Design Study

EGI_DS

DRAFT EGI BLUEPRINT PROPOSAL

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1. INTRODUCTION

1.1. PURPOSE

Research does not stop at national borders. While national infrastructures are fundamental in providing local connectivity and resources to researchers, they need to be linked seamlessly at a world-wide level to enable global scientific collaboration. This is in particular required inside Europe itself where the construction of a European Research Area (ERA) overcoming the current limits of Member States' research, has been recognized as one of the top European priorities. The ERA will provide a unified framework for the selection and realization of the best scientific projects, will avoid the multiplication of similar parallel efforts in all member states, providing in this way large synergies, economies of scale and a dimension for the European research more adequate to remain ahead in a world-wide competition. A general pan European e-infrastructure is required to support the research projects of ERA in many research disciplines enabling them to easily share of all sort of national resources: compute, storage, data, instruments, and easing their effort to reach a global dimension

Over the last few years the pan-European distributed grid infrastructure has been developed and operated through a series of short term projects such as EGEE and DEISA. DEISA It has demonstrated to be very successful and to be able to satisfy the needs of thousands of users of a large variety of scientific disciplines. The EGI Design Study was partially funded by the EC as a project over 27 months from September 2007 with the aim of bringing about the creation of new European Organizational model, which will be capable of fulfilling this vision of a sustainable European grid infrastructure for research. The foundation for e-Infrastructure sustainability has been identified since the beginning in establishing National Grid Initiatives (NGI), as legal organizations, in general supported by governments, providing a unique representation at European and international level of all the national communities related to a national grid infrastructures: from resources providers to scientific users. Over the last nine months the study has collected and consolidated the requirements of a wide range of research disciplines within a large number of NGIs, and designed the required functionality & modelled the organization that could consolidate, operate, manage and continue to develop a sustainable European e-Infrastructure. The study has developed this draft EGI Blueprint as a description of what that sustainable infrastructure would look like.

The purpose of this blueprint is for NGI and other stakeholders to assess whether it meets their requirements, and if not to inform the design project of changes they would like. The design project will modify this draft blueprint on the basis of feedback provided, and produce a convention of the new organization that can be agreed.

1.2. EDITORIAL RESPONSIBILITIES

This document has been drafted with the aim to support the discussions in the EGI Geneva Workshop (30 June 2008). The individual sections have been developed by different groups of people, with many contributions especially from EGI Task Forces, including members not only from the organisations carrying the EU Project EGI_DS; the actual work has been performed under the guidance of the EGI_DS Management Board and the respective EGI_DS Work packages, with the editorial responsibility remaining with several authors. The following table lists the individual responsibilities:

Section	Task force	Responsible editor(s)	Work Package
1	Na	M. Wilson, G. Wormser, D.	

		Kranzlmüller	
2	Na	M. Wilson, G. Wormser	
3	Na	D. Kranzlmüller	
4	Na	J. Knobloch	Work Package 5
5.1	EGI Operations Task Force Chairman: Jamie Shiers (CERN) Members: Maite Barroso (CERN), Nick Thackray (CERN), Sven Hermann (DE), Rolf Rumler (FR), Per Öster (FI), Fotis Karayannis (GR), Tiziana Ferrari (IT), John Gordon (GB), Romain Wartel (CERN)	T. Ferrari	Work Package 3
5.2	EGI Middlware Task Force Chairman: Mirco Mazzucato (IT) Members: Alistair Dunlop (UK), Achim Streit (DE), Farid Ould-Saada (NO), Ludek Matyska (CZ), Ian Bird (CERN), Christoph Witzig (CH), Sergio Andreozzi (IT), Ignacio Martin Llorente (ES), Uwe Schwiegelshohn (DE)	M. Mazzucato, L. Matyska	Work Package 3
5.3	EGI Usersupport Task Force Chairman: Diana Cresti (IT) Members: David Fergusson (UK), Jacko Koster (NO), Jakub Moscicki (CERN), Patricia Mendez-Lorenzo (CERN), Morris Riedel (DE), Torsten Antoni (DE), Vincent Breton (FR)	Patricia Mendez-Lorenzo	Work Package 3
5.4	na	P. Öster	Work Package 5
6	na	K. Schauerhammer, K. Ullmann	Work Package 4
7	na	B. Merlin, A.-C. Blanchard	Work Package 4
8	na	M. Wilson	Work Package 5

1.3. DOCUMENT ORGANISATION

Following this introduction, the executive summary, and some definitions chapter 4 considers the transition from the current project based approach towards a sustainable infrastructure from the start of EGEE III in 2008 until the EGI is operating normally.

Chapter 5 contains the functionality of the EGI across operations, middleware, user support and management. It is important for NGIs to consider whether the proposed functionality meets their requirements.

Chapter 6 proposes a management structure for the EGI while chapter 7 lays out the legal issues associated with creating the EGI as a European institution. A call for tenders for NGIs to host the EGI is being issued at the same time as this document, and is available in Annex 5. Therefore the location of the institution is not stated in this blueprint.

Chapter 8 outlines the funding model proposed to support the EGI, and the relationship between the EGI.org, the NGIs, the resource centres and the national funding bodies. The EGI proposed in this document is dependent on particular funding becoming available. NGIs should consider whether the relationships described are appropriate for them, and whether the funding model proposed is appropriate.

1.4. DOCUMENT AMENDMENT PROCEDURE

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

1.5. TERMINOLOGY

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

Glossary

AAA	Authorisation, Authentication, Accounting
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
CSIRT	Computer Security Incident Response Team
CTO	Chief Technical Officer
DANTE	Delivery of Advanced Network Technology to Europe
DEISA	Distributed European Infrastructure for Supercomputing Applications
DESY	Deutsches Elektronen-Synchrotron
EC	European Commission
EDG	European Data Grid
EGEE	Enabling Grids for E-sciencE
EGI	European Grid Initiative
EGI_DS	European Grid Initiative Design Study
eIRG	e-Infrastructure Reflection Group

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
GDP	Gross Domestic Product
GGUS	Global Grid User Support
GNI	Gross National Income
gNOC	National Grid Operating Centre
GNP	Gross National Product
IGTF	International Grid Trust Federation
JRU	Joint Research Unit
JSPG	Joint Security Policy Group
LHC	Large Hadron Collider
M	Million
MoU	Memorandum of Understanding
NGI	National Grid Initiative
NREN	National Research and Education Network
OCC	Operation Coordination Centre
OGF	Open Grid Forum
OMII	Open Middleware Infrastructure Institute for Europe
PB	Policy Board
QA	Quality Assurance
ROC	Regional Operating Centre
SDC	Strategic Discipline Cluster
SLA	Service Level Agreement
UMT	Universal Middleware Toolkit
UNICORE	Uniform Interface to Computing Resources
US	United States of America
USD	US-Dollar
VDT	Virtual Data Toolkit
VO	Virtual Organisation
W3C	The World Wide Web Consortium

WLCG	Worldwide LHC computing Grid Project
WP	Work package
WS	Workshop

2. EXECUTIVE SUMMARY

2.1. THE EGI VISION

The success of the knowledge based economy in Europe will be built on scientific and technological breakthroughs needed to keep Europe ahead in the international competition. A critical mass of specialist researchers and facilities which can only be provided by pan-European research will be required to reach this goal. In particular, an integrated and well organized pan-European e-infrastructure, capable of enabling the sharing of all sorts of IT resources to all researchers, regardless of their countries or their disciplines, will form a key element of this European Research Area. This draft EGI Blueprint is based on the vision of a large pan-European distributed computing and data grid infrastructure, the future European Grid infrastructure, providing such services as described in the EGI Vision Document (available at http://www.eu-egi.eu/vision.pdf). The EGI Blueprint is a proposal how to realise such a vision, with all the necessary implications for the implementation, operation, user interaction and management of the corresponding infrastructure.

2.2. EGI.ORG AND NGIS' ROLES

The proposed EGI consists of a core central entity EGI.org which provides a coordination framework for the National Grid Initiatives (NGIs) being established in each country and manages the central functions required by the pan-European grid. The NGIs will provide the general high level management and steering of the evolution and operation of the European grid infrastructure through the EGI Council, will make available the IT resources at the level required by the scientific communities, and will be responsible for the proper operation of their national grid infrastructures and for those services necessary for their integration into a general pan-European e-Infrastructure.

The transition period from the current Grids in Europe to EGI has already started. The EGEE3 project will move towards an EGI/NGI structure during its third phase that started in May 2008. The transition will continue through the initial three years of EGI after June 2010, when it is expected that the number of NGIs contributing to EGI will steadily ramp up.

2.3. THE EGI FUNCTIONS

The EGI will provide functions to address the operation of the infrastructure, user support and application development, middleware consolidation, middleware development, and management. Table 1 summarizes the number of FTEs required for each of these functions and their proposed location.

Nr.	Costs for	EGI.org Costs (in FTE/a)	Inl. Part of NGI Costs (in FTE/a)	Section
1	Operations	16	250-300	5.1
2	Middleware interfaces and final certification	8	100-120	5.2
3	Application Support and training	11	230	5.3
4	External functions	4	60	5.4

5	EGI.org Management and Administration	10	90	6
	Total	49	720-800	

2.3.1. Operation function

The operations and security function includes those EGI services needed to ensure optimal functionality of the pan-European infrastructure and the overall seamless effective interoperation of national and regional Grids. These goals rely on the provisioning of both EGI.org services and of international NGI tasks, which are complementary and equally important. Individual countries are encouraged to federate in order to share the effort. In this section, the term NGI is used to refer to both a national Grid infrastructure and a federation of national infrastructures, where applicable

The EGI operations model consequently needs to face three challenges: scalability, interoperation, promotion of autonomy of NGIs in running operational services in the region.

We see distribution as a strategy to follow to address these issues. For example, reporting of usage will need to be collated and trouble tickets may well also traverse several helpdesks. In order to support interworking, EGI will agree some standards and/or specifications for interoperation between NGIs, and it will aggregate some information centrally (e.g. for resource discovery and accounting), which will require standards for information publishing. In this model the main operational functions of EGI are the coordination of activities to agree the standards for interoperation, and the operation of central data aggregation services and interworking services (e.g. the helpdesk).

A strong central team is, in any case, needed for proper operation of the pan-european grid. Table 2 lists the manpower estimates in EGI.org structure to run central operations: (see details in section 5.1)

ACTIVITIES	FTE
Operation of tools and services	6.5
User support	4.5
Coordination	3
Security	2
TOTAL	16

Together with this central team, 160 to 200 FTE summed over all NGIs will need to achieve EGI ambitious goals.

2.3.2. User support and application development

The goal of user support activities within the EGI organization is to foster international and interdisciplinary collaboration, including both scientific and technical collaboration. In the short term, supporting multiple middleware stacks allows users of those stacks to transition to the EGI infrastructure and allows EGI to initially build a larger user community. However, few disciplines have the resources necessary to adapt their applications to more than one middleware. The EGI organization must therefore actively work within the EGI user support activities to help the various applications adapt to EGI supported middleware.

The various ways in which EGI must give support to the application developers are listed below together with the number of FTEs needed in the central team to perform this task, for a total of 11 FTEs (see details in Section 5.3).

