of choice in cloud service provider</li> <li>- Possible use of new and legacy applications</li> </ul>
<p>Researchers need access to a large scale of computing or data analysis services, which cannot be provided by their current local resource provider, but the migration process would require a considerable amount of resources and effort.</p>	<p>Single cloud system, providing resources targeted at the research community, able to scale to user requirements</p>	<ul style="list-style-type: none"> <li>- Facilitated access to existing knowledge</li> <li>- More efficient use of available resources, both computational and human</li> <li>- Time and effort saving, more efficient research process</li> </ul>
<p>Loss of efficiency resulting from the diversion of resources from the community's core work into the development of technical solutions</p>	<p>Existing or innovative solutions that can be adapted / re-used for the community by the community; expert assistance provided from a distributed, multidisciplinary, expert centre</p>	<ul style="list-style-type: none"> <li>- Improved user experience</li> <li>- New, innovative ways of producing Science</li> </ul>



## 4. Success Stories

The EGI Federated Cloud solution will be rolled into production in spring 2014. Despite being in a pre-production state the Federated Cloud has already been used by some communities to improve their scientific results. These have also been used to shape and fine tune the Federated Cloud offering.

BioVel is an EC-funded project providing computational tools for biodiversity researchers using Ecological Niche Modelling (ENM) workflows. The Federated Cloud allowed them to integrate their diverse service portfolio so they could be used, re-used and scaled up on-demand. Another advantage the Federated Cloud had was the ability to migrate from one cloud provider to another when needed with very little effort.

The Federated Cloud has also had success in deploying tools from external technology providers. SlipStream is an Open Source web interface allows users to configure multiple cloud services including EGI's Federated Cloud resources, just as they do with commercial cloud providers. Other cloud providers have tested SlipStream and the European Space Agency (ESA) has provided a Proof of Concept to demonstrate its integration with the Federated Cloud resources.

## 5. Conclusion

The Federated Cloud solution is a key part of EGI's solution portfolio. It is aimed specifically at ensuring that EGI meets the needs of researchers, a crucial element in growing the European Research Area, whose base is being expanded.

With this solution researchers can obtain larger capacity of publicly-funded Resource Centres without modifying their applications or having to learn the technical or administrative specifications of the new environment. This is possible, because clouds are accessible using the same standards.

The solution also enables the Resource Centres to expand their potential customer base, to whom they offer unused capacity. The usage of the available resources is thus more effective not only at the level of the resource centre, but also of the community considered as a whole.

With the Federated Cloud solution individual researchers and small research collaborations gain seamless, easy access to computational capacity, in a way which allows them to concentrate on their own business, obtaining research results in a secure and swifter way. The whole community is also benefited by a systematic approach to addressing problems and the creation of a structure that produces creative and innovative solutions.

## 6. Notes

<sup>1</sup> [support@egi.eu](mailto:support@egi.eu)

<sup>2</sup> <http://www.egi.eu/community/ngis/NILs.html>

<sup>3</sup> The DCC is a distributed team of experts which runs under the EGI.eu coordination. It is composed of: National Grid Initiative representatives with expertise in user support, application porting, analysis of data and compute model requirements; User Communities with expertise in application porting who are interested in supporting others in becoming users of EGI; Technology Providers who join the DCC to get in touch with users, and can help in the technical analysis of the requirements and in suggesting technical solutions. The DCC can also invite other experts from across the EGI community or from outside, ensuring that the best possible solution is enabled.

<sup>4</sup> <http://www.egi.eu/services/catalogue/>