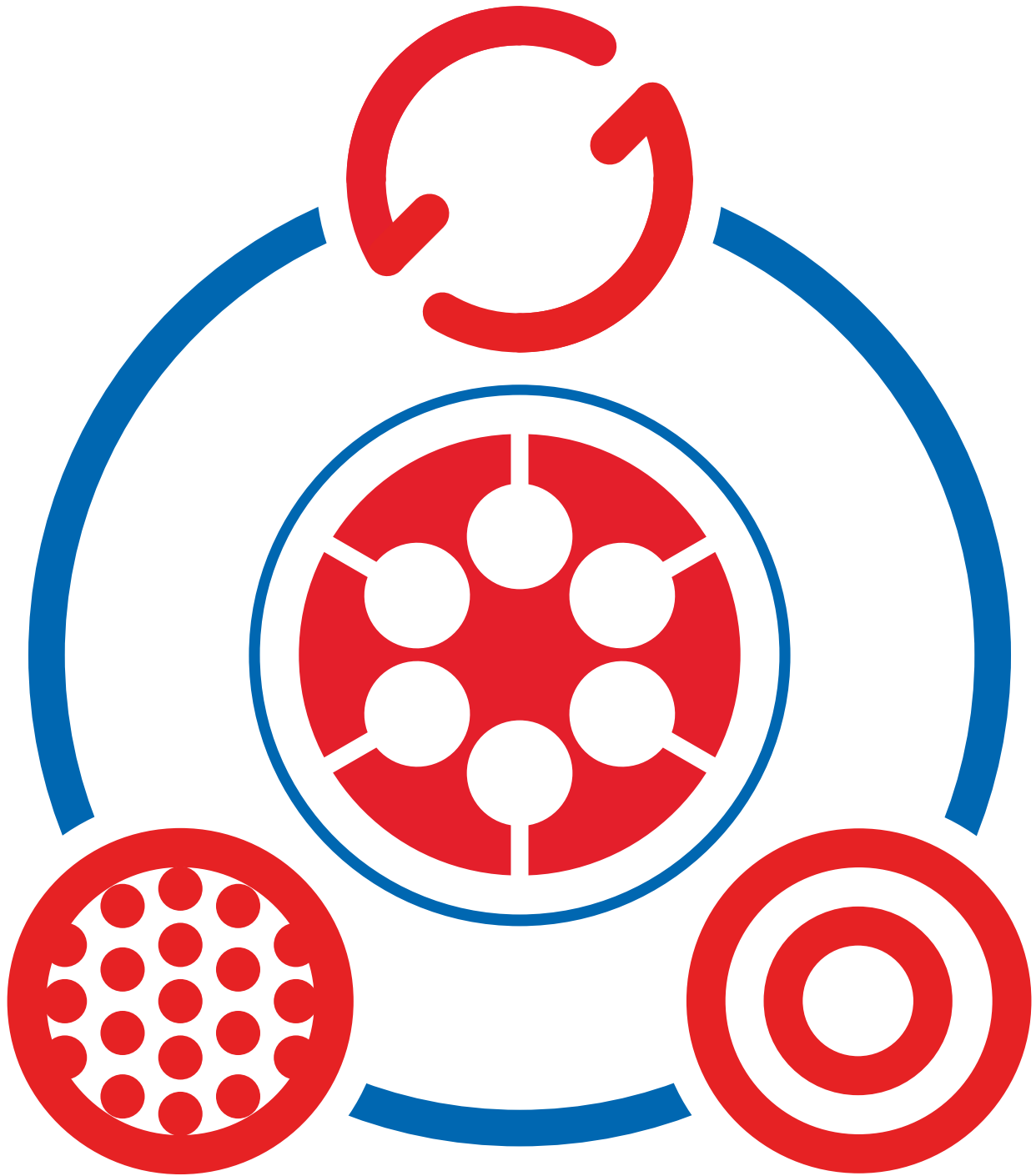


EUROPEAN GRID INFRASTRUCTURE

EGI SOLUTIONS



- FEDERATED -
OPERATIONS



WWW.EGI.EU



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Introduction

The Federated Operations solution is primarily aimed at Research Infrastructures and Resource Centres already within the European Grid Infrastructure EGI community or wishing to become part of it. It can also help other IT service providers that are geographically and/or structurally dispersed, and wish to organise themselves for federated service provision.