2.3.3. Middleware consolidation function

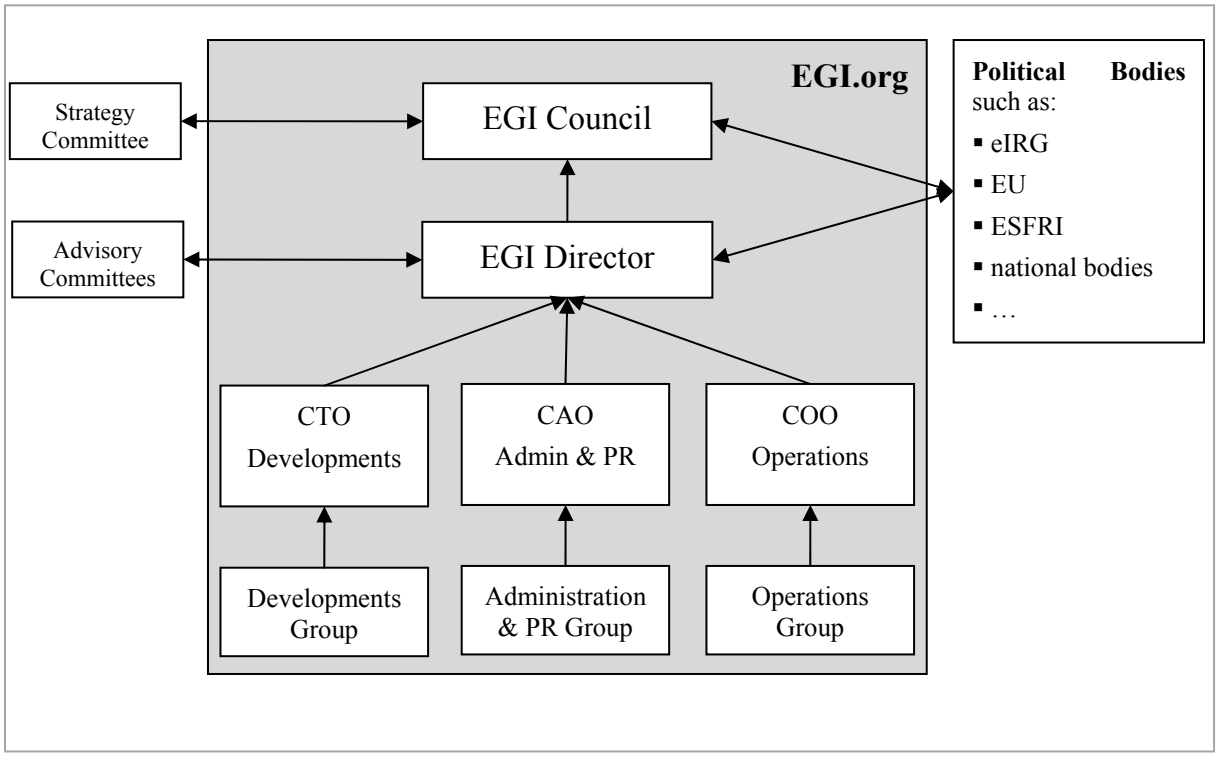
The EGI middleware consolidation function is responsible for the process of the definition of the set of policies, rules and specifications to be satisfied by the EGI middleware services and for the selection of reference implementations from best practices in use in the current e-Infrastructures compliant to those criteria The EGI.org middleware function in particular transforms expectations and requirements coming from the NGIs and user communities into a coherent set of specifications and reference services implementations that constitute the EGI middleware services. It also tests and verifies and finally certifies components submitted by the reference development teams as fulfilling these specifications and the strict quality criteria required for a general grid infrastructure. NGIs are expected to run only certified components at the core level.

2.3.4. Middleware development function

The EGI middleware development function is responsible for the crucial task of implementing the production quality services and the new functionalities according to the EGI.org specifications. The development must be reasonably tightly coupled with operations and deployment (users) for fast feedback, adaptations, and also to provide a platform from which request for specification changes will come. While the process is open - anybody can develop a service and submit it for verification to EGI.org - EGI must set priorities to ensure that there are enough capacities (man power) to test and certify the necessary services at the level required for a production grid and not just at the one interesting for computer science or similar communities. Also, the EGI middleware development is not only responsible for supporting the initial implementation of a particular service, but especially for the process of its improvement and eventual adaptation after the service is actually deployed and exposed to users. The “middleware hardening” task is one of the most important goals of the EGI middleware development function that can not be immediately outsourced to commercial companies and needs guaranteed budget within EGI.

2.3.5. EGI management

The proposed model for EGI.org management structure is illustrated in the figure below. The EGI council formed by representatives of the participating countries through their NGIs will be the overarching body. The proposed organization is typical for an international endeavour.



2.4. EGI.ORG AND NGIS LEGAL STRUCTURES

2.4.1. EGI.org legal framework

The list of requirements that a formal entity should fulfil in order to be adapted to EGI.org needs are :

- autonomous legal entity
- legal structure which allows both public and private entities to be member
- legal form which allows for membership of entities established in non-EU member States
- not-for-profit status
- limited liability of its members
- fast to create
- location in a EU member State

2.4.2. NGI guidelines

The main foundations of EGI.org will be the National Grid Initiatives (NGI), which will operate or coordinate the grid infrastructures in each country. EGI.org will provide a general grid infrastructure management framework to existing NGIs and will actively support the setup and initiation of new NGIs in countries where they do not yet exist. The list in section 7.2 contains all requirements that an NGI must fulfil in order to become a member of EGI.org.

NGIs fulfilling these requirements should ideally exist by spring 2009.

2.5. FINANCIAL MODEL

The long term vision for EGI.org is that its management will be funded through membership fees, its operation will be funded through usage charges and its continued innovation will be funded through co-funded grants from the EC and other sources. Given the strong European integration dimension of the EGI, and that it is currently taking its first steps, strong support from the European Commission will be required both to get the new construct off the ground, and to continue to keep it at the leading edge of the technology. Usage fees will not be introduced during the transition phase for the EGI where only the membership fees and EC funding will be used.

The sum collected through membership should be around 1 M€ to finance the core management EGI.org personnel listed in table 1. The membership repartition between the various countries should be according to GDP or some other composed index (see details in section 8). The EC contribution should be initially around 20 M€ per year, comparable to the present EC contribution to the baseline grid infrastructure program. Each country will have to continue funding its own local infrastructure including national IT resources and user communities, and NGI management.

Once established, the EGI requires a periodic review every 3-5 years of the EGI funding model and its required budget based on the usage, commercially available technologies and the required innovation. NGIs must ensure their own national funding required in addition to the funding from the EC for European integration. If the EC or the NGIs do not provide the funding planned, then the EGI cannot take place in the form proposed.

3. EGI, THE EGI ORGANISATION (EGI.ORG) AND NGIS

The European Grid Initiative (**EGI**) aims to establish a sustainable and operational grid infrastructure in Europe. Driven by the needs and requirements of the research community, it is expected to enable the next leap in research infrastructures, thereby supporting collaborative scientific discoveries in the European Research Area (ERA). The term EGI describes the overall efforts to achieve this goal and is, in this sense, a voluntary activity by institutions and people to develop the ideas outlined above.

The main actors of EGI are the National Grid Initiatives (**NGI**), which ensure the operations of the grid infrastructures in each country and a transparent representation of the requirements of all their scientific communities together with resource provider an all e-Infrastructure related Institutions. The goal of EGI is to link existing NGIs together and to actively support the setup and initiation of new NGIs in those countries, where corresponding efforts do not yet exist. The characteristics of the NGIs can be identified as follows[1]:

Each NGI should

- be a recognized national body with a single point-of-contact representing all institutions and research communities related to a national grid infrastructure
- mobilize national funding and resources
- ensure the operation of a national e-Infrastructure and its integration in EGI
- support user communities (application independent, and open to new user communities and resource providers)
- contribute and adhere to international standards and EGI policies and quality criteria

At this point in time, all NGIs in Europe are at different stages of their implementation, ranging from individuals claiming to represent an NGI to early implementations of NGIs with a preliminary legal status. During the development of EGI, these early forms of NGIs are expected to transform into legal entities, which are able to collaborate on formal grounds in the European landscape. The EGI effort intends to support this development in order to achieve a mature level for all NGIs in Europe.

To facilitate the interaction and collaboration between NGIs and to provide a common managerial framework of the pan-European grid infrastructure, EGI intends to setup and implement the so-called EGI Organization (**EGI.org**), which is expected to start its operations in 2010. This deadline must be met to ensure a smooth transition without interruption from today's EGEE-based infrastructure into the future **EGI model**. (Over the course of time, other grid infrastructures are expected to employ the EGI model as well or at least benefit from the EGI services). The EGI model itself captures the relations between EGI.org and the NGIs, as well as the procedures needed during their life-time. It is clear that EGI.org will evolve over time corresponding to the evolution of the NGIs.

As part of EGI conceptual design and during the EU Project EGI_DS, the EGI Preparation Team (**EGI PrepTeam**) develops the new organizational model, the so-called EGI model, for a sustainable pan-European grid infrastructure

The NGIs have been collaborating to the work of EGI_DS via the EGI Advisory Board (**EGI AB**), which was installed during the initial phases of EGI_DS based on written letters of support from the

[1] These characteristics are further developed in an EGI_DS Document "Guidelines for NGIs", which also reflects the different stages of evolution of the NGIs. This document is summarized in 7.2.

NGIs. Each NGI declared their support for the **EGI Vision** (http://www.eu-egi.eu/vision.pdf) and the EU Project EGI_DS, and nominated up to two representatives for the EGI AB. At this point in time, 38 countries are collaborating via their NGI to the work of EGI_DS.

Meanwhile, the NGIs assembled in the EGI AB evolved into the EGI Policy Board (**EGI PB**), where a chairman (Prof. Barreira, Portugal) and a vice-chairman (Michal Turala, Poland) have been elected. Currently, the EGI PB discusses the EGI PB Bylaws, which describe the collaboration within the EGI PB. Upon installing the EGI model and instantiating EGI.org, the EGI Policy Board is expected to transfer into the EGI Council, which is the sole governing and decision making body for EGI.

The following chapters describe the EGI model in more detail, focusing on the high-level description of its components and the environmental effects and requirements, such as a necessary funding model.

4. TRANSITION PERIOD

The transition period from the current Grids in Europe to EGI has already started. As described below, the EGEE project will move towards an EGI/NGI structure during its third phase that has started in May 2008. The transition will continue through the initial three years of EGI when it is expected that the number of NGIs contributing to EGI will steadily ramp up. During this period, additional EU funding – amount to be decided - will be necessary to allow the full functioning of EGI.org from the beginning. After the transition, a steady co-funding by the EC is continuously required.

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

We concentrate in this chapter on EGEE and related Grid projects. Other related projects in the same Ecosystem, such as DEISA and PRACE, which focus on Supercomputer, are establishing collaboration and coordination with EGI, e.g. in the field of standardizing middleware interfaces. Clearly, these projects are not concerned at the same level as EGEE with the transition to EGI.

4.1. EGEE III AS A STARTING POINT

The Grid infrastructure, which is now operational over many European countries, was established through nationally and European co-funded projects starting early 2001 with the European DataGrid (EDG) 2001 under the fifth Framework Programme. After this proof of principle demonstrating the potential impact of Grid technologies on European science, a first large scale production Grid infrastructure was deployed by the Enabling Grids for E-SciencE project (EGEE), and its second phase (EGEE-II) has provided now a large-scale, production quality grid for scientists in Europe. These Grid projects together with related activities such as DEISA, OMII-Europe, BalticGrid and SEE-Grid, exploiting the pan-European network GÉANT2 and the NRENs carrying the Geant2 activity have established European leadership in the development and exploitation of Grid technology. The latest e-Infrastructure project, EGEE-III, co-funded by the European Commission for two years started on May 1st, 2008.

A growing number of scientific disciplines organized in Virtual Organizations (VOs) rely now on production quality grids and the underlying infrastructure:

- Astronomy & Astrophysics
- Computational Chemistry
- Earth Sciences, including Earth Observation, Solid Earth Physics, Hydrology, Climate
- Fusion
- High Energy Physics
- Life Sciences - Bioinformatics (Drug Discovery, medical imagery, etc.)
- Condensed Matter Physics
- Computational Fluid Dynamics

- Computer Science/Tools
- Civil Protection

It is imperative that these sciences using the current grid operations supported by EGEE and other EU-funded projects can transit without disruption to the envisaged EGI/NGI-based model.

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

- Before the beginning of EGI a sufficient number of NGIs must have been established (or be in the process of being established) to represent a credible European Grid infrastructure.
- The concept of federating several countries to share common tasks was very successful in EGEE building the Regional Operations Centres (ROCs). It is inconceivable that these centres cease to exist from one day to next without appropriate replacement or continuation. In EGEE-III it is planned to move towards National Grid Operating Centers, so-called gNOCs.
- There is a central place providing overall coordination (such as the Operations Coordination Centre – OCC, in EGEE-III located at CERN). These functions will be taken up by EGI.org. The transfer of people from the current locations to a new one chosen by EGI is a concern.
- Strategic Discipline Clusters (SDC) have been established to maximize the penetration of Grid technology into key scientific disciplines ensuring that the requirements of each area can be met and that the scientists get focused support and help for the development of high-level application services. This task will still be required for existing and new communities in EGI.
- The middleware is still under development within the community and this effort is co-funded by the EU. These developments have to continue through the transition phase from the current organization to the EGI/NGI model and new requirements and technology evolution will imply new development throughout thereafter.
- The developments and operational tasks are performed by staff having built up their expertise through the lifetime of the current grid projects. Care must be taken that this expertise is not lost during the transition period.

