Design Study

EGI_DS

EGI BLUEPRINT

EU DELIVERABLE: D5.4

Document identifier:	EGI_DS_D5-4
Date:	**22 December 2008**
Workpackages:	**WP5 Establishment of EGI**
Lead Partner:	**CERN**
Document status:	**V3.00**
Document link:	http://www.eu-egi.eu/blueprint.pdf

Abstract:

This European Grid Initiative (EGI) Blueprint describes the proposal developed by the EGI Design Study (EGI_DS) to establish a sustainable grid infrastructure in Europe in place by the end of EGEE-III in spring 2010. The basis of EGI will be National Grid Initiatives (NGIs) to be established in each participating European country. EGI will be composed of the NGIs and a central (mostly coordinating) part, called EGI-Organisation (EGI.org). In this document the functions to be performed by EGI are described. A model for financing EGI is presented and the transition from the current situation to EGI is explained.

Design Study

Table of Contents

EXECUTIVE SUMMARY

The grid infrastructure for science in Europe was established through projects starting early 2001 with the European DataGrid (EDG) project followed by the Enabling Grids for E-SciencE project (EGEE), and its second and third phases (EGEE-II and EGEE-III) [1] which provide a large-scale production quality grid for scientists in Europe and beyond. In parallel to this major effort, many regional or scientific grid activities and projects have contributed to the grid infrastructure ecosystem available in Europe today. Though the initial driving force behind EGEE was High Energy Physics with the enormous computing requirements of the Large Hadron Collider (LHC) at CERN, many other disciplines now contribute to and exploit the European grid infrastructure.

EGEE and similar European grid infrastructure projects rest on three pillars for support[1]:

1. Funding of computing infrastructures by national or institutional sources
2. Contribution of the European Commission
3. Matching national funding

This European Grid Initiative (EGI) Blueprint describes the proposal developed by the EGI Design Study (EGI_DS) to establish a sustainable grid infrastructure for science in Europe in place by the end of EGEE-III in spring 2010. The Blueprint is based on the vision of a large pan-European distributed computing and data grid infrastructure responding to the needs and requirements of the research community in the European Research Area (ERA) [2] as described in the EGI Vision Document [3].

EGI is a partnership between NGIs **and** a coordinating body, named EGI.org. NGIs are national legal entities charged with taking care of the grid infrastructure related matters in their countries. NGIs govern EGI.org. EGI.org is seen as the "glue" enabling coherence between the NGIs for the benefit of their international user communities. Major European research institutes represented in the EIROFORUM [4] and ESFRI [5] projects are also invited to contribute to and to benefit from EGI. Associated Membership to EGI is open for the EIROFORUM institutions and for one institution per ESFRI project of the project's choice.

Although all effort must be made to ensure continuity of service for the current users of the European grid infrastructure **EGI is not a simple continuation of EGEE or other infrastructure projects** where direct agreements between resource providers and research institutions defined the resource allocation. In contrast, the EGI concept is built on each member state's NGI which can represent the resources as well as the local user communities. EGI.org will not provide any IT resources but will enable a coherent access, interworking and accounting between national grid infrastructures.

The EGI.org key role will be to ensure pan-European grid coordination and integrity, aiming at standardization wherever possible. EGI.org will link existing NGIs and will actively support the set-up and initiation of new NGIs where none exist. The relation between EGI.org and the NGIs is governed by the "subsidiarity principle", meaning that tasks that are more effectively performed at the national or regional level should be left there.

EGI.org will provide functions to address the operation of the infrastructure (17 FTEs[2]), middleware interfaces and final certification (8 FTEs), application support and training (11 FTE), external functions (4 FTEs) and management and administration (11 FTEs).

It should be noted that these 51 FTEs in EGI.org represent only a small fraction, equivalent to a few percent, of the total effort spent on grid infrastructure in Europe today.

To run an NGI as part of EGI, it is estimated that between 2.5 and 30 FTEs are necessary to cover the basic regional and international tasks. The precise requirement depends on the size of the NGI, on the

---

[1] EGEE receives in addition the unfunded contributions from Asia and US.

[2] Throughout this document "FTE" is equivalent to "FTE/year"

demands of the local user communities and on the commitment to take up international tasks. In countries with an operating grid infrastructure, most of these resources already exist.

The user communities will be supported by Specialised Support Centres (SSCs) provided by an NGI or an institution where the respective discipline has its natural centre of gravity.

It is necessary that the underlying middleware for the European grid be further developed. This **development** will continue to take place in the "middleware consortia" or other development teams, and **is not part of the EGI funding model** sketched below. EGI will foster middleware commonality and interoperability wherever possible. A common European unified middleware distribution (UMD) is strongly supported.

For the successful launch of EGI initial co-funding by the European Commission will be necessary. The major purpose of this co-funding is to bring all the players—NGIs—together, not to substitute for national funding which is the basis of EGI financial stability and sustainability. Full sustainability of the EGI operations should be eventually achieved using national funding only, helped by the expectation that effort to operate the grid can be gradually decreased thanks to streamlining and automation. However, in the highly dynamic environment of distributed computing, EC funding for innovation has to continue — most logically on a project basis. Table 1gives the basic figures of the EGI financial model. In the initial phase of about five years, NGI co-funding is expected to total 20 M€/year with an equal matching EC contribution to cover the estimated costs of EGI.org tasks and the international tasks in NGIs. The tasks and the funding will be allocated according to the size and commitment of the individual NGIs (and EIROFORUM institutes/ESFRI projects). The financial stability of EGI.org will be guaranteed by a membership fee shared by the NGIs according to a key (e.g. TERENA) reflecting the GDP of the country.

Table 1: EGI Financial Reference Model

	NGI International tasks		Middleware maintenance	EGI.org	Total
	Operations	User services			
Costs					
EGI Effort (FTEs)	225	110	70	51	
EGI costs (M€/year)	20.25	9.90	6.30	4.59	**41**
Income					
NGI membership fees (M€/year)				1,0	**1**
EC Contribution (M€/year)	10.125	4.95	3.15	1.80	**20**
NGI, Middleware consortia and EIRO/ESFRI co-funding Contribution (M€/year)	10.125	4.95	3.15	1.80	**20**

A particular concern is the transition from the current, limited duration grid projects to the new sustainable EGI/NGI structure. A joint transition plan is being developed between EGEE-III and related infrastructure projects on one hand and with EGI_DS on the other.

1. INTRODUCTION

1.1. PURPOSE

Research does not stop at national borders. While national infrastructures are fundamental in providing local connectivity and resources to researchers, they need to be linked seamlessly on a world-wide level to enable global scientific collaboration. In particular, this is required inside Europe itself where the construction of a European Research Area (ERA) to overcome the current limits of Member States' research, has been recognized as one of Europe's top priorities. The ERA will provide a unified framework for the selection and realization of the best scientific projects and avoid the multiplication of similar parallel efforts in all member states, leading to large synergies, economies of scale and a dimension for European research to remain globally competitive.

A pan European e-infrastructure is required to support the research projects of the ERA in many research disciplines, to enable them to easily share a range of national resources: compute, storage, data, instruments, and ease their efforts to attain a global dimension.

Over the last few years the pan-European distributed grid infrastructure has been developed and operated through a series of short term projects such as the Enabling Grids for EsciencE (EGEE) project. It has successfully satisfied the computing needs of thousands of users from a wide range of scientific disciplines. The EGI Design Study project (EGI_DS), which started in September 2007, is partially funded by the European Commission over 27 months, with the aim of bringing about the creation of a new European Organizational model, capable of fulfilling this vision of a sustainable European computing grid infrastructure for e-science. The foundation for e-Infrastructure sustainability relies on establishing National Grid Initiatives (NGI) as legal organizations, supported by governments, and providing a unique representation at the European and international levels for all the communities related to national grid infrastructures: from resources providers to scientific users.

EGI_DS has collected and consolidated the requirements of a wide range of research disciplines within a large number of NGIs. It has designed the required functionality and modelled the organization that could consolidate, operate, manage and continue to develop a sustainable European e-Infrastructure model as described in this EGI Blueprint.

This document was initially drafted to support the discussions held at the EGI Geneva Workshop (30 June 2008, CERN, Geneva, Switzerland). Following the feedback from the participants of the workshop and in particular the representatives of the NGIs, a major revision of the document was presented for discussion at the EGI Transition Workshop in Istanbul, Turkey (22 September 2008) [6].

This final version of the blueprint, having incorporated most of the comments received, will be submitted for approval by the EGI Policy Board at its meeting on 20 January 2009 in Prague, Czech Republic.

1.2. EDITORIAL RESPONSIBILITIES

The individual sections have been developed by different groups of people, with many contributions especially from EGI Task Forces – specializing in operations[3], middleware[4] and user support[5] - including members not only from the organisations involved in the EGI_DS project; the actual work

---

[3] **EGI Operations Task Force** Chairperson: Jamie Shiers (CERN); Members: Maite Barroso (CERN), Nick Thackray (CERN), Sven Hermann (DE), Rolf Rumler (FR), Per Öster (FI), Fotis Karayannis (GR), Tiziana Ferrari (IT), John Gordon (GB), Romain Wartel (CERN)

[4] **EGI Middleware Task Force:** Chairperson: Mirco Mazzucato (IT); Members: Alistair Dunlop (UK), Achim Streit (DE), Farid Ould-Saada (NO), Ludek Matyska (CZ), Ian Bird (CERN), Christoph Witzig (CH), Francesco Giacomini (IT), Ignacio Martin Llorente (ES), Uwe Schwiegelshohn (DE)

[5] **EGI User support Task Force**: Chairperson: Diana Cresti (IT); Members: David Fergusson (UK), Jacko Koster (NO), Jakub Moscicki (CERN), Patricia Mendez-Lorenzo (CERN), Morris Riedel (DE), Torsten Antoni (DE), Vincent Breton (FR)

has been performed by WP5 with participation from all other work packages under the guidance of the EGI_DS Management Board.

1.3. DOCUMENT ORGANISATION

Following this introduction, Chapter 2 makes the case for e-infrastructures in Europe and EGI in particular, introducing the major actors – the user communities and the grid service providers, as well as the legal requirements for creating EGI.

Chapter 3 presents the functionality of EGI across operations, user support and management. The requirements for middleware development and support are also described. It is important for NGIs to consider whether the proposed functionality meets their requirements.

Chapter 4 outlines the funding model proposed to support EGI, and the financial relationship between the EGI.org, the NGIs, and the funding bodies. EGI proposed in this document is dependent on particular funding becoming available both at the national level and from the European Commission.

Chapter 5 considers the transition from the current project-based approach towards a sustainable infrastructure from the start of EGEE-III in 2008 until the establishment and seamless operation of EGI.

1.4. DOCUMENT AMENDMENT PROCEDURE

Amendments, comments and suggestions should be sent to the authors.

1.5. TERMINOLOGY

This subsection provides the definitions of terms, acronyms, and abbreviations required to properly interpret this document.

Glossary

ARC	Advanced Resource Connector
CA	Certification Authority
CAO	Chief Administrative Officer
CERN	European Organization for Nuclear Research
CIP	Collaborating Infrastructure Project
COO	Chief Operational Officer
CPU	Central Processing Unit
CTO	Chief Technical Officer
DANTE	Delivery of Advanced Network Technology to Europe
DEISA	Distributed European Infrastructure for Supercomputing Applications
EC	European Commission
EDG	European Data Grid
EGEE	Enabling Grids for E-sciencE
EGI	European Grid Initiative
EGI_DS	European Grid Initiative Design Study
eIRG	e-Infrastructure Reflection Group
ERA	European Research Area
ERI	European Research Infrastructure

EU	European Union
EUGridPMA	European Policy Management Authority for Grid Authentication
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GGUS	Global Grid User Support
gNOC	National Grid Operating Centre
ICT	Information and Communication Technology
JRU	Joint Research Unit
LHC	Large Hadron Collider
MCB	Middleware Coordination Board
NGI	National Grid Initiative
NREN	National Research and Education Network
OCC	Operation Coordination Centre
OGF	Open Grid Forum
OMII	Open Middleware Infrastructure Institute for Europe
PB	Policy Board
QA	Quality Assurance
RC	Resource Centre
ROC	Regional Operating Centre
SDC	Strategic Discipline Cluster
SLA	Service Level Agreement
SSC	Specialised Support Centre
UCS	User Community Services
UCO	User Coordination Officer
UF	User Forum
UFSC	User Forum Steering Committee
UMD	Universal Middleware Distribution
UNICORE	Uniform Interface to Computing Resources
VDT	Virtual Data Toolkit
VO	Virtual Organisation
WLCG	Worldwide LHC computing Grid Project
WP	Work package

2. THE EUROPEAN GRID INITIATIVE AND ITS MAJOR ACTORS

The main foundations of EGI are the **National Grid Initiatives (NGIs),** which will provide on the national level the services for a seamless, shared and uniform access to a variety of computing resources, ranging from PC clusters to sites also operating supercomputers and all sorts of scientific archives (Figure 1). EGI will be composed of the NGIs and a central (mostly coordinating) part, called EGI Organisation (EGI.org).

The NGIs have been contributing and providing continuous feedback to the work of the EGI Design Study project (EGI_DS) via the **EGI Policy Board** (PB), where each NGI is a voting member. Each of the current 38 NGIs declared their support for the EU Project EGI_DS and for the EGI Vision [3].
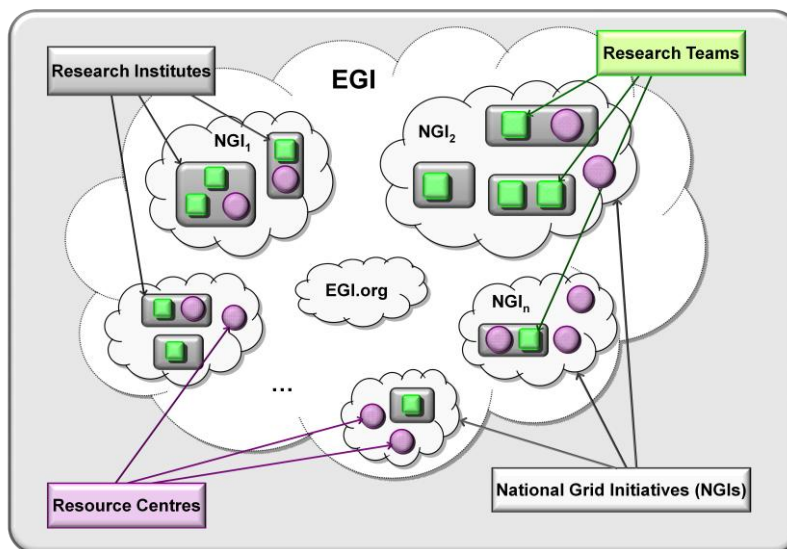

Figure 1: EGI and the NGIs

Fundamental for the functioning of EGI, but outside the proposed scope of EGI, are the developers of the middleware ("**Middleware Consortia**") and the providers of computing resources (**Resource Centres – RCs**).

The *raison d'être* of EGI is its **users,** the scientists. A scientist is affiliated to a Research Institution (RI). Scientists from various scientific disciplines organize their scientific work in **Research Teams**. To use the grid, Research Teams establish through the research institutions one or more **Virtual Organizations** (VOs) according to their needs. VOs will– as in EGEE – often be international and linked to multiple funding agencies and therefore need a suitable representation of their needs in EGI.

2.1. THE NEED FOR A EUROPEAN E-INFRASTRUCTURE FOR RESEARCH

The Lisbon Strategy, agreed by EU leaders in 2000, asserts that the knowledge component will make the European economy competitive in the global market. In order to maintain the competitiveness of the European knowledge-based economy it is essential to ensure a steady stream of scientific and technological breakthroughs from research that will provide the innovations that can be exploited to drive the economy.

Major research breakthroughs in the future will be in interdisciplinary areas and in large-scale cross-border research projects such as those represented by the EIROFORUM [4] members (CERN, EFDA, EMBL, ESA, ESO, ESRF and ILL) or the new facilities addressed in the ESFRI [7]. Creating interdisciplinary teams often requires experts from across Europe, since the necessary expertise will not be available in any single country. Therefore international research projects are required to provide

the innovations needed to drive the knowledge economy, and maintain European competitiveness in the global market.

Current research in many disciplines now includes not only theory and experimentation, but also the computational modelling of theories to derive experimentally testable predictions as the third essential element of research.

Grid infrastructures pave the way for all researchers of one project to work seamlessly together within a country and also across countries, sharing the Information and Communication Technology (ICT) resources of all types allocated to them in individual computer centres in a managed way. Grid allows the owner of the resources to keep control over them while ensuring the resources as a whole are used in an optimal way.

2.2. THE NEED FOR A EUROPEAN GRID INITIATIVE

For national, international and interdisciplinary research to flourish, researchers need to be able to easily share their local computing resources – data storage and computing capacity allocated to one project – with other teams.

Researchers can themselves establish links between the computing resources of each individual site involved in each collaborative project, however, this entails a considerable overhead (including legal, policy, operational, technical, training, etc.), especially where there are many sites (N) involved in a project resulting in a very large number - $N \times (N\text{-}1)$ - of interactions.

The main aim of EGI is to provide a common access infrastructure to national or international projects or disciplines, enabling the sharing of computing and data resources with minimal overhead. Without EGI each project or each discipline would have to develop its own solution for computational and data interoperability. This would spread the cost of the infrastructure between all the projects, but it would also replicate the same work by different groups again adding to the overall cost. For governments and national funding bodies who fund research across a broad range of disciplines, the additional cost of a piecemeal solution would be considerable.

EGI is composed of a small central coordinating body (called the EGI.org) and National Grid Initiatives (NGIs) performing the following tasks:

1. Authentication of individual users as the people they claim to be.
2. Allocation of project or discipline collaboration members to VOs where resources are shared.
3. Allocation of computing resources to those VOs which VO members will be authorized to use.
4. Authorization of VOs to run computing jobs, store and retrieve data on individual computing resources (machines, data centres, facilities, etc.).
5. Distribution and scheduling of computing jobs, workflows, data retrieval and access requests to authorized computing resources.
6. Monitoring of the jobs submitted, processed, and the data stored by individuals.
7. Accounting of users and VO in their allocations and usage of computing resources.
8. Reporting to each NGI of their allocation of resources to VOs, and the use of those resources by individual users, in order to enable the NGI and the national funding bodies to account for the use of funds in terms of the research results produced by VOs.
9. Coordinated management of software updates and hardware upgrades while maintaining a continuous service.

The NGI in each member state needs to support these functions so that it can interact with EGI. The technology and organisation to support these functions have been developed over the last eight years in the series of EGEE and related projects. In order for EGI to operate, each country needs to coordinate its research computing using commonly agreed procedures and interfaces to share resources enabling the integration into a pan-European e-Infrastructure.

Since EGEE has already established a very successful pan-European infrastructure with connections to other parts of the world, it is reasonable to integrate the EGEE services into EGI. However, EGEE in its current form is not the complete solution, and EGI will not just be "EGEE renamed". The EGEE Consortium was formed by direct agreements of some resource providers and particular institutions; in contrast, it is necessary for each NGI to ensure that it establishes its own NGI which can represent the users and the resource providers of all interested research domains in its country and which can interface to EGI. Such a change should not be underestimated in terms of enhancements required to the current EGEE services, but it is necessary in order to support international research collaborations in all domains while also maintaining national independence of computing resources.

The activities of the overall EGI will be undertaken within each member state by its NGI. The computing resources will continue to be hosted and funded within the member states or international facilities. Consequently, the vast majority of the EGI costs will be within the NGIs, which must obtain funding for providing and operating the grid services necessary to establish a national grid infrastructure where all sorts of ICT resources can be uniformly accessed and shared according to the owners' policies. This is the main added value of EGI which justifies its creation. EGI.org will perform a co-ordination role and only undertake those functions which need to be operated more efficiently at a central level to create a pan-European grid infrastructure.

Once the central EGI.org and the NGIs in each member state are able to offer and support general grid infrastructure services with common interoperable interfaces, then each new national or international collaboration will easily be able to create a VO, allocate resources to it, and uniformly access and use its computing resources across the participating countries in a coordinated way.

2.3. THE EGI ACTORS

2.3.1. The National Grid Initiatives

The main actors of EGI are the National Grid Initiatives (**NGIs**), which ensure the operation of the grid infrastructures in each country, as well as a transparent representation of the requirements of all their scientific communities together with resource providers and all e-Infrastructure-related institutions. The goal of EGI is to link existing NGIs together and to actively support the set-up and initiation of new NGIs in those countries, where corresponding efforts do not yet exist. The characteristics of the NGIs can be identified as follows:

Each NGI should:

- be the **only** recognized national body in a country with a single point-of-contact representing all institutions and research communities related to a national grid infrastructure;
- have the **capacity to sign** the statutes of EGI.org – either directly or through a legal entity representing it;
- have a **sustainable structure,** or be represented by a sustainable legal structure in order to commit to EGI.org in the long term;
- mobilise **national funding** and resources and be able to commit to EGI.org financially, i.e. to pay EGI.org membership fees and – if there is a demand for such services in the NGI – request and pay for EGI.org services;
- ensure the **operation of a national e-Infrastructure** to an agreed level of service and its integration into EGI;
- **support user communities** providing general services to the applications and fostering the grid usage for new communities;
- adhere to **EGI policies** and quality criteria.

The NGIs in Europe are currently at different levels of implementation, ranging from individuals claiming to represent an NGI, early implementations of NGIs with a preliminary legal status to fully

government recognized legal entities. During the development of EGI, the early forms of NGIs are expected to acquire the status to be regarded as legal entities, or be represented by established legal entities which are able to collaborate on formal grounds in the European landscape. The EGI effort intends to support this development in order to achieve a mature level for a growing number of NGIs in Europe to achieve critical mass by the start of EGI.

NGIs are fully autonomous in their choices, within the boundary conditions of the commonly decided EGI model and the commonly established EGI policies and rules. The autonomy of the NGIs is not limited to the tasks each NGI performs for supporting the national grid infrastructure and the national users and application communities (NGI National Tasks). It also naturally extends to the tasks that are specifically aimed at allowing the sharing of the national IT resources at pan-European and international level in a uniform, robust, and seamless way, and at supporting the international application communities (NGI International Tasks). The EGI model and the EGI.org coordination intend to promote such autonomy and related responsibilities, proposing only the specifications, operational rules and policies needed for the good working of the infrastructure and for the benefit of research teams and resource providers. More details are documented elsewhere [8].

2.3.2. EGI Council

The top level management layer in EGI is the EGI Council. The NGIs fulfilling the above requirements and accepting the basic principles of this Blueprint constitute the EGI Council. **The NGIs govern EGI.org** and voice their views on all EGI matters as voting members in the EGI Council. Other members of this body are the **Associate Members**, i.e. European institutions represented in the EIROFORUM or ESFRI, and **non-voting representatives** of extra-European partner grid infrastructures. It is expected that this representation could be reciprocated and that the EGI Council will be represented in the governing bodies of those partner grids. The EGI Council may designate committees that will work on topics specified by the Council. It may furthermore elect an Executive; details will be defined when the EGI.org statutes are worked out and when the future EGI Council will decide on them. The director and the heads of units of EGI.org as well as the Chair of the User Forum Steering Committee will be *ex officio* Council members.

The EGI Council may contribute to creating an international grid infrastructure coordination to handle the issues related to the overall international interoperability.

2.3.3. The EGI Organization – EGI.org

To facilitate the interaction and collaboration between NGIs and to provide a common managerial framework of the pan-European grid infrastructure a new legal organisation, the so-called EGI Organisation (EGI.org), will be implemented such that it can start its operation in 2010 at the latest. This deadline must be met to ensure a smooth transition without interruption from today's EGEE-based infrastructure into the future EGI model.

One of the obviously necessary functions for EGI is the management of EGI.org. The following description (**Figure 2**) provides a general picture of the management.
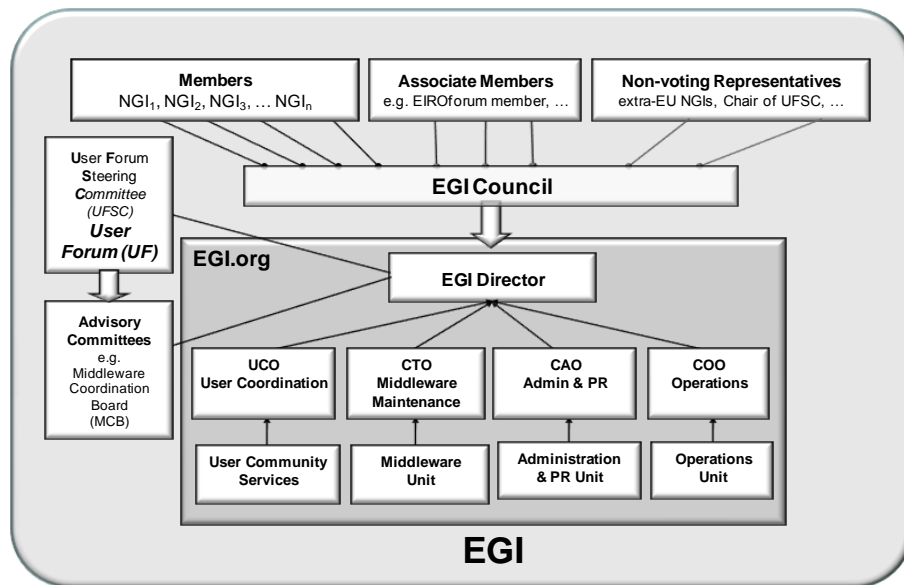
EGI blueprint

Figure 2: The EGI.org Management Structure

2.3.3.1. EGI.org Director and Heads of Units

The EGI.org Director, who works full time for EGI.org, provides the organisational interface to the EGI Council, to funding and policy bodies (EC etc.) and to several EGI committees on the one hand, and to the heads of the EGI.org units on the other hand. For all internal and external activities the EGI.org Director has an assistant who will help with handling the work. Among the unit heads, the functions of a Central Technical Officer (CTO), a Central Operational Officer (COO), a Central Administration Officer (CAO) and a User Coordination Officer (UCO) are identified. The administration also includes staff to cover public relations, human resources, administrative and legal services. The EGI.org Director will be supported by a secretariat and by dedicated staff to prepare policy developments, representation on European level, and to support the EGI Council.

2.3.3.2. EGI.org Legal Aspects

Analysing a range of possible legal structures matching the needs, the following criteria for EGI.org were established ([8] and [9]):

- autonomous legal entity;
- legal structure that allows both public and private entities to be members;
- legal form that allows for membership of entities established in non-EU member States;
- not-for-profit status;
- limited liability of its members;
- located in an EU member State;
- rapid creation and implementation.

National laws in Europe offer solutions that fulfil these requirements (for example: French Société Civile, the English Company Limited by Guarantee, the Foundation or the Association).

A potential solution would be the legal framework currently being defined by the EC for European Research Infrastructures (ERI). The use of the ERI framework for EGI.org would enhance its political status and credibility in Europe and with regard to the rest of the world. It could also offer advantages in terms of tax exemptions and other facilities which might be granted to an ERI. It is, however, unlikely that the ERI proposal will be approved in time for the initial EGI.org installation. Therefore, an interim solution based on national law is required.

2.3.3.3. Location of the EGI Organisation and creation calendar

According to the EGI_DS Description of Work, the agreements of the NGIs on the EGI.org Statutes should have been obtained in October 2008 [10]. However, the Statutes cannot be completed as long as the legal structure is not defined, which cannot be done until the location is known.

Therefore, a call for proposals was launched in October 2008 for the location of the EGI.org central office, so as to receive the expressions of interest by early January 2009. Bidders have been requested to describe one or several types of legal entities existing within their national legal framework and satisfying the EGI.org requirements. This bidding process has been launched by the EGI Policy Board, which will determine the best procedure to select a location. The location will be selected by March 2009. After that the final EGI.org Statutes will be finalised and agreed by their future members and the creation process will be initiated to meet the goal of having the EGI.org established by January 2010.

2.3.4. The Grid Users

2.3.4.1. EGI User Forum

The user communities will have representation and support mechanisms in the EGI **User Forum** (UF). The UF will organize an annual general meeting of all user communities favouring information exchanges at all levels.

The services necessary to support the EGI users are distributed among NGIs covering the national needs and **Specialised Support Centres** (SSCs) – entities typically organised to ensure the EGI e-Infrastructure corresponds to the needs of the large international scientific disciplines and can efficiently support their users. In some cases, this could also be defined by function, for example an "SSC new" which would specifically support new user communities of international relevance as notably, those related to the new ESFRI Research Infrastructures or smaller ones with a European-level organization. SSCs are by definition entities which are governed by the user communities and not by EGI. NGIs may decide to collectively organise parts or all of their user handling in SSCs where EGI.org should especially for the next years take a coordination role through its User Community Services (UCS) Unit, lead by the User Coordination Officer.

SSCs are described more in detail in Chapter 3.3 and in [11]. User communities are represented in the User Forum Steering Committee (UFSC) through the respective SSC or – if there is no SSC - through their bigger international grid based projects. The chairperson of the UFSC is an *ex officio* member of the EGI Council. The UFSC advises both the Council and the EGI.org Director on all matters regarding the involvement of the users of the EGI e-Infrastructure. The SSCs will contribute to collecting and transferring the requirements and feedback from the user communities to EGI on two levels:

(a) the **User Technical Support** team covering the day to day technical needs in cooperation with the operations helpdesk team, and

(b) the **Grid Planning** team which participates in the EGI Middleware Coordination Board, providing a more long term technical planning and which may establish other advisory committees to work with the EGI.org Director.

The capability to serve new user communities has proven very important for the continuous growth of the EGEE infrastructure. Each new user community brings additional requirements for e-Infrastructures. There exist many examples of this today with the successful user community-based projects that expand the functionality and services provided by the e-Infrastructures. Many of these advances are relevant for other user communities as well. This cross-community sharing of developments has many examples which are often highlighted at the current User Forum events organised by EGEE. What is important is to ensure that such advances become part of the EGI e-Infrastructure ecosystem and are accessible to all communities so the investments made can benefit the most users. But to do this requires the commitment of EGI in guaranteeing the continued support and

development activities. It is therefore important to setup a process to encourage all parties in EGI to participate in improving the knowhow and use those with the best expertise and willingness to do so.

As in EGEE in the past, EGI will in general not directly fund such activities. It is expected that in the future additional EC and national funding will continue to be available to support the new user communities in expanding/adapting the functionalities of the services made available by EGI possibly in collaboration with the Middleware Consortia. It is then vital for EGI to continue to be able to integrate those enhancements in the offered production services making them generally available. The organization of EGI.org and of EGI in general is structured to be able to satisfy such fundamental needs. Specifically, certain SSCs, with some central support in EGI.org, could elect to have **Front Desk** services, as described in more in detail in [11]. This option would be particularly advisable for an SSC dedicated to new communities.

2.3.5. International Relations

EGI will liaise on different levels with other grid initiatives worldwide. There are plans to form the equivalent of EGI in Latin America and Asian countries have all expressed their intention to continue the expansion of grid usage in the future and see interoperation with EGI as crucial. The same is true for the Open Science Grid in the US and other grid infrastructures in the world.

To ensure cooperation at the management level of EGI with equivalent structures around the world, in an initial phase, representatives from other regions will be accepted as non-voting observers in the EGI Council and this invitation could then be reciprocated. In a more long term future, in line with the interest expressed by several extra European grid infrastructures, EGI could foster the set up of an overall world-wide coordination aiming at supporting international interoperability through the adoption of standards and common policies.

2.3.6. Business Communities

The role of the business communities is still likely to face the same situation as today: the publicly funded pan-European e-Infrastructures cannot be used for pure commercial applications but a successful technology/knowledge transfer service can be put in place and companies that cooperate with publicly funded research could be allowed to use the same infrastructure for their research and development activities. There are several examples of how companies have profited from or have been created as a result of pre-competitive access to e-Infrastructures such as EGEE.

2.3.7. Resource Providers

The Resource Providers and their funding agencies collectively fund, procure, host, and operate the IT resources for the Research Teams in specific Resource Centres.

The NGIs' services include global monitoring and accounting tools that are useful for a funding agency to verify and tune the resource allocation to the applications it supports and the overall resource usage balance.

A Resource Centre (with its hardware and the usual system level support for it and for the research teams it supports) joins the EGI grid via its reference NGI, which, being part of EGI, takes care of making its resources part of the global grid. The resource owners will of course still be free to decide who has the right to use their resources.

EGI provides secure and transparent sharing of the resources, data and other networked services provided by distributed Resource Centres, according to the resource allocated to each VO. An additional benefit is the allocation of idle CPU cycles to lower priority tasks thereby optimizing the overall efficiency.

Researchers in several disciplines (e.g. computational chemistry) require access to both the grid based commodity computing provided by EGI and top-end supercomputers provided by **PRACE** [12] to run

simulations using services provided by DEISA [13]. As a provider of an access infrastructure EGI will collaborate with PRACE, DEISA and GEANT2 [14] to coordinate the European e-infrastructure activities and provide a standard, uniform access to all types of ICT resources. A dialogue between these projects has started at the ICT Conference in Lyon, November 2008.

2.3.8. Middleware Consortia

The maintenance, support, interoperability, and development of the middleware will not be a direct internal EGI activity since the necessary expertise could not be present in the NGIs. However, the EGI infrastructure consists of a set of essential software services. A tight relation with middleware expert teams will therefore be established and maintained by EGI.org who will keep the full responsibility for the procurement and deployment of the components deployed in the EGI e-Infrastructure.

There will be two main tasks of the Middleware Consortia and development teams:

1. to guarantee the maintenance, support and interoperability of the middleware currently deployed on the e-Infrastructure – this is a task similar to any software maintenance, with its rules and costs provided as a general service offered to all European grid users.

2. to provide the further development required by the research communities, VOs and operational teams.

Even if these tasks are strongly related they are conceptually different and should be treated separately in terms of financial responsibility. To guarantee the continuity of the grid infrastructures in Europe, the natural partners for EGI are the Middleware Consortia providing the middleware stacks: gLite, ARC and UNICORE. EGI sees further evolution in the form of an EGI Unified Middleware Distribution (UMD), which does not constitute the development of a new middleware stack but implements a unified distribution of certified components of the current stacks - see Chapter 3.2.2.

2.3.8.1. The EGI Middleware Coordination Board (MCB)

The Middleware Coordination Board (MCB) is the EGI body that sets technical priorities and makes all decisions concerning the maintenance, support and evolution of the middleware deployed on the EGI e-Infrastructure.

The MCB is composed of representatives of the following areas, appointed in agreement with the EGI.org management:

- the main **middleware** developers of the components in use in the EGI e-Infrastructure as the three European Middleware Consortia;
- the **operation** function representing globally the operational requirements of EGI.org, NGIs and Resource providers;
- the **User Community** Services (UCS) teams on behalf of the Specialised Support Centres, representing the various user communities organised in thematic disciplines.

3. FUNCTIONS OF EGI

This chapter describes the functions needed for accomplishing the primary goal of EGI:

- Operations and Security – the services required to provide a large scale production quality grid for science in Europe;
- Middleware – ensuring maintenance, support and interoperability of the middleware currently deployed on the e-Infrastructure;
- User Community Services – providing the essential interface and basic support for existing and new user communities;
- External Liaison Functions – providing dissemination as well as the link to other grids and related organizations.

Within each function the bulk of the activities will be performed by the NGIs, some specific tasks with international scope will be taken up by EGI.org, and some by other actors. Effort estimates are given based on the assumption that each NGI is a fully independent organization that provides a grid infrastructure at the country level. The estimates are split between functions for which EGI.org is directly responsible and between tasks necessary for EGI to fulfil its role but forming part of the NGI responsibilities. Overall estimates for NGIs are also provided, but these are more a description of the effort expected at the national level to operate national grid infrastructures and the actual numbers will vary depending on the structure each NGI adopts (for example, several NGIs could decide to combine their efforts for specific tasks).

3.1. OPERATIONS & SECURITY

The operations and security function includes those EGI services needed to ensure optimal functionality of the pan-European infrastructure and the overall seamless effective interoperation of national and regional grids. In addition, a common authentication trust domain is required to persistently identify all grid participants. In a European e-Infrastructure, coordination will be required on security policies and operational security to support and coordinate the work of teams drawn from the NGIs.

The EGI operations model needs to satisfy various requirements: scalability and interoperability, availability and reliability, sustainability, and autonomy of NGIs. The distribution of operations and security tasks is an approach designed to ensure both a smooth transition and to address these requirements.

Interworking in EGI relies on common standards and/or specifications for interoperation between NGIs. To this end, collaboration from the NGIs is important to jointly define specifications, policies, best practices, and in general, to share operational responsibilities.

In this model the main operational functions of EGI.org are the coordination of NGI activities, definition of common procedures, policies, specifications and standards for interoperation, and the operation of central monitoring data aggregation and user-support services including the helpdesk. The added value of the EGI.org tasks is to grant the seamless and efficient integration of the national grids, providing coordination, procedures, repositories etc. The European grid infrastructure projects already now distribute various operational and security responsibilities to regions.

Many of the EGI operations and security tasks are jointly delivered by EGI.org and the NGIs, i.e. the EGI.org tasks complement those carried out by NGIs themselves in the regions, as illustrated in Figure 3. These tasks are indicated as "EGI.ORG + NGI" in Table 2.

The effort estimate in the table only refers to the EGI.org part of the task.

EGI.org tasks will be run, where possible, in collaboration with the NGIs by distributed staff under the responsibility of EGI.org. During the transition phase, some coordination of the operations and security functions may be carried out by staff co-located with EGI.org.

EGI blueprint

A critical task for the daily running of operations is the development and maintenance of operational tools, such as monitoring tools, dashboards and alarm systems, ticketing systems, portals, measurement and reporting tools on the quality of networks (to ensure the underlying network infrastructure is working properly and efficiently, and to assess SLA constraints established with network providers), and possibly new tools to increase automation.
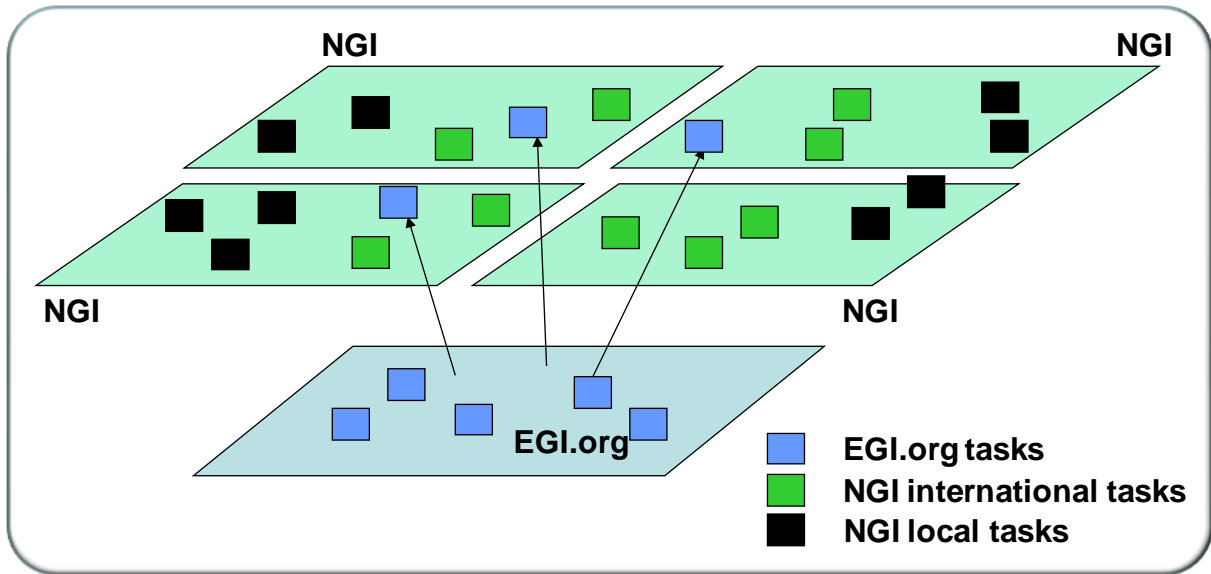

Figure 3: EGI operations and security tasks (blue rectangles) as a sum of NGI international tasks and EGI.org tasks. EGI.org tasks under the EGI.org responsibility are technically run by NGIs (arrows)

The maintenance of the set of the tools presently in use in European production grids, and the upgrades that will be necessary for keeping in step with the quantitative and qualitative evolution of the grid are included in the responsibility of the operation function of EGI. EGI.org will only take coordination responsibility while a set of willing NGIs will take care of the development work (to be co-funded by the EC).

3.1.1. EGI.org Tasks and Resources

Table 2: Tasks and resources in EGI.org for the operations and security

TASKS	FTEs in EGI.org
Operation of tools and services: 6 FTEs	
Operation of the grid configuration repositories, providing information on service nodes, contact details, certification status and downtime status (EGI.ORG + NGI) - EGI.org task: gathering and making publicly available configuration information (as applicable) for each NGI (for example, via a central repository, or through the definition and implementation of an exchange protocol between peer NGIs, or via other implementation techniques)	1
Operation of the grid repositories storing monitoring data (EGI.ORG + NGI) – EGI.org tasks: publication of monitoring information regarding grid functionality, grid service status, assessment of quality of the services delivered by various EGI actors (resource providers, the NGIs, etc.) which needs to meet the level agreed, operation of repositories and supervision of the processes to populate them, maintenance of schema for publishing of site and service status information, preparation of reports.	2.5
Operation of the Grid Operations Portal (EGI.ORG + NGI) – EGI.org: support and central instance	0.5
Oversight of the NGI grid (monitoring of status of services operated by sites, opening of tickets and their follow up for problem resolution), 1st line support for operations problems: this task includes all the work related to operation support including managing and responding to problems reported by the grid operator, running the required grid services at each site as well as services provided by the NGI, and services required by virtual organizations, such as file catalogues, and other VO-specific services (EGI.ORG + NGI) – EGI.org: support and active overall control of status of grid services and sites, opening of tickets for requesting problem fixing. Residual problems not successfully distributed to NGIs	1
Operation of the grid accounting repositories, needed for Global VO's in order to make information available to VO managers about the amount of IT resources consumed by the VO across different domains of the e-Infrastructure (EGI.ORG + NGI) – EGI.org task: gathering and making publicly available accounting information (as applicable and according to local lows) for each NGIs.	1
User Support: 4.5 FTEs	
Maintenance and Operation of a central ticket handling system for grid and network end-to-end problems. User support relies on a central helpdesk, which is a regional support system with central coordination, GGUS. It gives access to user documentation and support, and to a problem ticketing system. 1st line local/regional support by NGIs	2
Triage: assignment of tickets to the 2nd line support units, ticket escalation end ticket follow-up to ensure they get closed	2
Gathering of requirements for user support tools and process taking input from NGI's and VOs, interoperations of ticketing systems (EGI.ORG + NGI): to take into account additional requirements which may arise with the evolution of the middleware stacks in use, and with the support of new user communities EGI.org coordination and support	0.5

Security: 1.5 FTEs	
Security policy development and maintenance to define agreement on best practice and security policies, CA policies (EUgridPMA) etc. (EGI.ORG + NGI). A team of security people in NGI's will take care of ensuring the definition and application of standard security policies - EGI.org support and coordination	0.5
Coordination of security and incident response (EGI.ORG + NGI): in the region for NGI and overall for EGI.org to ensure that common policies are followed for coordinated incident response by grid participants- EGI.org coordination and support	1
Other international tasks: 4 FTEs	
Middleware deployment and support (roll out of updates), operation of pilot and certification testbeds: to ensure that resource sites and NGI's in general, deploy whenever new critical updates of supported middleware stacks are released, and to provide testing facilities for testing and certification of middleware (EGI.ORG + NGI) - EGI.org support and coordination	1
Resource allocation and brokering support for VOs from NGI's - resources and membership services (EGI.ORG + NGI)	0.5
Interoperations between NGI's and with other grids, with Asia-Pacific regional grids, OSG, Naregi, etc, and related infrastructure projects: this role includes the definition of the middleware and the models allowing the NGI's to interoperate. EGI aims at continuing the collaboration established with operations centres outside Europe in order to preserve the current integration of non-European sites into the production infrastructure. The goals of this collaboration will also include the promotion of the EGI middleware outside the EU. An international body will need to be defined (EGI.ORG + NGI)	0.5
Network support: network operation design, trouble handling, network assessment and improvement, application network requirement assessment, ensure the projects know the state of the network used and that problems raised by the grid are managed, link between grid operations and network operations.	0.5
Definition of best practices, operations procedures, operations requirements (EGI.ORG + NGI)	0.5
EGI.org Operation of catch-all production grid core services, catch-all services for global VOs, catch-all CA: running the required grid services provided by the NGI, and services required by global VOs	1
Development and tool maintenance: 1 FTE	
Coordination of development and maintenance of the operation tools	1
Overall Sum	**17**

3.1.2. NGI Resources

The international tasks that each NGI (or federation of NGIs) is expected to take care of are those needed for the good working of the grid infrastructure. However, not all NGIs will have to execute them. For example, an NGI can share effort by federating with other NGIs, or by outsourcing them to EGI.org (where catch-all services are foreseen to this effect) or to some other NGI, via specific agreements between them. The NGI is free to adopt the most suitable approach.

Individual countries can federate in order to share the effort, thus saving effort. In this section, the term NGI is used to refer to both a national grid infrastructure and a federation of national infrastructures, where applicable. The estimation for the total effort needed from the NGIs depends on the size of the NGI and on its model of working.

Here tentative estimates are provided separately for three broad categories of NGIs, namely "small", "medium" and "large". These are based on the present EGEE experience, assuming that increasing

automation and expertise will at least partly make up for the increase of the number of application disciplines and of middleware complexity.

Table 3: NGI Resources for Operations and Security

NGI Size	Small	Medium	Large
Resources [FTEs]	2-4	5-10	14-22

Note that in the countries presently involved in EGEE a similar number of people are already working on such grid tasks envisaged here for the NGIs.

In the long term, when all the NGIs that have expressed interest in EGI will have been properly constituted and joined EGI, EGI will count approximately 6-7 large NGIs, 12-16 medium NGIs and 16-20 small NGIs. For the first year the number of NGIs is expected to be somewhat smaller.

More details are provided in [15] including an example of a classification based on a possible "NGI-size" parameter, which envisages 6 large, 16 medium and 17 small NGI's.

The minimum effort needed in the NGIs for operating the EGI grid, in addition to the 17 FTEs in EGI.org, is estimated to be 225 FTEs.

3.2. MIDDLEWARE

3.2.1. Need for an EGI Middleware Function

Production grids in Europe depend critically upon specialised software, the grid middleware that allows management of data distribution and access, job submission, monitoring, user authentication and authorization. The main middleware distributions currently used in European production grids are ARC, gLite and UNICORE. They support now a large number of user communities with complementary requirements and dimensions, ranging from teams of a few individuals to very large international collaborations with thousands of researchers and tens to hundreds thousand jobs daily. These middleware solutions have become a reference in many countries outside Europe (Asia-Pacific, Africa, India, China, South America, etc.) thanks to the efforts of EC-funded international projects.

Although the existing middleware has demonstrated the ability to support a production infrastructure, there is also clear evidence that it will need to evolve in response to the evolution of technology and to the continuous flow of user and operation requirements in areas such as functionality, robustness, usability, deployment, adherence to standards, interoperability with other infrastructures, with the additional constraint to maintain interface stability.

As a collaboration of NGIs to run grid infrastructures and to provide accompanying services, EGI itself is not directly responsible for the middleware development. However, the success of EGI is critically dependent on high-quality middleware components. Past experience has shown that only the strong interaction between operation, application and middleware activities is able to deliver the best results. Therefore the strategic planning of the activities related to the EGI middleware function should be made by the Middleware Coordination Board, an EGI.org body including representatives from the operations (including NGIs), applications and middleware development sectors.

This proposal foresees that the middleware development be carried out by organizations outside of the EGI funding, supported by a small EGI.org unit to coordinate the middleware evolution and distribution.

3.2.2. Unified Middleware Distribution

The middleware consortia ARC, gLite and UNICORE propose to foster the convergence of their current solutions into a Unified Middleware Distribution (UMD), similar to what the Virtual Data

Toolkit (VDT) in the US is for the Open Science Grid (OSG). UMD is a pragmatic way to coordinate at the European level the current independent and parallel developments avoiding duplication of effort.

UMD will contain the necessary high-quality middleware components satisfying the strict policies, interoperability standards and quality criteria defined by the EGI.org Middleware Unit and endorsed by the Middleware Coordination Board (MCB). The set of services included in UMD will expand and evolve according to the requirements of European research communities and the operational needs of the resource providers. Components from sources other than ARC, gLite and UNICORE can also be part of UMD if requested by users or NGIs, following the same rules agreed by the MCB.

UMD will also deliver stable documented interfaces that will enable the development and the contribution of additional higher-level services by third parties.

Initially, to avoid any disruption of the current e-Infrastructure, UMD will include selected services currently made available by the different EU middleware stacks and any additional component requested by the MCB. UMD may also include components with similar functionality present in multiple stacks, provided they adhere to rules, policies, standards of interoperability and any other requirements defined by the MCB and endorsed by the EGI Council.

If necessary, during a transition period, gateways and other means may be developed and deployed to guarantee an immediate availability of the EGI grid infrastructure to communities currently not using any of the afore-mentioned middleware stacks. In particular, a high degree of interoperability with Globus- and Condor-based grid islands will be provided if required. This clearly requires collaboration with the middleware providers.

UMD would allow EGI to continue to be an open infrastructure and to promote a close collaboration with other international development teams, e.g. Globus and Condor, and in particular with VDT. These include all the components deployed on grid infrastructures such as OSG and NAREGI, with the goals to define and adhere to global standards, to adopt common components and to agree common policies and quality criteria.

3.2.3. Working Model and EGI.org Role, Effort Evaluation and Funding

The EGI.org Middleware Unit, led by the Central Technical Officer (CTO), will provide central technical support and coordination for middleware maintenance and development according to the guidance of the MCB. The tasks of the Middleware Unit are described in Table 4.

The actual middleware development will be outsourced in an appropriate form to the development teams of the middleware Consortia or other providers that are able to comply with the interfaces and standards defined by the MCB. In the future, the non-profit Consortia will possibly include industrial partners who, following the usual Open Source general practices, might offer and charge for maintenance and support services of UMD components. This model could ultimately include a commercial offer of the components.

Table 4: Middleware Related Tasks in EGI.org

MW Tasks in EGI.org	FTEs
Maintain and document processes and quality criteria common to all the middleware providers	1
Provide and support tools to enable and monitor the processes (such as configuration management system, bug and task tracker, wiki)	1
Define quality and conformance criteria that UMD components need to satisfy in areas such as security, performance, scalability, functionality, usability, interoperability, adherence to standards Verify that accepted components are certified according to the agreed process and satisfy the quality and conformance criteria, specifically aimed also against security vulnerabilities	3
Maintain a repository of certified middleware components or references thereto	2
Follow the daily execution of the strategic plan endorsed by the MCB Promote the EGI participation to standardization bodies	1
Sum of Resources in EGI.org Middleware Unit	**8**

The Open Source middleware developments and the related maintenance and support services are not immediately self-supporting economically and the middleware Consortia cannot expect to gain economic sustainability through standard fee-for-service contracts because software can be freely downloaded and used by skilled communities in a similar way to how Linux is used today. Therefore, specific actions to expand the usage of UMD by novice user communities should be undertaken, in order to progressively extend the user base. Sustainability should rely on the generalization of the UMD services to adapt to requirements from a growing user community, including business and government (similarly to the case of Red Hat or Apache). This process will take time and will require continuity of explicit support of the development efforts leading to general and standard products.

As the key component of the European grid infrastructure, the UMD needs to rely on adequate funding lines agreed with the national funding bodies and the EC and, in the longer term, on service charges. The practical maintenance and support work will be carried out by the enlarged EU Middleware Consortia and the other development teams of the middleware currently being used.

This strategy addresses continued support by the European funding Agencies of the European middleware development teams as well as collaborative agreements with other international development teams such as Globus [16] and Condor [17] in the US. The transatlantic collaboration is already working well with the exchange of components between the different middleware stacks.

An approximate evaluation of the effort needed by the three Consortia to maintain and support the existing middleware components and to adopt standards aimed at interoperability is about 70 FTEs. The estimation includes all the phases of software preparation, from development to integration, full testing and packaging. Only the final conformance tests are under the responsibility of the EGI.org Middleware Unit.

More technical details are provided in [11].

3.3. USER COMMUNITY SERVICES

3.3.1. General Tasks and EGI.org Coordinating Team

The stated goal of EGI is to provide significant added value for the existing and new user communities. The growing user demands have provided, and will continue to provide, the necessary

push for development and extension of the grid infrastructure. Therefore the active support for these communities is a primary concern for the EGI.org / NGI ecosystem, as the users are the *raison d'être* of the grid.

EGI, broadly intended, will support European communities that use the e-Infrastructure by offering collaborative support in the following areas:

1. Gathering requirements from the user communities and providing efficient channels for their representation *vis à vis* the middleware – and other software – providers.

2. Carrying out a review process to integrate useful "external" software – i.e. software packages that can help application developers use the grid infrastructure, but are not part of the core middleware distribution(s).

3. Establishing Science Gateways that expose common tools and services (e.g. workflow engines, web services, semantic annotation) in a transparent and user-friendly manner to user communities in the various disciplines.

4. Establishing technical collaborations with the large European Research Infrastructure projects (e.g. ESFRI) in support of users of the European Research Organisations.

5. Providing "umbrella" services for collaborating projects, to streamline information management tasks and ensure continuity of service between project cycles (e.g. maintenance of repositories, FAQs, wikis, etc.).

6. Maintaining a European grid Application Database that allows applications to be "registered", permitting people to search for similar applications and contact the authors for guidance.

7. Organising European events such as the User Forum meetings and **topical meetings** for specific user communities.

8. Providing **services** for new communities – e.g. "Front desk" services, VO creation counselling, etc..

9. Ensuring that the user communities and grid administrators are provided with high quality **documentation** and **training services**.

This is carried out mainly by the NGIs in the context of a structured network of **User Community Services** (UCS), with coordination by a small team in EGI.org. Activities such as providing support to porting activities and training of the users and administrators is generally delivered through NGIs, either on a national level or via specific agreements with other NGIs in the context of the creation of a **Specialised Support Centre**. A detailed discussion of the UCS services and their related tasks, is provided in the EGI function definition [10], and will be further elaborated in the second incarnation of this document (deliverable D3.2) [15].

The EGI.org will provide overall coordination for these services, structured as shown in Table 5. Aside from the activities that are carried out by senior personnel and therefore directly associated with two full time employees, the estimated effort for the other activities are overall activity averages – e.g. event organisation requires more than 2 FTEs in certain periods and less in others, documentation-related activities are often performed in conjunction with coordination of SSC activities.

Table 5: User Community Services in EGI.org

Coordination of SSC activities A small team of coordinators to assist the User Coordination Officer (UCO) in all collaborative activities, such as (1)-(6) above, attend meetings, and work with the Grid Planning team to organise the representation of user community needs, new software etc. in EGI management. The User Coordination Officer (UCO) is counted in the management structure.	2
Services for new and small communities & Front Desk coordination This will include the coordinate services in (8) above, and work with Grid Planning in analysing new trends in typology of grid users and new resources.	2
Event organisation & User Forum Support The EGI User Forum is represented at various levels both in the EGI Council and as a Strategy Committee (see section 3). 2 people in EGI.org will provide liaison and support for the work of the UFSC, and coordinate the organisation of the main User Forum Events, plus others as needed in collaboration with their counterparts in the NGIs and SSCs.	2
Grid Planning & Technical Coordination One senior person and deputy to represent the UCS team in the Middleware Coordination Board and to liaise with any user committees that are established for technical representation and advisory activities with respect to the EGI Council and EGI.org management on behalf of their communities. Representatives of the International user communities will be members of the MCB who will steer, define priorities and provide feedback to the technical work program of the EGI.org Director and the group of technical units in charge of the UMD component evolution and deployment.	2
Coordination of technical information and documentation This will cover the activities in (9) related to technical information gathering, content and material creation, and support of central services such as material repository and online resources.	2
Coordination of training efforts Covering the activities in (9) related to management and coordination of training efforts in the NGIs and management of grid central services.	1
Sum of User Community Services in EGI.org	**11**

3.3.2. Specialised Support Centres

The formation of SSCs is the responsibility of the interested communities, who will establish their preferred services and collaborations and negotiate with EGI.org a layer of UCS tasks specifically focused on EGI representation, collaboration on the tasks listed above, and the interaction with the central UCS team.

The articulation in SSCs will provide flexibility to the EGI ecosystem, minimising the load on the central EGI.org, and optimising support services for the user communities.

There is **no obligation for an NGI to be part of an SSC**. SSCs will be encouraged to have a clear procedure in place to allow new members to join at a later date, or – if appropriate – to allow a community within an NGI to make partial use of its services, which would be properly acknowledged by the relevant NGI.

The establishment of SSCs will ensure that the user communities that currently receive support in projects that are coming to an end will continue to be supported. Thus some of the SSC effort is expected to provide continuity of service to the current EGEE scientific clusters. However, an SSC may also be formed around specific functional needs of communities or groups of projects that have – or wish to establish – collaborations and request formal representation and "umbrella services" for the sustainability of their contributions to user communities. A particularly important "functional" SSC

would be one dedicated to **new users** and those communities that have not yet reached the point of being able to form their own SSCs. This SSC would of course work very closely with the central team's "services for new communities" personnel and in general provide representation for these smaller communities in the EGI governing and advisory bodies.

Examples of SSCs can in any case be drawn from the characteristics of a number of current projects, and new ones can be considered.

An SSC can be hosted by an NGI that has (or can host) the appropriate resources and **European-level commitment**, under a specific agreement among the interested parties. As mentioned, an NGI is free to provide support to its "international" users without contributing to the relevant SSCs; however this NGI would clearly miss the synergies and consistent representation of its community offered by the SSC system.

3.3.3. Effort Estimates for SSC Interfacing Layer and NGIs

The effort for the SSCs is established and organised by the relevant communities; wherever appropriate, an SSC will leverage collaborative efforts from specific other projects, as determined by the SSC and representatives of these projects.

The initial effort expected for the UCS layer in an SSC may range between **4** and **12** FTEs, depending on:

a) the size and maturity of the community served by the SSC;
b) the possibility of delegating tasks to collaborating projects; and
c) additional effort that may be offered by the NGIs.

As a first approximation, considering the current services for the EGEE scientific clusters plus a few other items (possibly including the effort for an SSC for new communities), it is estimated that the global UCS layer for the initial SSCs will account for about **50** FTEs.

It is possible that the effort expected of NGIs for international UCS activities may evolve into a network of SSCs, resulting in a net saving in overall effort.

With respect to these latter activities – the NGI international UCS tasks –the NGI contribution to the collaborative activities (1)-(9) above will be in the ranges given in Table 6.

Table 6: NGI International User Community Services

NGI Size	Small	Medium	Large
Resources [FTEs]	0.5-1.7	1-2.5	1.5-4

The ranges given in Table 6 represent **average** effort – e.g. it may be the case that an NGI provides user community services with another NGI through an SSC. Again as a first approximation, these International UCS tasks are projected to add up to about **60** FTEs.

In conclusion the initial **aggregate** UCS effort – including the SSC-related effort and NGI International UCS tasks – is estimated to be around **110** FTEs to be attributed to the individual NGIs and associate members according to their commitments and contributions.

These numbers were derived from the total estimates (minimal national + international tasks) quoted in [11] under the assumption that most of the training effort is expected to be purely national, while the effort related to application support is expected to be equally shared between national and international tasks.

3.4. EXTERNAL LIAISON FUNCTIONS IN EGI.ORG

A small team will execute the **dissemination** activities of the EGI.org. The team will focus on content production and coordinating activities. Technical and specific services will preferably be bought from third parties.

The dissemination team of the EGI.org will support and coordinate the publication work of EGI. Press releases and newsletters detailing the work and key achievements will be published and widely distributed in order to increase the visibility of EGI. NGIs will be expected to contribute by providing material to paper and electronic publications. The EGI.org will also be in charge of the organisation of annual events and conferences, similar to the current EGEE User Forum or DEISA Symposium.

The NGI dissemination interface for EGI will require approximately 0,5 FTE for each participating NGI. Dissemination experts in the NGIs can also contribute to the general dissemination effort.

Other **external relations** are defined as relations with organisations and initiatives outside of EGI and of direct relevance for EGI in terms of collaboration or interoperation. Examples of such organisations and initiatives are:

1. Grids outside Europe.
2. Commercial grids (e.g. cloud computing efforts).
3. Large-scale international research collaborations (e.g. the EIROFORUM and ESFRI organisations and WLCG).
4. Networking organisations (e.g. NRENs, DANTE, TERENA).
5. Policy and standard shaping bodies (e.g. e-IRG [18], ESFRI [5], OGF [19]).
6. Private sector entities that could bring extra competences and resources to EGI.

The EGI.org management and specifically the Director should be in charge of External Relations. This responsibility should primarily be focused on

- establishment of formal relations when necessary;
- promotion of common understanding on policies in scope of grid interoperation;
- influence on policy and standards shaping activities.
- networking and enlargement of the EGI "sphere of influence".

Table 7 summarizes the resources required for external liaison functions in EGI.org:

Table 7: External Liaison Functions in EGI.org

External Liaison Functions	FTEs
Dissemination Dissemination manager Web editor	2
Other External Relations Policy and external liaison manager Standardisation liaison manager	2
Sum External Liaison Functions in EGI.org	**4**

4. FUNDING EGI

The long term sustainability model of EGI is based on the NGIs—running national grid infrastructures with long term guaranteed funding at the national level—complemented by the EGI.org, the coordinating body funded through NGIs with a contribution from the EC at least during the initial phase. The largest part of the total EGI costs is not related to the actual organizational scheme, as it covers generic functions that must be present in any grid infrastructure. While the financial stability of NGIs is a crucial pre-requisite, it is expected that EGI will create synergies between the NGIs which would be impossible without the pan-European organization, offsetting in this way the cost of the coordination body.

To continue to promote and fully exploit the synergies between the Member States, cohesion funding is fundamental to ensure continuity and support in the set up phase. The European Commission's support is crucial here to ensure this happens seamlessly to absorb the end of the current EC-funded projects and their transition to the sustainable structure.

EGI.org will not provide any IT resources directly, i.e. no specific equipment funding is foreseen at the European level. On the other hand, EGI.org will provide extensive accounting data on users and resources ("who is using what and to which extent") to allow NGIs (and their funding bodies) to account for the use of national resources by "their" and "foreign" researchers. While NGIs are the basic building blocks, the European International Research Organizations (EIRO) [4] and similar international bodies (ESFRI projects) [5] are also considered to be an essential part of EGI since they share the same fundamental objectives through their Associate Membership.

4.1. EGI FUNDING MODEL

The EGI activities can be split into:

  a) NGI national tasks with full responsibility of each NGI/country.
  b) NGI international tasks, related to international cooperation.
  c) EGI.org coordination tasks.

These are complemented by:

  d) the middleware support and maintenance,

performed independently by third parties (in particular by the middleware consortia), on request and coordinated by EGI, and by

  e) the support to new user communities

funded by the appropriate EC programs and not included in the EGI costs.

The funding necessary to perform all these activities must be provided by members (full and associated) in the following way:

- The NGI national tasks a) are under the full responsibility of NGIs, funded nationally and not considered in the Blueprint.
- The NGI international activities mentioned under b), together with the EGI.org coordination mentioned under c) form the *EGI international tasks*, which are to be covered by EC, NGI and EIRO funding.
- The middleware support and maintenance mentioned under d) is also part of the direct EGI costs as it is essential to guarantee production level quality middleware with bug fixes, minor adaptations etc.. It is to be covered by EC, Middleware Consortia,NGI and EIRO/ESFRI funding.

These costs for b), c), and d) are assumed to be co-funded by the EC and by NGIs, Middleware Consortia and EIRO/ESFRI, using an appropriate cost distribution key. The cost of middleware development (as distinct from support and maintenance) will be taken care of by the Middleware

Consortia with appropriate EC co-funding, independently from any NGI co-funding but with control and steering provided by EGI. The support to new user communities e) is outside the EGI direct activities and individual NGIs or Member States Institutions are expected to contribute with appropriate EC co-funding as in the past.

4.1.1. Financial sources

To cover the costs for EGI international tasks, the following financial sources are considered:
1. EGI.org membership fees paid by the NGIs.
2. EC contribution.
3. NGI, Middleware consortia and EIRO/ESFRI co-funding contribution.

The basic EGI funding reference model is provided in Table 8, based on the effort estimates described in this Blueprint. It follows two assumptions:
i. the cost of 1 FTE is averaged to 90 K€/year[6] and
ii. the total EC contribution to the costs of the EGI international tasks will be at the level of 20M€/year.

Table 8: EGI Financial Reference Model

	NGI International tasks		Middleware maintenance	EGI.org	Total
	Operations	User services			
Costs					
EGI Effort (FTEs)	225	110	70	51	
EGI costs (M€/year)	20.25	9.90	6.30	4.59	**41**
Income					
NGI membership fees (M€/year)				1,0	**1**
EC Contribution (M€/year)	10.125	4.95	3.15	1.80	**20**
NGI, Middleware consortia and EIRO/ESFRI co-funding Contribution (M€/year)	10.125	4.95	3.15	1.80	**20**

As NGIs will contribute to the international tasks to a different extent, their co-funding will reflect their commitment to the EGI international tasks. The effort to be dedicated to these is in principle proportional to the amount of IT resources, number of sites and users that will be part of each NGI and involved in the international activities. As a zero order approximation, we divided NGIs (countries) to three categories—small, medium, large[7]—differing in the extent of effort provided for the NGI international tasks. Corrections will possibly be applied during the EGI project preparation phase to take into account the different level of development and interest (involvement) of each NGI. Each NGI (each country) will in principle be free to adjust its classification (in the small, medium or large categories) and this classification will define the expected contribution to the EGI international tasks.

---

[6] This number is approximated from the current cost of man power in EGEE III, which is slightly below 80 K€/year including all costs and overheads.

[7] Based on the EGEE III experience, Belarus, Bulgaria. Croatia, Cyprus, Estonia, Iceland, Latvia, Lithuania, Luxembourg, Macedonia, Malta, Moldova, Montenegro, Serbia, and Slovenia may belong to small category, Austria, Belgium, Czech Republic, Denmark, Finland, Greece, Hungary, Ireland, Israel, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Switzerland, Turkey, and Ukraine to medium category, and France, Germany, Italy, Spain, and UK to the large category.

Also, each EIRO/ESFRI can offer a contribution proportional to its expected activities to fulfil the necessary international tasks and thus define its contribution to EGI also in the financial term. Naturally, in case of oversubscription (i.e. when offers to contribute surpass the EC co-funding), a negotiation between NGIs and EGI.org will lead to a conclusion (in respect to the EC co-funding distribution), as is the case in any EC-funded project.

4.1.2. NGI Membership Fee

The financial stability of the EGI.org will be based on fixed annual NGI contributions: the NGI membership fees. The minimalist model presented here assumes that the total sum collected annually through the NGI membership fees is 1 M€/year. The amount of the NGI membership fees (these will not be imposed on EIRO institutions/ESFRI projects based on their statute of Associated Members) will follow the TERENA keys.

Table 9: NGI Membership Fees

NGIs of	% contribution according to TERENA key	each NGI's EGI.org membership fee (€/year)
Moldova, Macedonia	0.0014	1,400
Montenegro, Latvia, Lithuania, Serbia	0.0019	1,900
Malta, Cyprus, Iceland, Estonia	0.0024	2,400
Belarus	0.0028	2,800
Bulgaria	0.0038	3,800
Luxembourg, Slovenia	0.0047	4,700
Croatia, Slovakia	0.0095	9,500
Ukraine, Romania, Hungary, Israel, Czech Republic	0.0237	23,700
Portugal, Ireland, Finland, Greece, Denmark, Norway, Poland	0.0285	28,500
Austria, Turkey, Sweden, Belgium, Switzerland, Netherlands, Russia	0.038	38,000
Spain	0.057	57,000
Italy, France, UK, Germany	0.076	76,000
Total		**1,000,000**

4.1.3. NGI Co-Funding

As seen in Table 8 the NGI co-funding is expected to total 20 M€, with an equal matching EC contribution to cover the total estimated costs of EGI.org central tasks and the NGIs international tasks. The precise amount of NGI co-funding will depend on many factors such as NGI contribution to the NGI international tasks, the NGI maturity level and also the eventual regional agreement about the NGI international tasks provision within a region. To give an approximate expected EC contribution and corresponding NGI co-funding we use the classification of NGIs into three categories (small, medium, large). In Table 10 we provide a possible (indicative) co-funding distribution for a case with 17 small, 16 medium and 6 large NGIs.

EGI blueprint

Table 10: Expected EC contribution and NGI co-funding

NGI classification	Number	EC Contribution per NGI (k€/year)	NGI Co-funding (k€/year)
Small	17	25 – 250	25 – 250
Medium	16	400 – 900	400 – 900
Large	6	1 100 – 1 800	1 100 – 1 800

The exact NGI co-funding (and the matching EC contribution) will depend on the precise amount of FTEs the NGI will provide to support the NGI International tasks. This will be finally defined as part of the future EGI project preparation.

The membership fee of 1 M€ does not cover all the costs of EGI.org. If necessary, EGI_DS recommends that a part of the estimated NGI co-funding could be eventually provided as an increase of the membership fees bringing this to a total of 2.1 M€/year. In such a case, all the EGI.org top coordination positions of the four units will be covered by the Membership fees, providing for more stable financial position of EGI.org.. The total annual costs for each NGI will remain the same. A decision in this direction needs to be taken by the EGI Council.

4.1.4. Specific Case – Limited NGI Participation

The financial breakdown presented above assumes all the countries join EGI around September 2009 and contribute to the EGI.org from the outset. While this is the ideal and optimal scenario, it may not be possible and the EGI implementation will start with a smaller number of NGIs.

The Blueprint provides, for International Operations and User Community Services, an estimation of the ranges of the necessary efforts for the different classes of NGIs (small, medium and large).

If we assume that in the start-up phase a smaller number of NGIs will be present, this reduced set will have to provide an effort equal to about the maximum of the reported ranges (e.g. 18 FTEs for the International Operations of a large NGIs) to set up, adapt and configure the new services both in EGI.org and in the NGIs to make them correspond to the needs of the EGI users.

Once this initial phase is completed, it is expected that the NGIs will be established in all member states but that they will need to contribute to the overall EGI with efforts corresponding to the mean values of the ranges indicated in the Blueprint.

As the size of EGI.org is not proportional to the number of NGIs forming EGI, we must assume that in this case the 1 M€ must be collected from the NGI membership fees. We have evaluated the indicative NGI fees when only 17 countries are ready to financially support EGI.org (the selection of countries is purely arbitrary and does not reflect in any way their willingness to actually contribute to EGI). For a large enough number of countries, we have worked on the assumption that the EC contribution stays at approximately the same level (20 M€) and individual countries start with larger co-funding that would gradually be reduced as more NGIs join. The result is an increase of the contributions of about 30% for each of the initial participating NGIs. This constitutes a necessary flexibility that the NGIs have to take into account.

4.2. EVOLUTION OF FUNDING IN TIME

The EGI financial reference model is proposed for the first few years of EGI's existence, i.e. for a period not longer than 5 years. In Figure 4 the expected evolution of the total funding in a medium- to long-term timeframe is shown. With the expected reduction of the operational costs (due to automation and increased quality of the middleware) the EC funding is expected to be gradually reduced, to cover mostly the cost of innovation and introduction of new functions and services at the pan-European level.
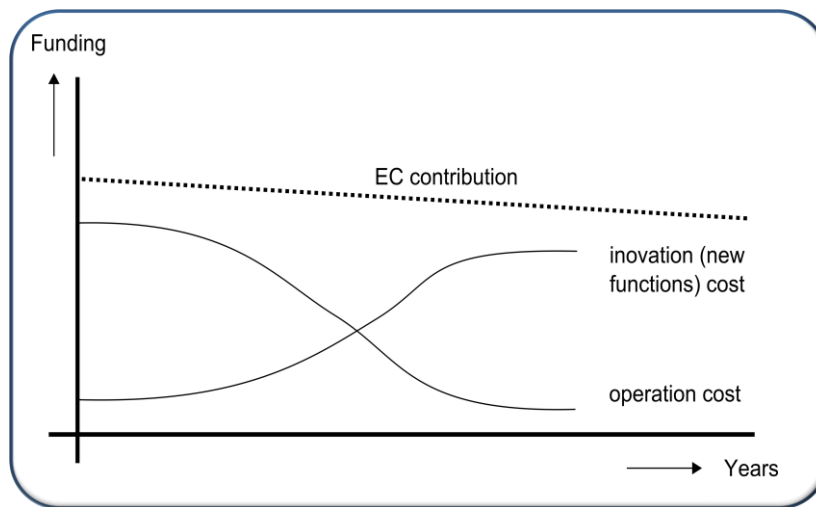
Figure 4: EGI Funding Evolution (schematic)

4.3. FUNDING OF INTERNATIONAL RELATIONS

While the primary purpose of EGI is to stabilize the grid infrastructure in Europe (EU), it must be able to interact with grid infrastructures outside this region, continuing the current successful practice of extending European grids (especially those based on the EGEE model) to other regions (Asia Pacific, Latin America, Africa). We expect these activities to continue through a mix of direct international collaboration between EGI (represented by EGI.org or through some NGIs) and the target region or through participation in specific projects (support actions) when appropriate. Gradually, some mechanism similar to the membership fee (but with limited membership rights) may be applied to countries/regions that will be successful in setting-up their own sustainable grid infrastructures and organizations, but further elaboration of this model is out of scope of this document.

4.4. EC CALLS

To cover the different aspects of EGI and related financing of activities, the following scenarios of EC contribution are foreseen:

- Since EGI is expected to be formed by NGI organizations representing one country each, in an ideal case the EC contribution would be provided via calls dedicated to NGIs and EGI.org, thus adopting a model that has been very successful in supporting the establishment of the pan-European network through dedicated call for NRENs, DANTE and TERENA.

- EGI international activities in collaboration with grids outside Europe will continue to be co-funded by the EC through specific competitive programs.

- The middleware development activities are also expected to be co-financed by the EU, in a special competitive program dedicated to the development of the middleware/software used in production on the EU e-infrastructure (e.g. EGI).

- The porting and development related to new applications is also not included within the EGI financial model. It is expected to continue to be co-funded via competitive calls dedicated to support of new user communities willing to use the EU e-infrastructure.

EGI blueprint

4.5. RESOURCE PROVISIONING FOR EGI

EGI.org will not directly own any resources. NGIs will serve as proxies to actual resource owners (providers). At the national level, NGIs may own resources directly but it is foreseen that every NGI will also have to interact with resource owners to become the national point of contact for EGI resources originating in its country. The resource centres' funding is not in the scope of EGI, as it has to happen at the national level. However, EGI must provide mechanisms for proper accounting of resource usage so that each resource owner (and its funding agency) will be able to evaluate the impact of providing resources to their scientists via the EGI infrastructure (i.e. to evaluate the efficiency of sharing resources through EGI from their national point of view).

EGI blueprint

5. TRANSITION PERIOD

The transition from the current grids in Europe towards EGI has already started. The most prominent example is the EGEE project taking significant steps towards an EGI/NGI structure during its third phase that started in May 2008. The EGEE-III project has recently published a document [20] describing the steps needed to migrate the EGEE operation to EGI. The document not only covers the EGEE-III project itself but also input from Collaborating Infrastructure Projects (CIPs) Baltic-Grid-II, EELA-2, EUAsiaGrid [21], EUChinaGrid [22], EUIndiaGrid [23], EU MedGrid [24], and SEEGRID [25]; Collaborating Software and Services Projects (such as BELIEF-II [26], Edutain@Grid [27], ETICS-2 [28], GridTalk [29], KnowARC [30], OGF EUROPE [31] and OMII-UK [32]); and other Collaborating Projects WLCG [33], EC-Gin [34], NDGF [35] and GRIDPP [36]. Furthermore the document also provides input from non-European countries such as the US (OSG) [37], Ukraine and EGEE's Asia federation.

EGI_DS is now preparing a similar document from the point of view of EGI which will be published in March 2009. The document will elaborate in more detail the transition process and requirements sketched in this chapter.

As EGI is expected to start its first organisational steps during 2009, the transition from the current projects to the EGI infrastructure overlaps with the first three year phase of EGI. During this period the EGI structure and membership will be finalised, as the currently fragmented or loosely coupled national and international infrastructures will be integrated. Also, this transition period will allow individual projects to start adoption of EGI at different times as best suits their current work plans.

The main change from the present situation towards the distributed model of EGI will be organizational: the emphasis moves from individual interested institutions to national initiatives and from central supervision to central coordination of European NGIs. In addition, NGIs will represent all national scientific communities and institutions, as the ones providing resources to their national grid infrastructures. It is essential that the operating large-scale production EGI grid continues to serve the scientific communities throughout the transition period with at least the same quality of service to obtain the same level of user satisfaction as today.

It is assumed that after the transition period all different types of e-infrastructures in Europe will become either part of EGI or will have a well-defined relation with EGI. While this concerns primary the different national, EU and international grid initiatives and infrastructures, a clear relationship with supercomputing activities will also be established during the transition period.

5.1. EGEE-III AS A STARTING POINT

The EGEE/CIP infrastructure, which is now operational in many European countries, was established through national and European co-funded projects starting early 2001 with the European DataGrid project (EDG) under the fifth Framework Programme. After this proof of principle demonstrating the potential impact of grid technologies on European science, a first large scale production grid infrastructure was deployed by the Enabling Grids for E-SciencE project (EGEE), whose second phase (EGEE-II, 2006-2008) provided a large-scale, production quality grid for scientists in Europe. The EGEE/CIP projects, exploiting the pan-European network GÉANT2 and the NRENs, have established European leadership in the development and exploitation of grid technology. The latest wave of e-Infrastructure projects started in the spring of 2008, including the third phase of EGEE – EGEE-III – co-funded by the European Commission for two years. The current EGEE-III grid, representing the world's largest multi-science production grid today, deserves special attention as it is assumed that the resources currently connected through this grid will continue to be available for EGI as the core infrastructure.

The major purpose of EGI is to build on the extensive knowledge gained in Europe through these and other related national and international projects, and to consolidate the currently fragmented or loosely coupled infrastructures into one large, stable, and more efficient. Therefore the transition from the

current environment to EGI must protect the previous investments and provide a clear and smooth path for users already dependent on the current e-infrastructures.

Although High-Energy Physics and the enormous computing requirements of the Large Hadron Collider (LHC) in particular were a major initiator of scientific grid computing in Europe, other sciences use a growing fraction of the EGEE infrastructure as shown in Figure 5, showing the growth of this fraction from 10% two years ago to more than 30% by mid-2008. Even more impressive is the 12-fold growth of overall CPU usage of non-LHC communities over the same period.
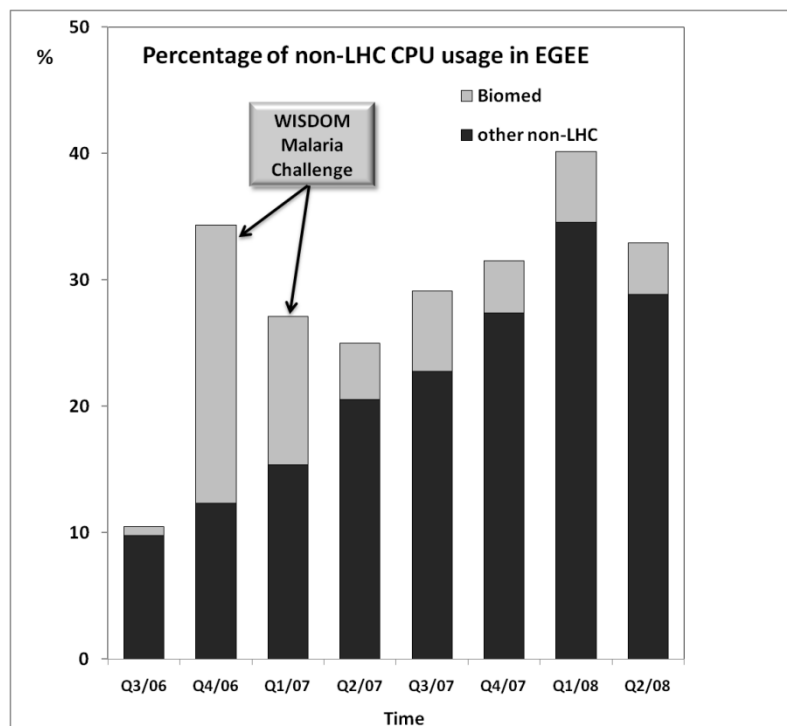
Figure 5: non-LHC CPU usage in EGEE

A growing number of scientific disciplines organized in more than 200 Virtual Organizations (VOs) with more than 7500 users now rely on the production quality EGEE grid and the underlying infrastructure, notably:

- Archaeology
- Astronomy & Astrophysics
- Civil Protection
- Computational Chemistry
- Computational Fluid Dynamics
- Computer Science/Tools
- Condensed Matter Physics
- Earth Sciences

- Finance
- Fusion
- Geophysics
- High-Energy Physics
- Life Sciences
- Multimedia
- Material Sciences

This set of research areas is supported within the EGEE/CIP projects. For EGI to succeed, it is imperative that the scientific research disciplines, which use the current grid infrastructure supported by the EGEE/CIP projects can transit without disruption to the envisaged EGI/NGI-based infrastructure.

Therefore it is clear that the transition must address the following issues:

- The EGI membership in 2009, when it will be established, must already represent a large and significant fraction of EU countries to represent a credible European grid infrastructure.

EGI blueprint

- The organizational and operational structure of current grid projects is usually not based directly on the country-based model of EGI/NGI. Several projects, including and most notably EGEE-III, use the federated approach, with Regional Operations Centres (ROCs) which are not directly part of EGI/NGI model. EGEE-III plans to move towards National Grid Operating Centres (gNOC), at the same time encouraging NGIs to consider keeping the federated model where appropriate. EGI_DS recommends other e-infrastructure projects to develop and implement appropriate strategies to convert their internal structures to the EGI/NGI model as part of their integration into EGI.

- The knowledge and personnel transfer from the present projects to EGI must be very carefully planned too. This is especially true for EGEE, where some key personnel, hired by CERN, is currently not associated with any NGI and their future is uncertain. The same is true for personnel hired by institutions without any formal relationship with their NGI, where again there is no direct guarantee of personnel and knowledge transfer. The early set-up of NGIs is a key element to provide partners with whom the current projects can plan for the appropriate personnel and knowledge transfer.

- The future of central coordination bodies such as the Operation Coordination Centre (OCC) in CERN or Global Grid User Support (GGUS) in Karlsruhe, whose activities will be taken care of by the EGI.org is important to safeguard current users. Therefore the early setup and start of work of EGI.org is crucial for a smooth transition.

- Within EGEE-III, Strategic Discipline Clusters (SDC) have been established to maximize the penetration of grid technology into key scientific disciplines ensuring that the requirements of each area can be met and that the scientists get focused support and help for the development of high-level application services. There are similar activities within other projects and this task will still be required for existing and new user communities in EGI. While some of these SDCs will transform into SSC, others must be carefully analysed and appropriate support planned within interested NGIs. Again, early establishment of EGI.org and NGIs is crucial for EGEE and other projects to be able to start a serious discussion about their key research areas and the way future support will be provided.

- The middleware is still under development within the grid community and this effort is co-funded by the EC. These developments have to continue through the transition phase from the current organization to the EGI/NGI model and new requirements and technology evolution will imply new developments thereafter.

These issues require that NGIs and EGI.org be set up as early as possible in 2009, as the grid related projects need partners to discuss and finalize the transition plans. Proper and timely funding is another key element, particularly critical in the set-up and early stages of EGI (during the transition period).

With EGEE-III operating in parallel with EGI_DS, the work plan of EGEE-III already contains the implementation of structural changes required to simplify the transition from the current project-based EGEE model to a stable EGI model based on NGIs. A close collaboration between these two projects was foreseen in both Descriptions of Work and was implemented through direct participation of EGEE representatives in the preparation of the Blueprint and other EGI_DS deliverables. Moreover, this close collaboration is being extended to other related grid projects, as the transition must be performed for all infrastructures and scientific communities already engaged with grids. This close collaboration with grid projects must continue after the foundation of EGI.org, which will take over the EGI_DS activities during the year 2009.

The tight coupling between specific timetables for EGI_DS and the planning of EGEE-III is provided in Figure 6. The timetables for CIPs are similar to EGEE-III.

The search for cooperation between grid and supercomputing activities could take longer, as DEISA2 runs through to 2011.
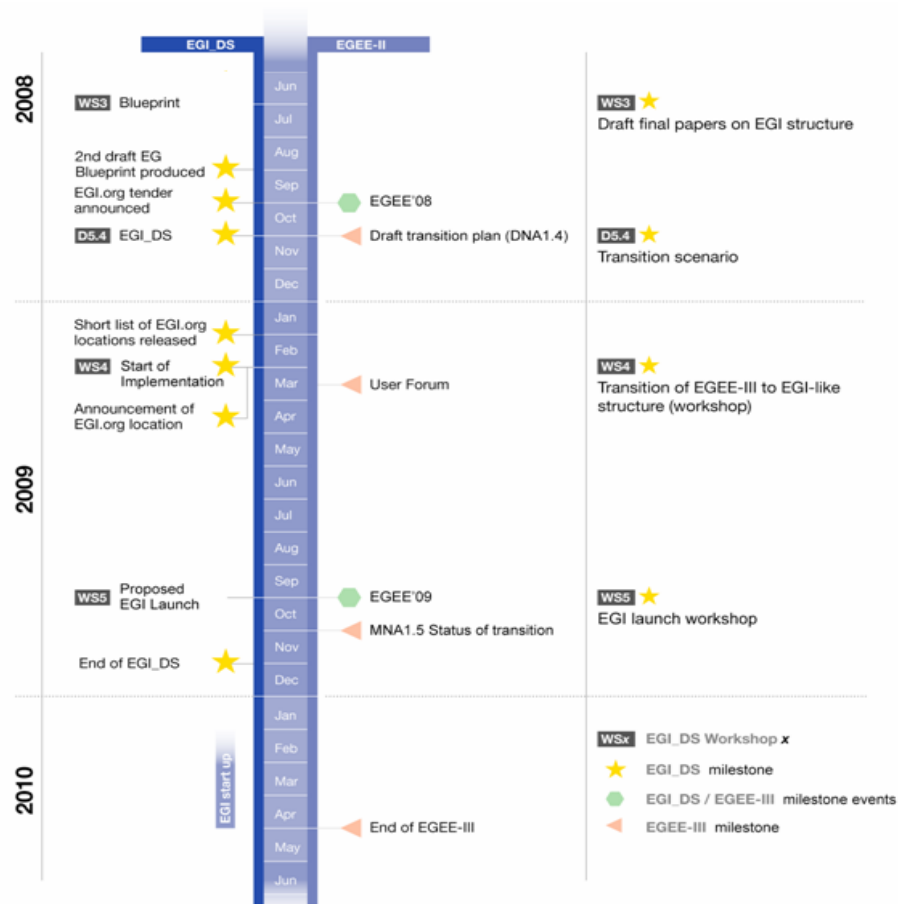
Figure 6: EGEE-III and EGI_DS common workplan

5.2. TRANSITION MILESTONES

A more detailed transition scenario will be laid down in an upcoming document [38]. During 2009 the following key milestones are established to progress with the transition to EGI:

- January 20th: Vote for approval of the EGI Blueprint by the EGI_DS Policy Board; first list of NGIs subscribing to the principles of EGI.
- March 2nd: Catania Workshop – Approval of the EGI location; common work plan with EGEE on transition scenario.
- Spring 2009: Transition team in place with authority to prepare key tasks and to negotiate with the EU; work on calls for EC funding
- Summer 2009: The core of the EGI project transition team is agreed and confirmed by the Policy Board; latest date for formal establishment of the EGI.org .
- Autumn 2009: The EGI project proposal is prepared and submitted to the EC.
- January 1st, 2010: EGI.org is operational, with all key personnel appointed (who may not yet be working for EGI.org, as e.g. still working for EGEE III or any other project).
- April 2010: EGI.org fully operational, taking over from EGEE-III and other CPs as they end

EGI blueprint

5.3. FROM JOINT RESEARCH UNITS TO NATIONAL GRID INITIATIVES

As only a few countries have already identified the institutions that will serve as National Grid Initiatives, the EGEE-III project initiated the establishment of Joint Research Units (JRU), to prepare the ground for long term sustainability by creating a stable institutional basis and promoting international standards. JRU is an organizational structure introduced in the EC's Framework programs that allows two or more legal entities to work as a one single body, participating in projects. While the defining conditions for JRU:

- *scientific and economic unity*
- *last a certain length of time*
- *recognised by a public authority*

cover some but not all of the criteria of NGIs, JRUs are considered an excellent starting point for the establishment of NGIs. A requirement still to be established is:

- An NGI must have a sustainable structure or be represented by a legal structure which has a sustainable structure in order to commit to EGI.org in the long term, being authorized to sign the EGI statutes and to commit financially to EGI.

Most of the formal conditions for NGIs are today already fulfilled by several existing JRUs in EGEE. To establish the required conditions in all participating NGIs will be a major task during the transition period.

BIBLIOGRAPHY

[1] EGEE.; *EGEE web page*. http://www.eu-egee.org/

[2] *ERA, European Commission Research Area*. ; http://ec.europa.eu/research/era/index_en.html

[3] *EGI Vision Statement*. ; http://www.eu-egi.eu/vision.pdf

[4] *EIROforum*. ; http://www.eiroforum.org/

[5] *ESFRI, European Strategy Forum on Reasearch Infrastructures*. (n.d.).

[6] D4.4. *EGI Blueprint Proposal, Version 2.*

[7] *ESFRI Roadmap*. ; http://cordis.europa.eu/esfri/roadmap.htm

[8] D4.3. *Guidelines for NGIs.*

[9] D4.2. *Options analysis of different legal structures.*

[10] D5.2. *Draft convention of new EGI organisation.*

[11] D3.1. *First EGI functions definition.*

[12] *PRACE*. ; PRACE: http://www.prace-project.eu/

[13] *DEISA*. ; DEISA: http://www.deisa.eu/

[14] *GEANT2*. ; GEANT2: www.geant2.net

[15] D3.2. *Final EGI Function Definition, to be published in March 2009.*

[16] *Globus*. ; http://www.globus.org/

[17] *Condor*. ; http://www.cs.wisc.edu/condor/

[18] *e-IRG, e-Infrastructure Reflection Group*. ; http://www.e-irg.eu/

[19] *OGF, Open Grid Forum*. ; http://www.ogf.org/

[20] *EGEE-III DNA1.4*. ; Plan for a Transition to a Sustainable Infrastructure: https://edms.cern.ch/document/971629/

[21] *EUAsiaGrid*. ; http://www.euasiagrid.org/

[22] *euchinagrid*. ; http://www.euchinagrid.org/

[23] *EU-IndiaGrid*. ; http://www.euindiagrid.org/

[24] *EUMEDGRID*. ; http://www.eumedgrid.org/

[25] *SEE-Grid*. ; http://www.see-grid.org/

[26] *Belief*. ; http://www.beliefproject.org/

[27] *edutain@grid*. ; http://www.edutaingrid.eu/

[28] *ETICS2*. ; http://etics.web.cern.ch/etics/

[29] *GridTalk*. ; http://www.gridtalk-project.eu/

[30] *KnowARC*. ; http://www.knowarc.eu/

[31] *OpenGridForum Europe*. ; http://www.ogfeurope.eu/

[32] *OMII-UK*. ; http://www.omii.ac.uk/

[33] *Worldwide LHC Computing Grid*. ; http://lcg.web.cern.ch/LCG/

[34] *Europe-China Grid InterNetworking*. ; http://www.ec-gin.eu/corpsite/display/main.asp

[35] *Nordic DataGrid Facility*. ; http://www.ndgf.org/ndgfweb/home.html

[36] *GridPP*. ; http://www.gridpp.ac.uk/

[37] *Open Science Grid*. ; http://www.opensciencegrid.org/

[38] D5.5. *Transition Scenario from Current Grid Infrastructures to EGI, to be published in March 2009.*

EGI blueprint

Delivery Slip

	Name	Partner/ Activity	Date	Signature
From	Jürgen Knobloch on behalf of WP5	CERN/WP5	22-Dec-2008	
Reviewed by	EGI Management Board		22-Dec-2008	
Approved by	EGI Management Board		22-Dec-2008	

Document Log

Issue	Date	Comment	Author/Partner

Document Change Record

Issue	Item	Reason for Change