The problems they face can be summarised by the possible loss of efficiency of running operations in a federated ecosystem. With this solution they are provided with tools, services and expertise needed to run their services smoothly and seamlessly for their community. In the case of infrastructures dedicated to research, the term “users” refers to researchers.

The solution is built over a combination of services already provided by expert teams within the EGI community coordinated by the organisation EGI.eu. It covers areas such as helpdesk support, coordinated management of operations, security coordination, and the centralisation of typical operation capabilities such as monitoring and accounting. The solution relies as well on the FitSM standard family, which EGI has helped shape, and which is aimed at facilitating service management in federated IT service provision.

This solution is one of the ways in which EGI attends to the needs of one of the main actors in the EGI community, the Resource Centres and Research Infrastructures.

1. Target Groups and Specific Challenges

1.1. Target Groups

The Federated Operation solution is aimed primarily at Research Infrastructures and Resource Centres already within the EGI community or those wishing to become part of it. The solution may also be used by other IT service providers that are geographically and/or structurally dispersed, but plan to organise themselves for federated service provision.

1.1.1. Research Infrastructures and Resource Centres within the EGI community

The main targets for the solution are the Resource Centres, both European and non-European, in the EGI ecosystem. In total, they number about 340 heterogeneous data centres in 43 countries around the world. The majority of these centres, and EGI's userbase, are within the European Research Area

These organisations are tasked with maintaining, coordinating and integrating the resources and services they provide. Researchers can request services either as individuals or through larger communities, which creates an additional degree of complexity. Most resource centres are already federated at a national level to some degree. However as the research community becomes more and more connected, with higher requirements for computing capacity, improving and evolving how they provide services is necessary.

The Resource Centres are using the coordination, software, tools, consulting and other high skilled services and expertise from EGI.eu and other Resource Centres that work as Operation Centres . These services are maintained and updated, so that Resource Centres can serve their user community in an efficient and cost-effective way.

1.1.2. Resources Centres aiming to integrate with EGI

These are single Resources Centres, Research Infrastructures and other e-infrastructures that are not yet part of the EGI, but want to join the federation. Their primary goal is to serve research communities in their data- and computational-intensive investigation activity. These resource centres want to go further in the level of service operation, and connect their primary user community with other communities across national borders.

1.1.3. Resource Centres aiming to form an independent federation

These are different entities providing services largely based on IT, with a high degree of internal complexity. They may perceive a need to organise themselves into a bigger, well organised community that shares information and provides larger, more complex services, with a high level of efficiency and effectiveness.

These organisations do not necessarily need to be providing services for the research community. The specific nature of their needs might be different in some aspects, but they can benefit from the practices and procedures put in place by this solution. In fact, the expertise needed for going up to this level of organisation is not easy to find.

2. Needs of the Resource Centres

In general any Resource Centre within a federated infrastructure wants to:

- Provide their own, local research customers with larger capacity or facilitate their research collaboration with teams across borders. This entails enlarging their customer base and need to provide remote access to their facilities.
- Offer predictable quality of service.
- Be accessible to one or more research communities.
- Coordinate their operations services with a wider collaboration. These include among other activities: accounting for usage, monitoring, support and incident management, infrastructure oversight, security operations, etc.
- Plan and execute their operations in such a way that do not compromise their budget, while maintaining a high standard of services with high degree of satisfaction among their users.

2.2.1. Resource Centres external to EGI

Their needs are the same but they also need to go through the integration process, requiring further services such as training and integration. This group is probably the one that can experience the most benefit from the Federated Operations solution.

2.2.2. Resource Centres aiming to form an independent federation

In addition to the common needs they also want to establish, and later coordinate the operations of distributed facilities or resources that span across organisations and countries.

2.2. Challenges

The challenges are common to all target groups, but they are experienced at a different phase of the integration process. Whereas the resource centres to be integrated may suffer greatly from the lack of integration and expertise, the resource centres already federated within EGI are already running federated operations on a daily basis.

2.2.1. Lack of integration

The systems already in use by a Resource Centre for running the common operations (such as monitoring, accounting, authentication and authorization and technical support) may have been developed ad-hoc from multiple providers, which pose a barrier towards integration. This can prevent interoperation and the technical staff may need to invest major effort to solve the technical problems and get the systems to work together, which ultimately have a negative impact on level of service and on the budget.

2.2.2. Lack of expertise

The delivery of production-quality services and the development of an operations infrastructure require a substantial amount of expertise and effort. Small Resource Centres may not have enough resources and expertise for the tasks and therefore will benefit more by outsourcing such activities by joining/forming a federation.

2.2.3. Beta-testing in production

It is the nature of research infrastructures and research-targeted resource infrastructures that they are developed incrementally in collaboration with user communities. As a result, instead of preparing a full service which is then released in its entirety as a finished product, these communities tend to develop as they operate, in effect beta-testing in production.

2.2.3. Problems

These challenges present the resource centres, end users and IT service providers outside the EGI community with a series of problems.

2.2.4. Inefficient or unpredictable service provisioning

Services with similar functionality are developed and deployed by different e-Infrastructures increasing spending on maintenance and effort costs. Introducing harmonization at a later stage requires substantial effort and coordination activities with other organisations.

2.2.5. Unpredictable service quality

Due to the diverse distribution of expertise and effort among Resource Centres the ability to increase the quality of service delivery is limited and will vary, which may have a dramatic impact on the quality of the research. This is a major issue in a federated organisation.

2.2.6. Limited functionality or serious bugs in production

Users see early versions of products with limited functionality or serious bugs that may make them lose confidence in the solution rather than if they only saw polished, finished products.

3. EGI Solution

The Federated Operations solution is built on the services provided by EGI.eu and its partners within EGI. Some of these services use FitSM, a family of lightweight standards aimed at facilitating service management in federated IT service provision. They bring a state-of-the-art solution for service management in complex environments where disparate organisations cooperate to manage services but lack the hierarchy and formal agreements that characterise a federation.

3.1. Objectives

EGI offers technologies, processes and expertise for operating heterogeneous infrastructures using multiple independent resource centres, while maintaining lightweight central coordination.

By using these services the Resource Centres can expect to:

- Create a seamless core infrastructure platform with accounting, monitoring, configuration databases, an operations portal, security tools, information discovery, and messaging functions;
- Establish processes to coordinate operations, user communities, security, integration, and service management;
- Implement documentation policies, information procedures, best practices, data gathering and reporting for specific functions (accounting, monitoring, service level reports)
- Develop Human Resources through training, support practises, collaborative tools, working groups, and task forces.

3.2 .Accessing the Solution

Applicants can approach EGI.eu operations team, (operations@egi.eu). Sometimes Resource Centres may approach other Resources Centres or their existing points of contacts at the national level. In this case, the request will be passed to the EGI operations team.

External IT service providers may not know about this solution. A way to encourage take up from this community is by marketing and promoting EGI and EGI.eu activities through Above-the-Line and Below-the-line channels.

3.3 .Building the Solution

The solution is created by combining and delivering existing services provided by EGI.eu in collaboration with the Operation Centres and/or National Grid Initiatives (NGIs). The full catalogue can be found on the EGI.eu website.

Although other services or new approaches can be used, the “Federated Operations” solution mainly integrates the following services:

- Technology Coordination ensures continuous technological innovation through sourcing of software components from diverse technology providers to meet the current and emerging needs of both researchers and Resource Centres.
- 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 is naturally a top priority.
- Federated Operation Services brings together the tools, processes and people necessary to guarantee standard operation of heterogeneous infrastructures from multiple independent

providers, with lightweight central coordination.

- 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 that are within the EGI community.
- Specialised Consultancy offers tailored technical and management advice to help partners and clients make the most out of e-Infrastructure technologies.
- 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 an agreed service level.

3.4 .The EGI solution for IT service providers

Although generic IT service providers have similar problems to those within the EGI community they are unlikely to use or need solutions specifically developed for researchers. However they can benefit from the expertise in applying Best Management Practices in Federated Operations that has been accumulated by EGI. In particular, they can make use of the innovative approach detailed in the FitSM standard.

4. Value Proposition

This solution enables cost efficient operations in a federated environment while leaving responsibility of local operations in the hands of the individual Resources Centres. This solution allows an extremely efficient implementation of Best Management Practices for IT services.

PROBLEM	PROVIDED SOLUTION	ADDED VALUE
Lack of integration	A common core infrastructure platform based on standards, common interfaces and protocols, communication, planning and coordination	
Lack of expertise and specific knowledge in integration or coordination, which leads to duplication of services or inefficient use of effort	Centrally-provided expertise and streamlined best practices on how to set up and manage federations	<ul style="list-style-type: none"> - Enhanced access to computational infrastructure, - Facilitated access to existing knowledge - More efficient use of available resources, both computational and human
Beta-testing of applications and services in production, perception of instability within the user community	Federated service management best practices, cost-effective sharing of services (support, processes, policies, activities), community expertise & re-use of tools/output from public funded projects	<ul style="list-style-type: none"> - Time and effort saving, more efficient research process - Improved user experience - New, innovative ways of producing Science - Predictable service levels
Loss of efficiency resulting from the diversion of resources to implement integration, duplication of services	Existing technical solutions that can be adapted / re-used	

5. Success Stories

This solution has already been used to allow and manage the activity of the largest federated data and computing infrastructure in the world. With 340 heterogeneous data centres in 43 countries around the world the total installed capacity amounts to 435,000 logical CPU cores running 1.6m jobs per day with 99.6% reliability.

The solution is also being used to currently integrate the operational tools of the European research infrastructures such as EGI, EUDAT and PRACE. This will ensure that the researchers gain easier access to a wider range of infrastructures where their scientific data can be, shared, transferred and used to produce excellent science.

6. Conclusion

The EGI Federated Operations Solution contributes to the EGI strategy by implementing a secure federated data-analysis capability for the European Research Area.

The expertise gathered over the last ten years by EGI.eu and the EGI community is quite unique in the industry. This can be profited from by the Resource Centres, and e-Infrastructures dedicated to research but also by entities providing services largely based on IT that aim to integrate themselves into a federation. This experience has been collected in a lightweight standard for federated service management (FitSM). By converting this expertise and capacity into a marketable product the EGI and EGI.eu can contribute to their own sustainability while collaborating in the construction of a society based on innovation and knowledge.

The Federation model includes a collection of, at least partially, autonomous entities and a central federator, whose role varies widely depending on the type of federation considered, from strong central control through to weak coordination or even internal support for the federation and its members.

7. Notes

¹ There are 32 distributed Operations Centres, 22 of these are managed at a national level and one at CERN. Their activity is coordinated by EGI.eu, which is also considered as an Operation Centre. Operation Centres are commissioned by EGI.eu to offer specialised services such as accounting, or monitoring to Resource Centres. The assignment has a defined pattern for charging and payment for the services provided. The figures are given as per January 2014. Updated key numbers can be found in EGI.eu website at <http://go.egi.eu/EGINumbers>.

² More information about FitSM can be found at the link: <http://www.fedsm.eu/fitsm>.

³ Above-the-line (ATL), and Below-the-line (BTL), are advertising techniques, or different strategies that companies and organisations use to create brand awareness, promote and, ultimately, sell their products or services. ATL communications use media that are broadcast and published to mass audiences, while BTL communications use media that are more niche focused.

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