These issues require that appropriate funding for EGI.org and the NGIs is ensured in a timely manner. This is particularly critical during the transition and early phase of EGI.

With EGEE-III operating in parallel with EGI_DS, the work plan of EGEE-III contains already the implementation of structural changes required to allow for a seamless transition from the current project based EGEE model to a stable EGI model based on NGIs. To achieve this goal, a close collaboration between EGI_DS and EGEE-III is essential. This is also clearly stated in the Annex I – Description of Work - of the EU Project EGEE-III:

"EGEE-III will take key steps in moving Grids to dependable and sustainable production infrastructure while providing a continuous service to its expanding user base.

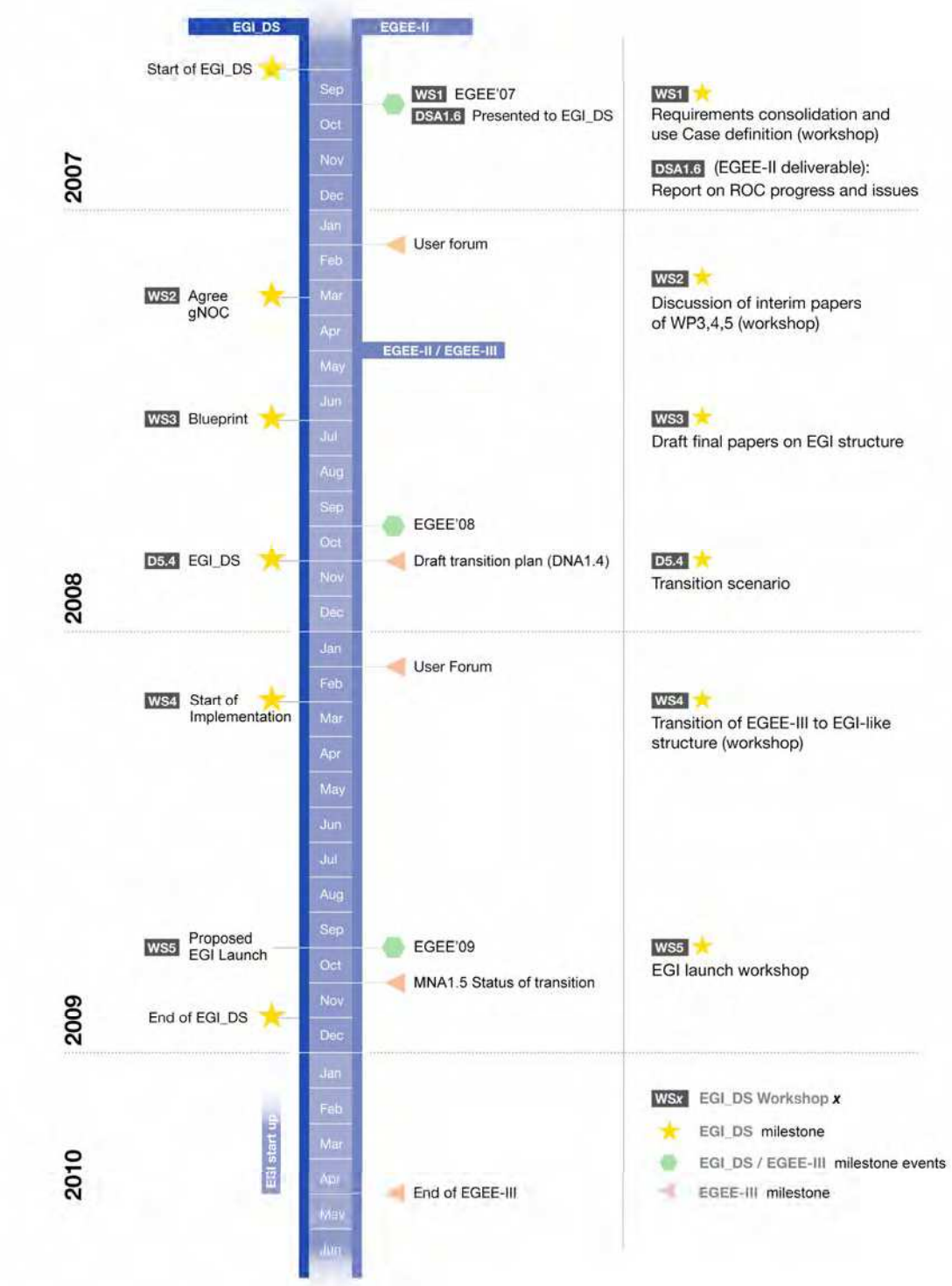
The Project Director and Technical Director of the project will interact closely with the EGI_DS project management team to check the progress of the parallel goals and ensure carefully timed milestones are met to ensure the progress of the project towards a sustainable model. These milestones, agreed with the EGI_DS management, are illustrated in the figure below. In a series of joint workshops EGEE will provide input to EGI_DS, such as EGEE-II deliverable DSA1 (WS1), the status of National Grid Operating Centers (gNOC) will be reviewed (WS2), and based on this input the EGI_DS blueprint document will be developed and discussed (WS3). This blueprint document will

form the basis of the draft transition plan (DNA1.4) EGEE-III will develop and discuss at its annual conference, EGEE'08. This plan will detail the steps needed to migrate EGEE's operation to EGI, identify major risks and shortcomings and develop stop gap strategies in case a full transition seems unlikely in the remaining lifetime of EGEE-III. The implementation of this transition plan will start in project year two and the EGEE description of work will be updated accordingly, taking into account any major changes to the programme of work to ensure the objectives are met. The status of the transition will be reviewed at the EGEE'09 conference (MNA1.5) which will probably also see the EGI launch workshop. This interaction is paramount for the overall coherence of plans, both technical and strategic. In addition to the technical work outlined above, EGEE-III's adoption of JRUs will provide the necessary legal and organisational groundwork for EGI as discussed in Section 3.1. The project will actively participate in concertation initiatives and meetings related to the e-Infrastructures and other related areas including the participation and contribution in relevant working groups established under the above initiative. The objective of the concertation activity is to optimise synergies between projects and the collective impact and value of the programme.

In order to manage the large number of partners, the EGEE-III consortium will be structured in federations (13 in this project) clustering countries on a regional basis. In addition, the Joint Research Unit (JRU) instrument introduced in EGEE and EGEE-II is being expanded to all countries where recognised National Grid Initiatives do not yet exist, to prepare the ground for long term sustainability by promoting international standards."

This current draft Blueprint of EGI_DS constitutes an important step to continue the definition of the EGI and to complete the planning of EGEE-III for its second year.

The figure mentioned in the EGEE text above is re-copied here visualizing the tight coupling between the planning of EGEE-III and EGI_DS:


EGI_DS
EGEE-II
Start of EGI_DS
WS1 EGEE'07
DSA1.6 Presented to EGI_DS
WS1
Requirements consolidation and use Case definition (workshop)
DSA1.6 (EGEE-II deliverable): Report on ROC progress and issues
2007
Sep
Oct
Nov
Dec
Jan
Feb
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May
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Jul
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Nov
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2008
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Jul
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Nov
Dec
2009
Jan
Feb
Mar
Apr
May
Jun
2010
User forum
WS2 Agree gNOC
WS2
Discussion of interim papers of WP3,4,5 (workshop)
EGEE-II / EGEE-III
WS3 Blueprint
WS3
Draft final papers on EGI structure
EGEE'08
D5.4 EGI_DS
Draft transition plan (DNA1.4)
D5.4
Transition scenario
User Forum
WS4 Start of Implementation
WS4
Transition of EGEE-III to EGI-like structure (workshop)
WS5 Proposed EGI Launch
EGEE'09
MNA1.5 Status of transition
WS5
EGI launch workshop
End of EGI_DS
EGI start up
End of EGEE-III
WSx EGI_DS Workshop x
EGI_DS milestone
EGI_DS / EGEE-III milestone events
EGEE-III milestone

4.2. FROM JOINT RESEARCH UNITS TOWARDS NATIONAL GRID INITIATIVES

The concept of Joint Research Units (JRU) that is an organizational concept introduced in the EC's Framework program was already implemented in the early phases of EGEE has now been established for 21 countries out of the 38 that have expressed interest in joining EGI. The goal in EGEE-III is to establish JRUs in all countries where recognized National Grid Initiatives do not yet exist, preparing the ground for long term sustainability by creating a stable institutional basis and promoting international standards.

The definition of JRUs in EGEE is as follows:

Joint Research Units (JRU) are research laboratories/infrastructures created and owned by two or more different legal entities in order to carry out research. They do not have a legal personality different from that of its members, but form a single research unit where staff and resources from the different members are put together to the benefit of all. Though lacking legal personality, they exist physically, with premises, equipment, and resources individual to them and distinct from "owner" entities. A member of the JRU is the beneficiary and any other member of the JRU contributing to the project and who is not a beneficiary of the Grant Agreement has to be identified in the clause. The JRU has to meet the following conditions:

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

This covers some but not all of the criteria of NGIs. Nevertheless JRUs may be considered an excellent starting point for the establishment of NGIs. A requirement still to be established is

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

Some of these conditions for NGIs as described in Section 7.2 are today already fulfilled by the existing JRUs in EGEE. This needs to be improved in the near future.

4.3. EVOLUTION OF HUMAN RESOURCES DURING THE TRANSITION

The evolution of the overall level of human resources will be governed by several factors:

- De-centralization in general requires more effort than centralized solution. In EGEE-III this is expected to be compensated by reducing the effort required for daily operation through automating tools and processes.
- With increasing maturity of software, the emphasis shifts from development to maintenance. In the medium term it is, however, expected that additional effort will be required to implement in existing middleware components the standards agreed in the EGI framework. In addition, new communities using the European Grids are likely to have new requirements that need to be analyzed and implemented.
- During its existence, the EGEE program has seen a constant increase in the number of user communities supported, countries and sites connected to the infrastructure, collaborating projects and partners in the consortium. The usage of the infrastructure (CPU and storage) has increased by an order of magnitude in the last two years. This trend is likely to continue

through the transition period and beyond. The observed growth could up to now be handled with constant or even slightly decreasing human resources. Significant cuts in personnel developing, maintaining and operating the Grids in Europe would seriously hamper the growing scientific community relying on the Grid.

5. FUNCTIONS OF THE EGI

The main goal of EGI is to realize a large-scale, production Grid infrastructure – built on National Grids that share basic services and interoperate seamlessly at many levels, offering reliable and predictable services to a wide range of applications, ranging from "mission critical" to prototyping and research.

This section provides the description of the functions that need to be implemented by EGI to reach the above goal, specifying the list of the services to be included. The list of services is based on the preliminary specification of a list of tasks, part of which is identified as services. It also identifies which services could be potentially outsourced to the Middleware Consortia, to the NGIs , or to other parties, and finally which ones could be better provided directly by the new EGI Organization (EGI.org) itself. It quantifies the personnel required for the execution of the identified services and proposes a funding model.

EGI needs to make available the necessary services in terms of operational tasks, user support, Middleware availability and support and requirements based on feedback collected from Scientific Communities in a phase in which the middleware currently deployed in the EU e-Infrastructure and the operational services still need to continue to be strengthened and further developed, in particular in view of emerging standards, and, in some parts, completed and hardened from their current stage to fully satisfy the operational quality criteria and the new VOs requirements .

Funding and initial phase of EGI

The funding of EGI is described in detail in Chapter 8 of this document, here we recall only what is needed for understanding how the EGI functions will be implemented and sustained.

The mechanism for covering service costs includes:

- fee-for-service contracts with NGIs for the EGI.org services
- EU contribution obtained through a project submitted to a possibly reserved call aiming either at the consolidation of some specific services , or more generally at sustaining EGI (NGIs included) in its initial phase.

Project based co-funding by EU is foreseen to last as far as developments and EU incentives will be needed to keep the EGI grid infrastructure at the leading edge of the technology. It should be stressed that after 20 years the EU is still promoting innovation within GEANT. Such EU contributions are essential to keep the EU wide Research Networking Infrastructure at the leading edge, and similar arguments apply to the grid infrastructure as well.

The funding scenario in this section specifically addresses the need of EC co-funding for the items included in the following list; the details for each item will be clarified within each specific function. The purpose of the list is also to establish a set of categories that will be used in the specification of the services within each function.

(a) Projects

Projects are the natural instruments to fund all the common developments needed for bringing tools or services at the level needed for supporting a full production EGI general grid infrastructure common to all applications, for keeping them at the leading edge, and to incentive the effort required for the integration of NGIs national resource offering into the pan-European EGI environment. The EU funding may be asked to promote these tasks through a call reserved to EGI.org and the NGIs.

(b) EGI.org Critical Services

Critical Services are a subset of the services provided by EGI.org to the NGIs; this subset includes the services that are needed for the general good working of the grid infrastructure and of the user applications running on this infrastructure

These include the general services that EGI.org needs to provide to NGIs to guarantee: e.g. the reaction to a security accident or the quality of the Middleware made available to the NGIs (final acceptance tests).

The availability of the monitoring and accounting tools, of the ticket system, of the Operation portal and in general of all the other common tools and services tools required for the seamless operation of the EGI infrastructure

The coordination of the application support at the level of EGI.org and the links of Application Support to the Operation and Middleware, (these links will need effort also outside EGI.org)

When EGI.org services will be in steady state, critical services will be possibly fully sustained by the NGIs which will pay service charges to the EGI Organization for these services; however for some time the NGIs will not have yet accumulated enough financial resources in their budgets for acquiring all the services needed to run the EGI grid infrastructure and co-funding by the EC will be a necessary source of support.

Note that every service, including critical ones, may be outsourced by EGI.org to an NGI or other organisations.

(c) NGIs' international tasks and general services

The NGIs' tasks from one side naturally include the support of the national grid infrastructure and the support of the national users and application communities and, from the other side, those tasks and services that are specifically aimed at allowing the sharing of the NGIs' resources or the access to country-specific resources at pan-European and international level in a uniform, robust and seamless way and at supporting the international application communities.

When EGI.org will be in its steady state, NGI international tasks, necessary for their pan-European integration, will be possibly sustained by each NGI with its own internal effort.

The co-funding from EC of NGI tasks is especially important because it is needed to incentive the offering of the NGIs' resources to the general EGI e-Infrastructure and constitute a strong mean to favour a major convergence, starting from today's situation of large non-uniformity (presently some NGIs are strictly connected to EGEE and obey its general prescriptions, while other ones have much looser links with it). Establishing contracts with the NGIs will be a powerful means for EGI.org to achieve the convergence, full interoperability and adherence to quality criteria in the overall e-Infrastructure.

In EGI general services include the maintenance of the general middleware services needed by most VOs' authorization services, Workload Management services, data management services etc

The cost of these general services, necessary for the pan-European infrastructure, will be sustained for some time by a mixture of middleware developers' effort, of EC contributions and of standard fee-for-service contracts.

5.1. OPERATIONS & SECURITY

The operations and security function includes those EGI services needed to ensure optimal functionality of the pan-European infrastructure and the overall seamless effective interoperation of national and regional Grids. These goals rely on the provisioning of both EGI.org services and of international NGI tasks, which are complementary and equally important. Individual countries are encouraged to federate in order to share the effort. In this section, the term NGI is used to refer to both a national Grid infrastructure and a federation of national infrastructures, where applicable. In addition, we define as *global VO* those user communities that are supported by two or more NGIs, whereas *national/regional* VOs are those supported by a single NGI.

As detailed in [D5-1], the operation of the pan-European Grid infrastructure relies on a number of principles. These are the foundation of the set of services and tasks defined in this section, and are reported in the following section.

5.1.1. Principles

1. **Reliability of Grid services and SLAs**: notwithstanding the different and evolving needs of application communities and NGIs, a key component of the EGI vision is the provision of a large-scale, production Grid infrastructure – built on National Grids (NGIs) that interoperate seamlessly at many levels, offering reliable and predictable services to a wide range of applications, ranging from "mission critical" to prototyping and research. It is understood that it will be a long and continuous process to reach this, with additional NGIs and/or application communities joining at different times, with varying needs and different levels of "maturity". In addition, sites of widely varying size, complexity and stage of maturity must be taken into account. The EGI shall negotiate the minimal size and set of functions for an NGI to participate in a wider context, including the associated Service Level Agreements. This includes the agreement and follow-up of the associated processes. In some cases, these requirements may be more stringent than those used within a given NGI. That is, only a subset of sites participating within an NGI may satisfy the wider requirements at the EGI level.
2. **Multi-level operation model:** highly centralized models – e.g. for monitoring – have been shown to be both intrusive and non-scalable. This suggests a move to a multi-level operations model. Whilst building on the positive experience of today's production Grids, these concerns must nevertheless be taken into account as part of the EGI/NGI operations architecture. This includes designing and deploying for low-cost-of entry and ownership, whilst maintaining sufficient flexibility to meet the requirements of the application clusters. The EGI shall foster agreement on the definition of the key operations infrastructure, its establishment and delivery. Such functions are preferably located at one or more NGIs (to offer both resilience and scalability).
3. **NGIs and ROC**: The NGIs participation to the operation of the European grid infrastructure requires set of services to be operated in a coherent way. Currently, within EGEE, this is guaranteed by the Regional Operations Centres (ROCs) that either span over several countries (NGIs) or are serving one country only. The NGIs must assure that the services are operated, either at the NGI level or through associating into ROC equivalents.

4. **A secure environment:** Security is essential for establishing trust in the Grid infrastructure. It spans a wide range of topics, from low level computer forensics through middleware security to the highest level policies negotiated between networks and institutions. It ranges from immediate incident response to adapting to advances in technology which may be years from deployment. Furthermore, security will vary between NGIs, and will certainly differ between different types of Grid middleware. The challenge is to build on the security expertise of the NGIs, to foster collaboration, coordination and best practice, to ensure that the whole is not just as strong as the weakest link. The continuing development of international standards, for example in OGF, will be essential for interoperability. Both NGIs and EGI have responsibilities to ensure a secure operating environment for users, VOs and sites.
5. **Planning, coordination and gathering of new requirements:** EGI.org operations represent a "thin layer" mainly responsible for operations planning and coordination of efforts by the various NGIs and other parties. Also, EGI.org operations staff works towards a smooth evolution of tools and operational procedures according to the new requirements gathered.
6. **Cooperation:** EGI.org and NGI operations cooperate to solve problems of common interest such as: implementation rules for robust services, security best practices, middleware security issues, steering of new developments, site maintenance, intervention procedures, incident response, escalation procedures and so forth. For this reason, EGI promotes and coordinates meetings, workshops, EGI.org and NGI joint working groups, etc.
7. **Federation, interoperability and data aggregation**: EGI must federate a variety of operational aspects – some of which are implemented by NGIs and/or component sites. Consistency of security procedures, user support, incident tracking, monitoring and accounting must be ensured. EGI ensures interoperability of operational tools/infrastructures for security, monitoring, support, accounting, etc. For scalability reasons, operational data such as monitoring information, availability statistics and accounting records – collected by the NGIs need to be aggregated at the EGI.org level for SLA monitoring in full respect of the relevant national legal constraints.

5.1.2. Distributed Operations Model

We expect the level of complexity of the EGI Grid infrastructure to gradually increase due the growing number of NGI sites involved, the number of user communities and, possibly, the number and complexity of middleware stacks that may need to be supported. In such conditions, the capability of global VOs to operate in an inter-domain fashion, for example to perform resource discovery, job submission across national boundaries, etc., needs to be facilitated and supported. The EGI operations model consequently needs to face three challenges: scalability, interoperation, promotion of autonomy of NGIs in running operational services in the region.

We see distribution as a strategy to follow to address these issues. For example, reporting of usage will need to be collated and trouble tickets may well also traverse several helpdesks. In order to support interworking, EGI will agree some standards and/or specifications for interoperation between NGIs, and it will aggregate some information centrally (e.g. for resource discovery and accounting), which will require standards for information publishing. In this model the main operational functions of EGI are the coordination of activities to agree the standards for interoperation, and the operation of central data aggregation services and interworking services (e.g. the helpdesk).

With this model in mind, the EGEE III project is already planning to distribute its current central operations across its ROCs. Thus, by the end of EGEE III, there should be a working distributed infrastructure in place, ready for further distribution to NGIs.

5.1.3. Resource estimates

In what follows we specify the list of tasks for the Operation Function, at the central level (EGI.org) and at the NGI level, together with the corresponding cost in terms FTEs needed, and the specification of the category of the task.

Criteria for FTE Estimates: note that the FTE estimates refer specifically to the overall amount of effort needed during the EGI transition phase. Efficiency after a few years might reduce the staff requirement for the initial operational model but we expect this to be matched by the requirement for new services to meet the evolving requirements of new communities.

Estimates do not take into account activities which require code development work, which will be part of the Middleware Function. Similarly, additional tasks more directly related with the Middleware Function (i.e. the deployment and management of experimental and pre-production Grid testbeds) are still expected to be under the responsibility of operations staff but are described in the Middleware Function Section.

Mandatory Services: services described in this section are indicated as *mandatory* if deemed necessary to ensure interoperation of operational tools and to implement a consistent operational model across countries. We assume mandatory services to be already provided in year one of EGI.

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.

The list of tasks for EGI.org and NGI is provided below, while a summary table of EGI.org activities and corresponding effort is provided in Table 1.

Detailed service and task descriptions are provided in the appendices. Note that for several services and tasks below, development activities may be still needed when EGI will start, as ongoing developments may not be finalized yet at the end EGEE III, and NGIs less involved in EGEE III may introduce new requirements.

5.1.4. EGI.org Mandatory Services – Operations

Services and tasks are described in general and abstract terms, however they rely on the current operational model developed in the framework of the current and past EGEE projects.

Operation of tools and services

O-E-1. Operation of the Grid central configuration repository providing information about service nodes, contact details, certification status and downtime status – *mandatory*, FTE: 1

O-E-2. Operation of the central accounting repository for Grid-wide VOs – *mandatory*, FTE: 1

O-E-3. Operation of the central repository for performance monitoring, maintenance of tools and schema for central publishing of site and service status information, preparation of reports on performance of NGIs, maintenance of monitoring tools able to generate alarms in case of SLA violations, central dashboard. Availability and performance of Grid services, sites and the network

infrastructure, are important elements of information to check the health of the infrastructure and to verify the Quality of Service delivered to VOs and other NGIs.– *mandatory*, FTE: 2

O-E-4. Operation of the Operations Portal: the central operations portal provides an entry point for various actors to support their operational needs – *mandatory*, FTE: 0.5

O-E-5. Operation of production Grid core services, catch-all services for global VOs, catch-all CA: core Services are those mandatory middleware components on which the overall Grid functionality relies in order to operate – *mandatory*, distributed, FTE: 1 for catch-all CA and other services

O-E-6. Grid Operations: active control of status of Grid services and sites operated by NGIs, opening of tickets to request problem fixing. Residual problems not successfully distributed to NGIs – *mandatory*, FTE: 1

User Support

O-E-7. Maintenance and Operation of the central ticketing system (GGUS like): run a central ticket handling system for Grid and network end-to-end problems. User support relies on a central helpdesk, which is a regional support system with central coordination [GGUS]. It gives access to user documentation and support, and to a problem ticketing system – *mandatory*, FTE: 1

O-E-8. Triage of incoming problems: assignment of tickets to the 2nd line support units, ticket escalation end ticket follow-up to ensure they get closed – *mandatory*, FTE: 3

O-E-9. Coordination of gathering of requirements for user support tools, coordination of the support process taking input from NGIs and VOs, coordination of interoperations of ticketing systems: to take into account additional requirements which may arise with the evolution of the middleware stacks in use, and with the support of new user communities – *mandatory*, FTE: 0.5

Coordination

O-E-10. Coordination of middleware deployment and support (roll out of updates): to ensure that resource sites and NGIs in general, are encouraged to upgrade whenever new critical updates of supported middleware stacks are released – *mandatory*, FTE: 0.5

O-E-11. Coordination of resource allocation and of brokering support for VOs from NGIs (resources and membership services) – *mandatory*, FTE: 1

O-E-12. Coordination of interoperations between NGIs and with other Grids, with OSG, Naregi, etc., and related infrastructure projects: this role owns the definition of the middleware and the models that allows the NGIs to interoperate – *mandatory*, FTE: 1

O-E-13. Definition of best practices, operations procedures, operations requirements – *mandatory*, FTE: 0.5

5.1.5. EGI.org mandatory Services – Security

Today, the EGEE Operational Security Coordination Team provides pan-regional coordination and support to respond to security threats faced by the Grid infrastructure. In EGI, this capability should grow to include all NGIs and must be appropriately coordinated with the existing NREN CERTs. The deployment of Grid middleware must deal with the speedy handling of the inevitable security vulnerabilities.

A common authentication trust domain is required to persistently identify all Grid participants. The International Grid Trust Federation [IGTF], and the EUGridPMA [EUgridPMA] in particular, operated in line with the relevant e-IRG recommendations, exist to ensure interoperability at the European as well as the global scale. This must continue in EGI and must also adapt to take advantage of the work currently underway in TERENA and the National Research and Education Networks on developments of large-scale Authentication/Authorisation federations and infrastructures. Work has already started in IGTF on defining the policies and best practice for authorisation and the establishment of trust between the Grid and the VOs.

The Joint (EGEE/WLCG) Security Policy Group has successfully developed common interoperable security policies now in use across a number of international Grids. During EGEE-III, JSPG will encourage participation by more NGIs during the with the view of harmonizing policy across more Grids to assist the move towards a single sustainable Grid infrastructure.

In a European e-infrastructure some central coordination will be required on policies, vulnerability handling, IGTF and operational security. This work will mainly be to coordinate the work of teams drawn from the NGIs.

O-E-14. Grid security and incident response coordination, EUgridPMA/IGTF: to ensure that common policies are defined and followed for coordinated incident response by Grid participants; EUgridPMA/IGTF – *mandatory*, FTE: 1

O-E-15. Coordination of security policy development and maintenance to define agreement on common policies for AAA, trust, data retention, etc. (Joint security policy group and vulnerability group): coordination of a team of security people in NGIs to ensure the application of standard security policies – *mandatory*, FTE: 0.5

O-E-16. Coordination of a team dealing with security vulnerabilities in middleware and its deployment – *mandatory*, FTE: 0.5

Table 1: overall effort for EGI.org operations and security critical services

ACTIVITIES	FTE
Operation of tools and services	6.5
User support	4.5
Coordination	3
Security	2
TOTAL	16

5.1.6. NGIs International Tasks

The list of tasks in this paragraph is intentionally not comprehensive, as it is meant to only contain those *mandatory* tasks that the NGI needs to supply in order to support interoperation with the distributed model of EGI, and to support global VOs. Many of the tasks in this section are performed by the NGIs and coordinated by EGI.org. They are detailed in the EGI.org Services and in the appendix. The mandatory property of many of the tasks below does not prevent an NGI to devolve the operation of the task itself to a third party or to choose the option of purchasing it from EGI.org. Tasks not relevant to the overall EGI operation model, or specific to national VOs, are omitted.

NGI Resource Estimates

An overall estimation of the effort requested from all NGIs to operate the overall Grid infrastructure is indicated below. FTE numbers are based on the resource estimation carried out per-ROC during the preparation phase of the EGEE III project for the SA1 activity (Operations). As NGIs have different levels of complexity, the amount of effort needed to run operations tasks, varies according to that. The average number of FTEs per ROC needed to run those tasks that are necessary to interoperate, is estimated to be equal to 16 FTEs (5 for Grid Management, 6.5 for Operations and Support, 3.5 for Support to VOs, Users and Applications, and 1 for Grid Security). This gives an overall amount of FTEs from NGIs/ROCs which is today equal to about 160 FTEs, considering that ten different ROCs are currently operating in Europe. We expect this amount of resources to increase to 200 FTEs in year 1 of EGI (accounting for 20 NGIs), and to 300 FTEs in year 5, assuming an increasing number of NGIs in EGI.

O-N-1. Operation of the NGI Grid configuration repository - *mandatory*

O-N-2. Operation of the NGI accounting repository - *mandatory*

O-N-3. Operation of the NGI repository for SLA compliance and performance monitoring - *mandatory*

O-N-4. Operation of the NGI ticketing system - *mandatory*

O-N-5. Operation of the NGI Operations Portal - *mandatory*

O-N-6. Operation of production Grid core services, catch-all services for global VOs, catch-all CA: running the required Grid services provided by the NGI, and services required by global VOs - *optional*

O-N-7. NGI Certification Authority: to distribute X.509 certificates to users and servers in the region - *mandatory*

O-N-8. NGI Grid oversight (monitoring of status of services operated by sites, opening of tickets and their follow up for problem resolution), 1st line support for operations problems: this task includes all associated effort related to support for the operation including managing and responding to problems reported by the grid operator, running the required grid services at each site as well as services provided by the NGI, and services required by virtual organizations, such as file catalogues, and other VO-specific services - *mandatory*

O-N-9. Regional helpdesk: user and application support with local/regional helpdesk - *mandatory*

O-N-10. Operations Coordination at the NGI level - *mandatory*

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

In order to fully interoperate, the operational model poses requirements on the NGIs in terms of operation of a set of mandatory operational tools and services, as listed above. The NGI is free to choose the most suitable supply model for those, for example, it can federate with other NGIs to share

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 – to meet the demand of the NGIs. We believe the number of FTEs needed by EGI.org to run catch-all services remains fairly constant with the number of NGIs requesting it.

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5.2. MIDDLEWARE

5.2.1. Need for an EGI Middleware Function

The EGI general purpose, large scale production level Grid infrastructure depends upon a coherent set of middleware components that satisfy stringent quality criteria and fulfil functionality requirements. Only such components enable seamless sharing of resources provided by the NGIs and scientific institutions and communities. Without them, it is not possible to provide a scalable infrastructure spanning Europe and beyond, providing computing, data and storage resources for small and large communities with differing expectations. Proper middleware components will also allow to establish an effective common pan European resource pool and to support the easy creation of pan-European and global scientific collaborations.

While at this moment there is no complete set of such components fulfilling all the expectations, the European vision in the past lead to the creation of three consortia—gLite, ARC, and UNICORE—that offer not only practically complete sets, but whose components are at the production quality, as clearly demonstrated by the existence of the current EU e-Infrastructure which is the largest and most stable in the world. These middleware systems reached a world-wide reputation, being already adopted globally, and they are currently used to support the production activity of a large number of user communities with complementary requirements and dimensions, ranging from teams of few individuals to very large international collaborations with thousands of researchers and ten to hundred thousand jobs daily. They all adhere to a general service oriented approach aimed at compliance with the evolving Web Services and the Open Grid Forum standards. Other middleware projects in Europe,

funded by EU or at national levels, provide additional higher level services that complement and enhance offer of these three middleware consortia. While there are other middleware systems developed and deployed worldwide (including in Europe) like Condor, the Globus system or GOC, they are either in earlier stages of development or they are used in a much fragmented way, never clearly demonstrating the ability to present a foundation for truly global Grid with thousands of sites.

The recent NGI poll on the EGI/NGI functionalities revealed a shared agreement of the importance of middleware to the success of the EGI. This agreement is interpreted as a confirmation of the absolute necessity to establish an EGI Middleware function that will continuously guarantee that there is a high quality middleware available to run the EGI grid. The undisputable success of the middleware developed in EU is the justification of recommendation to base the EGI middleware on the middleware systems currently provided by the above mentioned three EU middleware consortia. However, as none of these systems can fulfil all the user communities' requirements nor being yet sufficiently mature to support "all sciences'' EGI grid, it is also recommended to start with the components provided by these three consortia and establish a process that will lead to a convergence into a coherent EGI middleware. This process must not only provide a stable professionally managed service, but also the continuous innovation of the middleware, sustained scaling of services in pace with expected increase of number of available resources, inclusion of new ideas and components, encouraging also new experiments on top of the basis (core) services to help the components' selection and innovation.

5.2.2. Universal Middleware Toolkit (UMT)

We propose that the best strategy to be adopted by the EGI to reach this goal is to offer as a general common service a new **U**niversal **M**iddleware **T**oolkit **(UMT),** similar to the Virtual Data Toolkit (VDT) in the US, which will contain the necessary high quality middleware components. **The UMT toolkit should be considered as a common general component of the EGI infrastructure, whose existence and development is guaranteed by the EGI.org via outsourcing going initially to the enlarged EU Consortia**.

The UMT Toolkit will constitute the common "glue" which will allow the European NGIs to integrate their national grid infrastructure into a pan-European common e-Infrastructure where all kinds of compute and data resources become easily and quickly shareable for the benefit of the scientific communities. The UMT will make available best services originated currently in the different EU middleware systems (stacks). The UMT services will be guaranteed to interoperate and obey to rules, policies and requirements defined by the EGI relevant technical bodies. During a transition period, gateways and other means can be developed and deployed if required to guarantee an immediate availability of EGI grid also to communities currently not using any of the base middleware from the three EU Consortia. In particular as high as possible interoperability with Globus-based grid islands can be provided, with the aim to help such scientific communities to use immediately the EGI grid without exorbitant new investment and to provide them with adequate assistance to port immediately their applications and already established workflows into the EGI grid environment.

Apart from the basic (core) services UMT will also provide well defined interfaces and other "hooks" that will allow independent development of higher level services (in a national and international competitive setup) aiming at easing the usage of the EGI grid infrastructure. This will encourage the faster development of these new services, while making sure that they will remain compatible with the UMT and therefore will run on the EGI Grid. The software ecosystem thus created will provide a

further pool for innovation and extension of the UMT without placing unacceptable immediate overload on the UMT developers.

5.2.3. Working model and organization

The current environment of EU middleware development consists of distributed multiple teams of experts specialized in one or more services in general organized around the 3 Middleware Consortia with additional teams with complementary expertise belonging to other EU initiatives.

In order to leverage the existing clusters of competence it is then advisable to maintain this decentralized model based on decentralized teams while introducing with EGI an effective pan-European technical and financial coordination. The decentralization will also leave open the road for the introduction of other development teams, including eventually for teams who developed components on a commercial basis.

The *Central technical coordination* should be provided by an EGI.org unit having as head a Chief Technical Officer (CTO). The main objective of this unit is the coordination of the EGI middleware development at the pan-European level with the assistance of additional technical bodies including the relevant experts appointed by the Consortia. These will include a Middleware Architect Group and a Middleware Technical Management Group which will be more precisely defined when this general proposal is accepted.

This EGI.org Development Unit should be the unique place in Europe where the development of the European middleware will be planned and coordinated, in particular with respect to:

- Common baseline architecture
- Full interoperability of existing services through standardization
- Validation/testing of the released services;
- Increasing complementarities and specializations of the included services
- Adoption of application and operation requirements;
- Convergence and interoperability through the implementation of standard interfaces with Globus and other non-EU stacks;
- Definition of additional APIs that will allow independent development of higher level services.

The EGI.org development unit will achieve this goal as the major responsible body (both politically and technically) for the UMT development. The Unit will not develop the software itself, this will be in an appropriate form outsourced to the development teams (initially the current Consortia but in no way restricted to them forever).

Based on the past experience that only the strong interaction between Operation, Application and Middleware activities (included in the same project) has shown to be able to deliver the best results, it is proposed that the strategic planning of the activities related to the EGI middleware function be made by an horizontal EGI.org body (EGI Technical Coordination Board) which will include representatives from the Middleware Development, Operations (including NGI's ROC equivalent) and Applications sectors. This body will decide about priorities and long term planning while it will be up to the Middleware Technical Management Group of the EGI.org to plan and guarantee the detailed execution of the decisions taken.

5.2.4. Objectives

The release, maintenance, support and evolution of the set of components included in UMT, steered by the need of the general scientific user communities and NGIs, are the main objective of the **EGI.org Development Unit.**

In the EGI/NGI scenario the operational model will be based on a large autonomy of each individual National/Regional Grid Infrastructure. Therefore the components which will be included in UMT release should adhere to the following criteria:

Interoperability: services deployed in a national Grid infrastructure should be fully interoperable with all other UMT implementations adopted in the EGI Grid infrastructure.

Completeness: the set of available components and tools adopted at the regional level should allow the national infrastructure to be fully self-functional and autonomous and at the same time completely integrated with the pan-European EGI infrastructure. The Grid services included in UMT should address the needs of all current VOs and evolve according to new scientific communities requirements.

Scalability: available services should allow the management of resources and services in an e-Infrastructure which must satisfy scientific user communities ranging in size from a few 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 largest ones. In addition the services should be able to face the expected growth in scale (in terms of users, services and sites operated) over a short time period.

Simplicity: UMT should contain tools to download the appropriate services, to provide assistance during their configuration, and to perform as much automatic set up as possible.

Extensibility: UMT must provide interfaces (and "hooks") that allow independent development (by any interested party) of higher level and additional services that will create a software pool from which further UMT innovation will be drawn. Gateways to the other (EU and non-EU like Globus) grid systems and components will be one example of services built on the extensibility APIs.

Special care will be taken to assure that the UMT software components are easily installed and configured. The goal of the UMT development is to make it as easy as possible for NGIs to deploy, maintain and use the grid services that they need.

Another important objective for the **EGI.org Development Unit** will be to provide the necessary testing and certification to guarantee a seamless operation and interoperation of the components included in UMT. This will also include provision of test suites for Quality Assurance and to validate standards compliance of considered new or modified already introduced services. To guarantee these functions, we propose the Development Unit also provides and runs common software configuration, build and test system.

In addition, the Unit will establish effective collaborations on an equal basis to promote the inclusion with their related support of services coming from outside Europe (like for instance Condor and Globus) compliant to the same set of EGI rules.

5.2.5. Funding

The proposal envisages that the development is currently taken care of by the potentially enlarged existing Consortia. This proposal is based on the fact that there are currently no commercial products

with the required functionality, stability and proved scalability and that there will be no such products in a near future. The lack of existence of a large scale general scientific grid built on commercial products anywhere in the world serves as the necessary proof. In future, the no-profit Consortia will possibly include industrial partners who following the usual Open Source general practices might offer for fees maintenance and support services for UMT components. And the model does not restrict even a commercial offer of the components, provided they fulfill the requirements.

To guarantee the development, a budget must be available to the Consortia. This budget must be controlled by the **EGI.org** as a means to guarantee that all the requirements, standard compliance and development priorities defined by the EGI are met. Most of the current successful and widely used services have been developed as part of an integrated development cycle, with a very tight connection to the operations and users. Relying on external independent development teams, as the past experience of EDG and EGEE with the Globus and Condor teams have shown, without such a tight relationship imposes additional high non-acceptable risk to the EGI.

As the middleware is the glue for pan-European collaboration, the proposal is to guarantee the funding through an explicit EU support. As all the current Consortia partners are used to make a co-financing up to the 50% level (this funding goes directly from the national sources of Consortia partners), the EU should be asked to finance the remaining 50%, put under control of the EGI. This way, the EU money will be used to guarantee EU level collaboration, while EGI control will make sure that the development process is steered in benefit of NGIs and scientific communities (i.e., the ERA). And it will also guarantee that the development is progressively more coordinated, the components truly interoperable, complementary, standards adhering and hence sustainable and effective. Also, the EGI control will guarantee the openness of the process, as the development will not be guided by just selfish interest of Consortia and their partners. On the other hand, with their 50% co-financing, the Consortia will be forced to make the development process efficient and effective.

The maintenance, support, development certification and testing of existing UMT services is a service that, once established, the EGI.org Development Unit could offer under a fee for service charge to NGIs.

5.3. USER SUPPORT

The general principles and basic organization of these activities have already been discussed in D5.1; some of the D5.1 text is repeated in this document for the sake of readability.

Our current hypothesis envisions a fundamental transition phase from EGEE to EGI, which must ensure a smooth and transparent migration between the two infrastructures. We should not forget that the new EGI infrastructure provides the NGIs with the important support role, which was provided by central community clusters in the previous EGEE infrastructure. This fact could affect dramatically the end-user communities if a transition phase is not ensured by the project. Then the bulk of user support is foreseen to be handled by the NGIs, with a largely coordinating role by the central EGI.org.

It is understood that the proposed scope of the EGI is not intended to provide actual sustenance for the entire European e-Infrastructure. All the user oriented functions will require some form of (co-) funding at the European level in the medium term.

Specifically, EGI will engage with the ESFRI roadmap projects to make the grid part of their computing architecture. Similarly it will engage with structures such as the European Research Council (ERC), which funds the work of individual researchers in many scientific fields.

During FP7, the EC provides financial support directly to user communities to make use of e-Infrastructures via competitive calls. This has lead to projects such as D4Science, DORII, e-NMR, EUFORIA and GENESI_DR etc., which help specific user communities engage with e-Infrastructures. EGI expects the EC to continue to fund such projects to further increase the uptake of European e-Infrastructures.

One way to structure this partnership between EGI and the user communities is by means of Specialised Support Centres (SSCs), as described below.

The structuring of the relationship of EGI with the user communities needs to be considered very carefully. Ensuring a minimum of central coordination for the support structures is essential to avoid the duplication of effort and tools which could damage the final user support and vision of EGI.

It is understood that no specific discipline or thematic project should be privileged by EGI. Structuring the EGI support landscape into SSCs will provide current user communities with the continuity that they require and provide "centers of gravity" for new communities with similar needs to the ones served by a given SSC.

It is unlikely that the SSCs can be entirely supported by a combination of NGIs and competitive project funds for projects that would have to begin in early 2010. The requirements gathering exercise that is being extended and reported in deliverable D3.1 aims in to elaborate the structure of the SSCs and their relationship with EGI. It is already apparent that there are expectations that the EGEE scientific clusters will become more inclusive.

One idea is that EGI could have a brokering role wrt funding sources for the SSCs, but this would be part of an allocation process (of common funds) guided by EGI.org and the NGIs.

Clearly, these common funds must ensure the needed services for those already existing VOs which “might suffer” the transition phase. The SSCs will therefore ensure the full knowledge and expertise for the already existing communities requirements to transparent , negotiate with EGI/NGIs the best transition procedure and reallocated as the centres evolve and become more self-sufficient. Hence we should also expect support from "thematic" projects. But relying exclusively on competitive projects (at least at the initial stage) would create a disruption especially for the EGEE strategic discipline clusters.

5.3.1. Specialised Support Centres

In the current project-based scenario, there is close interaction between the training and application support teams on the one hand, and the operations and middleware activities on the other. As the European e-Infrastructure becomes more generalised and increasingly distributed, there is a need to maintain the levels of expertise in application support that were acquired by close collaboration with the operations and middleware teams in a context where the various teams and activities will not necessarily be co-located.

Under the assumptions outlined above , and in order to establish a smooth transition from the current project-based model to the future EGI environment, we envisige the establishment of Specialised Support Centres (SSC), which would fulfil the bulk of the application support activities exercised by current teams such as those established for the EGEE III Strategic Discipline Clusters.

The user support infrastructure should be defined in different phases of a fully evolving EGI project in order to ensure a smooth transition for those VOs which are now (or will be at the beginning of the EGI project) in full and stable production using the current Grid infrastructures as EGEE for example.

The user support infrastructure is finally the most exposed team to the final end-users or Grid clients and it is its responsibility to ensure this transparent transition.

The transition phase is targeted at existing VOs and user communities to ensure their continued support. This transition phase will take several months (7-8). This time can decrease while ensuring a full collaboration of EGI with the EGEE support member experts, involving these members during the transition phase. In this period, the SSCs will play a central role for those existing VOs and should be configured by EGEE expertise together with the future NGIs and the coordination team. It is the responsibility of EGI to locate the team basing the decision on the current requirements of the already existing VOs. In this sense SSC will be responsible of the following tasks:

1. Ensure the same support infrastructure that the already existing VOs have. This can be achieved with the collaboration of EGI with the current EGEE project
2. The transition will be easier for those local VOs which have a local NGIs but not for the international collaborations which up to now had a physical close support team totally independent of any NGI. For these collaborations, which might not be observed as an individual NGI into EGI, the SSC will have to ensure:
    a. SSC will have to ensure a fluent collaboration with the services and operations teams in order to ensure the same level of service and support that these VOs are now enjoying
    b. SSC will have the responsibility to hide or at least to smooth any negotiation with the EGI/NGIs, which will take the role of the support.
    c. It will be responsible for the training of the new support members if these have to change from the current infrastructure

All this effort will have a cost zero for the VOs. In the future and only after ensuring that the transition was finished, the SSC will play a less relevant role, acting basically as observers of the NGIs

5.3.2. Application Support

5.3.2.1. General Principles

The primary goal of the Grid is to act as the "ultimate application accelerator", providing a significant added value for the existing and new applications and user communities. The growing application

demands have provided and will continue to provide the necessary push for development and extension of the Grid infrastructure. Therefore the active support for existing and new applications and user communities is a primordial concern for the EGI / NGI community: applications and users are the raison d'être of the Grid (middleware, infrastructure, operations and deployment).

The full EGI, which includes the NGIs, will collaboratively implement the community building and support functions and establish "Specialized Support Centres". It is expected that a close collaboration among centres of excellence, in particular within specific application areas with the coordination of EGI.org would allow the NGIs to reduce the overhead of porting new applications to the Grid and provide a framework for organizing the long-term application support.

The EGI.org will provide a overall coordination point for the application support and community building activities; these activities, in turn, should feed into an analytic role which we label "change management", tasked with monitoring growth trends and new entries among the user communities and contributing to strategies for related resource provisioning.

Application Support must be directly sustained by the National Grid Initiatives once and ony once the full transition phase has ensured the require expertise level of the NGIs to provide the required support; thus it cannot be stressed enough that the tasks we describe here can be put it place only if we succeeded to provide an smooth transition to the communities and the SSCs have ensured the required expertise level of the NGIs.

Some user support falls under the operations activity, however current experience with EGEE shows that for a successful new demonstration a pilot user must be especially introduced even to the basics (VO registration, certificates, helpdesk etc). In EGI this will keep being a fundamental role of the support team assigned to the new community, ensuring a fluent collaboration with the operations to avoid these fundamental but "bureaucratic" aspects of the entrance into any secure Grid environment.

5.3.2.2. Application Support Tasks

Supporting the (existing and new) large international VOs is an issue whose importance cannot be underestimated and that we have already mentioned in the previous section The extended EGI/NGI model must provide a medium-term strategy to bridge gaps in ongoing support at the end of current EU-funded projects.

Establishment of The SSCs at central level to ensure a smooth transition phase:

The number of FTEs associated to this tasks must be calculated based in the current principles of EGEE in order to ensure a non-gap of services and support to the already existing communities

Event Organization

4 FTEs in EGI.org (This should be a larger team considering the effort required by EGEE)

A sustainable e-Infrastructure can only exist in the context of strong, self-reliant grid user communities. As already mentioned, the model proposed here relies on the user communities

themselves providing their own support in their area of interest, by means of the SSCs described above.

At the same time, it is clear that an "area of interest" is typically larger than the service coverage area provided by an SSC; EGI must encourage interaction between grid users within areas of interest and between different areas of interest or scientific disciplines, to facilitate the development of technical solutions to specific application needs.

1. User Forum and other international events.
   Mandatory. The organisation of such events must continue, in a way similar to what in presently done in EGEE, and EGI.org should take a leading role in coordinating these events.
2. Discipline-specific events
   highly recommended. SSCs and related VOs. Application support teams specialized in certain application areas are encouraged to attend general scientific events and be able to present their grid activities to researchers who know little about the grid. It helps in this regard to have transparently accessible community portals (e.g. sites that are accessible to people who don't have a personal certificate) with clear illustrations of what applications are available to the relevant VOs.
3. Liaison with Training and Dissemination

Demonstration for new communities (a.k.a. "free test drives")

3 FTEs in EGI.org not including application porting support

4 FTEs in SSCs and NGIs (In order to ensure the transition a similar number of members already appearing in EGEE must be ensured. These persons can be members of the NGI, which will be at the beginning of the project into the SSCs to gain familiarity with the communities and share knowledge with the current EGEE support team. Once the transition phase becomes less important, the members can be sent back to the specific NGIs. We have a very clear and real example in HEP. At this moment and during the ramp up of the LHC there are continuously more than 50 persons in the control room of each experiment. Surely this number will decrease up to 3-4 members per shift one the level of knowledge and expertise of the machine increases. The number of persons in the experiment will be the same, just the activities will change)

As said in the point above EGI should take care of introducing new communities to the use of the grid. This introduction will be done with

1. talks disseminating "success stories" of communities in the use of the EGI grid, in the different events where best these communities can be reached
2. support offered for running freely example application of the new community on the EGI infrastructure. The procedure in this sense should be totally flexible, allowing this fast immersion by any NGI or support group. The SSCs should be therefore ready to provide a Grid infrastructure at any moment (including certificates, services and support) to port immediately the applications to the Grid. The key of the success of such fast applications is

the time. The structure should be ready to demonstrate first promising results in less than a couple of days as previous Grid projects have already widely demonstrated.

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This porting is the responsibility of VOs, in collaboration with specialized support teams provided by the SSCs and the NGIs. EGI.org does not provide this service, but could redirect requests for this service within the demonstration activities.

VO Interfacing with Operations

SSC and NGI task; 2 FTE in EGI.org for coordination (to be completed by more than one individual to ensure availability)

There are several specific areas where the application support activities must interact with operations. To coordinate activities in this area, EGEE currently has a joint operations-application support group (USAG - https://twiki.cern.ch/twiki/bin/view/EGEE/SA1_USAG) which meets on a regular basis. Specific tasks for the application support side are:

1. VO registration assistance, policy and feedback
   SSC task, mandatory,
   Coordination and tracking of feedback and policy development done by EGI.org in collaboration with NGIs.
2. The support team does not need to act during the definition of the SLAs, this is not part of the support
3. Help Desk requirements
   The evolution of help desk tools (e.g. GGUS) managed by operations should be guided by user requirements collected by this app support task.
4. Liaison between the operations team and the communities to ensure a fluent communication of the operation procedures at any site and affecting any service
5. Participation and representation of the communities by all operation meetings to ensure a forum where the specific community problems are discussed
6. Depending on the level of services required by the corresponding VOs, this personnel might be also engaged on several operation procedures which require a high level of expertise
7. Requirements for CIC portal and similar tools
   Similar to (3). A number of user support tools are foreseen to evolve in response to user needs.
8. . Dashboard is not a VO specific tool, moreover is a general tool and its generalization is part of the EGEE-III scope. The specific support team will have to ensure that the VO specific services are monitored in the best way but always using common tools as SAM, generic UIs, Dashboard, etc. The EGI infrastructure will have to ensure the correct expansion of these tools to all communities. This is not part of the middleware, this is a task of the support teams and a coordination of the software developments have to be centralized somewhere.

VO Interfacing with Middleware

SSC and NGI task; 2 FTE in EGI.org for coordination (to be completed by more than one individual to ensure availability)

It is arguable that there needs to be a dedicated and well-articulated effort to maintain an adequate level of middleware expertise in the generalised EGI e-Infrastructure, that can be transmitted to the various support centres for their activities. The middleware providers should explicitly provide some of this effort, minimally in the form of documentation and some levels of training.

Furthermore, since the effort dedicated to this task in the EGI.org is assumed to be minimal (1 FTE for coordination / representation of VO middleware requirements), it is incumbent upon the NGIs (including their support centres) to provide the appropriate human resources to (a) build and maintain the necessary middleware expertise for supporting their communities and (b) collect their users' feedback in an organised way to adequately represent their communities' needs to EGI.org and consequently, to the middleware providers.

The MW interfacing task will liaise with the main actors involved in these activities, provide a platform for VOs to communicate and prioritise their requirements, and work with EGI management and the NGIs to establish further communication channels where needed.

It cannot be excluded that the NGIs or SSCs may communicate directly with the MW providers. Nevertheless, the EGI.org MW interfacing task must maintain specific awareness of the most important relevant communications, and provide an explicit way of tracking and publicising key decisions in this regard.

This task is also responsible for carrying forward the work done in identifying external software and services that work well with the existing e-Infrastructure and further enhance its use, such as the EGEE RESPECT program.

Specific tasks:

1. Review and distribution of documentation
   The production of middleware documentation is a mandatory task for the developers. The documentation itself must be reviewed by a user-oriented task such as app support or training. Distribution of the resulting materials is a mandatory task of EGI.org.
2. Adaptation and translation of documentation
   Adaptation to specific user communities is a task for the SSCs; translation is a task for the NGIs.
3. Middleware components evaluation and intensive testing
   Active evaluation and testing is currently carried out by several user communities,
4. New feature requests including middleware standards
   Related to (3). EGI.org should act as a brokering agent for these requests.

5.3.3. Training

5.3.3.1. General Principles

The overall goal of the activity to is increase usage of the e-Infrastructures by providing users with the skills needed to access the services, increasing attractiveness of the services by encouraging the provision of applications by providing developers with the skills need to create them, and supporting usability of the infrastructure by disseminating good operations practice. Added values for infrastructures are support to several middleware, as well as the possibility to clone the infrastructure for training or educational purposes.

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 support them in disseminating experience of changes in the system, which they must then pass on to their communities (local and in different user communities / VOs).

Training provision will be largely federated by its nature. Each NGI will be required to provide training both for users and for operations. However there will be a central role in providing coordination of the dissemination of technical changes, support to encourage sharing of teaching materials and experience, coordination of sharing t-Infrastructure resources.

5.3.3.2. Training Tasks

The experience gathered during EGEE and ICEAGE shows that production infrastructures don't fully match needs of education trainers and students, starting from the strict identification procedures that often discourages students and beginners through their learning process, or even the difficulties for trainers on finding suitable resources to effectively run events. Therefore an infrastructure specialized for training (a t-Infrastructure) is required, in order to match requirements of this kind

The current scenario is that the majority of training provision occurs at the NGI level, gradually moving towards education being taken over by universities in their normal duties.

However, the expectation is that, especially initially, coordination and facilitation of sharing of resources and expertise will be required.

Estimates of staff are separated into:

1. National/regional
2. Central

For **1**. Estimates will depend on size, engagement of communities and maturity of local infrastructures. In general, assuming we are purely discussing resources for a NGI, we might see approximately

- 2 FTEs engaged in material creation, live or broadcast training events and provision of web based materials;
- 1 FTE to maintain local repositories and online teaching environments;
- 1 FTE supporting coordination and interoperation of regional t-Infrastructure resources

- 1 FTE for operations in each site part of the regional t-Infrastructure.

For **2** the likely requirement is:

1. Management and coordination of training efforts in the NGIs
2. Technical information gathering, content and material creation
3. Support of central services such as material repository and online resources
4. Support of t-Infrastructure interoperation and management of grid central services

5.4. EXTERNAL FUNCTIONS

5.4.1. 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 bought from third party.

The objectives of the dissemination activities of EGI.org are

- to ensure the visibility and inform about EGI among decision makers, funding bodies, research communities, industry partners and other grid initiatives in Europe and worldwide
- 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. The EGI.org will typically be in charge of tasks requiring coordination between NGIs. In general terms, the EGI.org will deal with the 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 the 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 maximizing the visibility, providing support to users and stakeholders and informing about the EGI. It is therefore a clear need for a professional and dedicated web editor.

The dissemination team of the EGI.org will support and coordinate the publication work of the EGI. Press releases and Newsletters of the work and key achievements will be published and widely distributed in order to increase the visibility of the EGI. NGIs have to contribute by providing material

to paper and electronic publications. The EGI.org will also be in charge of organisation of annual events and conferences, similar to e.g. EGEE User Forum and DEISA Symposium. These events not only increase the visibility and inform existing users but also aim to enlarge the user community. Also presence in other major events in Europe and outside will be coordinated and organised by the dissemination team of EGI.org, whereas NGIs are responsible of the EGI presence in local and regional events. The presence can be for example, a presentation, where the dissemination team would support in finding the right experts. Further in practical arrangements, such as drafting of abstracts, or planning for an exhibition booth.

The core EGI.org dissemination team will be small at the beginning, but can be augmented by a rotation of 1-2 colleagues from the NGIs. The NGIs will further be requested to provide a contact person for the dissemination activities within their organisations.

FTEs estimation: 3 (or 2) FTEs for EGI.org and 0,5 for each NGI

According to the above analysis the following expertise is proposed:

1. A dissemination manager – 1 FTE for EGI.org
2. A dissemination support person – 1 FTE for EGI.org (this can be combined with the one of the admin person at the EGI.org management function).
3. A web editor – 1 FTE for EGI.org
4. NGI dissemination interface for EGI – 0,5 FTE for each participating NGI. As said above 1-2 of the NGI interfaces can also further staff the EGI dissemination team.

5.4.2. Industry take up

The limited staffing of the EGI.org external liaison function will not permit specific activities or extensive support for industry take up. The activities will be limited to what falls within the duties of the Director(s) and the dissemination team. However, it has been identified that sustainability of EGI would benefit from a persistent activity aimed at increasing participation of the private sector in the European Grid Infrastructure, bringing additional competences and financial resources to the initiative.

As a publicly funded infrastructure aimed for 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 and thus dedicated to research usage. Business usage is then limited, and primarily 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 although it by essential qualities will be limited in its commercial potential.

The general interest and potential use by industry can be very different. The most likely forms are;

- 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)

Preferably EGI.org would initiate a work together with the stakeholders, to elaborate on policies for access for industrial research projects in the pre-competitive domain and industrial production projects accessing innovative technologies or deploying innovative strategies. The 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 act positively towards such initiatives and establish policies allowing emerging companies and other initiatives a fair competition in providing services for the EGI.

FTEs estimation :

According to the above analysis it is proposed that the EGI.org director and the management team cover these activities.

5.4.3. Other External Relations

External relations are defined as relations with organisations and initiatives outside of the EGI and of direct relevance for the 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 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 common understanding on policies in scope of grid interoperation
- influence on policy and Standards shaping activities
- networking and enlargement of the EGI “sphere of influence”

The operational aspects in interoperation with other grids are handled by the EGI.org Grid Operations function. In such collaborations the externals relations activity only lays the formal groundwork and leads the establishment of common policies.

The activity is not actively pursuing 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 it is found beneficial for EGI. The work could include coordination and reporting of participation in different Standards working groups and interfacing with the technical teams doing the actual standardisation.

To maximise the outcome of the external relations activity the EGI.org management should encourage bridging to external organisations and initiatives through the NGIs.

FTEs estimation: 2 FTEs 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

6. MANAGEMENT OF THE EGI

One of the obviously necessary functions for EGI is the management of EGI.org. The following description contains a rough sketch of the management levels and (within text-boxes) assumptions how the functions should be funded.

6.1. ASSUMPTIONS ABOUT EGI.ORG'S FINANCING STRUCTURE

The first assumption is on the general budgetary structure:

(a) Central management,

(b) Projects,

(c) Service provisioning

are accounted in separate cost centres. Cost centres are an efficient way of presenting activities of EGI.org in a transparent way to the EGI Council. The most important formal characteristic is that only the EGI Council is able to transfer resources from one cost centre into another one.

The second assumption is on the budget sources. The income is provided by three different streams:

(a) membership fees from NGIs according to an EGI-Key, which is decided by the EGI Council,

(b) income from project grants

(c) . service charges to be paid by those NGIs who get specific services from EGI

6.2. EGI COUNCIL

The top level management layer in EGI.org is the EGI Council. The NGIs own EGI.org and voice their views on all EGI matters through the EGI Council. The EGI Council may install committees, which elaborate recommendations to the EGI Council for specific topics. It may furthermore elect an Executive; details will be determined later.

The EGI.org Management has to provide legwork services to the EGI Council and its committees and it is assumed that arising costs are covered from the EGI "general central services" budget.

6.3. EGI.ORG DIRECTOR AND HEADS OF UNITS

The EGI.org Director, who works full time, provides the organizational interface to the EGI Council, to political bodies (EU etc.) and to several EGI committees on one side and to the Heads of the EGI.org Units on the other side. The EGI Director has to direct the group of unit heads. For all internal and external activities the EGI.org Director has one person who will assist him with handling his work. Within the unit heads the functions of a Central Technical Officer (CTO), a Central Operational Officer (COO) and a Central Administration Officer (CAO) are implemented. The administration also covers efforts for the public relations and contains positions in the administrative and legal services. The EGI.org Director needs a secretariat and must have some staff which prepares policy developments, the representation on European level and the legwork function for the EGI Council.

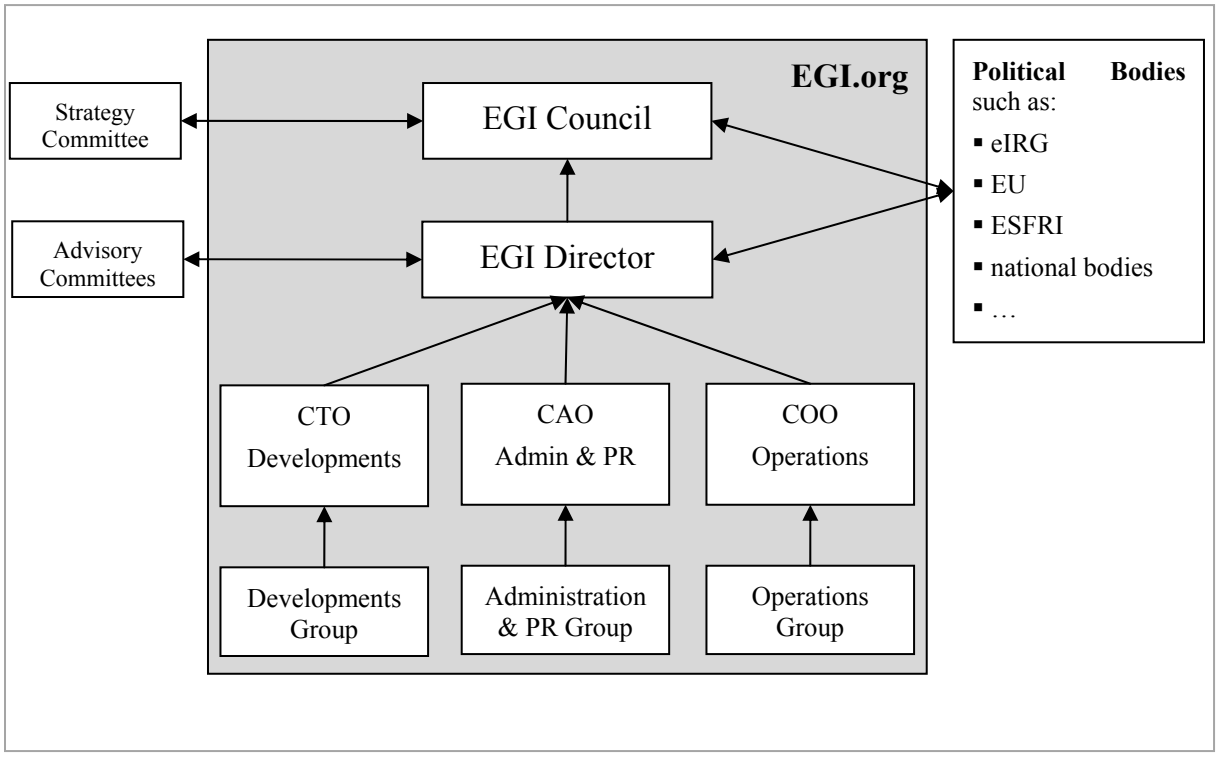
It is assumed that the positions of the EGI.org Director, the CAO and the administration and PR group are paid through the EGI.org "general central services" budget which relies (only) on the NGI's membership fees.

EGI.org should be positioned in a flexible way as far as EGI.org units are concerned. It seems that only three units should have a permanent basis: the Operational Unit, the Development Unit and the Administration Unit with the COO, the CTO and the CAO as head of the respective unit.

Projects may, based on EGI.org's findings, be embedded in these units or they may be organized as a separate project oriented unit within EGI.org, but always embedded in the organization's structure.

This project management layer should, if possible, be paid by project grants and their complements, mostly resources organized by the NGIs.

The following graph summarizes the features of the EGI.org management structure:



Summary EGI.org Funding and Management Structure

The following table summarizes the financial implications of the items mentioned above:

Position	**FTE/a**	**Funding source**
Director Assistant to the Director Secretaries	1 1 2	membership fees from NGIs
CTO	1	Project grants, if available otherwise NGIs contribution
COO	1	Service Charges or project grants
Administration + PR: CAO Admin. Staff Legal expert	 1 2 1	membership fees from NGIs
Total (positions paid by membership fees)	**8**	
Total (position not paid by membership fee)	**2**	

7. LEGAL ASPECTS

7.1. LEGAL STRUCTURE OF THE EGI ORGANIZATION

7.1.1. The Statutes of the EGI Organisation

Although the Statutes of the EGI.org cannot be completed until the legal entity and the location are defined, the basic elements which EGI.org will in any event have to fulfil have been defined. These main elements of the Statutes of EGI.org are reported in the following section

Purpose:

1. The EGI.org shall ensure the long-term sustainability of the European e-infrastructure and coordinate the integration and interaction between National Grid Initiatives.
2. The sharing of tasks between the National Grid Initiatives and the EGI.org shall follow the "subsidiarity principle" meaning that tasks that are more effectively performed at the national or regional level should be left to the National Grid Initiatives.
3. The EGI.org shall ensure pan-European Grid operation and coordination - aiming at standardization wherever reasonable.
4. In view of the above, the EGI.org shall carry out the following activities:
    a. The EGI.org shall operate the European level of the production Grid infrastructure for a wide range of scientific disciplines linking National Grid Initiatives. The national level of operation is ensured by the National Grid Initiatives.
    b. The EGI.org shall provide Grid services and support at the pan-European level, complementing and coordinating national services.
    c. The EGI.org shall coordinate middleware development and standardization to enhance the infrastructure
    d. The EGI.org shall integrate, test, validate and package software from selected Grid middleware providers and make it widely available.
    e. The EGI.org shall coordinate and implement a security policy.
    f. The EGI.org shall liaise with other e-infrastructure projects and standardization bodies in Europe and elsewhere.
    g. The EGI.org shall support the National Grid Initiatives in matters of training, dissemination and outreach.

Membership:

The members of the EGI.org shall be the National Grid Initiatives (NGIs) in Europe. The requirements NGI will have to meet to become a member of EGI.org are set out in the document D4.3 "NGI Guidelines", produced by the legal aspects working group of the EGI_DS project. They are also summarized in 7.2 below.

There shall be also a status of Associate Members for International Organisations. These may participate in EGI.org activities and contribute financially but will not have a vote at the EGI.org Council (defined below).

EGI.org Organisational structure:

The EGI.org members shall be represented in the EGI Council. The Council shall be composed of one authorized representative from each member. Members may appoint a deputy or a proxy.

A chairman will be elected for a period of one year.

The Council shall:

a. determine EGI.org policy in technical and administrative matters;
b. approve projects and activities in which EGI.org participates;
c. approve changes in activities ;
d. adopt the annual budget of EGI.org;
e. decide on the contributions to the budget and its terms of payment;
f. review expenditures and approve annual accounts of the EGI.org;
g. appoint the Director and staff structure;
h. decide on the staff establishments required and on employment conditions;
i. decide on application of membership, on exclusions or on requests for withdrawal;
j. amend the statutes;
k. have such other powers and perform such other functions as may be necessary to fulfill the purpose of the EGI.org.

The executive powers of EGI.org will be exercised by a Director, appointed by the Council. The Director will be supported by a Chief Technical Officer (CTO), a Chief Operational Officer (COO) as well as a Chief Administration Officer (CAO).

Budget & contributions:

The budget of EGI.org shall be composed of:

- contribution by EGI.org members (according a key yet to be defined),
- special contributions;
- funding from the European Union;
- revenues generated by the EGI (i.e. from services charges).

7.1.2. Definition of the legal structure: Legal Requirements

(For more details, consult EGI_DS deliverables D4.1 & D4.2)

The choice of the legal structure is of importance since it will ensure that EGI will be able to fulfil all the functions it is meant to.

By analysing a great range of legal structures and their characteristics, and coupling them with EGI.org specific needs, we could define a list of requirements that a legal entity should fulfil in order to be adapted to EGI.org:

- autonomous legal entity
- legal structure which allows both public and private entities to be member
- legal form which allows for membership of entities established in non-EU member States
- not-for-profit status
- limited liability of its members
- fast to create
- location in a EU member State

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

An alternative solution may be the legal framework currently defined by the Commission for European Research Infrastructure (ERI) (see annex IV for the latest version of the draft regulation). The fact to use the ERI framework for EGI.org would enhance its political status and credibility in Europe and with regard to the rest of the world. It would also offer advantages in terms of tax exemptions and other facilities which will probably be granted to an ERI. However, the suitability of the ERI legal framework for EGI.org will finally depend on the time by which the regulation will be in force as well as any constraints it may impose and their compatibility with EGI.org's needs.

7.2. LEGAL STRUCTURE OF THE NGIS

(For more details, consult EGI_DS deliverable D4.3)

The main foundations of EGI.org will be the National Grid Initiatives (NGI), which will operate or coordinate the grid infrastructures in each country. EGI.org will link existing NGIs and will actively support the setup and initiation of new NGIs in countries where they do not yet exist.

Many countries have launched National Grid Initiatives to establish national Grid infrastructures. They all aim at providing in the long-term a common e-Science Infrastructure in support of all sciences, but with wide expected variations in maturity level and in implementation schemes. This following section will not try to define the best way to set up an NGI, but will list all requirements that an NGI must fulfil in order to become a member in EGI.org.

To become a member of EGI.org an NGI **must:**

(a) have the capacity to sign the Statutes of EGI.org – either directly or through a legal entity representing it.

(b) have a mandate to represent its national Grid community in all matters falling within the scope of EGI.org

(c) be the **only** organisation having the mandate described in (b) for its country and thus provide a single contact point at national level.

(d) be able to commit to EGI.org financially i.e. to pay EGI.org membership fee and – if there is a demand for such services in the NGI – order EGI.org services and pay for these services.

(e) nominate a representative duly authorised to deliberate, negotiate and decide on all matters falling within the mandate of the EGI.org Council.

(f) have a sustainable structure or represented by a legal structure which has a sustainable structure in order to commit to EGI.org in the long term.

Technically and organisation-wise NGIs will have to ensure that:

- storage and computing resources (as well as baseline services to share and use them) are provided
- the national Grid Infrastructure is permanently operated and maintained to an agreed level of service
- user communities are registered and supported
- resource owners/providers are registered and supported
- standards and other consensus accepted by EGI (on supported middleware stacks for example) are implemented
- EGI policies are implemented

NGIs fulfilling these requirements should ideally exist by spring 2009.

7.3. LOCATION OF THE EGI ORGANISATION AND CREATION CALENDAR

According to the EGI_DS Description of Work, we should start obtaining the agreements of the NGIs on the EGI.org Statutes in October 2008 (D5.3). However, the Statutes cannot be completed as long as the legal structure is not defined, which cannot be done until the location is known.

Therefore, a call for tender shall be launched for the location of EGI.org central office. Bidders will also be required to describe one or several types of legal entities existing within their national legal framework and satisfying the EGI.org requirements. This bidding process will be launched by the EGI_DS Policy Board, who, upon a proposal from the EGI_DS Consortium, will determine the best procedure to select a location. As Annex V to this document you shall find the proposed Call for Tenders.

It is our plan that the call be launched in summer 2008, so as to receive the expressions of interest by October 2008. The process might then take 4 to 6 months to be completed. Afterwards the EGI.org Statutes will be finalised and agreed by their future members and the creation process will be launched so that we meet the goal to have the EGI.org established by January 2010.

8. RESSOURCES AND FUNDING

With the EGI, the European Grid Research Infrastructure is moving towards a new, more sustainable organisational scheme, relying on national grid organizations in each country, namely the NGIs, and a central organization, namely EGI.org. Sustainability does not only refer to the financial aspects - it mainly refers to the organisational aspect, i.e. moving from the institute level participation in European Grid projects to a national NGI model, and from short term project based commitments to longer term commitments.

The long term vision for EGI.org is that its management will be funded through membership fees, its operation will be funded through usage charges and its continued innovation will be funded through co-funded grants from the EC and other sources. Given the fact that the EGI venture[2] has a strong European integration dimension, and is currently taking its first steps, strong support from the European Commission will be required both to get the new construct off the ground, and to continue to keep it at the leading edge of the technology.

NGIs are expected to obtain their own national funding to operate their internal national e-infrastructure and to provide resources centres. EGI.org will not provide central resources; it will only provide the infrastructure to interconnect the national e-infrastructures provided by the NGIs to create the whole EGI.

EGI.org will provide the mechanism to provide the e-infrastructure required to support international research projects and facilities. EGI.org will report to the NGIs on the national provision of resources and their use by VOs, as is currently available through EGEE, but also on the use of EGI resources consumed by researchers from their nation who are users of the EGI. The purpose of the EGI is to support international projects to produce new and significant research breakthroughs in many disciplines. The reporting structure provided by the EGI will be appropriate to allow NGIs and their national funding bodies to account for the research breakthroughs of international projects in terms of the usage of the EGI by researchers.

The EGI must undergo a review on a 3-5 year cycle of its funding model and required budget, based on the actual usage of the EGI, available commercial technologies, and the innovation required.

8.1. FUNDING OF THE EGI

In summary the following sources of funding have been introduced:

- Membership fee to pay for the EGI.org management and coordination costs
- Project contributions (such as grants) provided by the European Commission and the NGI funding agencies to pay for the EGI core activities and to bridge the financial gaps until NGI operational budgets have been built up
- