



Design Study



# EGI\_DS

## FINAL EGI FUNCTIONS DEFINITION

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**Abstract:** This deliverable describes the purpose of EGI, its actors and their relationship, and details the EGI technical activities and services – the EGI “Functions” – together with the related resource requirements. The EGI Functions are needed to implement and operate a pan-European infrastructure satisfying the needs of Science in Europe. These include operations and security, middleware development and support, user community services, external liaison functions and management.

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# 1 INTRODUCTION

## 1.1. Purpose

The European Grid Initiative (EGI) aims at establishing a large-scale pan-European e-Infrastructure to support research projects across a wide range of scientific disciplines, to access and share a variety of national resources (computing, storage, data, instruments, etc.) and to participate to global collaborations.

The overall organisational, operational, and financial framework for this future organisation, composed by a number of actors among which the National Grid Initiatives (NGIs) and a coordinating body (EGI.org), is detailed in the EGI Blueprint (project Deliverable D5.4), which was endorsed by the NGI representatives during their Prague meeting on the 20<sup>th</sup> January 2009. While the EGI\_DS Blueprint document gives the initial organisational plan for EGI.org, the purpose of the present Deliverable is to provide a more detailed technical description of the EGI functions. This deliverable and the EGI Blueprint constitute the conceptual platform for the EGI project, which has been designed to establish the future EGI organisation.

The definition of the EGI functions will be fully finalized only when the EGI project will be ready. The feedback on this deliverable is an important step on this definition path. Feedback from the NGIs and other stakeholders is welcome and will be actively encouraged. The received feedback will be considered in the framework of a further Deliverable (“EGI Function Definition Feedback”) to be released two months after the present one.

Specifically the “other stakeholders” targeted for feedback will be :

- a) The present Grid Users and their VOs, as organized in the EGEE NA4 activity, in the WLCG Project, and in the projects listed in Appendix A of this document.
- b) Other Actors, presently involved in operating the Grid infrastructure, in the EGEE III projects and outside it.
- c) The Middleware Consortia (see chapter 5 of this document)

Organisation and content of this Deliverable are similar to Deliverable D3.1 (EGI Functions: First Definition), however each chapter has been revised to make it consistent with the final EGI Blueprint, reflecting comments received from NGI representatives and other stakeholders. The transition period is no longer addressed in this document, since it is specifically dealt with by a further Deliverable (D5.5), currently in preparation.

## 1.2. Editorial responsibilities

Section	Main Providers of material	Responsible editor(s)	Work Package
Chapter 1		L.Perini	WP3
Chapter 2		L.Perini	WP3
Chapter 3		T.Ferrari	WP3
Chapter 4	T.Ferrari	T.Ferrari	WP3
Chapter 5	F.Giacomini, M.Mazzucato	F.Giacomini, L.Perini	WP3
Chapter 6	D.Cresti	D.Cresti, L.Perini	WP3
Chapter 7	F. Karayannis, P.Öster,	L.Perini	WP3
Chapter 8	L.Matyska, K.Ullmann,	A. Candiello, L.Perini	WP3
Chapter 9	Chapter 1-8	Pekka Lehtovuori,	WP3
Chapter 10		L.Perini	WP3
Appendix A	D.Cresti, S.Fantinel, , project coordinators of reported projects	A.Caltroni	WP3

### 1.3. Document organisation

Following the Introduction and the Executive Summary in Chapter 2, Chapter 3 introduces EGI and his Actors specifying the EGI scope and purposes, the major players and the benefits EGI will bring to them; it contains part of the material of chapter 5 in D3.1, fully reworked

From Chapter 4 to 8, this document describes the main EGI functions, including indications for the effort estimates:

- Chapter 4 deals with Operations and Security; it is a revised version of the corresponding chapter from D3.1.
- Chapter 5 considers Middleware Maintenance Support, it is a revised version of the corresponding chapter in D3.1.
- Chapter 6 deals with the support EGI will provide to Research Teams to run the application of interest to them on the grid, after becoming grid-enabled Virtual Organisations (VO); this activity was referred to as “Application Support” in D3.1, and “User Community Support (UCS)” throughout this document and the EGI Blueprint; it is a substantially revised version of the corresponding chapter in D3.1.
- Chapter 7 touches on External Liaison Functions, including Dissemination, Industry Take-up, and other issues like relations with extra-European grid infrastructures. It has been included in this document for completeness sake, albeit it is unchanged from D3.1.
- Chapter 8 outlines the Management Function of EGI; it is a revised version of the corresponding chapter in D3.1

Chapter 9 provides a summary of the tasks included in this document and their estimated effort

Chapter 10 gives some conclusions and outlines the next step in the EGI process

Appendix A provides an overview of European grid projects to assess the functions they fulfil and to provide an estimation of the effort they deploy: it is a revised version of chapter 3 in D3.1

Funding and related issues are outside the remit of this document; the reader is referred to the EGI Blueprint which specifically addresses these issues.

### 1.4. Document amendment procedure

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

### 1.5. Terminology

This sub-section provides the definitions of terms, acronyms, and abbreviations used in this document.

#### Glossary

AM	Associate Member of the EGI Council
API	Application Programming Interface

ARC	Advanced Resource Connector
CA	Certification Authority
CAO	Chief Administrative Officer
CERN	European Organization for Nuclear Research
COO	Chief Operational Officer
CPU	Central Processing Unit
CTO	Chief Technical Officer
DEISA	Distributed European Infrastructure for Supercomputing Applications
EC	European Commission
EDG	European Data Grid
EGEE	Enabling Grids for E-scienceE
EGI	European Grid Initiative
EGI_DS	European Grid Initiative Design Study
eIRG	e-Infrastructure Reflection Group
ENOC	EGEE Network Operation Centre
ERA	European Research Area
ERI	European Research Infrastructure
EU	European Union
EUGridPMA	European Policy Management Authority for Grid Authentication
FTE	Full Time Equivalent
GGUS	Global Grid User Support
LHC	Large Hadron Collider
M	Million
MC	Middleware Consortia
MCB	Middleware Coordination Board
MoU	Memorandum of Understanding
NGI	National Grid Initiative
NREN	National Research and Education Network

OGF	Open Grid Forum
OMII	Open Middleware Infrastructure Institute for Europe
PB	Policy Board
QA	Quality Assurance
ROC	Regional Operating Centre
SDC	Strategic Discipline Cluster
SLA	Service Level Agreement
SSC	Specialised Support Centres
UCO	User Coordination Officer
UCS	User Community Services
UFSC	User Forum Steering Committee
UMD	Uniform Middleware Distribution
UNICORE	Uniform Interface to Computing Resources
US	United States of America
VDT	Virtual Data Toolkit
VO	Virtual Organisation
WLCG	Worldwide LHC computing Grid Project
WP	Work package

## 2 EXECUTIVE SUMMARY

This Deliverable defines the Functions of EGI and together with the European Grid Initiative (EGI) Blueprint (D5.4) outlines the proposal developed by the EGI Design Study (EGI\_DS) to establish a sustainable grid infrastructure in Europe by the end of EGEE-III in spring 2010.

This Deliverable and the Blueprint have been prepared in the context of EGI\_DS to describe and detail the implementation of a sustainable e-Infrastructure in Europe. The two documents form the conceptual basis for the EGI project that will be prepared over the next few months by the NGIs in conjunction with other EGI stakeholders. The present Deliverable specifically provides the more detailed technical descriptions, implementation scenarios and other background material that, together with the chapter “Functions of the EGI” in the Blueprint, give the complete picture of EGI function definition performed by EGI\_DS to date.

This document, like the Blueprint, is based on the vision of a large pan-European distributed computing and data grid infrastructure providing such services as outlined in the EGI Vision Document [1].

The grid infrastructure services offer to research teams a high added value. They enable geographically dispersed researchers working on a joint project to collaborate seamlessly by **sharing** a variety of ICT resources distributed across several compute centres, in a coordinated way that ensures both the owner’s control and the efficient use of those resources.

Without EGI, each project or discipline that requires national, European or international-scale projects to be competitive such as those mentioned in the ESFRI roadmap, would need to develop their own solution for computational and data management interoperability. This would spread the cost of the infrastructure across all projects, but would also replicate the same work by different groups adding, once more, to the overall cost and resulting in many incompatible solutions.

The ultimate purpose of EGI is providing its Users ( working in the Research Teams) with this added value; all the EGI structure and functions are designed with this final aim. EGI as European Organization will specifically take care of the functions needed for allowing the cross-border collaboration needed by the international research collaborations

The identification of the EGI Actors and stakeholders is preliminary to the definition of its Functions. EGI is a partnership between National Grid Initiatives (NGIs) **and** a coordinating body called EGI.org. NGIs govern EGI.org. In addition to the NGIs, EGI stakeholders include:

1. The EGI customers:

National **Research Institutions** (RIs): Universities, research laboratories, national research organisations, etc.

**Research Teams** (RTs) operating throughout Europe that come together in national and European Virtual Organisations (VOs), whose members are the **DIRECT USERS**, target and final motivation of the services offered by EGI.org and NGIs to the RIs,

2. Stakeholders with associate membership (AM) status: **European International Research Organisations** (EIRO) with formal representation in EIROFORUM or ESFRI, having been accepted as EGI members; CERN is the first example of EIRO with AM status.

3. Stakeholders with partnership status: the **Middleware Consortia** (MC), which provide the open source middleware needed to implement the European e-Infrastructure and which have so far supplied the middleware used in current e-Infrastructures.
4. Stakeholders represented by the NGIs include providers of computing resources (**Resource Centres – RCs**).
5. The **Funding Agencies** that fund both the Research Teams and resource providers and seek optimum return from their investments.

Each NGI is represented by a legal organisation which should: be the single point of contact for each country national grid infrastructure, with a sustainable structure, mobilizing national funding and resources and with the capacity of signing the statutes of EGI.org. The main functions of the NGI are

- ensure the **operation of a national e-Infrastructure** to an agreed level of service and its integration into EGI;
- **support user communities** by providing general services to applications and promoting grid usage to new communities;
- following **EGI policies** and quality criteria.

The EGI functions described in this document comprise:

- the EGI management and the external liaison functions, which are responsibility of EGI.org;
- the EGI operations, including related security provisions; i.e. all the activities needed for ensuring the grid infrastructure operates safely and with the required efficiency, across national borders. The EGI operations are performed by NGIs and AMs with the coordination and support of EGI.org;
- the services for ensuring the maintenance, support and standardisations of the middleware used in EGI. These services are provided by the Middleware Consortia under the coordination of EGI.org;
- the User Community Services, intended to provide support to the Users belonging to international scientific communities that run their applications on the grid. The EGI UCS are provided by NGIs and AMs with the coordination and support of EGI.org.

Note that all the functions described are at European level: operations and UCS exists also at purely national level, but the purely national level is outside the scope of this document EGI.org is seen as the “glue” providing the required pan-European coordination and enabling coherence and synergies between the NGIs<sup>1</sup> for the benefit of their international user communities.

EGI.org will link existing NGIs and will actively support the set-up and initiation of new NGIs where none exist. The relationship between EGI.org and the NGIs is governed by the “subsidiarity principle”,

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<sup>1</sup> In this document, “NGI” is generally used for indicating both the proper NGIs and the AMs.

to the effect that tasks that are more effectively performed at either the national or regional level should be run under the NGI responsibility. EGI.org will ensure pan-European grid coordination.

The top-level executive layer in EGI is the EGI Council (see Figure 3). The NGIs, as defined above, and the Associate Members, i.e. European International Research Organisations (EIRO) with formal representation in EIROFORUM or ESFRI, having been accepted as EGI members, constitute the EGI Council. They govern EGI.org and voice their views on all EGI-related matters as voting members in the EGI Council. Other members of this body are the Associate Members, 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 upper management of EGI.org as well as the Chair of the User Forum Steering Committee will be *ex officio* Council members.

EGI.org will provide functions to address the coordination of:

- the operation of the infrastructure (17 FTE<sup>2</sup>),
- the definition of common middleware interfaces and final component certification (8 FTE),
- the services for the application support and training (11 FTE),
- the external liaison functions (4 FTE)
- the management and administration (11 FTE).

The FTE figures shown in parentheses are the estimates proposed in the Blueprint. It should be noted that these **51 FTE in EGI.org** represent only a small fraction of the total effort spent on grid infrastructures in Europe today.

To run an NGI as part of the EGI, **2.5 to 30 FTE** are estimated to be necessary to cover basic international tasks: operations and UCS. The exact requirement depends on the size of the NGI, on the demands of the local user communities and on the commitment to take on international tasks. In countries with an operating grid infrastructure, most of these resources already exist.

The operation and security of the infrastructure accounts in each NGI for the majority of the above FTE, in a range estimated from **2 to 22** depending on different parameters, as detailed in the Chapter 4 of this document. The total operational effort provided by the NGI system is estimated in **225 FTE**.

Research teams are organised in user communities which will be supported by User Community Services (UCS) provided by the NGIs. This includes Specialised Support Centres (SSCs): the total effort provided by the NGIs for UCS is estimated in **110 FTE**.

It is essential that the underlying middleware for the European grid be maintained and further developed. This development will continue to take place in the “Middleware Consortia” or other development teams who have demonstrated to have the necessary expertise. To minimise the risk for the infrastructure to rely on un-maintained software, the costs sustained by the Middleware Consortia for the maintenance and support of the deployed components (e.g. bug fixes and small enhancements addressing requests from operations and applications) are included in the costs of the EGI infrastructure

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<sup>2</sup> Throughout this document “FTE” is equivalent to “FTE/year”

and are quantified in **70 FTE**. These costs will be covered jointly by the European Commission and the Middleware Consortia under the coordination of the EGI project. New specific developments are to be funded by other means (for example through other EC co-funded projects). Wherever possible, EGI will foster middleware commonality and interoperability. The EGI infrastructure relies on a Unified Middleware Distribution (UMD) to provide standard and homogenous access to resources.

EGI will typically not provide any IT resources, but will enable coordinated access, interoperability and accounting between national grid infrastructures.

### 3 EGI AND ITS ACTORS

A new European organisational model is herein proposed to fulfil the vision of a sustainable grid infrastructure satisfying the requirements of science in Europe. This relies on the establishment of National Grid Initiatives (NGIs) as legal organisations supported by national funding agencies to collect, organize and represent all national grid players, ranging from resource providers to scientific users, and of a coordinating body called EGI.org.

Thanks to the efforts of the Enabling Grids for E-SciencE project (EGEE), and the contribution of related European projects and of various other regional/national or scientific grid initiatives, today researchers across many disciplines in Europe and worldwide are in a position to operate in a large-scale production-quality grid ecosystem.

At present, the EGEE grid infrastructure is interconnected to other regional grid infrastructures in Europe, such as BalticGrid and SEE-Grid (South Est Europe) as well as to grid initiatives in China, India, other Asian countries, in the Mediterranean and in Latin America (EU projects EuChinaGrid, EuIndiaGrid, EuAsiaGrid, EuMedGrid, EELA, respectively). In addition, it is peered with independent international grids, such as the Open Science Grid in the US and NAREGI in Japan. It is this interconnection of grid infrastructures across the world that enables truly global collaborative research in a wide range of disciplines.

This document illustrates the functions and the organization that are proposed to consolidate, operate, manage and further develop a sustainable e-Infrastructure in Europe. These take into account the requirements gathered from a wide range of research disciplines across many NGIs. These are detailed in the following section.

#### 3.1 REQUIREMENTS

Research teams (RTs) typically collaborate on a temporary basis (at national, European or international level) within a Virtual Organisation (VO) to form a project with specific research objectives (e-Research project). Such a project is normally approved by peer review committees (acting at national and/or European or international level) set up by the involved research institutions or funding agencies that allocate the necessary funds, including those for IT resources.

VOs typically need to share specific IT resources, and are characterised by a particular usage model for a given set of EGI baseline services, such as authentication and authorisation services, accounting services for NGIs and VOs, services for data sharing at different levels of abstraction, services for compute sharing for different types of resources, monitoring services, etc. (*User requirement 1*).

Research teams often belong to different research institutions (universities, laboratories, applied research institutions etc). Resource provisioning can be organised in different ways depending on the VOs. For example, a VO may autonomously fulfil its resource needs by getting access to resources from its constituent research institutions, or alternatively to resources provided by external providers (for example, either from another research institution or from a commercial partner). The European e-Infrastructure should be sufficiently flexible to accommodate a variety of combinations of resource provisioning models. In general, the e-Infrastructure should evolve in all its aspects to satisfy the requirements of existing and new communities of users (*User requirement 2*).

An e-Research project needs to rely on a set of *software tools* which enable the *secure sharing* of every “local” IT resource and data from many partner organizations and distributed over different administrative domains (**User requirement 3**).

The resources to be shared are typically *heterogeneous*. These include CPU cycles of the commodity clusters for data analysis, the fast interconnected parallel systems for MPI applications from many scientific disciplines (computational chemistry, earth observation, life sciences, weather forecast etc.), the files located in distributed storage systems for image visualisation, the metadata distributed among remote archive systems which are relevant to a large variety of applications, etc. However, despite of this heterogeneity, access should be simple and transparent to the resource location and the resource specific properties (**User requirement 4**).

The sharing can be enabled by software services (*grid middleware*) which offer the user a uniform interface for access, hiding the local diversities and allowing a distinct level of authorisation according to the VO member’s role and agreed project policies. In this way, a common pool for all kind of computing resources is created for the project, enabling the project partners to use the available distributed resources and data as efficiently as possible. Middleware services need to be fully *interoperable* (**Middleware requirement 1**), and *complete* in order to allow the national infrastructures to be operated in a fully self-functional and autonomous way, to be completely integrated with the rest of the pan-European EGI infrastructure and to address the needs of all VOs (**Middleware requirement 2**). In addition, middleware components should be *scalable* to allow the management of resources and services in an e-Infrastructure that is to cater for scientific user communities ranging in size from a few individuals to thousands of researchers (**Middleware requirement 3**). Finally, the middleware should be easily *deployable* (**Middleware requirement 4**), i.e. simple to download and operate, and *extensible* (**Middleware requirement 5**). For more information of the Unified Middleware Distribution requirements please refer to Section 5.1.2 “Guidelines for Unified Middleware Distribution”.

Given the distributed and transparent nature of resource access in Grid, simplicity of use is of paramount importance. This can be technically achieved in many different ways, such as through an adequate middleware layer, the possibility to share expertise with other user communities, the availability of tools to monitor and assess the status of the infrastructure and the quality of service provided, of a helpdesk system and user guides, etc. (**User requirement 5**). Simplicity is also required by the staff that is responsible of operating the Grid middleware services. To this end, also Grid site managers and NGI operational staff need support for a highly available and reliable infrastructure (**Operational requirement 1**).

The reference resource centres/providers are requested by the VOs to operate the set of services which enable them to reach the above goal. Distributed accounting at institutional level is also required together with tools to monitor the activities as well as support services to the VOs to manage them and to run their legacy user applications in this multi-administrative domain pool (**Operational requirement 2**).

It is economically much more *convenient and efficient* for funding bodies to promote, support and fund the procurement and the operation of a shared, robust, secure and certified set of baseline grid services rather than a chaotic set of tools that each VO may freely ask to adopt or develop. In addition, the use of a layer of services, shared by other VOs whenever possible, has the advantage of manpower saving and facilitates the development and, even more importantly, the seamless operation and maintenance of more fundamental baseline services essential for the sharing. This enables also partial sharing with different VOs, thus increasing the pool of available resources.

Such an integrated set of services can be offered and operated by EGI.org at European level and by the NGIs at national level as part of the general EGI/NGI e-Infrastructure to enable global sharing. In this way, past investments at European or national level can be re-used and are likely to benefit also new Vos. High-level special services that may still need to be developed, will be less expensive and founded on a mature layer with a longer lifetime and wider user spectrum (***Economy requirement 1***). The perspective of a better global return for the money invested by funding bodies as well as of the creation of global pools based on a well-defined certified set of services constitutes one of the main drivers for EGI.

Resource centres/providers have so far obtained the general grid middleware services they need to operate from external providers (EU projects or Middleware Consortia). In line with different VO consolidated practices, at times they are supporting more than one middleware solution. Based on the need for simplified operations, to *avoid* having to charge the *costs* associated with the support of chaotic and very expensive multiple special environments, and having to offer a well-defined *quality of service* for multiple solutions, resource providers will typically appreciate and support the coordinated action of EGI.org and of their respective NGIs in moving towards a *progressively unified solution* for the services they will have to operate. (***Operational requirement 3***).

A comprehensive description of EGI requirements and use cases are described is provided by the EGI\_DS project deliverable D2.1 [2].

**Table 1: Summary of requirements for EGI**

Requirement Type	N	Description
<i>User Requirements</i>	1	<i>Sharing of distributed and heterogeneous resources</i> via a set of baseline services such as authentication and authorisation services, accounting services for NGIs and Vos, services for data sharing at different levels of abstraction, services for compute sharing for different types of resources, monitoring services, etc.
	2	The European e-Infrastructure should be sufficiently flexible to accommodate a variety of combinations of resource provisioning models, and should evolve to satisfy existing and new user requirements.
	3	Need of <i>software tools</i> to enable the <i>secure sharing</i> of every “local” IT resource and data from many partner organizations and distributed over different administrative domains.
	4	<i>A simple and transparent access</i> to the resource location and the resource specific properties
	5	<i>Simplicity of use</i> , this means an adequate middleware layer, the possibility to share expertise with other user communities, the availability of tools to monitor and assess the status of the infrastructure and the quality of service provided, of a helpdesk system, of user guides and proper documentation, etc.)
<i>Operational requirements</i>	1	<i>Simplicity of infrastructure maintenance</i>
	2	Distributed accounting at institutional level, tools for VO management and monitoring, support services to the Vos to run their legacy user applications in a multi-administrative pool of resources
	3	A progressively unified solution for the services to be operated by resource providers
<i>Middleware requirements</i>	1	Interoperability
	2	Completeness
	3	Scalability
	4	Deployability
	5	Extensibility
<i>Economy requirement</i>	1	Efficient use of past investments

### 3.2 OVERVIEW OF ACTORS AND THEIR RELATIONSHIPS

The above-mentioned requirements are satisfied in EGI by a network of partners that join to offer the services needed to implement a global pan-European shared pool of resources. EGI comprises a number of stakeholders.

1. The EGI customers:
  - a. National **Research Institutions** (RIs): universities, research laboratories, national research organisations, etc.
  - b. **Research Teams** (RTs) operating throughout Europe that come together in national or international Virtual Organisations (VOs) whose members are the immediate users of the services offered by EGI.org and NGIs to RIs. Research teams can be an interdisciplinary or inter-institutional group of people, members can be consequently affiliated to different Research Institutions, as illustrated in Figure 1. The main driver for EGI is the support of international VOs, as the support of national VOs falls under the responsibility of a given NGI.
2. **National Grid Initiatives (NGIs) and the related Resource Providers (RPs)**: the NGI is a legal organisation responsible for the management of the national grid e-Infrastructure and for maintaining relationships with customers (primarily the research institutes and research projects carried out by the VO constituted by research teams) as well as with a set of national resource providers. A given NGI and the national/regional RPs join to form a national partner alliance to jointly offer the services needed to implement a global pan-European shared pool of resources as the most efficient way to satisfy the requirements of the national RTs. Resources from national/regional resource owners, are made available to customers via RPs and are distributed among **Resource Centres (RCs)**. One owner is also a provider if it both owns and provides resources to the Grid (RIs which operate their own resource centres which share resources via the Grid, are typically both owners and providers).
3. **European International Research Organisations (EIROs)**: CERN, ESA, EBI etc, are organization that may be willing to contribute to and interested in the availability of a European e-Infrastructures. EIROs are associate members of EGI. Associated Membership to EGI is open for the EIROFORUM institutions and for one institution per ESFRI project of the project's choice.
4. **EGI.org** is the organization proposed to offer those services that are of common interest to all NGIs, such as the overall coordination framework for the development, operations including security across national borders and user support activities, and the hosting of operation/maintenance of operational tools and critical services which are more conveniently performed centrally. In addition, it is responsible of the overall coordination framework for the development, operations including security across national borders and user support activities. The main customers of EGI.org are the National Grid Initiatives (NGIs), which operate the Grid infrastructures in each country.
5. Stakeholders with partnership status: the **Middleware Consortia (MC)**, which provide the open source middleware needed to implement the European e-Infrastructure (e.g. ARC, gLite, UNICORE, and other development teams in Europe as well as Globus, Condor etc in the US) and which have so far supplied the middleware used in current e-Infrastructures. Maintenance and development work will be commissioned to those partners by EGI to guarantee a smooth

transition to EGI from current grid infrastructures and to fulfil the requirements of the user communities.

6. The **Funding Agencies** that fund both the research teams and resource providers and seek optimum return from their investments.

EGI.org, the NGIs, EIROs, the Resource Providers and the Middleware Consortia constitute a partner network. The role and responsibility of NGIs and EIROs are comparable in the EGI e-Infrastructure. For simplicity, the role of these two stakeholders is illustrated in the figure by the “NGI” box. The EGI offer is articulated in a set of integrated services offered by EGI.org at the European level, by the National Grid Initiatives (NGIs) and the RPs at the national level. Resource Provider resources are made available to RTs directly through the relevant RIs, or indirectly through EGI.org and/or the NGIs in accordance with the different scenarios.

EGI.org itself is the channel for centralized services, while the (global) EGI offer is channelled to Research Institutes and Research Teams via the partner NGIs.

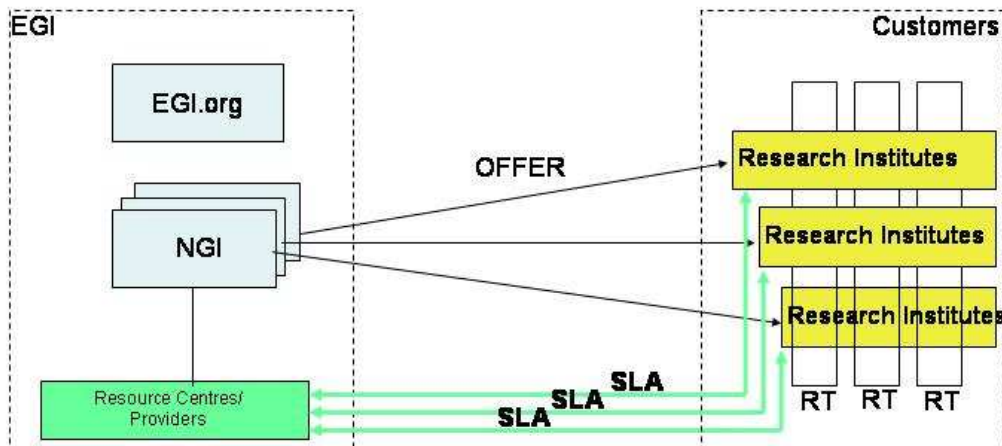
The relationship between EGI and the funding agencies is out of the scope of this deliverable, and is detailed in the EGI Blueprint, while the relationship between the customers and EGI is defined in the following section.

### 3.3 USER-EGI INTERACTIONS

The relationship between users and EGI depends on the type of EGI services considered. While for resource sharing and usage of Grid middleware services every VO is characterized by specific requirements, other types of services concerning user support, application porting and other similar user-oriented services, can be more effectively and efficiently delivered to users by grouping them into discipline clusters. In the former case, a direct VO user-NGI relationship is foreseen, while in the latter, services are provided through Specialized Support Clusters to groups of VOs operating in the same scientific field, as detailed below.

The former type of relationship – linking the users and EGI – is illustrated in Figure 1. In this scenario EGI Grid middleware services and resources are made available to the customers via the NGIs. The procurement of Grid resources for those users that do not own resources in the Grid, can be based on a negotiation between the users themselves (typically the legal entities that represent them such as the Research Institutes) and the Resource Centres/Providers. Alternatively, the NGI can assist an RI in the process of resource brokering, when requested to do so. In this case, the NGI provides the resources and there is a triangle contractual arrangement between the NGI, the RP and the VO. In both cases, a Service Level Agreement between the RI and the RP is established as a result of the negotiation process.

A contract can be established between NGIs with the national RIs, and Service Level Agreements can be negotiated with RPs to ensure that the Grid services from the resource centres are operated according to an adequate production-level standard.



**Figure 1: Relationship between EGI and the users for grid resource procurement**

In the second case, the two main organisational entities in EGI to provide representation and services to the user communities are the **EGI User Forum (UF)** and the **EGI Specialised Support Centres (SSCs)**. The EGI User Forum (UF) is established by the communities themselves and is headed by a **Steering Committee (UFSC)** which interacts directly with EGI.org management and with the EGI Council. The User Coordination Officer (UCO) in EGI.org and the related UCS team are expected to interact with the UF at a central level. Acting as the main managerial body to represent users in EGI, the UF will include representatives from any number of user groups – national, international, thematic, and “functional” (e.g. new and small user communities). The **EGI SSCs** are also established by the user communities.

The SSCs will assist in collecting and transferring requirements and feedback from the user communities to EGI via a **User Technical Support** team covering the day-to-day technical needs in cooperation with the Operations Help-Desk team, and a **Grid Planning** team, which participates in the EGI Middleware Coordination Board; the latter is responsible for more long-term technical planning and may establish other advisory committees to work with the EGI.org Director.

An SSC could also include **Front Desk** services, as described more in detail elsewhere. This option would be particularly recommended for an SSC dedicated to new communities. A detailed description of the User-Community services of EGI is provided in Section 6.1.

### 3.4 MIDDLEWARE CONSORTIA-EGI INTERACTION

The Middleware Consortia, as members of the EGI partner network, hold relationships with various EGI actors.

#### 3.4.0. Relationship with EGI.org

For what concerns EGI.org, the central technical coordination of the development teams will be supported by an EGI.org unit, called **Middleware Unit**, as detailed in Chapter 5. The main objective of this Unit is to ensure the availability of the required middleware services at pan-European level with the assistance of additional technical bodies, including the relevant experts appointed by the Consortia.

In addition to the Middleware Unit, the Middleware Consortia participate to the Middleware Coordination Board (MCB) – as explained in Section 2.3.8.1 of the EGI Blueprint, an EGI body which is responsible of setting technical priorities and making all decisions concerning the maintenance, support and evolution of the middleware deployed on the EGI e-Infrastructure. In addition to the Consortia representatives, the MCB includes members from the NGIs and the related Resource Providers, who are responsible representing the operational requirements of the EGI actors, and from the User Community Services teams, representing the various user communities organised in thematic disciplines.

#### **3.4.1. Relationship with the NGIs**

The Middleware Consortia and the NGIs collaborate through the Middleware Coordination Board, where the NGIs can bring their own middleware requirements to the developers. Other forms of collaboration are currently under discussion, and will be more precisely defined once this general proposal is ready for implementation.

Other forms of direct technical and financial partnership depend on the agreements that the Middleware Consortia and the individual NGIs are willing to establish, and are out of the scope of EGI.

## 4 FUNCTIONS OF EGI: OPERATIONS AND SECURITY

The Operations and Security Function includes those EGI services needed to ensure the functionality of the pan-European infrastructure and the overall seamless effective interoperation of national and regional Grids. At the same time, a common authentication trust domain is required to persistently identify all Grid participants, common security policies need to be defined and enforced. 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 various tasks of this Function need to be structured according to a common operational model that meets various requirements: scalability and interoperability, availability and reliability, sustainability, and autonomy of NGIs.

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. *NGI International Tasks* are those activities aimed at allowing the sharing of the national IT resources at pan-European and international level in a uniform, robust, and seamless way. Depending on the needs of the individual NGIs, the international tasks are integrated by the *NGI national tasks*, which are carried out to satisfy the NGI local requirements.

In this scenario, common standards and/or specifications for interoperation between NGIs play a critical role in order to ensure interworking within EGI. To this end, collaboration from the NGIs is important to jointly define specifications, policies, best practices, and in general, to share operational responsibilities. It is important to note that at the time of writing, the devolution of operational and security activities and responsibilities is already a common approach adopted by the main European Grid infrastructure projects.

Regarding the activities of this Function, the main operational functions of EGI.org are the coordination of NGI activities, the definition of common procedures, policies, specifications and standards for interoperation, and the operation of central data aggregation facilities (for accounting, monitoring, etc.), and the central user-support services. 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.

In what follows the Operations and Security tasks of EGI.org on one side, and of the NGIs on the other, together with the corresponding effort, are presented. Explicit indication is given for those tasks that are deemed *necessary* (as opposed to *optional* services) and for those EGI.org activities to be run under the EGI.org responsibility which may be technically *distributed* to NGIs, as they do not need to be located in the EGI.org site.

Tasks are described in general and abstract terms, however they rely on the current operational and security activities currently adopted by many European Grid infrastructure projects. We assume necessary tasks to be already provided in year one of EGI.

### 4.1 EGI.ORG TASKS

EGI Operations and Security activities belong to five broad categories:

1. operation of tools and services;
2. support;
3. other tasks;

4. security;
5. development.

**Notation:** *EGI.org* and *NGI* tasks are numbered according to the following scheme. Prefix *O-E* identifies operations services provided by *EGI.org*, whereas *O-N* identifies those provided by *NGIs*.

#### 4.1.0. Operation of tools and services

This section describes a set of tasks that are proposed to provide an infrastructure that is simple to use and maintain (User requirement 5, Operational requirement 1) and to provide various tools for distributed accounting, VO management and monitoring (Operational requirement 2).

Purpose of this section is to define international tasks, i.e. those services that need to be provided to those user communities that are pan-European in scope (the international VOs). The services that are necessary for other types of user communities (national VOs, institutional VOs, personal VOs, etc.) can be autonomously provided by individual *NGIs* and are therefore out of the scope of this deliverable.

O-E-1 and O-N-1: Operation of the Grid topology and configuration repositories (*EGI.org* and *NGIs*) – *necessary, can be distributed*

Many aspects of operations rely on the availability of information (as applicable) from *NGIs* about service nodes, contact details, security contacts, certification status, sites in scheduled downtime, etc. The Grid repository provides all such information. Information input is devolved to regions and sites. The current central repository (known as *GOCDDB* in *EGEE*) may need to be adapted to support a two-tier distributed model. This requires the definition and implementation of common interfaces and transport mechanisms to ensure the exchange of information between different Grid domains.

O-E-2 and O-N-2: Operation of accounting repositories for international VOs (*EGI.org* and *NGIs*) – *necessary, can be distributed*

The accounting repository is responsible of keeping records about usage of compute, storage, networking and other types of resources as required by the users, resource providers, *NGIs*, etc. It is the responsibility of a *NGI* to collect accounting data, and to keep a permanent master copy of usage records. Accounting information is needed by international VOs in order to allow VO managers to know about the amount of IT resources “consumed” by the respective users across different domains of the e-Infrastructure. For this reason, the deployment of standard interfaces between accounting systems in different *NGIs*, is important to ensure the interoperable exchange of records between different domains. For each *NGI* *EGI.org* is responsible of gathering and making publicly available accounting information (as applicable and in agreement with local laws and the privacy requirements of the *EGI* actors). The availability of a pan-European accounting infrastructure is a key enabling component of the *EGI* business model.

O-E-3 and O-N-3: Operation of Grid repositories storing monitoring and performance data and other related information (*EGI.org* and *NGIs*) – *necessary, can be distributed*

Availability, status and performance information about Grid services and sites are needed to check the health of the infrastructure and to verify the Quality of Service delivered to VOs and other NGIs. Gathering and 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.) – is consequently important to help the infrastructure to assess its level of service and compare it to the VO requirements. This also requires the operation of repositories and supervision of the processes to populate them, the maintenance of schema for publishing of site and service status information, the ownership of the information schema used, the preparation of reports, etc.

This task includes network performance monitoring for network quality assurance/reporting and metrics follow up, to ensure the underlying network infrastructure is working properly and efficiently, and that network providers are respecting their contractual obligations.

To this extent, EGI.org tasks are the publication of statistics, the maintenance of schema for central publication of site and service status information, the deployment of monitoring-related tools such as the dashboard and the alarm system, and the preparation of performance reports.

O-E-4 and O-N-4: Operation of the Grid Operations Portals (EGI.org and NGIs) – *necessary, can be distributed*

The Grid operations portals provide an entry point for various actors to support their operational needs. Different "views" are necessary according to the role of the customer (Grid operators, VOs, Grid site managers, Region Operations Managers, etc.). The information displayed is retrieved from several distributed sources (databases, Grid information systems, etc.). It provides static information about sites/VOs, and dynamic information about resources/services status and allocation. The central Operations portal is the aggregation point of regional information, which is also accessible via regional operations portals.

O-E-5 and O-N-5 Grid operation and oversight of the e-Infrastructure (EGI.org and NGIs) – *necessary, can be distributed*

EGI.org operation and oversight activities over the include the detection and coordination of the diagnosis of problems affecting the entire EGI e-Infrastructure during the entire lifecycle until resolution, the reporting of middleware issues to the developers, the execution of quality checks of the services provided by NGIs, and the handling of operational problems that can not be solved at the NGI level. This task coordinates the oversight of the NGI e-Infrastructures (run under the responsibility of the NGIs), which – at the NGI level – includes the monitoring of the services operated by sites, the management of tickets and their follow up for problem resolution, 1<sup>st</sup> and 2<sup>nd</sup> line support to operations problems, the suspension of a site when deemed necessary, etc.

This EGI.org task is currently done in EGEE in cooperation with the relevant Regional Operations Centres (via rotating shifts) according to a two-level hierarchical model [3]. We foresee the possibility to evolve this model, in such a way that NGIs can autonomously run oversight activities in the region, or to federate in order to share efforts.

#### 4.1.1. Support

This section describes a set of tasks that are proposed to provide an infrastructure that is simple to use and maintain from the point of view of the *user* and of the *System Administrators* – from the resource centres and NGIs (User requirement 5, Operational requirement 1), and to satisfy the evolving support requirements (User requirement 2). These tasks are:

- *Coordination of support.* Monitoring the use of current support mechanisms, evaluating the quality of the support, and determining if new support mechanisms are needed.
- *User Support.* Providing support for problems that occur while using the grid infrastructure. Providing support on how to use the infrastructure. The technical activities related to this task are carried out in collaboration with the User Community Services Function.
- *System Administrator Support.* Support for installing and configuring grid services. Problem solving support in case of broken functionality of grid middleware services.

Various mechanisms are possible for providing user and system administrator support, such as documentation, the operation of trouble ticketing systems, e-mail, chats and others. For the medium term we assume that central support in EGI will be mainly provided through documentation and tickets. The related administrative tasks are:

- the operation of a central ticketing system and of a document repository;
- the distribution of tickets to appropriate support teams.

O-E-6, O-E-7 and O-N-6, O-N-7: central and regional Grid support, operation of a ticketing system and of a document repository (EGI.org and NGIs) – *necessary, can be distributed*

Support to users and Grid system administrators relies on a central helpdesk, which is a regional support system with central coordination [5]. It gives access to documentation and support, and to a central ticketing system. The central system is interfaced to a variety of other ticketing systems at the NGI level in order to allow a bi-directional exchange of tickets (for example, those opened locally can be passed to the central instance or other areas, while user and operational problem tickets can be open centrally and subsequently routed to the NGI local support infrastructures).

Support to network end-to-end problems in the Grid is also important – especially for applications requiring high-availability – as connectivity is provided by the pan-European network research backbone and by a large number of National Research and Education Networks, each providing links to sites within countries. A Network Operation Centre provides the operational interface between the Grid and the relevant network players to check the end to end connectivity of Grid sites [4].

The NGIs provide 1<sup>st</sup> line local/regional support to users and to Grid operators at resource centres, while EGI.org takes care of the Maintenance and Operation of the central ticketing system (GGUS like) and of the Triage of incoming problems.

- a. Maintenance and Operation (*can be distributed*): run a central ticket handling system for Grid and network end-to-end problems. Support relies on a central helpdesk, which is a regional support system with central coordination [5]. It gives access to documentation and support, and to a trouble ticketing system.

- b. Triage of tickets entering the central support system (also known as ticket processing management in EGEE) – can be *distributed*, consists of the monitoring and routing of all active tickets in the Grid support system by Grid and VO experts, who are responsible of addressing the problems to the appropriate second-line specialized support units. This process combines manual as well as automated procedures.

O-E-8 Gathering of requirements for support tools and process; reporting of requirements for user support (SSCs) and reporting of requirements for system administrator support (NGIs); coordination of support activities – *necessary, can be distributed*

Tools and the process for support are designed to meet the requirements of customers (users and Grid operators) taking input from NGIs, VOs and resource centres. Additional requirements may arise with the evolution of the middleware stacks in use, and with the support of new user communities. EGI.org is responsible of the coordination of this process.

#### 4.1.2. Other tasks

This section describes various tasks that are proposed: to operate the baseline services necessary for sharing of distributed resources (User requirement 1), to provide different resource provisioning mechanisms (User requirement 2), and to ensure a simple and transparent access to resources across Europe (User requirement 4).

O-E-9 Coordination of middleware roll-out and deployment (EGi.org, *necessary, centralized*), middleware pilot and certification testbeds (EGI.org and NGIs, *necessary, can be distributed*)

It is important to ensure that middleware updates move from certification and into production as quickly as possible, while also assuring that the updates are suitable for deployment in the production Grid. EGI.org coordination will be needed for strategy decision, for example to decide significant changes to processes, and to ensure that resource sites are encouraged to upgrade whenever new critical updates of supported middleware stacks are released. Being still in a phase where middleware is subject to frequent bug fixing cycles, prompt alignment of the Grid services and components to the latest releases, contributes to better functionality and availability of the overall infrastructure.

In addition to this, the operation by NGIs of facilities for testing and certification of middleware are important for the deployment of high-quality middleware by allowing VOs and site managers to test Grid components during the early development and release phase.

O-E-10 Coordination of resource allocation and brokering support for VOs from NGIs (EGI.org) – *optional, centralized*

International VOs can specify requirements in terms of resources to be guaranteed by the overall pan-European Grid infrastructure used. In this case, coordination – as required by VOs – contributes to ensure that a suitable production infrastructure (Grid core services and resources offered) is in place, to meet such requirements. Development is still needed to provide tools for the automation of the management and the negotiation of SLAs. EGI.org is responsible of support and coordination of this process.

O-E-11 Coordination of interoperations between NGIs and with other Grids (EGI.org) – *necessary, centralized*

Coordination is needed to foster the creation of a seamless operations model across administrative boundaries, in order to pursue pervasiveness and sustainability of the infrastructure. This is of great importance as users who want to cross Grid boundaries need to know that the environments will be similar, and applications must function properly without major changes. Interoperation covers a number of aspects, such as the availability of common tests for monitoring of site status, the interconnection between helpdesks/ticketing systems, etc. "Other Grids" includes Asia-Pacific regional Grids, OSG, Naregi, and related infrastructure projects.

This role owns the definition of the operational tools interfaces, the procedures and the operational activities allowing the NGIs to interwork. 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. EGI.org is responsible of support and coordination.

O-E-12 Coordination of network support (EGI.org) – *necessary, centralized*

Network operation design, handling of troubles affecting international VOs, and network assessment, allow EGI to keep the state of the network under control, and to establish a link between Grid operations and network operations. A centralized approach is proposed here in order to keep this task in close relationship with the other External Liaison tasks run by EGI.org.

O-E-13 Definition of best practices, operations procedures, operations requirements (EGI.org and NGIs) – *necessary, can be distributed*

Interoperation relies on the definition of best practices and of general operational procedures for daily monitoring activity for sites and federations. EGI.org is responsible of the coordination of these activities.

O-E-14 and O-N-8: Operation of the production Grid core services, catch-all services for international VOs, catch-all VO (EGI.org) – *necessary and distributed*

Grid core services are components of the EGI e-Infrastructure. They are software components that typically run on server machines. With Grid service we refer to a software instance (a Web service in many cases) "that is designed to operate in a Grid environment, and meets the requirements of the Grid(s) in which it participates." [6].

In particular, core Services are those necessary components on which the overall Grid functionality relies in order to operate. Catch-all instances can be required to support small user communities. It is a responsibility of EGI.org to ensure that user communities are properly supported by the NGIs of reference. Examples of Grid core services are: the VO management service (e.g. VOMS), the File catalogue and transfer services (e.g. LFC and FTS), Job management services (e.g. WMS), Information services (e.g. BDII), Security services, etc.

Authentication is also fundamental to get access to resources in the Grid. This is why a catch-all Certification Authority needs to be available to any user community in EGI.

### 4.1.3. Security

The character of the security vulnerabilities and risks presented by Grid infrastructures provides a rationale for coordination among the Grid participants at various levels.

In a European e-infrastructure some central coordination will be required on policies and operational security in order to guarantee secure access to users (User requirement 3). Support and coordination of the work of teams drawn from the NGIs, will be the task of EGI.org

O-E-15 Coordination of security policy development and maintenance – *necessary, centralized*

Security policy development and maintenance are needed to define an agreement on matters such as best practices, security policies, CA policies, etc. A team of security people in NGI's will take care of ensuring the definition and application of standard security policies. EGI.org is responsible of support and coordination.

O-E-16 Coordination of security and incident response - *necessary, centralized*

It is needed to ensure that common policies are followed for coordinated incident response by EGI members from NGIs. EGI.org is responsible of coordination and support.

### 4.1.4. Development

O-E-17 Coordination of development and maintenance of operational tools – *necessary and centralized*

While the tools for accounting are included in the Middleware, other tools are needed to support operations. Examples are: tools for monitoring, dashboards and alarm systems, ticketing systems, portals, etc., and new tools to improve automation.

EGI.org is responsible of coordination of the maintenance of the set of the tools presently used in Europe production Grids and of the upgrades that will be necessary for keeping them in step with the quantitative and qualitative evolution of the Grid. This includes monitoring tools to measure and report on the quality of networks used by Grid project to ensure the underlying network infrastructure is working properly and is efficiently used, and that SLA constraints with network providers are met.

It is foreseen that EGI.org will only take coordination responsibility (necessary task) while a set of willing NGI's will take care of the development work, to be co-funded by the EC.

## 4.2 EGI.ORG EFFORT AND TIMING

Given the detailed description of activities provided above, the following paragraphs summarize the list of activities carried out by EGI.org and NGIs, and indicate the effort needed to support those tasks in the first three years of EGI. For the sake of simplicity, estimations are expressed in Full Time Equivalents.

### Operation of tools and services

- O-E-1. Operation of the Grid topology and configuration repositories. EGI.org FTE: 1
- O-E-2. Operation of accounting repositories for international VOs. EGI.org FTE: 1
- O-E-3. Operation of the grid repositories storing monitoring and performance data, and other related information. EGI.org FTE: 2.5

- O-E-4. Operation of the Grid Operations Portals, EGI.org FTE: 0.5
- O-E-5. Grid operation and oversight of the e-Infrastructure. EGI.org FTE: 1

**Support**

- O-E-6. Maintenance and operation of central ticketing system and document repository: EGI.org FTEs: 2.
- O-E-7. Triage of incoming problems: assignment of tickets to the 2<sup>nd</sup> line support units, ticket escalation end ticket follow-up to ensure they get closed, EGI.org FTEs: 2
- O-E-8. Gathering and reporting of requirements for support tools and process, coordination of support activities: EGI.org FTE: 0.5

**Other tasks**

- O-E-9. Coordination of middleware roll-out and deployment, middleware pilot and certification testbeds. EGI.org FTE: 1
- O-E-10. Coordination of resource allocation and of brokering support for VOs from NGIs, EGI.org FTE: 0.5
- O-E-11. Coordination of interoperations between NGIs and with other Grids. EGI.org FTE: 0.5
- O-E-12. Coordination of network support, EGI.org FTE: 0.5
- O-E-13. Coordination of definition of best practices, operations procedures, operations requirements, FTE: 0.5
- O-E-14. Operation of production Grid core services, catch-all services for international VOs, catch-all CA: EGI.org FTE: 1

**Security**

- O-E-15. Coordination of security policy development and maintenance; EGI.org FTE: 0.5
- O-E-16. Coordination of security and incident response. EGI.org FTE: 1

**Development**

- O-E-17. Coordination of development and maintenance of operational tools. EGI.org FTE: 1

**Table 2: overall effort for EGI.org operations and security critical services**

ACTIVITIES	FTE
Operation of tools and services	6
Support	4.5
Other tasks	4
Security	1.5
Development	1
<b>TOTAL</b>	<b>17</b>

### 4.3 NGI TASKS

The list of tasks in this paragraph is not intentionally comprehensive, as it is meant to only include the *necessary* international tasks of an NGI. Many of the tasks in this section are performed by the NGIs and coordinated by EGI.org. The necessary property of such tasks does not prevent an NGI from devolving the operation of the task itself to a third party, or from choosing the option of purchasing it from EGI.org. Tasks not relevant to the overall EGI operation model, or specific to national VOs, are omitted.

NGIs are free to choose the most suitable supply model. For instance, it can federate with other NGIs to share their joint effort, it can buy a set of services from other NGIs or other partners, or request them to EGI.org. In order to facilitate NGIs, especially during the transition phase, we foresee the possibility for EGI.org to supply catch-all operational services – in addition to the central ones – according to the demand. We believe the number of FTE needed by EGI.org to run catch-all services remains fairly constant with the number of NGIs requesting it.

- O-N-1. Operation of the NGI Grid topology and configuration repository - *necessary*
- O-N-2. Operation of the NGI accounting repository - *necessary*
- O-N-3. Operation of repositories storing monitoring and performance data, and other related information – *necessary*
- O-N-4. Operation of the NGI Operations Portal – *necessary*
- O-N-5. NGI e-Infrastructure oversight (monitoring of status of services operated by sites, opening of tickets and their follow up for problem resolution), 1<sup>st</sup> and 2<sup>nd</sup> line support in case of operational problems, site suspension, reporting to EGI.org in case of middleware problems and general operational issues, etc. – *necessary*
- O-N-6. Operation of the NGI ticketing system, gathering of new requirements for support tools in the region – *necessary*
- O-N-7. Regional helpdesk: support to users and site managers via a local/regional helpdesk and documentation - *necessary*
- O-N-8. Operation of production Grid core services, catch-all services for international VOs, catch-all CA: running the required Grid services provided by the NGI, and services required by international VOs – *optional*; availability of Certification Authority: to distribute X.509 certificates to users and servers in the region - *necessary*
- O-N-9. Operations Coordination at the NGI level - *necessary*
  - a) Security and incident response coordination in the region
  - b) Roll out of middleware updates in the NGI
  - c) Resource allocation in the NGI
  - d) Interoperation with national and regional Grids

## 4.4 NGI EFFORT AND TIMING

The estimation for the NGI total manpower depends of course from the size of the NGI, the service level requirements to be met in the respective region, the level of participation to EGI activities, and from its organizational structure (e.g. an NGI can decide to outsource tasks or take care of extra tasks on behalf of other NGIs or EGI, etc.).

Here tentative estimations are provided for the initial three years of EGI. NGIs are divided among three categories: “small”, “medium” and “large”. Estimations are based on the present EGEE experience, assuming that increasing automation and expertise will at least partly make up for the increase of Application variety and Middleware complexity.

- Small NGI: 2-4 FTE
- Medium NGI: 5-10 FTE
- Large NGI: 14-22 FTE

Note that for countries presently involved in EGEE, we estimate that in the first years of EGI an amount of people similar to the one currently available, will be funded to work on NGI international activities. The amount of FTEs currently involved in operational activities for the EGEE III project alone is 189.9, of which 85.9 are funded by the EC.

We envisage that when all the NGIs that have expressed interest in EGI will have been properly constituted and will have joined EGI, in EGI will comprise 6-7 large NGIs, 12-16 medium NGIs and 16-20 small NGIs. Nevertheless, for the very first year the number of NGIs could be somewhat smaller.

The Operations and security function is supported by manpower effort and additional hardware resources, that are needed (mainly at the NGI level) to host Grid core technical services, operational tools, testbeds and auxiliary IT services (wiki pages, agenda pages, databases, etc.). Based on the current status, it is estimated that for some large EGEE ROCs about 150 servers are needed for these functions. Hardware resources needed for the realization of the NGI e-Infrastructure are funded via national funding sources (i.e. no EC co-funding is requested in this case).

### 4.4.0. Evolution

FTE estimates refer specifically to the overall amount of effort needed during the EGI transition phase (about three years). Efficiency after a few years might reduce the staff requirement for the initial operational model but we expect this to be partially matched by the requirement for new activities to meet the evolving requirements of new communities. As to development, we foresee a reduction in cost in about three or five years when operational tools will likely reach maturity. At this point, still a small fraction of funding will be needed for maintenance of existing tools.

In three years we foresee the possibility to evolve some Operational and security tasks of EGI.org into services, of which some will be necessary and sold as a bundle, while others will be optionally subscribed by the NGI. Depending on the type of service, these will be charged through a per-use or flat rate.

## 5 FUNCTIONS OF EGI: MIDDLEWARE DEVELOPMENT AND SUPPORT

This chapter provides the technical details that complement and complete the Middleware Section (3.2) of the Blueprint document. The concepts expressed in the latter will generally not be repeated here as the reader is assumed to have prior knowledge of the Blueprint.

### 5.1. MIDDLEWARE TASKS AND SERVICES

The overall goal of EGI is to establish a large-scale, production-grid infrastructure for the sharing of IT resources and data, built on national grids that interoperate seamlessly at many levels. EGI will supply reliable services to a wide range of applications, ranging from “mission critical” to prototyping and research. The approach to meet this objective consists in distributing a variety of responsibilities among the various players.

The EGI-specific technical objective, to be achieved in a coordinated effort by the EGI central organisation (EGI.org) and the National Grid Initiatives (NGIs), is to oversee, on behalf of all stakeholders, the procurement, certification, deployment, and operation of software services (i.e. the software infrastructure) and to define the organisational rules, policies and procedures that constitute the required standard access and sharing mechanisms for all sort of IT resources and data which currently are and will continue to be made available to researchers by national resource providers. At present, these providers are predominately public or semi-public resource centres of varying scope and dimensions, which will continue to be 100 percent funded at national level.

The Blueprint calls for the establishment of a Middleware function in EGI and outlines the reasons why it needs to remain in full control of the software infrastructure, which constitutes one of the key services offered to all stakeholders. To avoid the risk of disruption of the current services, used daily by thousands of researchers, the Blueprint recommends the implementation of the Middleware function, at least during the first stage of EGI, with limited manpower in EGI.org, no further immediate mandatory contributions from NGIs and the usual co-funding of the activity aimed at maintaining and supporting the middleware components deployed in the current e-Infrastructures. The providers of such middleware, the Middleware Consortia mentioned below and other development teams, have agreed to move towards a Unified Middleware Distribution (UMD) under EGI coordination.

This chapter provides more details about:

- Middleware components and Middleware Consortia.
- Guidelines for UMD.
- Role of the EGI.org Middleware Unit.
- Components and services proposed for inclusion in UMD in the first stage of EGI.
- Cost estimates for middleware maintenance.

#### 5.1.1 Middleware Components and Middleware Consortia

A variety of middleware components are currently deployed in the EU e-Infrastructures. They are the result of several years of European and international competitive efforts aimed at satisfying the needs of 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. They

all adhere to a general service-oriented approach aimed at complying with the evolving Web services and the Open Grid Forum standards.

A large part of components are provided by three middleware distributions, namely ARC, gLite and UNICORE. Developed predominantly in Europe, all three of them are used in production in the three main EU e-Infrastructures: EGEE, DEISA and NDGF. Each provides a middleware stack suitable to meet the most fundamental needs; however, none of them represents a fully satisfactory solution for all needs. Other middleware platforms are in use in Europe (such as GridWay, pGrade, AssesGrid, GRIA, etc.) which are funded by the European Commission and by national funds; they provide higher-level services designed to complement the basic services provided by the aforementioned three major stacks.

Recent efforts, in particular those undertaken by the OMII Europe project, have already succeeded in improving the interoperability between the three main grid platforms in use in Europe. Building on the successful developments over the last eight years, on the contributions provided mainly by other EU initiatives, as outlined above, and in conjunction with selected components originating from the US-based Globus and VDT, the ARC, gLite and UNICORE stacks provide the bulk of the services in use in the largest general-purpose EU e-Infrastructures (EGEE, DEISA and NDGF), serving thousands of researchers every day.

The ARC, gLite and UNICORE stacks thus constitute the basis for the creation of the open-source Unified Middleware Distribution (UMD) that the future European Grid Initiative (EGI) will make available to national resource providers as a key integral part of its offer and business model. The availability of certified grid services that can be easily downloaded from a common UMD repository, together with a set of common procedures, policies and rules to be established by the EGI, will enable research teams to easily access and share computational resources and data, supplied by their national resource centres and funded at national level.

The EGI Middleware function is designed to ensure the current level of quality of the deployed services in the transition period and during the initial years of consolidation of the new EGI organisation.

To fully satisfy the operational quality requirements, it is essential that, during the transition towards the new sustainable European organisation embodied by EGI, the middleware currently represented by these stacks and other identified services continues to be supported, maintained and further developed, particularly in view of emerging standards and, in some parts, completed and hardened from its current stage. The requirements will be established by the Middleware Coordination Board to include representatives of VOs, operations and middleware development teams; this represents a logical development of current best practices in EGEE, DEISA and other national experiences.

The maintenance, development and evolution towards standards for these three EU stacks and related middleware projects are currently co-funded by national institutions or consortia and by the EC via competitive bids.

#### **5.1.1.1 ARC**

The Advanced Resource Connector (ARC) has been developed by the NorduGrid collaboration [9] and associated projects since 2001. Its decentralised architecture entails high efficiency, low maintenance costs and robust performance. It is highly portable and is available for all major Linux flavours. This, in turn, allows a decentralised deployment of ARC in more than 60 sites, with over 30,000 cores. In particular, ARC is adopted by the NDGF (Nordic DataGrid Facility) to support the world's only

distributed heterogeneous Tier1 centre. The next generation of ARC is currently under development; it sets out to minimise dependencies on third-party components, to improve extensibility, interoperability and to allow portability to non-Linux platforms.

The NorduGrid consortium was established in 2001 by five nordic academic institutions and is based upon a Memorandum of Understanding (MoU) which is not legally binding. The MoU establishes the Steering Committee and the Chairperson and defines their duties. The consortium has no termination date and has no collectively owned resources. NorduGrid currently conducts consultations towards establishing an international “ARC consortium” designed to become a legal entity prior to the EGI start. NorduGrid thus guarantees middleware support, maintenance and further development of ARC beyond the scope of the current project.

#### **5.1.1.2 gLite**

The gLite middleware is the result of a truly pan-European development effort undertaken by the EDG-EGEE project series which started in 2001 and is co-funded by the EC via competitive bids. The services offered by gLite provide the backbone of the EGEE infrastructure, the largest multi-disciplinary grid infrastructure in the world, bringing together more than 140 institutions to produce a reliable and scalable computing resource-pool available to the European and global research communities. At present, it consists of approximately 300 sites in 50 countries and gives its 10,000 users around-the-clock access to 80,000 CPU cores (largely commodity clusters with some HPC systems) and to very large (> 15 PB) distributed storage systems, processing up to 300,000 jobs per day from scientific domains ranging from biomedicine to fusion science. The gLite middleware consists of an integrated set of components, compliant with open standards and covering all aspects of the grid infrastructure. Originally developed for the scientific Linux environment, extensive efforts are now underway to make it more widely available on other platforms. The development of gLite is managed in many of its phases with the tools provided by ETICS (e-Infrastructure for Testing, Integration and Configuration of Software), an EC-funded project.

The gLite community is actively pursuing the constitution of the gLite Open Consortium to maintain and evolve the gLite middleware beyond the EGEE series of projects and thus to provide a long-term sustainable roadmap for the gLite software to meet the needs of its diverse user community. The Consortium will be established as a not-for-profit entity and will be open not only to the institutions currently providing components but also to any other partner willing to contribute to the Consortium’s objectives. The organisational model for the software development and related activities will be based on teams fully responsible for the individual middleware components; the coordination among the teams will rest with a Technical Coordination Board led by a Technical Coordinator.

#### **5.1.1.3 UNICORE**

The UNICORE middleware [10] has a traditional HPC background (for 10 years). It is used in HPC-related infrastructures, like DEISA, (serving a similar amount of CPUs as in EGEE, but concentrated on a few powerful supercomputers) and in the future PRACE (European PetaFlop/s Supercomputers), but is also implemented in non-HPC-focused NGIs, such as D-Grid and some Swiss SwiNG projects. UNICORE is characterized by its open, extensible, lean, and interoperable Web services architecture which supports many open standards, providing seamless, secure and intuitive access to grid resources. Emphasis is on workflow capabilities, security, application support and ease of installation and

configuration. Since 2004, the UNICORE middleware has been open source under a BSD license and publicly available at SourceForge [11]. It is developed by the open source developer community of UNICORE with a set of core partners who provide major elements of the software and are responsible for the development of the core components as well as for the release management. Institutions that have a long-term interest in the UNICORE grid technology have joined the “UNICORE Forum e.V.” [12] established in 1999; its legal status is a registered, open, non-profit association pursuant to German law. Its objective is to promote the development and distribution of UNICORE beyond the scope and duration of EU- or nationally funded projects. The UNICORE Forum e.V. currently has 32 members comprising research institutions as well as commercial organizations. The Technical Advisory Board of the UNICORE Forum e.V. is tasked with devising the roadmap and strategy of the future UNICORE development. It evaluates technical proposals, discusses technical solutions to be implemented in UNICORE and, thus drives and monitors the open source development process of UNICORE.

### 5.1.2 Guidelines for the Unified Middleware Distribution (UMD)

The Consortia mentioned in the previous section have agreed that the middleware components, tools and services they currently support have to evolve into a Unified Middleware Distribution (UMD). UMD will contain components which will satisfy the needs of the user communities and of the resource providers and conform to quality criteria defined by the EGI.org Middleware Unit and endorsed by the Middleware Coordination Board.

The criteria that will determine which components will be included in UMD comprise:

- **Interoperability:** services included in a UMD release should be fully interoperable with all other UMD implementations adopted in the EGI grid infrastructure. Where applicable, interoperability will be achieved through the adoption of established standards.
- **Completeness:** the set of available components and tools included in UMD, once adopted by an NGI, should allow the national infrastructure to be operated in a fully self-functional and autonomous way and should, at the same time, be completely integrated with the rest of the pan-European EGI infrastructure. At the same time the grid services included in UMD should address the needs of all current VOs.  
Moreover a process should be put in place to allow UMD to evolve, either through changes to existing components or through the inclusion of new components, according to new needs coming either from old and new scientific communities or from the operations.
- **Scalability:** available services should allow the management of resources and services in an e-Infrastructure that is to cater for scientific user communities ranging in size from a few individuals to thousands of researchers. Different service implementations should be included to take into account both the need of simplicity for small user communities and scalability for the larger ones. In addition, the services should be able to cope with the anticipated growth in scale (in terms of users, services and sites operated) over a short time period.
- **Deployability:** the installation and configuration of UMD components should conform to the standard installation and configuration norms for the supported systems, minimizing manual intervention.
- **Extensibility:** UMD must provide interfaces (and “hooks”) to allow independent development

(by any interested party) of higher-level and additional services that will create a software pool from which further UMD innovation will be drawn. Gateways to other EU and non-EU (e.g. Globus) grid systems and components will be one example of services built on the extensibility interfaces.

Given the wide variety of needs, it is acceptable that different implementations of the same service or of the same interface are available at the same time in UMD, provided they are actually requested and compliant with the UMD criteria. However, wherever possible, a progressive specialisation of the different services, preserving the service interface, will be pursued to avoid unnecessary duplication of effort.

### 5.1.3 Role of the EGI.org Middleware Unit

The environment, in which EU middleware development currently takes place, consists of distributed multiple teams of experts specialised in one or more services and typically organised around the three Middleware Consortia, alongside additional teams with complementary expertise belonging to other EU and international initiatives.

In order to leverage the existing clusters of competence, it is advisable to maintain this decentralised model based on autonomous teams while introducing with EGI an effective pan-European technical and financial coordination. Decentralisation will also allow the introduction of other development teams, eventually including teams who develop components on a commercial basis.

The central technical coordination of the development teams will be supported by an EGI.org unit, called Middleware Unit (MU) and led by the Chief Technical Officer (CTO). The main objective of the MU is to ensure the availability of the required middleware services at pan-European level with the assistance of additional technical bodies, including the relevant experts appointed by the Consortia. The exact scope and function of these bodies, established in agreements with the MCB, will be more precisely defined once this general proposal is ready for implementation.

EGI.org and its technical bodies should be the single place in Europe where the requirements concerning the middleware for EGI will be planned and coordinated, in particular with respect to:

- Common baseline architecture.
- Full interoperability of existing services through standardisation.
- Validation and testing of the released services included in UMD.
- Increasing complementarity and specialisation of the included services.
- Adoption of application and operations requirements.
- Convergence and interoperability through the implementation of standard interfaces with Globus and other non-EU stacks.
- Definition of additional interfaces to allow independent development of higher level services.

It needs to be assured that the UMD software components are easily installed and configured. The goal of UMD is to make it as easy as possible for the NGI national resource providers to deploy, maintain and use the grid services that need to guarantee to the VOs teams a uniform access to their resources.

Another important objective for the EGI.org MU is to provide the necessary testing and certification of

the services included in UMD to ensure seamless operation and interoperation of all the components included in UMD. This will also include provision of test suites for quality assurance and standard compliance validation of new or modified existing services. To ensure these functions in an efficient and effective way the MU is likely to rely on appropriate tools for software configuration, implementation and testing; the MU will have to make these tools available also to the middleware providers.

In addition, the MU will establish effective collaborations on an equal footing with players from outside Europe to promote the inclusion of extra-European services (like Condor and Globus) to be compliant with the same set of EGI rules.

The tasks under the responsibility of the EGI.org Middleware Unit are summarized in the table below which has been taken from the EGI Blueprint.

The overall software process that will drive the management of UMD, the maintenance and further evolution of the components that will be part of it is under discussion and is tracked at [7].

**Table 3: EGI Middleware tasks and related effort**

Middleware Tasks in EGI.org	FTE
Maintain and document processes and quality criteria common to all 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 targeted 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 in standardisation bodies.	1
<b>Sum of Resources in EGI.org Middleware Unit</b>	<b>8</b>

### 5.1.4 Components and Services proposed for inclusion in UMD in the first stage of EGI

The main components developed by ARC, gLite and UNICORE are summarized in the following table, that replaces a similar one provided by the OMII Europe project [8] and that was included in Deliverable D3.1. The information contained in the table is extracted from an on-going detailed survey, available still in draft form at [7].

Although ARC, gLite and UNICORE are the main Grid middleware providers in Europe, they are not the only ones. Other components exist (e.g. SGAS for accounting and dCache as another SRM implementation) that are widely used on the current production e-Infrastructures and are even integrated in those three main distributions.

**Table 4: Middleware components**

Middleware Functionality	ARC	gLite	UNICORE
<b>Computing</b>	Grid Manager A-REX libarcclient ng* job management CLI arc* job management CLI	WMS (service and client CLI/APIs) LB (service and client CLI/API) CREAM (service and client CLI/API) LCG-CE BLAH	TSI XNJS UAS-Compute OGSA-BES adoption Workflow Engine Service Orchestrator Rich Client Command Line Client HILA
<b>Data</b>	Classic SE libarcdata2 ng* data management CLI arc* data management CLI Chelonia (+ client)	DPM (service and client) StoRM FTS (service and client) lcg_utils htcp SRM client LFC (service and client) DPM/DICOM interface Hydra AMGA (service and client)	UAS-Data

Middleware Functionality	ARC	gLite	UNICORE
		API)	
<b>Information</b>	Classic Inforserver Classic Infoindex ALIS ISIS Libarcclient (infosys modules) Grid Monitor	BDII lcg-info lcg-infosites Service Discovery API	CIS Service Registry
<b>Accounting</b>	JURA	Accounting Service APEL DGAS	
<b>Security</b>	HED Security API Shibbridge arcproxy Charon AuthZ Service Proxy Store Fruitfly Credential Service	VOMS (service and client CLI/API) VOMS-Admin AuthZ Service SLCS (service and client) VASH STS SCAS LCAS LCMAPS gLExec Delegation Service Trustmanager Gridsite CGSI_gSoap	Gateway XUADB XACML Entity UVOS
<b>Other</b>	HED		

### 5.1.5 Cost Estimates for Middleware maintenance

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 70 FTE. The estimation includes all 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. The table below classifies the estimate of 70 FTE.

As for the list of components mentioned in Section 5.1.4 , also the estimated effort is subject to review by the corresponding providers and will be available in the same survey document.

**Table 5: Overview of effort for middleware maintenance and support**

Middleware Functionality	ARC	gLite	UNICORE	Total
<b>Computing</b>	6	11	6.6	
<b>Data</b>	4.5	11	1.7	
<b>Security</b>	2.5	10	1.6	
<b>Information</b>	5	3	1.1	
<b>Accounting</b>	1	3		
<b>Other</b>	2			
<b>Total</b>	21	38	11	70

## 5.2 OUTLINE OF TIME EVOLUTION

The description of the Middleware Function in EGI provided in this chapter and in the Blueprint refers to the first few years following the establishment of EGI. In the longer run, the middleware components should evolve into services that may be charged to customers and for which the maintenance and support may be more easily outsourced also to commercial partners.

## 6 FUNCTIONS OF EGI: USER COMMUNITY SERVICES

This section discusses the proposed organisation of the User Community Services. The first draft of these functions was referred to in D3.1 as “Application Support and Training” or “Extended Support Services”. Following several rounds of feedback from the NGIs and from representatives of the user communities, and considering the intuitive purpose of these functions, the descriptions have been modified in parts and thus the entire section has been renamed **User Community Services (UCS)**.

These services include activities such as:

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 across various disciplines [13].
4. Establishing technical **collaborations with the large European research infrastructure projects** (e.g. ESFRI) in support of customers of the European organisations.
5. Providing “umbrella” **services for collaborating projects** to streamline information management tasks and ensure some 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”, enabling people to search for similar applications and contact the authors for guidance.
7. Organising European events such as **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. [14].
9. Ensuring that user communities and grid administrators are provided with high quality **documentation** and **training services** [15].

The above activities are to be carried out mainly by the NGIs in the context of a structured network of User Community Services, under the coordination by a small team within EGI.org. Activities such as providing support to porting activities and training of users and administrators are typically delivered through NGIs, either on national level or via specific agreements with other NGIs in the context of the planned Specialised Support Centre (see below)..

For shortness’ sake, most of the corresponding content in D3.1 is not repeated here; where relevant (e.g. on topics such as science gateways or a possible front desk acquisition process) the reader is referred to the relevant parts of the EGI Knowledge Base at [16].

## 6.1 THE EGI USER FORUM AND SPECIALISED SUPPORT CENTRES

The two main organisational entities in EGI which provide representation and services to the user communities are the **EGI User Forum (UF)** and the **EGI Specialised Support Centres (SSCs)**.

### 6.1.1 EGI User Forum

The EGI User Forum was introduced in the final EGI Blueprint in response to requests by several NGIs and representatives from the user communities.

The EGI UF is established by the communities themselves; it is a body that provides representation to **all** user communities, and is not expected to have special restrictions on its composition. It is assumed that UCS representatives from the NGIs – whether or not they are organised as SSCs – will participate in the User Forum.

The EGI UF will establish a **Steering Committee (UFSC)** which interacts directly with EGI.org management and with the EGI Council via a **Chairperson**, who is a permanent representative in the Council.

The User Coordination Officer (UCO) in EGI.org and the related UCS team are expected to interact with the UF at a central level.

### 6.1.2 EGI Specialised Support Centres

The **EGI SSCs** are also established by the user communities, as any support centre. However, **in the context of EGI, an SSC is defined as a centre (or cluster of activities) that has a formal relationship with EGI**. The characteristics of this relationship are to be determined in the proposal phase of EGI; some initial suggestions are provided here to assist in the preparation of relevant proposals.

The SSCs will assist in collecting and transferring requirements and feedback from the user communities to EGI via a **User Technical Support** team covering the day-to-day technical needs in cooperation with the Operations Help-Desk team, and a **Grid Planning** team, which participates in the EGI Middleware Coordination Board; the latter is responsible for more long-term technical planning and may establish other advisory committees to work with the EGI.org Director.

An SSC could also include **Front Desk** services, as described more in detail elsewhere. This option would be particularly recommended for an SSC dedicated to new communities. In addition, SSCs, as well as NGIs in executing their international tasks, will collaborate in several other interdisciplinary UC Services, including contributing to the **EGI Application Database**, the **External and UMD Candidate Software Review** (similar to EGEE RESPECT), the creation and maintenance of wikis, repositories, gateways, etc.

These tasks are considered proper EGI UCS tasks; the SSCs will be typically supported by EGI in executing them. However, SSCs will also be able to leverage support from their communities and collaborations from other relevant projects.

An SSC is expected to have European scope and visibility. In some instances, the SSCs will take over some functions from the existing EGEE strategic discipline clusters connected to specific international communities and could be highly structured themselves. While these centres are not required to

structure themselves by a set template, it is assumed that some elements should be in place to facilitate communications related to EGI policy issues, such as participation in the User Forum Steering Committee, and the usage of the general technical services outlined elsewhere.

The core support for the SSCs is provided by NGIs who wish to – or have the resources to allocate to the SSCs via their International Tasks. **In the task descriptions below, all tasks are classified as NGI International tasks, including those designed for the SSCs.**

### 6.1.2.1 SSC Guidelines

The set of guidelines described in this sub-section is an initial proposal aimed to provide some structure with respect to the UCS layer in an SSC. It is assumed that an SSC is governed by its user community. The guidelines below only refer to those aspects of an SSC which are relevant to its relationship with EGI.

#### Establishment of an SSC

During the proposal phase, the EGI partners (NGIs and experts) will make specific proposals for initial SSCs and establish the User Forum and its Steering Committee.

Once EGI is established, the EGI Council will be responsible for evaluating proposals for new SSCs in consultation with the UFSC. Details and formalities regarding this process are outside the scope of this document.

#### General Rights and Responsibilities

**The SSCs are assumed to have a European-level existence.** An SSC must have a cohesive community behind it that is able to take ownership of the SSC and to drive its evolution.

Most SSCs will be created around scientific domains. However, an SSC may also be created to meet specific “functional” requirements (e.g. a Training SSC, or an SSC for new and small communities).

The SSC will have representation in the EGI Council, Middleware, Middleware Coordination Board group, and other appropriate bodies. SSCs are expected to feed their technical and non-technical requirements into EGI. The SSCs will also be able to interact with each other via the UFSC and other channels.

SSCs are expected to be “good citizens” of EGI and to follow the defined EGI policies (both security and operational policies).

The SSCs are expected to be (relatively) stable entities. The UCS layer in an SSC may be “re-adjusted” to meet the requirements of the user communities being served, and where an adjustment in personnel is requested, this will be negotiated with the UFSC and EGI Council. However, the SSC itself will evolve independently from this layer.

EGI may provide resources to the SSCs, in particular to support the central **UCS layer** of services (mainly manpower). EGI will also have a mechanism to provide seed resources for new communities, as discussed elsewhere.

SSCs will have access to resources. This includes mechanisms for making their own resources available and potentially (priority) access to centralised services, for example, help desks, central grid services, etc. This includes access to “community services” that are made available to the entire EGI user

community such as operations support, middleware support, etc. SSCs will also have access to training and documentation.

SSCs will report facts and figures about their use of EGI in order to help EGI (and its funding agencies) understand the scope of the work accomplished with EGI.

SSCs are expected to operate transparently, allowing a clear view of SSCs activities and making the list of provided services available to the entire EGI community.

**Typical UCS Personnel in an SSC**

An SSC will have a high-level **User Forum Representative** who can nominate a deputy. For large SSCs, this individual is by default a member of the EGI UFSC.

An SSC will have a **Grid Planning Officer** who participates in EGI MCB meetings.

An SSC will have personnel for **User Technical Support** and similar tasks.

An SSC will have personnel for assisting with dissemination efforts and (web) content management.

An SSC might have a **Gateway Officer** to coordinate the development and maintenance of its Science Gateway.

Various user communities have already been approached, and several are producing hypotheses on specific SSCs.

	SSC	Central coord	Central body
User Forum		U-E-1, 2,3	UFSC
Grid Planning		U-E-2,4	MCB
User Tech Support		U-E-5, O-E-4,14	distributed
Hi-level tools / Gateways		U-E-2.6	
Document / Training		U-E-7.8	SSC?
Front Desk		U-E-2.9	SSC?

**Figure 2: Overview of activities performed by a possible SSC**

In Figure 2, the international UCS activities are classified along 6 broad categories. The tasks within these categories are described later. It should be noted here that the central bodies indicated above do not necessarily exhaust the range of activities in their respective categories.

The category “High Level Tools” is very heterogeneous, therefore it is not clear if a central body should exist and what form it should take; it is recommended that the communities consider this issue themselves.

The classes of activities which are expected to be covered by NGI international tasks outside of SSC effort are:

- User Forum
- User Tech Support
- Some high-level tools (e.g. Application database)
- Training liaison
- Front Desk liaison

National training and front desk activities are not considered here, but are expected to exist at the national level.

## 6.2 USER COMMUNITY SERVICES: TASKS

It is estimated that the NGI international tasks classified as User Community Services should be roughly 110 FTEs, including all UCS effort in the SSCs.

At this stage, it is assumed that the international NGI tasks will require the kind of effort described below. It should be kept in mind that the indicated ranges of manpower are necessarily broad to accommodate the heterogeneity of the communities’ needs for these services. For instance, one may assume that in the short term there will be two very large SSCs (for Life Sciences and Earth Sciences) which may require 9 to 15 FTE (the latter also including activities with several collaborating projects) – hence the upper bound of the estimated effort for SSCs. Thus the global estimated ranges for manpower presuppose a rough division into “small”, “medium” and “large” SSCs, as was done with other NGI international tasks.

Please note that the NGI national tasks are not included here; this is a departure from the global estimates at the end of Chapter 8 of D3.1, where an estimation was attempted for some common national tasks.

Again, the broad UCS categories used here are:

1. Representation and Networking
2. Grid Planning and MCB
3. User Technical Support
4. Informational and High Level Tools
5. Documentation and Training Coordination

6. Front Desk
7. Other

**Notation:** Each task is numbered according to the following criterion: prefix U-E indicates a UCS task performed by EGI.org; prefix U-N denotes an NGI international task. For each U-N task there is an SSC paragraph indicating to what extent the task is expected to be part of SSC effort.

### 6.2.1 Representation and Networking

#### U-N-1 and U-E-1. EGI User Forum Representation

As mentioned above, the User Forum is composed of high-level representatives for all the EGI user communities. The UF Steering Committee interacts with other members to provide full representation at the EGI.org management level, both as an advisory body, and in the EGI Council, via the participation of the UFSC Chair.

Each SSC is assumed to have a UF representative, plus often a deputy. These can be part-time assignments, but there need to be named personnel for this task. NGIs should also take the responsibility of designating liaison points or UF representatives for communities which may not be covered by SSCs.

In EGI.org, the User Coordination Officer and the User Forum support personnel will provide central coordination and liaison for the UF activities.

#### U-N-2 and U-E-2. General Coordination

Coordination of all activities that concern a given user community. This includes common problems with the middleware, development of high-level services, political issues concerning SSC, funding, etc.

The coordinators, in collaboration with their UF representatives, will interact “externally” with the EGI Council, EGI.org administration, middleware coordinators, and (other) SSC coordinators. They must also provide information about the activities within their community or SSC to external parties and disseminate information from the external parties within their user community.

U-N-1 and U-N-2 may or may not be distinct roles, depending on the complexity of a particular user community. The main coordinator or UF representative is likely to be a researcher for scientific SSCs, as technical competence in the field is usually necessary to understand how grid technologies can facilitate scientific research.

#### U-N-3 and U-E-2. Feedback

The process of gathering, evaluating and representing user needs is one of the primary purposes of the UFSC, via the User Forum itself, the Grid Planning teams and other advisory bodies to be determined.

#### U-N-4, U-E-1, U-E-3, and EGI.org PR team. User Conference and other Events

There will be a large annual User Conference for all users of the EGI grid infrastructure.

This involves several parties, e.g.: the UF and its Steering Committee, who designate a program committee; relevant dissemination officers from SSCs and the NGIs – and of course the hosting NGI – who designate an organising committee; and the central EGI.org personnel that supports and coordinates the work of the involved parties.

Relevant SSCs and dissemination teams are also involved in the planning and organising of other, more specific events.

#### U-N-5, U-E-2, and EGI.org PR team. Public Relations

Dissemination of grid activities/technologies within a particular (scientific) community. Make dissemination efforts and their results available to EGI. This typically happens through direct interactions between scientists and via the domain's conferences. Additionally, EGI should sponsor/organise meetings for specific scientific disciplines.

Direct interaction between SSCs and their user communities. Interaction with EGI to obtain funding for grid-focused meetings. Funds for organising meetings can be drawn from various sources; an SSC can also choose to “convert” its budget, currently expressed in FTE, into monetary funds. Logistical support for those meetings.

Most efficient dissemination relies on word-of-mouth promotion within a certain scientific discipline. Probably also needs general dissemination for general public or for new communities.

It is not yet clear whether the SSCs themselves will have dissemination personnel, or whether there might be a “functional” SSC for dissemination. In large SSCs there may be some extra assistance in the form of a Dissemination officer. It is auspicious that the central EGI.org dissemination team is given a certain degree of “central” assistance – perhaps on a rotating basis – by dissemination experts in the NGIs, for a total of 1 or 2 FTE

In addition, each NGI is expected to provide some collaboration on dissemination activities as an international task.

## 6.2.2 Grid Planning and MCB

### U-N-6 and U-E-4. Development of Services

The EGI ecosystem expects the development efforts for high-level grid services and APIs (both generic and highly customised) in support of its user communities to continue. Within the EGI project there is a structured set of services for collecting and evaluating user requirements and transmitting them to development teams, for instance through the MCB and the RESPECT process, as well as via teams which assist with application porting.

In the EGI blueprint there is no budgeted effort for actual development in the EGI project. SSCs are therefore expected to take on this responsibility, which should be properly acknowledged at the level of the EGI Council and the funding agencies.

SSCs will have access to appropriate documentation and support for interfacing new services to the core grid services; in turn, they should provide the relevant software to their user communities. If the services are generic, dissemination (and support) of services should also be offered to other communities.

At the EGI.org level, the SSC coordination team will oversee these activities to prevent duplications and to encourage sharing, in collaboration with the Grid Planning Coordinator.

Global effort for actual development is consequently 0; however, each SSC should have a dedicated Grid Planning Officer to oversee the processes mentioned above, to participate in MCB meetings etc.

### U-N-7 and U-E-4. Coordination of the Grid Planning activities within different SSC's

Much of the technical coordination between different disciplines currently takes place within the NA4 Steering Committee or through TMB working groups with strong NA4 participation. To avoid duplication and ensure a coherent evolution, this technical coordination must continue in the EGI era.

Expect to be able to raise issues with the infrastructure and to influence the priority for resolving them. Expect that EGI.org will provide the coordination/tracking of raised issues. SSC coordinators should develop a consensus within their communities regarding issues and their priority. Provide funds for sponsoring these meetings and for inviting strategic stakeholders to attend.

### U-N-8 and U-E-4. Technical Feedback

Providing feedback to EGI with respect to the middleware requirements, the utility of the services, operational problems, and administrative processes. SSCs will interact with their user communities and then provide collected information / experiences with the relevant coordinator in EGI.org.

This is part of the Grid Planning activities in collaboration with members of the User Forum. Each large SSC will have a UF Representative who is a member of the User Forum Steering Committee. 8 FTE are estimated for these.

### 6.2.3 User Technical Support

#### U-N-9 and U-E-5. VO Registration and VO Database

EGI will have a central VO database with an interface for VO registration. These tools are part of the Operations portals described under Operations tasks O-E-4 / O-N-4, and under the responsibility of EGI.org Operations and U-E-5.

This service comprises such tasks as running the VO registration process, including providing support to VO managers and validating provided information; interface with VO managers for registration, with developers of other services regarding extent, format and access to registration information, and with operations to ensure comprehensive configuration information is provided. VO registration is performed in collaboration with Front Desk personnel.

#### U-N-10 and U-E-5. Site Validation Tests

EGI will also ensure maintenance of a battery of reusable site validation tests in support of VO managers and VO members, and interfacing with Operations and Middleware personnel to assist VOs in using these tests. This service presupposes that the SAM infrastructure (or equivalent) will be available in EGI. It is also assumed that some mechanism (CVS, SVN, etc.) for versioning and maintaining code for the tests will be in place.

The creation, maintenance and availability of these tests will be ensured by a small central team consisting of Operations and UCS personnel.

The actual running of tests is the responsibility of the VOs, with some assistance in the UCS layer of the SSCs. Many actors do a certain degree of testing, but it is the SSCs to be responsible for detailed testing in close collaboration with middleware providers. It is expected that an SSC may have some dedicated effort for this task.

In EGI.org the central service is the responsibility of the Operations team and the UCS task U-E-5.

#### U-N-11 and U-E-5. Core VO Service Provision

These services (VOMS, LFC, etc.) are already described in Operations O-E-14 and O-N-8. Their provision for all VOs running on the grid infrastructure should be guaranteed by EGI.org, but is likely to be actually run by various NGIs. The UCS: Technical Coordinator A will be responsible for working with the Operations counterpart within EGI.org to handle requests for the deployment of core services.

The NGIs must provide part of their international effort to sustain this task, which must be guaranteed by the Operations teams.

#### U-N-12 and U-E-5. Help Desk and Direct User Support

The description of the Grid User Support and ticketing system is given in Operations tasks O-E-6, O-E-7, and O-N-6, O-N-7. These activities require a UCS element to interface directly with users of the grid infrastructure on issues of documentation and utilisation of the grid. It is expected that the NGIs will provide this kind of service, in collaboration with their Operations counterparts.

It is also expected that large SSCs will have a User Technical Support unit which should include some (part-time) effort on the UCS side, providing help desk support focused on using community-specific software, services, data sources, etc. These activities would in any case use the common ticketing system to interact with users and other supporters.

This task is in part the responsibility of U-E-5, supplemented if needed by the personnel involved in SSC coordination.

#### 6.2.4 Informational and High Level Tools

This activity is also involved with front desk activities, VO registration, and ensuring that informational tools are integrated with the Science Gateways. In addition, the task may include responsibility for designing and maintaining these gateways, in which case the relevant SSC must seek personnel with specific competences for the scientific field in question.

#### U-N-13 and U-E-6. Case Studies

Providing written case studies of applications that have been successfully ported to the grid infrastructure. These serve as guidelines for future (similar) applications. Collaboration with application developers to port their applications to the grid to obtain case study material. Expect these studies to be made available through the EGI. The written case studies are a way to document application porting techniques and to provide a guide for future applications. Expect this to be done for each application receiving “consulting”; therefore this task interacts closely with the Front Desk teams.

This is the responsibility of the SSCs and the NGIs. At a central level, a depository or wiki should be provided, under the responsibility of U-E-6.

#### U-N-14 and U-E-6. Application Database

A central database containing information about the applications running on the grid infrastructure. Serves as dissemination tool and as support resource. This should be the responsibility of EGI.org, centrally coordinated by U-E-6, possibly with some assistance by a dedicated person sought among the NGIs international tasks.

Expect end users and funding agencies to access the database, and contributions from the user community to provide information. The central team should interact with various user communities to understand what information is relevant and how to make database user-friendly and intuitive.

Any effort to populate the database is considered NGI international effort. In addition, it is hoped that there will be “external” effort from collaborating projects, in particular projects aimed at new communities.

#### U-N-15 and U-E-6. Science Gateways / Portals

For any structured scientific community, the grid is useful insofar as it provides added value to the work of that community – i.e. if the work is carried out in a manner that is easier, faster, cheaper, etc. This entails intuitive and user-friendly specific tools available to **a particular user community**. The one-size-fits-all model is not appropriate for end users who need to use their particular applications, have their particular language, and are accustomed to particular kinds of interfaces.

Hence the idea of Science Gateways, which supply these specialised services to specific communities and are built by (or in consultation with) individuals who are familiar with a specific user community.

In D3.1 an initial description of the purpose and organisation of science gateways was provided; more information can be found at [13]. It is strongly recommended that the SSCs – in collaboration with other EGI actors – design, build, and then maintain these tools for the benefit of their communities. These gateways can be initially simple, and evolve from currently existing portals, or they can be very sophisticated. It is in any case recommended that there be named specialised personnel (e.g. individuals with strong experience in content management and decision-making capabilities) in charge of the content and structure of these sites.

The creation of a gateway may initially take more effort than its subsequent maintenance; this effort, however, should never be 0. It is expected that there will also be assistance by other activities in maintaining the services accessed through these gateways and various administrative tools.

### 6.2.5 Documentation and Training Coordination

As mentioned in the previous task, a dedicated Documentation and Training SSC might be proposed; thus the global UCS effort expected for this task may vary from current assumptions, which for the time being are that this entity is not in place.

Following is a brief overview of the task. For a more detailed discussion see [15].

#### U-N-16 and U-E-7. Documentation

Systematic review of documentation produced by entities within the project. Organisation (indexing) of the available documents along with some information about their quality and whether they are up-to-date.

Additionally, high-level documentation that treats the grid infrastructure as a coherent system must be produced and maintained. As this type of documentation is above any particular service, middleware developers cannot really be asked to provide it. Instead, EGI – either as

part of the NGI international tasks or by means of a dedicated SSC - must employ technical writers to create this documentation and to keep it up-to-date. Support for multiple middleware stacks will complicate this task and is likely to require dedicated manpower for each of the supported stacks.

In EGI.org, the Documentation Review Coordinator (U-E-7) is responsible for all these activities, with the assistance of the Middleware Coordinator.

#### U-N-17 and U-E-8. Training Coordination

Related to the high-level documentation is the creation of training courses targeted to 1) new users, 2) application developers, and 3) system administrators. Training is required by operations centres for system operators, by application developers who are developing programs to use the system and by users to allow them to access the services. Training is also required for trainers and educators regionally to assist them in disseminating experience of changes in the system which they are expected to subsequently pass on to their communities (local and in different user communities / VOs).

In EGI.org, the Training Coordinator (U-E-8) is responsible for all these activities, with the assistance of selected specialists from a possible Training SSC and the Middleware Coordinator.

In addition, larger SSCs may have effort dedicated to creating documentation specific to their user communities. This does not include documentation for applications, which is outside the remit of the EGI project.

National efforts in this area are not considered here, but are assumed to be present.

#### 6.2.6 Front Desk / Services for New Communities

The process of bringing new communities onto the infrastructure can be relatively simple or very challenging. In D3.1 a schema for a relatively large community was proposed, which is now available at [[Chyba! Nenalezen zdroj odkazů.](#)], and is expected to evolve at that site. The following tasks are classified as front desk activities. Note the interaction of these activities with others within UCS and in Operations and Middleware, as well as with the new communities themselves.

This task is currently very labour-intensive and may require a “functional” SSC in the initial phase of EGI. However, the acquisition process of new communities is expected to become simpler as the infrastructure itself evolves.

#### U-N-18 and U-E-9. Consulting for New Communities

This service requires direct interaction with application developers to get their applications running on the grid infrastructure, and with middleware (and RESPECT software) developers to establish the best ways to use their services/APIs. It also requires interaction with other support activity personnel and with SSC leaders to identify “clients”. In EGI.org, the UCS Consultant for new communities is expected to coordinate these activities.

The bulk of this activity is expected to rest with the SSCs and collaborating projects, and could require specialised effort from the hypothesised SSC for new communities.

Consulting teams typically interact with the personnel that manage informational resources such as U-E-6.

#### U-N-19 and U-E-9. Assistance for Application Porting

This service provides information concerning the porting of applications to the EGI infrastructure and on the integration of grid services with the application. It interfaces with application developers, either via GGUS or other fora (mailing lists, chat rooms, etc.) and with core middleware developers and “integration software” developers (e.g. the RESPECT software) to establish how the software can be used effectively.

At the EGI.org level, this activity is considered a shared responsibility of the SSC coordination team and the Front Desk personnel (U-E-9), with assistance by the technical coordinators if required.

Specialised help desk personnel are involved in this effort.

It is expected that these activities will be strongly sustained by the SSCs, plus potentially by 2 or 3 general consultants drawn from the NGIs; an NGI can thus opt to devote some of its international UCS effort to this task. Alternatively, there may be a specific dedicated effort for this task in a potential Training SSC or an SSC for new communities. The effort table below assumes no such SSC, but this may be subject to change.

In some cases, there may also be some effort dedicated to supporting the integration of a user community’s computing resources with the grid infrastructure. This is typically an Operations task – see O-E-10 – although the presence of some liaison personnel from the User Community Services may help on occasion.

### 6.2.7 Other NGI International Tasks

The estimated ranges of effort for the above tasks should not be added up without considering the discussion at the beginning of this section. However, it is expected that in line with the above guidelines for the tasks there is still a reasonable budget (perhaps in the order of 15 ~ 25 FTE) for cooperative NGI international tasks.

These coordination activities have not been specifically described in this document, as each NGI needs some flexibility in assigning its international effort, and as basic recommendations for each task have been given above.

Some cooperative effort is recommended to go toward the support for specific actions that are of interest to more than one large user community. In particular, both the Life Sciences and Earth Sciences communities have a strong need to work in a focused manner on fostering the integration between grid and cluster computing / supercomputing.

In projects such as EGEE the regional coordinators are currently responsible for interfacing between regional support and corresponding centralised support teams. They also provide overviews of user activities within their region and act as first-line support.

Expect interfacing between users within a region and centralised support structures to continue. The regional coordinators will also continue to report about use of the grid within the region.

Tools and information to effectively make use of centralised services.

To report on activities within the region and to provide an efficient liaison between EGI.org and the regional user community.

### 6.3 EGI.ORG TASKS

EGI.org will provide overall coordination for the services described above, structured as illustrated in Table 6. 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; event organisation, for instance, requires more than 2 FTE in certain periods and less in others and documentation-related activities are often performed in conjunction with coordination of SSC activities:

- U-E-1. User Forum Support  
One staff member in EGI.org will provide liaison and support for the activity of the UFSC.
- U-E-2. Coordination of SSC activities  
A small team of coordinators to assist the User Coordination Officer (UCO) in all collaborative activities among the SSCs, attend meetings, and work with the Grid Planning team to organise the representation of user community needs, new software etc. in EGI management
- U-E-3. Event Organisation  
One staff member in EGI.org will coordinate the organisation of the main User Forum Events, plus others as needed in collaboration with the EGI.org PR team and counterparts in the NGIs and SSCs.
- U-E-4. Grid Planning & MCB  
One senior person 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.
- U-E-5. Technical Coordination – UTS  
One Technical Coordinator for all User Technical Support activities – e.g. Help Desk
- U-E-6. Technical Coordination – Informational and High-level tools  
One Technical Coordinator to perform activities related to technical information gathering and support of central services such as material repository and online resources.

- U-E-7. Documentation Review Coordination  
One coordinator for all documentation-related activities such as content and material creation, review, and central documentation resources.
- U-E-8. Coordination of Training  
Covering all activities related to management and coordination of training efforts in the NGIs and management of grid central services. Works with Training SSC (if present)
- U-E-9. Services for new communities & Front Desk coordination  
This will include a Consultant for new communities and a Front Desk Coordinator. These personnel oversee the availability of seed resources for new communities, and works with Grid Planning in analysing new trends in typology of grid users and new resources.

**Table 6: User Community Services in EGI.org**

<b>ACTIVITIES</b>	<b>FTE</b>
User Forum Support	1
Coordination of SSC activities	2
Event organisation	1
Grid Planning & MCB	1
Technical Coordination – UTS	1
Technical Coord – Informational and High-level tools	1
Documentation Review Coordinator	1
Coordination of training efforts	1
Services for new communities & Front Desk coordination	2
<b>Total</b>	<b>11</b>

#### 6.4 NGI INTERNATIONAL TASKS – INCLUDING SSC EFFORT

The estimated effort for these tasks is expressed in deliberately broad ranges. Several attempts were made to distinguish between large-medium-small NGIs or SSCs, but the metrics for these are not obvious for this kind of activities, and should be determined by the user communities themselves.

##### Representation and Networking

- U-N-1. EGI User Forum Representation
- U-N-2. General Coordination
- U-N-3. Feedback

U-N-4. User Conference and other Events

U-N-5. Public Relations

Total range of effort: 12 – 29 FTE of which 9 – 18 articulated as SSC effort

### **Grid Planning including MCB**

U-N-6. Development of Services

U-N-7. Coordination of the Grid Planning activities within different SSC's

U-N-8. Technical Feedback

Total range of effort: 6 – 12 FTE of which 4 – 8 articulated as SSC effort

### **User Technical Support**

U-N-9. VO Registration and VO Database

U-N-10. Site Validation Tests

U-N-11. Core VO Service Provision

U-N-12. Help Desk and Direct User Support

Total range of effort: 7 – 14 FTE of which 4 – 8 articulated as SSC effort

### **Informational and High-level tools**

U-N-13. Case Studies

U-N-14. Application Database

U-N-15. Scientific Gateways / Portals

Total range of effort: 13 – 27 FTE of which 10 – 20 articulated as SSC effort

[N.B.: these ranges are affected by estimated initial effort levels dedicated to setting up scientific gateways, and may be subject to change]

### **Documentation and Training Coordination**

U-N-16. Documentation

U-N-17. Training Coordination

Total range of effort: 4.5 – 9 FTE of which 3.5 – 7 articulated as SSC effort

### **Front Desk**

U-N-18. Consulting for new communities

U-N-19. Assistance for Application Porting

Total range of effort: 12 – 20 FTE of which 8 – 16 articulated as SSC effort

**Other NGI International Tasks**

Effort to be determined.

Again, several simulations have been made for these tasks; however it was felt that these are not publishable and should be considered only in the context of practical guidelines for the UCS planning activities. These simulations can however be provided upon request. The global effort for all the UCS tasks should in any case be around 110 FTEs.

## 7 FUNCTIONS OF EGI: EXTERNAL LIAISON FUNCTIONS

### 7.1 TASK AND SERVICES

#### 7.1.1 Dissemination

A small team within this function 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 outsourced to third parties.

The objectives of the dissemination activities of EGI.org are:

- to ensure visibility and inform about EGI among decision makers, funding bodies, research communities, industry partners and other grid initiatives in Europe and in other parts of the world
- to inform the user communities and NGIs
- to arrange activities in collaboration with the NGIs
- to create and maintain excellent PR/media relations
- to coordinate publishing of activity and management reports
- to organise events such as EGI conferences and user forums

The dissemination activities need to be effective and well targeted. For EGI the dissemination activities at large must be executed both by EGI.org and the NGIs with a clear division of responsibilities. EGI.org will typically be in charge of tasks requiring coordination between NGIs. EGI.org will typically deal with common actions of the EGI while the NGIs are responsible for the EGI dissemination in their local and regional areas. It is important to note that in order to achieve good results, the dissemination team needs to act in close collaboration with the user-oriented, grid-operational and technical activities of EGI.

The dissemination team of EGI.org will serve as a horizontal link between the stakeholders (NGIs) and existing user communities, and has therefore a central role in maintaining the information flow to these parties. A dynamic and up-to-date website is a key element in maximising the visibility, providing support to users and stakeholders and informing about EGI. There is therefore a clear need for a professional and dedicated web editor.

The dissemination team of the EGI.org will support and coordinate the PR activities of the EGI. Press releases and Newsletters on the activity and key achievements will be published and widely distributed in order to increase visibility of the EGI. NGIs are expected to contribute by providing material to paper and electronic publications. The EGI.org will also be in charge of organising annual events and conferences, similar to e.g. the EGEE User Forum and the DEISA Symposium. These events not only increase the visibility and inform existing users, but also aim to broaden the user base. Exposure at other major events in Europe and beyond will also be coordinated and organised by the dissemination team of EGI.org, whereas NGIs are responsible for EGI representation at local and regional events. The representation may consist, for example, in a presentation, where the dissemination team would assist in identifying the right experts.

NGIs active on the international front are considered to represent themselves, but are of course free to propose coordination of any international activities with EGI.org.

In the initial phase of EGI, the core EGI.org dissemination team will be modest in size, but can be augmented by a rotation of 1-2 colleagues from the NGIs. The NGIs will be requested to provide a contact person for the dissemination activities within their own organisations.

### 7.1.2 Industry Take-up

It is recognised that sustainability of EGI would benefit from a persistent activity aimed at increasing participation of the private sector in the European grid infrastructure, which would bring additional competences and financial resources to the initiative.

As a publicly funded infrastructure dedicated to research, the usage policies will be determined not only by EU policies, but primarily by national law and policies. The usage policies can be expected to be comparable to those of other similar research infrastructures, such as the GÉANT network. Commercial usage is therefore limited, and usage by the business and industry sectors has primarily to be in form of research collaborations with European and national research institutes, universities and other educational institutions. The EGI.org management must develop a business model for the grid infrastructure, whose commercial potential is however foreseen to be limited.

The general interest and potential use by industry can come in many forms;

- use of the EGI infrastructure in R&D (collaboration with the publicly funded research community);
- the EGI infrastructure as “state-of the-art”/”best practice” for industry;
- industry use of the EGI infrastructure for testing and learning;
- industrial projects with occasional exceptional requirements (critical computing on demand).

EGI.org is to initiate discussions with stakeholders to establish access policies for industrial research projects in the pre-competitive domain and for industrial production projects accessing innovative technologies or deploying innovative strategies. NGIs are expected to work along similar lines on a national level.

Following the recommendations of the e-Infrastructure Reflection Group (e-IRG) Task Force on Sustainable e-Infrastructures, industry has to be seen as both a potential user and a service provider. Today it is possible to identify an emerging business based on the major European grid technologies. EGI.org should welcome such initiatives and establish policies allowing emerging companies and other initiatives a fair competition in providing services for the EGI.

### 7.1.3 Other External Relations

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

- grids outside Europe
- commercial grids (e.g. cloud computing efforts)

- large-scale international research collaborations (e.g. the EIROForum organisations, ESFRI projects and WLCG)
- networking organisations (e.g. NRENs, DANTE, TERENA)
- policy and standard shaping bodies (e.g. e-IRG, ESFRI, OGF)

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 a common understanding on policies of grid interoperation
- influence on policy and standards shaping activities
- networking and enlargement of the EGI “sphere of influence”

The operational aspects in interoperation with other grids are handled by the EGI.org Grid Operations function.

The activity does not entail pro-active standardisation work, but handles the relations of EGI.org with organisations such as OGF, e-IRG and OASIS. EGI.org should consider membership in organisations like OGF and OASIS if deemed beneficial for EGI. The work could include coordination and reporting of participation in different standards working groups and interfacing with the technical teams involved in the actual standardisation. To maximise the outcome of the external relations activity, the EGI.org management should encourage synergies with external organisations and initiatives through the NGIs.

## 7.2 OUTLINE OF TIME EVOLUTION

As for other tasks, the description provided in this chapter refers to the first year of EGI. Such activities are however expected to be rather constant in time, with the very important exception of industry take-up, which is likely to start rather modestly, as a kind of feasibility study, but expected to grow, and may in future also require some change to the EGI structure to better accommodate commercial partners.

## 7.3 EFFORT

Dissemination:

FTE estimation: 2 FTE for EGI.org and 0.5 for each NGI

According to the above analysis the following expertise is proposed:

- A dissemination manager – 1 FTE for EGI.org
- A web editor – 1 FTE for EGI.org
- NGI dissemination interface for EGI – 0.5 FTE for each participating NGI. As mentioned above, 1-2 of the NGI interfaces can also further staff the EGI dissemination team.

Industry Take-up:

FTE estimation: no additional manpower

It is proposed that the EGI.org Director and the management team cover these activities at the initial stage of EGI. The effort could increase substantially in the subsequent years once effective ways of collaborating with the business world are established.

Other:

FTE estimation: 2 FTE for EGI.org.

According to the above analysis the following expertise is proposed:

- 1) A policy and external liaison manager – 1 FTE for EGI.org
- 2) A standardisation liaison manager – 1 FTE for EGI.org

## 8 FUNCTIONS OF EGI: MANAGEMENT

### 8.1 EGI COUNCIL AND ITS MEMBERS

The main actors of EGI are the National Grid Initiatives (NGIs) which operate the grid infrastructures in each country and represent the requirements of their national scientific communities together with resource providers and all e-Infrastructure-related institutions in a transparent way.

The **top-level executive layer** in EGI is the **EGI Council**, constituted by the **NGIs** which accept the statutes. 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 non-European partner grid infrastructures. This representation is expected to be reciprocated, with the EGI Council being represented in the governing bodies of those partner grids.

The EGI Council may designate **committees** to work on topics specified by the Council. It may furthermore elect an **Executive**; details will be defined once the EGI.org statutes are finalised and the future EGI Council has voted on them. The **Director** and **Heads of Units** of EGI.org as well as the Chair of the User Forum Steering Committee will be *ex officio* Council members.

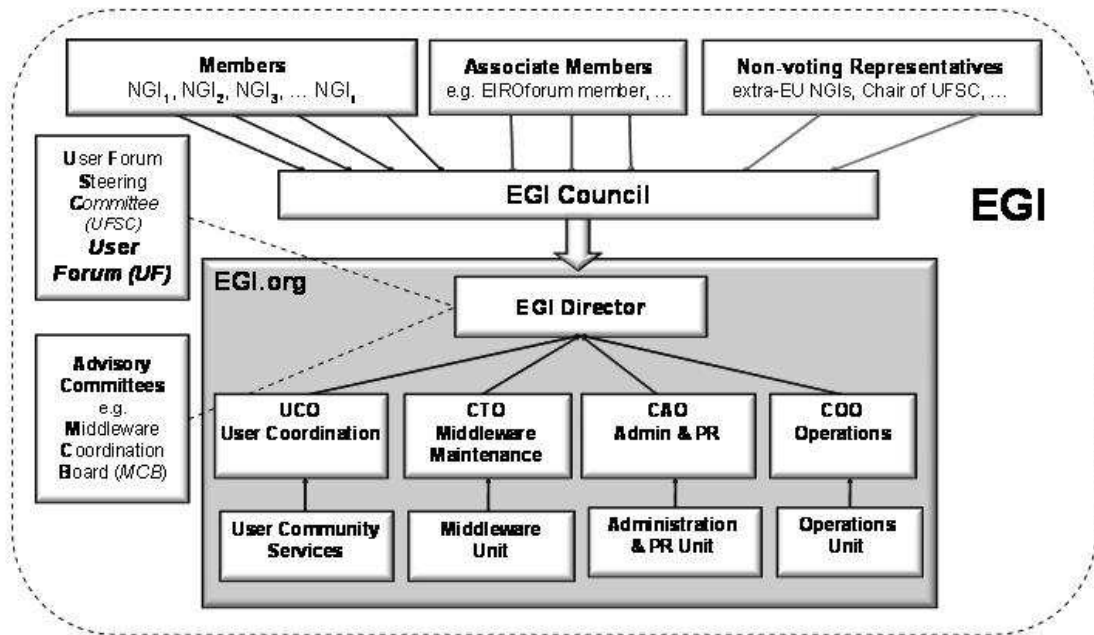
### 8.2 EGI.ORG AND ITS MANAGEMENT

The EGI.org full-time **Director** 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. For all internal and external activities, the EGI.org Director has an assistant. 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.

The EGI advisory *committees/bodies* identified at this moment are the User Forum Steering Committee (UFSC) and the Middleware Coordination Board (MCB).

In EGI.org four permanent *units* are identified: the *Administration Unit* headed by the Central Administration Officer (CAO), the *Operations Unit* headed by the Central Operational Officer (COO), the *Middleware Unit* headed by the Central Technical Officer (CTO) and the *User Community Services* headed by the User Coordination Officer (UCO). The administration also includes staff to cover public relations, human resources, administrative and legal services. Projects may, based on EGI.org's findings, be embedded in these units or they may be organised as a separate project-oriented unit within EGI.org, but need to be always embedded in the organisation's structure.

The following graph summarises the characteristics of the EGI.org **management structure**:



**Figure 3: EGI Management Structure**

The following table quantifies the management-related positions mentioned above.

**Table 7: EGI.org management effort**

Position	FTE
Director	1
<i>Assistant to the Director</i>	1
<i>Secretaries</i>	2
CTO	1
COO	1
UCO	1
CAO	1
<i>Admin. Staff</i>	2
<i>Legal expert</i>	1
<b>Total</b> (positions paid by membership fees)	<b>11</b>

### 8.3 EGI USER FORUM

The **user communities** will have representation and support mechanisms via the **EGI User Forum (UF)**. More details on User Communities Support and its structure are provided in Chapter 8.

User communities are represented in the **User Forum Steering Committee (UFSC)** through the NGI, the respective SSC, or – if there is no SSC – through the related international project. 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 users of the EGI e-Infrastructure. The UFSC will organise an annual general meeting of all user communities to facilitate information exchanges at all levels.

At the management level, the SSCs will assist in collecting and transferring the requirements and feedback from the user communities to EGI through the Grid Planning team (see Chapter 8); the team participates in the EGI Middleware Coordination Board which is responsible for more long-term technical planning; it may also establish other advisory committees to work with the EGI.org Director.

### 8.4 EGI MIDDLEWARE COORDINATION BOARD (MCB)

The Middleware Coordination Board (MCB) is the EGI body that sets technical priorities and takes all decisions concerning the **maintenance, support** and **evolution** of the **middleware** deployed on the EGI e-Infrastructure; more details about the Middleware Support are provided in Chapter 7. 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 (i.e. the three European Middleware Consortia);
- the **operations** function representing all operational requirements of EGI.org, NGIs and resource providers;
- the **Specialised Support Centers (SSCs)**, representing the various user communities organised in thematic disciplines.

## 9 SUMMARY OF TASKS AND EFFORT

This chapter summarizes the information of EGI functions, owner of the function (EGI.org, NGI, middleware consortia, SSC), and possible providers for the service (e.g. is the function provided for EGI by the personnel located in EGI headquarters or can it be delivered by the NGIs).

**Table 8: Summary of EGI tasks and related estimated effort**

Function			
Code	Description	Owner of the function	Effort in FTE
<b>OPERATIONS AND SECURITY</b>			
<b>Operation of tools and Services</b>			
O-E-1	Operation of the grid topology and configuration repositories	EGI.org	1
O-E-2	Operation of accounting repositories for international VOs	EGI.org	1
O-E-3	Operation of the grid repositories storing monitoring and performance data, and other related information	EGI.org	2.5
O-E-4	Operation of the grid operations portals	EGI.org	0.5
O-E-5	Grid operation and oversight of the e-Infrastructure	EGI.org	1
<b>Support</b>			
O-E-6	Central and regional Grid support, operation of a ticketing system and of a document repository	EGI.org	2
O-E-7	Triage of incoming problems	EGI.org	2
O-E-8	Gathering of requirements for user support tools and processes	EGI.org	0.5
<b>Other Tasks</b>			
O-E-9	Coordination of middleware roll-out and deployment, middleware pilot and certification testbeds	EGI.org	1
O-E-10	Coordination of resource allocation and of brokering support for VOs from NGIs	EGI.org	0.5
O-E-11	Coordination of interoperations between NGIs and other grids. EGI.org	EGI.org	0.5
O-E-12	Coordination of network support	EGI.org	0.5

O-E-13	Coordination of definition of best practices, operations procedures, operations requirements	EGI.org	0.5
O-E-14	Operation of production grid core software services, catch-all services for international VOs, catch-all CA	EGI.org	1
<b>Security</b>			
O-E-15	Coordination of security policy development and maintenance	EGI.org	0.5
O-E-16	Coordination of security and incident response	EGI.org	1
<b>Development</b>			
O-E-17	Coordination of development and maintenance of operational tools	EGI.org	1
<b>Operations</b>			
O-N-1	Operation of the NGI grid topology and configuration repositories	NGIs	a)
O-N-2	Operation of the NGI accounting repository	NGIs	a)
O-N-3	Operation of repositories storing monitoring and performance data, and other related information	NGIs	a)
O-N-4	Operation of the NGI operations portal	NGIs	a)
O-N-5	NGI e-Infrastructure oversight. 1 <sup>st</sup> and 2 <sup>nd</sup> line support.	NGIs	a)
O-N-9	Operations coordination at NGI level	NGIs	a)
<b>Support</b>			
O-N-6	Operation of the NGI ticketing system, gathering of new requirements for user support tools in the region	NGIs	a)
O-N-7	Regional helpdesk	NGIs	a)
<b>Other Tasks</b>			
O-N-8	Operation of production grid core software services	NGIs	a)
O-N-9	Operations coordination at the NGI level	NGIs	a)
<b>Middleware development and support</b>			
Middleware Unit of EGI.org			
M-E-1	Maintain and document processes and quality criteria	EGI.org	1

	common to all middleware providers.		
M-E-2	Provide and support tools to enable and monitor the processes	EGI.org	1
M-E-3	Define quality and conformance criteria for UMD components. Verify that accepted components are certified according to the agreed process and satisfy the quality and conformance criteria	EGI.org	3
M-E-4	Maintain a repository of certified middleware components or references thereto.	EGI.org	2
M-E-5	Follow the daily execution of the strategic plan endorsed by the MCB. Promote the EGI participation in standardisation bodies.	EGI.org	1
<b>Middleware maintenance</b>			
M-C-6	Maintenance and support of security middleware components	mw consortia	10 <sup>b)</sup>
M-C-7	Maintenance and support of data management middleware components	mw consortia	15 <sup>b)</sup>
M-C-8	Maintenance and support of job management middleware components	mw consortia	24 <sup>b)</sup>
M-C-9	Maintenance and support of information management middleware components	mw consortia	10 <sup>b)</sup>
M-C-10	Other middleware maintenance related activity	mw consortia	11 <sup>b)</sup>
<b>USER COMMUNITY SERVICES</b>			
<b>Representation and Networking (User Forum)</b>			
U-N-1	User Forum Representation	NGIs / SSCs	2-5
U-N-2	General Coordination	NGIs / SSCs	2-7
U-N-3	Feedback	NGIs / SSCs	3-6
U-N-4	User Conference and other Events	NGIs / SSCs	2-5
U-N-5	Public Relations	NGIs / SSCs	3-6

<b>Grid Planning and MCB</b>			
U-N-6	Development of Services	NGIs / SSCs	e)
U-N-7	Coordination of Grid Planning	NGIs / SSCs	3-6
U-N-8	Technical Feedback	NGIs / SSCs	3-6
<b>User Technical Support</b>			
U-N-9	VO Registration and VO Database	NGIs / SSCs	2-3
U-N-10	Site Validation Tests	NGIs / SSCs	1-3
U-N-11	Core VO Service Provision	NGIs / SSCs	2-4
U-N-12	Help Desk and Direct User Support	NGIs / SSCs	2-4
<b>Informational and High Level Tools</b>			
U-N-13	Case Studies	NGIs / SSCs	3-6
U-N-14	Application Database	NGIs / SSCs	3-6
U-N-15	Science Gateways / Portals	NGIs / SSCs	7-15
<b>Documentation and Training Coordination</b>			
U-N-16	Documentation	NGIs / SSCs	2-4
U-N-17	Training Coordination	NGIs / SSCs	2.5-5
<b>Front Desk / Services for New Communities</b>			
U-N-18	Consulting for New Communities	NGIs / SSCs	4-8
U-N-19	Assistance for Application Porting	NGIs / SSCs	8-12
<b>Other NGI International Tasks</b>		NGIs	Tbd
<b>UCS Team in EGI.org</b>			
U-E-1	User Forum Support	EGI.org	1
U-E-2	Coordination of SSC activities	EGI.org	2
U-E-3	Event Organisation	EGI.org	1
U-E-4	Grid Planning & MCB	EGI.org	1
U-E-5	Technical Coordination – User Technical Support	EGI.org	1
U-E-6	Technical Coordination – Informational and and High-level tools	EGI.org	1

U-E-7	Documentation Review Coordination	EGI.org	1
U-E-8	Coordination of Training	EGI.org	1
U-E-9	Services for new communities & Front Desk coordination	EGI.org	2
<b>External LIAISON Functions</b>			
E-E-1	EGI.org Dissemination team	EGI.org	2
E-N-2	Dissemination in regional / NGI level	NGIs	0,5 per NGI
E-E-3	Industry Take-up	EGI.org	<sup>d)</sup>
E-E-3	Other External relations	EGI.org	2
<b>EGI management</b>			
D-E-1	Director	EGI.org	1
D-E-2	Assistant of Director and secretaries	EGI.org	3
D-E-3	Chief Technical Officer, CTO	EGI.org	1
D-E-4	Chief Operational Officer, COO	EGI.org	1
D-E-5	User Coordination Officer, UCO	EGI.org	1
D-E-6	Chief Administrative Officer, CAO and staff	EGI.org	4

a) Amount of resources needed altogether for tasks O-N-1 – O-N-9 depends on the size of the NGI. Small NGI: 2-4 FTE; Medium NGI:5-10 FTE; Large NGI:14-22 FTE.

<sup>b)</sup>See table in Chapter 7.1.5. for detailed break down between middlewares

<sup>c)</sup> Effort not budgeted in EGI Blueprint

<sup>d)</sup> EGI.org director is assumed to take care of these functions

## 10. CONCLUSIONS AND NEXT STEPS

This Deliverable defines the Functions of EGI and together with the European Grid Initiative (EGI) Blueprint (deliverable D5.4) it outlines the proposal developed by the EGI Design Study (EGI\_DS) to establish a sustainable grid infrastructure in Europe by the end of EGEE-III in spring 2010.

This Deliverable and the Blueprint have been prepared in the context of EGI\_DS to describe and detail the implementation of a sustainable e-Infrastructure in Europe and describes the EGI actors, their functions and related effort that are needed to accomplish this. This amounts to 51 FTE for the coordinating organization EGI.org. On the other hand, 2.5 to 30 FTE are estimated to be necessary to cover basic international tasks at the NGI level in order to be part of EGI (the precise requirement depends on the size of the NGI, on the demands of the local user communities and on the commitment to take on international tasks). The estimated overall operational effort estimated for the NGIs is amounts to 225 FTE, while the estimated total effort provided by the NGIs for User Community Services amounts to 110 FTE.

The function that is currently estimated to require most of the EGI effort deals with the efficient, secure and seamless operation of the pan-European grid infrastructure. It is however worth recalling here that meeting the needs of the existing and new grid users, and enlarging the number of the research communities able to benefit from the grid advantages is one of the main objectives of EGI. Thus, the function that describes the User Community Services is at the very heart of EGI. For this function the effort estimated will be provided by the NGIs, coordinated and supported by EGI.org. For UCS it is expected that most of the activities will be organized in SSCs, set up by the relevant Scientific Communities.

The effort required for the maintenance and support of the Grid middleware is also crucial for the performances of the Grid and the satisfaction of its users: only a small fraction of it (about 10%), is however expected to be sustained by the NGIs via EGI.org, while the rest will be financially supported by other actors, typically the middleware consortia.

This document, together with the Blueprint, will form the basis for the preparation of the EGI project, to be completed by November 2009, and which will contain the final definition of the Functions described here. The next steps planned by EGI\_DS, which will also provide input for the preparation of the EGI project, are two further deliverables both due in June-July 2009: the “Grid Infrastructures transition towards EGI” (D5.5) and the “EGI function definition feedback” (D3.4). This latter deliverable will collect the views expressed by the different EGI actors on the functions proposed in this document, thus helping to provide guidelines for the preparation of the EGI project. The feedback to be incorporated in D3.4 will be actively solicited as soon as the present document is made public. The actors explicitly targeted for the feedback on this document will be:

- the NGIs;
- the existing grid Users and the respective VOs, as organized in the EGEE NA4 activity, in the WLCG Project, and in the active projects listed in the Appendix A of this document;
- other Actors contributing to the operation of the grid infrastructure (in the framework of EGEE-III and other infrastructure projects);
- the middleware consortia;

Feedback will be welcome also from any other party willing to contribute to the establishment of EGI.

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## APPENDIX A: DESCRIPTION OF EUROPEAN PROJECTS

### A.1 SUMMARY TABLES

Table A.1 below shows the European projects analyzed. The listed grid projects comprise international projects with European participation, projects aiming at extending the usage of the European infrastructure to research communities in other regions and a sample of projects dealing with middleware, data, etc. The objective is to illustrate that many projects implement similar functions that can be grouped in categories identified in this document; an EGI infrastructure, offering these functions, is likely to support such projects and to allow efficiency-enhancing and cost-effective synergies.

Table A.1 – European projects consulted/analyzed.

Name	Type <sup>3</sup>	Duration (months)	Yearly Effort (PMs)	Yearly Budget (€)	Link
EGEE III	I	24	4,505.00	16,000,000	<a href="http://www.eu-egee.org/">http://www.eu-egee.org/</a>
BALTIC-GRID II	I	24	448.00	1,499,000	<a href="http://www.balticgrid.org/">http://www.balticgrid.org/</a>
SEE-GRID-SCI	I	24	302.00	1,014,443	<a href="http://www.see-grid.eu/">http://www.see-grid.eu/</a>
ETICS 2	R	24	218.25	1,336,000	<a href="http://www.eticsproject.eu/etics">http://www.eticsproject.eu/etics</a>
OMII-EUROPE	R	24	678.00	3,174,191	<a href="http://www.omii-europe.org">http://www.omii-europe.org</a>
GRIDCC	R	36	449.00	1,763,000	<a href="http://www.gridcc.org/cms/">http://www.gridcc.org/cms/</a>
INT.EU.GRID	R	24	302.00	1,318,500	<a href="http://www.interactive-grid.eu">http://www.interactive-grid.eu</a>
BIOINFOGRID	F	24	146.00	527,104	<a href="http://www.bioinfogrid.eu/">http://www.bioinfogrid.eu/</a>
CYCLOPS	F	24	61.00	412,500	<a href="http://www.cyclops-project.eu/">http://www.cyclops-project.eu/</a>
E-NMR	F	36	100.00	922,217	<a href="http://www.e-nmr.eu/">http://www.e-nmr.eu/</a>
ITHANET	F	24	52.00	603,650	<a href="http://www.ithanet.eu/">http://www.ithanet.eu/</a>
DEGREE	F	24		670,000	<a href="http://www.eu-degree.eu/">http://www.eu-degree.eu/</a>
EUROVO-DCA	F	28	72.90	702,857	<a href="http://www.euro-vo.org/">http://www.euro-vo.org/</a>
EUCHINAGRID	C	27	693.00	577,777	<a href="http://www.euchinagrid.org/">http://www.euchinagrid.org/</a>

<sup>3</sup> I = Infrastructure projects, S = (Software) Development projects, F = Field-Specific projects, C = International Collaboration projects, D = Data Management projects, P = Policy & Public Relations projects, O = Other projects.

EUMEDGRID	C	26	587.00	759,231	<a href="http://www.eumedgrid.org/">http://www.eumedgrid.org/</a>
EUASIAGRID	C	24	180.00	727,075	<a href="http://www.euasiagrid.org/">http://www.euasiagrid.org/</a>
EUINDIAGRID	C	24	163.00	640,410	<a href="http://www.euindiagrid.org/">http://www.euindiagrid.org/</a>
EELA-2	C	24	672.00	1,284,160	<a href="http://www.eu-eela.eu/">http://www.eu-eela.eu/</a>
D4SCIENCE	D	24	200.00	1,575,000	<a href="http://www.d4science.eu">http://www.d4science.eu</a>
DRIVER	D	18	244.70	1,233,333	<a href="http://www.driver-repository.eu">http://www.driver-repository.eu</a>
BELIEF	P	24		604,226	<a href="http://www.beliefproject.org/">http://www.beliefproject.org/</a>
E-IRG SP	P	24	22.50	183,042	<a href="http://e-irg.eu/">http://e-irg.eu/</a>
ICEAGE	O	24	216.00	600,000	<a href="http://www.iceage-eu.org/">http://www.iceage-eu.org/</a>
ISSEG	O	24	102.50	655,000	<a href="http://www.isseg.eu/">http://www.isseg.eu/</a>
RINGRID	O	18	123.00	666,110	<a href="http://www.ringrid.eu/">http://www.ringrid.eu/</a>

Table A.2 below summarises the effort of projects for which full tables were included in this chapter: EGEE-III, BalticGrid, SEE-GRID-SCI, ETICS, OMII-Europe, GridCC, BIOINFOGRID, CYCLOPS, e-NMR, Ithanet, EUChinaGRID, EUMEDGRID, EUAsiaGrid, EU-IndiaGrid, EELA-2, D4Science and ICEAGE. A separate sum is reported for the infrastructure projects (EGEE-III, BalticGrid, SEE-GRID-SCI).

Effort per function		Effort in FTE	
		All Projects	Infrastructure Projects
Middleware	Total	146.85	60.65
	Funded	80.95	33.35
Operations	Total	308.32	215.75
	Funded	184.25	120.75
User-oriented activities (includes Application support, Training, and Dissemination)	Total	303.87	150.57
	Funded	198.11	89.77
<b>Global Effort</b>	<b>Total</b>	<b>759.04</b>	<b>426.97</b>

	<b>Funded</b>	<b>463.31</b>	<b>243.87</b>
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Note that for EUAsiaGrid, EU-IndiaGrid the non-EU effort is not separated, and thus is counted in the above table.

In the following of this Appendix, for each project is provided at least an estimate of the yearly manpower or annual budget, a description, detailing achievements and future plans; where available, a table is also included for the effort in each of the three clusters of functions expressed in FTE.

For a full description, more detailed information on the projects and for updates, please consult the EGI Knowledge Base: <http://knowledge.eu-egi.eu/>.

## A.2 INFRASTRUCTURE PROJECTS

### A.2.1 EGEE

Building on investments from member states into national resources and thanks to the EC-funded EGEE project (Enabling Grids for E-science), Europe has developed a scientific grid infrastructure for a wide range of research communities in and across many member states .

More than 250 sites in 48 countries contribute to the EGEE infrastructure which, at present, provides round-the-clock access to over 80,000 CPUs to communities across Europe, in areas such as Archeology, Astronomy, Astrophysics, Civil Protection, Computational Chemistry, Earth Sciences, Finance, Fusion, Geophysics, High Energy Physics, Life Sciences, Multimedia, Material Sciences; the infrastructure is serving over 10000 registered users spread across some 90 Virtual Organisations. In 2007, about 25PB of data were stored in disk and tape/MSS storage.

Peaks of 3.5 Mjob per month have recently been observed on the EGEE infrastructure, which corresponds to 115 kjobs per day. During 2007 20578 kSI2kyears of CPUs were used. The high-energy physics (HEP) community currently accounts for two thirds of the use of these computing resources, with the rest being used by researchers in other fields (see above). It is expected that the HEP community alone will increase the usage by a factor of 5 during the next year. Massive data transfer rates of up to 1.5 GB/s have already been reached.

**EGEE III Effort Table**

	Project Activities	Effort in FTE	
		Total	Funded
Middleware	JRA1: Middleware Engineering SA3: Integration, Testing and Certification TNA5.3: Monitor EGEE contributions to standardisation activities	Total	52.8
		Funded	26.4
Operations	SA1: Grid Operations SA2: Networking Support	Total	189.9
		Funded	94.9
User oriented activities	NA3: User Training and Induction NA4: User community support and expansion NA2: Dissemination, Communication and Outreach	Total	121.7
		Funded	60.9

Project duration: 24 months

Yearly effort: PM 4,505; Annual budget: €16,000,000

Project's home page: <http://www.eu-egee.org/>

### A.2.2 BalticGrid-II

The BalticGrid Second Phase (BalticGrid-II) project is designed to increase the impact, adoption and reach, and to further improve the support of services and users of the recently created e-Infrastructure in the Baltic States.

This will be achieved by an extension of the BalticGrid infrastructure to Belarus; interoperation of the gLite-based infrastructure with UNICORE- and ARC-based Grid resources in the region; identifying and addressing the specific needs of new scientific communities such as nano-science and engineering sciences; and by establishing new grid services for linguistic research, Baltic Sea environmental research, data mining tools for communication modelling and bioinformatics.

The e-Infrastructure, based on the successful BalticGrid project, will be fully interoperable with the pan-European e-Infrastructures established by EGEE, EGEE-associated projects, and the planned EGI, with the goal of establishing a sustainable e-Infrastructure in the Baltic region.

The e-Infrastructure of 26 clusters deployed in five countries during the first phase of BalticGrid is expected to expand, both in capacity and capability of its computing resources.

The BG-II consortium is composed of 13 leading institutions in seven countries: 7 in Estonia, Latvia and Lithuania, 2 in Belarus, 2 in Poland, and one in Sweden and Switzerland, respectively.

The overall vision is to support and encourage scientists and services used in the Baltic region to conveniently access critical computing resources available to them both within Europe and beyond, and thus to facilitate effective research collaborations.

**BalticGrid-II Effort Table**

	Project Activities	Effort in FTE	
		Total	Funded
Middleware	JRA1: Enhanced Application Services on Sustainable e-Infrastructure NA4: Policy and Standards Development	Total	4.25
		Funded	4.25
Operations	SA1: Grid Operations SA2: Network Resource Provisioning	Total	16.25
		Funded	16.25
User oriented activities	NA2: Education, Training, Dissemination and Outreach NA3: Application Identification and Collaboration SA3: Application Integration and Support	Total	16.87
		Funded	16.87

Project duration: 24 months

Yearly effort: PM 448; Annual budget: €1,499,000

Project's home page: <http://www.balticgrid.org/>

### A.2.3 SEE-GRID-SCI

The South-East European (SEE) e-Infrastructure initiatives are committed to ensuring equal participation of a less-resourced region like South-East Europe in European e-Infrastructure trends. The SEEREN initiative has deployed a regional network, interconnected with the pan-European GÉANT backbone, and has established a regional grid infrastructure through the SEE-GRID initiative.

SEE-GRID-SCI leverages the SEE e-Infrastructure to enable new scientific collaborations among user communities.

SEE-GRID-SCI stimulates widespread e-Infrastructure uptake by new user groups across the region, fostering collaboration and providing advanced resources to a wider range of researchers, with an emphasis on strategic groups in seismology, meteorology and environmental protection. The initiative thus aims to have a catalytic and structuring effect on target user communities that currently do not directly benefit from the available infrastructures.

In parallel, in response to user demand, it aims to expand the regional e-Infrastructure by increasing the computing and storage resources and involving new partner countries in the region.

Finally, SEE-GRID-SCI endeavours to help consolidate national grid initiatives in the region, paving the way for them to be part of a longer-term sustainable grid infrastructure in Europe.

**SEE-GRID-SCI Effort Table**

	Project Activities	Effort in FTE	
		Total	Funded
Middleware	JRA1 Development of application-level services	Total	3.6
		Funded	2.7
Operations	SA1 Infrastructure Operations	Total	9.6
		Funded	9.6
User oriented activities	NA4: User communities support NA3: Dissemination and Training	Total	12
		Funded	12

Project duration: 24 months

Yearly effort: PM 302; Annual budget: €1,014,443

Project's home page: <http://www.see-grid.eu/>

## A.3 DEVELOPMENT PROJECTS

### A.3.1 ETICS

The objective of the ETICS 2 project (e-Infrastructure for Testing, Integration and Configuration of Software) is to offer a software build, test and quality assurance validation service across different infrastructures and to promote the widespread adoption of grid-based software engineering technologies by existing and new infrastructures. The approach consists in consolidating and expanding the availability, flexibility and efficiency of the existing ETICS services across those infrastructures, capturing commonalities and promoting open standards on software build, testing and quality assurance.

During the first phase of the ETICS project (2006-2007), a number of major challenges in the adoption of common build and test services across several projects were identified through the close collaboration with many projects and via dissemination events. The challenges can be summarised as follows:

- The lack of skilled personnel able to design and implement efficient validation test suites for complex grid scenarios associated to the complexity of the deployment and management of grid software.
- The lack of widely adopted validation procedures and metrics as well as a relative lack of trust at technological level between users and providers.
- The diversity of utilisation scenarios, the need for specialised validation methods and tools and the necessity of supporting emerging technologies and standards (e.g. IPv6).
- The lack of grid-aware, implementation-independent test design and workflow management tools.
- The complexity of setting up and managing secure, multi-platform validation testbeds.
- The dispersion of resources across multiple software repositories, third-party testbeds and private resources, which are not accessible through common mechanisms, making it difficult to share information and protect existing investments in legacy systems.

ETICS 2 addresses the identified challenges by providing a common software configuration model, multi-platform and language-independent build and test tools, an open repository of packages and reports produced during builds and test runs, extensible tools to collect software metrics, generate reports and monitor the overall quality and standard compliance of distributed software and a standard-based certification model (Grid-QCM). The focus is on maximising automation of the software development process from build to release, minimising the time and effort required to perform complex tests in realistic grid and distributed environments.

In addition, ETICS extends the availability of distributed build and test services to multiple infrastructures, allowing the automatic deployment of complex multi-node tests using the major European and international middleware implementations such as gLite, UNICORE and Condor.

**ETICS 2 Effort Table**

	Project Activities	Effort in FTE	
		Total	Funded
Middleware	JRA1 - Testbed Management Technologies JRA2 - Test Management Tools	Total	4.6
		Funded	2.8
Operations	SA1 - Service Management SA2 - Infrastructures Support	Total	10.3
		Funded	7.7
User oriented activities	NA2 - Dissemination, training and certification	Total	2.0
		Funded	2.0

Project duration: 24 months

Yearly effort: PM 218.25; Annual budget: €1,336,00000

Project's home page: <http://www.eticsproject.eu/etics>

### A.3.2 OMII-EUROPE

The EU-funded Open Middleware Infrastructure Institute for Europe (OMII-Europe) has delivered a collection of re-engineered components that enable interoperability between key grid middleware platforms.

Components are selected for their potential in the field of interoperability: similar functionalities, availability and maturity of standards, open nature of the standard, etc.

In line with a service-oriented approach, the focus is on individual components rather than on full middleware distributions to prove that interoperability can be achieved even among completely different grid middleware architectures.

The final objective is to make the quality-assured re-engineered components available in a common repository to be re-introduced in their original middleware releases.

OMII-Europe started in May 2006 with 16 established partners from Europe, the USA and China.

OMII-Europe's primary focus is on the gLite, Globus and UNICORE platforms. Specific services were identified for re-engineering, such as job execution (BES/JSDL), data integration (OGSA-DAI), VO management (VOMS), accounting (RUS) and portal capability (GridSphere).

During the first year emphasis was on relationship-building among all internal and external partners, on participation in OGF and other working groups and on the design and prototyping of the components with the aim of delivering alpha versions by the end of the project year.

The second year saw the beginning of QA tests, ramp-up of training events, continued cooperation with partner projects and participation in standardisation events and the bulk of development leading to the delivery of final versions of all components by the end of the project.

OMII-Europe sets out to promote the definition and the implementation of open standards in all fields of grid computing. The project established the concept that standards are fundamental for the future of grid middlewares and proved that interoperability can be achieved even between very different architectures.

**OMII-Europe Effort Table**

	Project Activities	Effort in FTE	
Middleware	JRA1: Re-engineering of services JRA2: Identification of new services JRA3: Infrastructure integration JRA4: Benchmarking	Total	38.2
		Funded	17.3
Operations	SA1: Repository SA2: Quality Assurance SA3: Support	Total	14.9
		Funded	6.2
User oriented activities	NA2: Outreach and inreach NA3: Training	Total	3.4
		Funded	2.2

Project duration: 24 months

Yearly effort: PM 678; Annual budget: €3,174,191

Project's home page: <http://www.omii-europe.org>

### A.3.3 GRIDCC / DORII

While remote control and data collection was part of the initial grid concept, most recent grid developments have been focusing on the sharing of distributed computational and storage resources. In this context, compute-intensive applications only have to use these grid elements in order to access an unlimited amount of computational power and disk storage. However, scientific and technical facilities provide concrete use cases where a strong interaction between the instrumentation and the computational grid is required.

The EU-funded GRIDCC project, launched in September 2004, provides a validated technology that can be deployed on top of existing grid middleware, exploiting grid opportunities for the secure operation and monitoring of remote instrumentation. EGEE gLite is the natural reference grid middleware for GRIDCC and the EGEE e-infrastructure is the natural framework to deploy and integrate this instrument grid technology on.

The goal of GRIDCC was to build a geographically distributed system able to provide access to and control of distributed complex instrumentation, ranging over a large number of diverse environments, from a set of sensors used by geophysical stations monitoring the state of the Earth to a network of small power generators supplying the European power grid. These applications rely on real-time and highly interactive operations of grid computing resources. To achieve this goal the project has pursued three main objectives:

- To develop generic grid middleware, based on existing building blocks (Grid Services), which will enable the remote control and monitoring of distributed instrumentation.
- To incorporate this new middleware into a few significant applications to validate the software both in terms of functionality and quality of service. These applications include, among others, European Power Grid, Meteorology, Remote Operation of an Accelerator Facility, High Energy Physics Experiment.
- To widely disseminate the new software technology and the results of the application evaluations on the test beds, and to encourage a wide range of stakeholders to evaluate and adopt this grid-oriented approach to real-time control and monitoring of remote instrumentation.

**GridCC Effort Table**

	Project Activities	Effort in FTE	
		Total	Funded
Middleware	WP1: System Architecture WP2: Real-time and Interactive web services WP3: Grid-Enabled Instrumentation WP4: Brokering access to existing Grid resources WP5: Cooperative Environment (user-oriented?)	Total	21.7
		Funded	10.8
Operations	N / A	Total	0
		Funded	0
User oriented activities	WP6: Integration and Pilot Applications WP7: Information dissemination and exploitation	Total	15.7
		Funded	7.8

Project duration: 36 months

Yearly effort: PM 449; Annual budget: €1,763,000

Project's home page: <http://www.gridcc.org/cms/>

### A.3.4 INTERACTIVE EUROPEAN GRID

The objective of the Interactive European Grid project is the deployment of an advanced grid-empowered infrastructure in the European Research Area specifically oriented to support the execution of demanding interactive applications. The Interactive European Grid, whilst interoperable with EGEE, will focus on the support for remote interactive collaboration and the reinforcement of the global framework for operation of virtual organisations for research projects in areas like biomedicine, astronomy, environment, physics, robotics, archaeology that are likely to benefit from being grid-enhanced. The initiative exploits the expertise generated by the EU CrossGrid project to provide

researchers with interactive and simultaneous access to large distributed facilities through a friendly interface with powerful visualisation.

Project duration: 24 months

Annual budget: €1,318,500

Project's home page: <http://www.interactive-grid.eu/>

## A.4 FIELD-SPECIFIC PROJECTS

### A.4.1 BIOINFOGRID

Since the completion of the Genome Project, given the vast number of identified sequences, the problems associated with computational resources needed to process biological data have increased dramatically. Moreover, the amount of data continues to increase at a high speed as new technologies of high-throughput expression analysis create a continuous flow of information to be processed and interpreted. Furthermore, comparative genomics and genetic variation studies which employ modern analysis methods to identify genes in diseases create additional data challenges.

The BioinfoGRID project has successfully demonstrated the potential of grid computing for addressing the computational challenges the bioinformatics community is faced with. More specifically, BioinfoGRID has evaluated applications in the fields of Genomics, Proteomics, Transcriptomics and Molecular Dynamics, showing that data calculation times can be significantly reduced by distributing the computation across thousands of computers over the EGEE grid infrastructure. It is now possible to walk through the sequencing of the Human Genome and to study complex multigenic diseases, analysing in parallel thousands of molecular components.

However, the BioinfoGRID project has also identified limitations that still exist in terms of friendliness, completeness, robustness and standards compliance of the existing tools for the biological data access and management as well for the grid jobs submission, monitoring and bookkeeping. The project has also highlighted the need for continued dissemination activities to raise grid awareness within the bioinformatics community.

**BIOINFOGRID Effort Table**

	Project Activities	Effort in FTE	
Middleware	N / A	Total	0
		Funded	0
Operations	N / A	Total	0

		Funded	0
User oriented activities	WP1: Genomics applications in grid WP2: Proteomics Applications in grid WP3: Transcriptomics Applications in grid WP4: Database and Functional Genomics Applications WP5: Molecular Dynamics Applications WP6: Coordination of technical aspects and relation with grid infrastructure projects, user training, application support and resources integration WP7: Dissemination and Outreach	Total	12.2
		Funded	9.3

Project duration: 24 months

Yearly effort: PM 146; Annual budget: €527,104

Project's home page: <http://www.bioinfogrid.eu/>

#### A.4.2 CYCLOPS

CYCLOPS brings together two important communities: GMES (Global Monitoring for Environment and Security) and grid, focusing on the operative sector and needs of European Civil Protection (CP). The main objectives of CYCLOPS are:

- 1) To disseminate EGEE results to the CP community, assessing the suitability of the EGEE infrastructure for CP applications. A variety of activities will focus on dissemination and outreach, training, workshops, possibly in conjunction with EGEE events, and on promoting a close collaboration between the two communities.
- 2) To provide the EGEE community with knowledge and requirements that characterise CP services. These requirements will also be used to assess the possibility for the development of an advanced grid platform to enable real time and near-real time services and to implement a security infrastructure very similar to defence systems standards.
- 3) To evaluate the possibility to utilise current EGEE services for CP applications, developing research strategies to enhance the EGEE platform.
- 4) To develop research strategies to enhance the EGEE platform, especially for Earth sciences resources.

CYCLOPS will contribute to EU policy developments, establishing liaisons and synergies with other existing projects and initiatives dealing with GMES, grid and complementary sectors, including PREVIEW, Risk EOS, RISK-AWARE, BOSS4GMES, EGEE Networking Activities and Application Support, e-IRG and INSPIRE. In fact, Consortium partners are involved in all these projects and initiatives.

Furthermore, CYCLOPS aims to address the OGF standardisation needs as far as the Earth and Space Science community, GMES and gLite are concerned.

In this context, the project actively contributes to the OGC (Open Geospatial Consortium) OGF initiative.

**CYCLOPS Effort Table**

	Project Activities	Effort in FTE	
		Total	Funded
Middleware	N / A	Total	0
		Funded	0
Operations	N / A	Total	0
		Funded	0
User oriented activities	WP2: Coordination with EGEE activities WP3: Civil Protection System analysis WP4: research and Innovation Strategies definition WP5: Dissemination & Exploitation	Total	5.1
		Funded	5.1

Project duration: 24 months

Yearly effort: PM 61; Annual budget: €412,500

Project's home page: <http://www.cyclops-project.eu/>

### A.4.3 E-NMR

e-NMR aims at deploying and unifying the NMR computational infrastructure in system biology, a project funded under the 7th Framework Programme of the European Union (Contract no. 213010 - e-NMR).

NMR plays an important role in life sciences (biomolecular NMR), and structural biology in particular, at both European and international level. Its overall objective is to optimise and extend the use of the NMR research infrastructure of [EU-NMR](#) through the implementation of an e-Infrastructure in order to provide the biomolecular NMR user community with a platform designed to integrate and streamline the computational approaches necessary for NMR data analysis and structural modelling (e-NMR). Access to the e-NMR infrastructure will be provided through a portal integrating NMR software and grid technology.

**e-NMR Effort Table**

	Project Activities	Effort in FTE	
		Total	Funded
Middleware	WP3: Design and development of the e-NMR Grid platform	Total	5.1
		Funded	5.1
Operations	WP2: e-NMR Grid deployment and operation	Total	1.4

		Funded	1.4
User oriented activities	WP1: Monitoring, Standardisation and Outreach	Total	1.8
		Funded	1.8

Project duration: 36 months

Yearly effort: PM 100; Annual budget: €922,217

Project's home page: <http://www.e-nmr.eu/>

#### A.4.4 ITHANET

Ithamet is a Euro-mediterranean network of research centres conducting molecular and clinical research into thalassaemia and related haemoglobinopathies. Participants of Ithamet include all major European research institutions active in haemoglobinopathy research and a number of collaborating partner institutions from non-EU Mediterranean and Black Sea countries.

The main objective of Ithamet's co-ordination action is to enhance the scientific potential of this research community by using e-Infrastructures.. It focuses a set of powerful e-infrastructure tools on the needs of researchers, clinicians, patients and the public, giving them the ability to carry out collaborative research, to pool resources, to exchange data and to disseminate research results efficiently and cost-effectively.

Using e-Infrastructure tools to consolidate and strengthen a research community with a specific geographic distribution and research topic, Ithamet strives to create new opportunities for high-impact collaborative research in the European Research Area.

**Ithamet Effort Table**

	Project Activities	Effort in FTE	
		Total	
Middleware	N/A	Total	0.0
		Funded	0.0
Operations	WP2: e-Infrastructure (collaboration tools)	Total	1.05
		Funded	1.05
User oriented activities	WP3: Tools for clinical research WP4: Tools for molecular research WP5: Training and knowledge transfer WP6: Portal WP7: Dissemination	Total	3.3
		Funded	3.3

Project duration: 24 months

Yearly effort: PM 52; Annual budget: €603,650

Project's home page: <http://www.ithanet.eu/>

#### A.4.5 DEGREE

A major challenge for the DEGREE (Dissemination and Exploitation of GRids in Earth science) project is to build a bridge linking the Earth sciences (ES) and grid communities throughout Europe, with particular focus on the EGEE-II project. An ES applications panel with a range of candidate applications suitable for porting to grid will ensure key ES requirements for porting and deployment on the grid middleware are identified, communicated and discussed within the grid community. At the same time, the DEGREE SSA will ensure the ES community is informed and updated on grid-related developments and potential benefits.

The results will provide feedback to the grid community and dissemination in the ES community will increase awareness of and involvement in grid developments.

To ensure ES requirements are taken into account in the next grid generation, DEGREE will initiate collaborations on various levels: at short, medium and long term via EU horizontal initiatives, specific collaborations with grid projects and participation in the e-Infrastructure Reflection Group (e-IRG).

Objectives:

- Disseminate, promote uptake of grid in the wider ES community
- Reduce the gap between ES users and grid technology
- Inform ES users of grid benefits and its capability of tackling new and complex problems.

Project duration: 24 months

Annual budget: €670,000

Project's Home page: <http://www.eu-degree.eu/>

#### A.4.6 EUROVO-DCA

The concept of a Virtual Observatory (VO) consists in providing transparent access to the world's ever-expanding astronomical data through a standard interface which allows scientists to discover, access, analyse, and combine nature and lab data from heterogeneous data collections in a user-friendly way. A VO is a collection of interoperating data archives and software tools which utilise e-Infrastructures to form a scientific research environment in which astronomical collaborative research can be conducted.. Euro-VO is the European implementation of this idea that will produce a unified data and service resource (a data and service grid) able to perform complex data discovery and manipulation tasks across the whole range of astronomical research topics.

The Euro-VO Data Centre Alliance project will co-ordinate the national and European Agencies' Virtual Observatory initiatives, supporting the implementation of the Virtual Observatory framework by the European Data Centres to populate the Virtual Observatory with data produced by the European astronomy infrastructures.

Project duration: 28 months

Yearly effort: PM 72.9; Annual budget: €702,857

Project's home page: <http://www.euro-vo.org/pub/index.html>

## A.5 INTERNATIONAL COOPERATION PROJECTS

### A.5.1 EUCHINAGRID

Co-funded by the European Commission, the FP6 EUChinaGRID project officially started on 1st January 2006 with the aim to support the interconnection of the existing European and Chinese grid infrastructures and to enable their interoperability, thus creating a network of research collaboration between Europe and China.

EUChinaGRID provided specific support actions to foster the integration and interoperability of the grid infrastructures in Europe (EGEE) and China (CNGrid) for the benefit of e-Science applications and worldwide grid initiatives, in line with the support for the intercontinental extension of the European Research Area (ERA).

The project studied and supported the extension of a pilot intercontinental infrastructure using EGEE-supported applications and promoted the migration of new applications onto the grid infrastructures in Europe and China; this was achieved by training new user communities and supporting the adoption of grid tools and services for scientific applications. A set of existing Euro-Chinese collaborations in research with demanding computational needs was selected as pilot applications to validate the infrastructure.

During the 27 months of duration, the project achieved several goals.

The pilot infrastructure includes 12 sites, 5 of which are in China (4 in Beijing and 1 in Shandong). All relevant grid services were implemented and are maintained to facilitate the access of users and Virtual Organisations (VO) through the web portal ([www.euchinagrid.eu](http://www.euchinagrid.eu)). Some of these core Grid services are hosted in China.

Emphasis was on designing a fully interoperable e-Infrastructure, both horizontally (i.e. between European and Chinese middleware) and vertically (i.e. between grid middleware and the different versions of the IP protocol). Efforts towards both objectives led to promising results; furthermore, EUChinaGRID findings in this field raised interest amongst middleware developers in EGEE and ETICS communities leading to joint activities such as a code checker for IPv6 compliance, implemented in the ETICS building system.

A Gateway between gLite and GOS was built and extensively tested and improved. The Gateway allows exchanging jobs between the two infrastructures addressing differences related to the Job Description Languages and the Security mechanisms.

Application deployment has equally achieved significant impact in several science fields:

- High-energy experiments (ATLAS and CMS) at the CERN Large Hadron Collider (LHC) can run their applications on the pilot infrastructure.
- Astroparticle experiment ARGO-YBJ, a joint collaboration between Chinese and Italian researchers, is currently collecting data on Cosmic Ray showers in the YangBaJing laboratory in Tibet; a complete system has been deployed to perform the data transfer from YangBaJing to IHEP (Beijing) and INFN-CNAF (Bologna) sites, using the EUCINAGRID Grid infrastructure deployed on the 2.5 Gbps link provided by the ORIENT project.
- EUCINAGRID also supports biological applications in the field of simulation and discovery of new proteins. The work in this field, carried out in the laboratories of the Biology Department of University of Roma Tre (UROM3), Jagiellonian University – Medical College (JU-MC) and Peking University (PKU), resulted in the first ab-initio protein structure prediction processes ever deployed in a grid environment. The parallel approaches adopted by UROM3 and JU-MC have been compared on a large sample of candidates (2x10<sup>4</sup>), while the predicted protein structures are being experimentally verified by the PKU group.

EUCINAGRID undertook an intense dissemination activity with two website versions in English and Chinese and more than 300 Chinese researchers, engineers and students took part in the advanced knowledge tutorials held in China. A specific dissemination action was targeted towards the community of middleware developers to raise their awareness about IPv6 compliance and interoperability issues and to identify actions and best practices to overcome these problems. This included the delivery of focused workshops and tutorials that involved over 150 developers, and the development of a dedicated IPv6 website (<http://www.euchinagrid.org/IPv6/index.html>) and finally, the collaboration with related projects such as 6DISS.

**EUCINAGrid Effort Table**

	Project Activities	Effort in FTE	
		Total	
Middleware	N / A	Total	0
		Funded	0
Operations	WP2: Network planning and interoperability study WP3: Pilot infrastructure operational support	Total	20.08 (10 Non-EU)
		Funded	14.01 (6 Non-EU)
User oriented activities	WP5: Applications WP5: Dissemination	Total	37.64 (13 Non-EU)
		Funded	21.81 (5 Non-EU)

Project duration: 27 months

Yearly effort: PM 693; Annual budget: €577,777

Project's home page: <http://www.euchinagrid.org/>

## **A.5.2 EUMEDGRID**

Funded by the EC and coordinated by INFN, the FP6 project EUMEDGRID aimed to support the development of a grid e-Infrastructure in the Mediterranean region and to promote the porting of new applications on the grid platform, thus allowing Mediterranean scientist to collaborate more closely with their European colleagues.

EUMEDGRID has raised grid awareness and disseminated competences across the Mediterranean and, at the same time, identified new research groups to be involved in the project, assisting them to exploit the enormous potential of the grid for improving their own applications.

The implementation and coordination of a grid infrastructure at a national (or even broader) level can be regarded, especially in the beneficiary countries, as an opportunity to optimise the usage of existing limited storage and computing resources and to enhance their accessibility for all research groups.

The EUMEDGRID project was conceived with this objective in mind and has succeeded in establishing a pilot grid infrastructure for research in the Mediterranean region which is interoperable and compatible with EGEE and related initiatives. Emphasis was on improving both the technological level and the expertise of networking and computing professionals across the Mediterranean, thus fostering the deployment of an effective Mediterranean grid infrastructure to support eScience. In fact, the two main objectives of the project were as follows: firstly, creating a human network in e-Science across the Mediterranean and secondly, addressing technical issues and supporting the implementation of a pilot grid infrastructure and applications in the area.

EUMEDGRID lasted for 26 months and made a considerable step forward during the second project year with a series of considerable achievements.

Cooperation among all the participants was demonstrated by the enthusiastic participation in joint workshops and meetings organised during the duration of the project and by the successful promotion of the creation of National Certification Authorities and National Grid Initiatives. Impressive results were also obtained in events fostering knowledge dissemination on grid technology and services. They attracted over 700 participants ranging from system administrators, researchers to end users. Feedback was gathered through dedicated questionnaires.

Promotion of National Grid Initiatives carried out in all non-EGEE partner countries registered a good level of success with programmes already operational in Algeria, Egypt, Morocco, Tunisia and Turkey and well advanced plans, with clear commitments, in Cyprus, Jordan, Syria and the Palestinian Territories. The project was very active in promoting the creation of national Certification Authorities designed to issue digital certificates to ensure secure grid access. The process is completed in Morocco, the first African country to become member of EUGridPMA, and is well advanced in the other countries, with a temporary catch-all CA in place to meet the needs of EUMEDGRID users.

A pilot grid infrastructure, composed to date of 25 sites in 13 countries, was set up during the project's duration.

Applications selected to run on the EUMEDGRID e-Infrastructure span several fields of interests: High-energy physics, biology and biomedical, hydrology, archaeology, seismology and vulcanology. New communities and applications of regional interest were also identified by means of a survey based on web questionnaires<sup>4</sup>. Efforts to port the first applications on the EUMEDGRID e-Infrastructure began in the 1<sup>st</sup> quarter of 2006 with CODESA and ArchaeoGrid, a hydrological and an archaeological application, respectively, both pertinent to the Mediterranean region.

Various other applications were deployed during a dedicated event in Cairo, namely the first “EUMEDGRID School for Application Porting” (EGSAP-1 <http://www.EUMEDGRID.org/egsap-1/>) on 17-28 April 2007. Conceived as a full-immersion experience for selected new communities of regional interest, the school was deemed of paramount importance for the up-take of new applications on the regional pilot infrastructure. EGSAP-1 was consequently one of the largest dissemination efforts during the project, involving new communities in the project activities and supplying the required know-how to exploit the e-Infrastructure and deploy their own applications.

All selected applications were ported to the EUMEDGRID infrastructure. Moreover, these applications were also ported to the GENIUS web portal.

EUMEDGRID is however not confined to scientific issues, although the opportunity to port applications of regional importance, such as the hydro-geological and medical ones, on the pilot infrastructure is really exciting. Fostering grid awareness and the growth of new competences within scientific communities in Europe’s neighbouring countries is a concrete initiative towards bridging the digital divide and towards a peaceful and effective collaboration among all partners.

At social level, e-Infrastructures can help mitigate phenomena such as digital divide and, possibly, revert brain drain, allowing brilliant minds in the region to make valuable contributions to cutting-edge European scientific activities which would effectively enlarge the European Research Area (ERA). Research and education networks and grids are fundamental infrastructures that allow non-EU researcher to excel in their home laboratories without the need to migrate to more advanced countries.

An extended Mediterranean Research Area could thus be seen as a first step towards the suggestion of more politically ambitious plans for open market, open transportation infrastructures, free circulation of citizens, etc.

**EUMEDGRID Effort Table**

Project Activities		Effort in FTE	
		Total	
Middleware	N / A	Total	0
		Funded	0
Operations	WP3: Pilot infrastructure operational support	Total	22.33 (15.09 Non-EU)

<sup>4</sup> <https://secure.um.edu.mt/EUMEDGRID/questionnaire/wp2/>,  
<https://secure.um.edu.mt/EUMEDGRID/questionnaire/wp4/>

		Funded	12.1 (4.76 Non-EU)
User oriented activities	WP4: Application support WP2: Requirement capture and analysis WP5: Dissemination and Outreach	Total	26.57 (10.56 Non-EU)
		Funded	20.84 (8.36 Non-EU)

Project duration: 26 months

Yearly effort: PM 587; Annual budget: €759,231

Project's home page: <http://www.eumedgrid.org/>

### A.5.3 EUASIAGRID

The EUAsiaGrid proposal contributes to the objectives of the EU Research Infrastructures FP7 Programme by "promoting international interoperation between similar infrastructures with the aim of reinforcing the global relevance and impact of European e-Infrastructures".

The project's main goal is to pave the way towards an Asian e-Science grid infrastructure, in synergy with other European grid initiatives in Asia, namely EGEE-III via its Asia Federation, and the EUChinaGRID and EU-IndiaGRID projects and their follow-on efforts.

Exploiting existing global grid technologies, with particular focus on the European experience with the gLite middleware and applications running on top of it, the project plans to encourage federating approaches across scientific disciplines and communities.

EUAsiaGrid acts as a support action, aiming to define and implement a policy to promote the gLite middleware developed within the EU EGEE project across Asian countries.

Emphasis will be on dissemination, training, support for scientific applications and result monitoring. The use of the grid e-Science infrastructure is not only promoted on a geographical level, but also targeted towards new communities likely to benefit from this infrastructure, such as social sciences, disaster mitigation, building on the knowledge of more experienced fields, like high-energy physics and bioinformatics. The project intends to interact with standardisation bodies and other projects to help make the results sustainable over time.

**EUAsiaGrid Effort Table**

	Project Activities	Effort in FTE	
		Total	Funded
Middleware	N / A	Total	0
		Funded	0
Operations	N / A	Total	0
		Funded	0
User oriented	WP2: Requirement capture and coordination policy	Total	15.0

		Funded	13.1
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Project duration: 24 months

Yearly effort: PM 180; Annual budget: €727,075

Project's home page: <http://www.euasiagrid.org/>

#### A.5.4 EU-INDIAGRID

EU-IndiaGrid is a European project that has established and currently maintains e-Infrastructure ties with the Indian generalised grid infrastructure. Among the partners of the project are the Indian NREN (ERNET) and the Indian NGI (GARUDA). EU-IndiaGrid is formally endorsed by the Indian Government, as a letter sent to Ms Reding (EC) by the Indian Government Principal Scientific Advisor, Dr Chidambaram, is testimony of.

In addition to extensive dissemination and training activities, EU-IndiaGrid has set up a testbed running applications from several scientific communities, and has reported on its interoperation efforts in the context of many collaborative and standardisation/interoperability events. The efforts have established some specific requirements for interoperation between the European gLite middleware and the Indian middleware.

The project intends to collaborate with standardisation bodies and projects such as (a possible continuation of) OMII-Europe by implementing these requirements (either directly or in an effort mediated by EGI), and aims to consolidate the current EU-India Grid relationship.

**EU-IndiaGrid Effort Table**

	Project Activities	Effort in FTE	
		Total	Funded
Middleware	N / A	Total	0
		Funded	0
Operations	WP3: Network Planning Support WP4: Pilot grid infrastructure operational support	Total	4.7
		Funded	3.1
User oriented activities	WP5: Applications WP2: Building an eScience Network Community WP6: Dissemination & Networking Events	Total	8.9
		Funded	6.0

Project duration: 24 months

Yearly effort: PM 163; Annual budget: €640,410

Project's home page: <http://www.euindiagrid.org/>

### A.5.5 EELA-2

EELA-2 aims at building a high-capacity, production-quality, scalable grid facility, providing round-the-clock, worldwide access to distributed computing, storage and network resources needed by the wide spectrum of applications from European-Latin American scientific collaborations, with special focus on:

- offering a complete set of versatile services fulfilling applications requirements;
- ensuring the long-term sustainability of the e-Infrastructure beyond the term of the project.

Such an ambitious project would not be possible without the prior existence of a consolidated e-Infrastructure, set up with the original intention to build a sustainable grid platform. This was the objective of the EELA project ([www.eu-eela.org/first-phase.php](http://www.eu-eela.org/first-phase.php)) that provided its users with a stable, well supported Grid infrastructure based on 16 Resource Centres (RCs) with over 730 CPU cores and 60 Terabytes of storage space, thus proving that the deployment of a European-Latin American e-Infrastructure was not only technically viable but also demand-driven.

The EELA-2 vision is two-fold:

- consolidate and expand the current EELA e-Infrastructure built on the GÉANT2/European and RedCLARA/LA National Research & Education Networks (NRENs), to become an e-Infrastructure facility that provides a full set of enhanced services to all types of applications from a wide range of scientific areas in Europe and Latin America;
- establish the conditions for a sustainable e-Infrastructure, beyond the project duration.

**EELA-2 Effort Table**

	Project Activities	Effort in FTE	
		Total	Funded
Middleware	JRA1: Development of Services for Applications and Infrastructure	Total	7.5
		Funded	5
Operations	SA1: Grid Infrastructure Service Activity SA2: Network Resource Provision	Total	31.5
		Funded	18.3
User oriented activities	NA3: Application Support NA2: Dissemination and Training	Total	17.0
		Funded	8.7

Project duration: 24 months

Yearly effort: PM 672; Annual budget: €1,284,160

Project's home page: <http://www.eu-eela.eu/>

## A.6 DATA MANAGEMENT PROJECTS

### A.6.1 D4SCIENCE

Co-funded by the European Commission's Seventh Framework Programme for Research and Technological Development, D4Science is one of the main European e-Infrastructure projects. The project started in January 2008, has a duration of 2 years and involves 11 partners.

D4Science aims to continue the efforts that the GÉANT, EGEE, and DILIGENT projects have initiated towards establishing networking, grid-based, and data-centric e-Infrastructures that accelerate multidisciplinary research by eventually overcoming barriers to heterogeneity, sustainability and scalability.

The main objective of D4Science is to lay the foundations for next-generation collaboration and knowledge-management environments by deploying an infrastructure that allows members of dynamic Virtual Research Environments (VREs) to create on-demand transient digital libraries based on shared computing, storage, multi-type content and application resources. Knowledge sharing and collaboration in a secure, coordinated, dynamic and cost-effective manner are to be the two major facilities offered by the combination of hardware, network, software and content elements that constitute the D4science infrastructure. Whilst the infrastructure is designed to support many different research and industrial applications, two specific communities have been selected to validate the project: the Environmental Monitoring and Fisheries and Aquaculture Resources Management management communities.

The objectives of the project will be achieved through the synergetic operation of Networking, Service and Joint Research Activities. The overall objective of the Networking Activities (NA) is to serve the needs of the communities. The experience gathered in connection with these large communities will facilitate a future extension of the e-Infrastructure capabilities to other scientific communities. This will be achieved by disseminating the project outcomes, training of the various players, and exploiting and collecting feedback of the D4Science e-Infrastructure through the implementation of the communities VREs.

The Service Activities (SA) aim at providing and maintaining a stable, reliable and usable e-Infrastructure to these (and possible other) D4Science user communities.

Finally, the Joint Research Activities (JRA) address the technical requirements raised by the Environmental Monitoring and Fisheries and Aquaculture Resources Management communities against the gCube framework.

**D4ScienceEffort Table**

	Project Activities	Effort in FTE	
Middleware	JRA4: gCube Development	Total	6.1
		Funded	4.6
Operations	SA1: Infrastructure Operation	Total	9.4

		Funded	9.4
User oriented activities	JRA1: Overall Planning and Development Coordination JRA2: Environmental Monitoring Community-specific Software Development JRA3: Fishery Resources Management Community-specific Software Development NA3: Communication and Dissemination NA4: Training NA5 Communities VREs Definition, Validation and Exploitation	Total	15.25
		Funded	10.75

Project duration: 24 months

Yearly effort: PM 200; Annual budget: €1,575,000

### A.6.2 DRIVER

DRIVER is building the testbed for a future knowledge infrastructure of the European Research Area. Designed to be complementary to GEANT, the underlying network infrastructure for computing resources, data storage and data transport, DRIVER will deliver the content resources, i.e. any form of scientific output, including scientific/technical reports, working papers, pre-prints, articles and original research data.

The objective in a second phase is to establish the successful interoperation of both data network and knowledge repositories as integral parts of the e-Infrastructure for research and education in Europe.

The knowledge infrastructure testbed, delivered by DRIVER, will be based on nationally organised digital repository infrastructures, similar to GN2 and the NRENS. The successful DARE network in the Netherlands, recently presented to the public by the project partner SURF, will serve as a model to DRIVER.

DRIVER with its testbed is not intended to build a specific digital repository system with pre-defined services, based on a specific technology and needs of specific communities.

The testbed will in its inception focus on the infrastructure aspect, i.e. open, clearly defined interfaces to the content network, which allow any qualified service providers to build services on top of it. Like the data network GÉANT, DRIVER's knowledge infrastructure offers mainly a well structured, reliable and trustworthy basis. DRIVER opens up knowledge to the communities; it does however not prescribe how to use the knowledge.

Project duration: 18 months

Yearly effort: PM 244.7; Annual budget: €1,233,333

Project's home page: <http://www.driver-repository.eu>

## A.7 POLICY AND PUBLIC RELATIONS PROJECTS

### A.7.1 BELIEF

BELIEF's aim is to create a platform where e-Infrastructure stakeholders can collaborate, reach out to new communities and exchange knowledge, thus helping to ensure that e-Infrastructures are both developed and used effectively worldwide. It will be a one-stop shop for information on e-Infrastructure documentation and activities for both research and industry and will thus aid the knowledge transfer between them.

Project duration: 24 months

Annual budget: €604,226.5

Project's home page: <http://www.beliefproject.org/>

### A.7.2 E-IRGSP

The e-IRGSP project provides a number of services to support the work of the e-Infrastructure Reflection Group (e-IRG), such as a secretariat (in The Hague, The Netherlands), a knowledge base and policy and editorial support. e-IRG comprises official government delegates from the 25 EU member states, as well as from associated countries.

Project duration: 24 months

Yearly effort: PM 22.5; Annual budget: €183,042

Project's home page: <http://e-irg.eu/>

## A.8 OTHER PROJECTS

### A.8.1 ICEAGE

At European level, e-Infrastructure has been identified as a key element for the creation of the European Research Area (ERA) to stimulate industry, improve the lives of citizens, accelerate research and gain international competitive advantage. This presupposes a diverse, knowledgeable and creative community able to effectively exploit e-Infrastructure.

With the support of the European Union, the ICEAGE project aimed at encouraging and supporting the incorporation of education in distributed computing in academic courses throughout the ERA. Built on EGEE, ICEAGE has enabled students and educators to obtain and develop grid education via sustained, large-scale, multi-purpose e-Infrastructures. ICEAGE differs from EGEE in that its primary goals are educational and therefore embraces a wide variety of approaches to e-Infrastructure.

ICEAGE has catalysed the necessary infrastructure and skills by establishing a worldwide initiative to inspire innovative and effective grid education. Grid education implies the use of education in the grid, but also the use of the grid in education. In the context of ICEAGE, the term "grid" is indeed used in a broad sense to include computing and communications technology, working practices, and policies that underpin e-Infrastructure.

**ICEAGE Effort Table**

	Project Activities	Effort in FTE	
		Total	Funded
Middleware	t-Infrastructure – development and provision (with several middleware co-existent)	Total	3
		Funded	2
Operations	t-Infrastructure operation (during Grid Schools)	Total	2
		Funded	1
User oriented activities	WP1 - Extend and Advance Grid Education – Grid Education Policy Development WP2 - Advanced Grid Education Support, Outreach, Induction & Training Services WP3 - Educational events and Summer Schools WP4 - t-Infrastructure – development and provision	Total	13
		Funded	9

Project duration: 24 months

Yearly effort: PM 216; Annual budget: €600,000

Project's home page: <http://www.iceage-eu.org/>

### A.8.2 ISSEG

ISSeG aims to contribute to the consolidation of the European grid infrastructure in the field of computer security, by creating and disseminating practical expertise on the deployment of Integrated Site Security (ISS); this is to complement efforts undertaken within the Enabling Grids for E-scienceE (EGEE) projects Grid Security. ISS is a concept where all Site Security components (technical, administrative, educational) are developed in a coordinated fashion. The ISSeG vision is that Grid Security, which focuses on inter-site security, middleware, and authentication, needs to be complemented by a comprehensive ISS strategy at every centre. The ISSeG consortium comprises three large scientific centres, namely CERN, CCLRC and FZK, which are all involved in EGEE.

The project objectives will be achieved by the creation and capture of raw expertise through full-scale ISS deployment at CERN and FZK, and by dissemination through the provision of applicable recommendations and methodologies for further ISS deployments.

Project duration: 24 months

Yearly effort: PM 102.5; Annual budget: €655,000

Project's home page: <http://www.isseg.eu/>

### **A.8.3 RINGRID**

RINGrid provides an architecture which integrates scientific instruments in the e-Infrastructure and promotes a vision towards next-generation remote instrumentation systems. It encompasses the current state-of-the-art and near-future technology, delivers a conceptual design of missing architectural pieces to achieve such vision and assumes a grid environment and high-speed network interconnections.

Project duration: 18 months

Yearly effort: PM 123; Annual budget: €666,110

Project's home page: <http://www.ringrid.eu/>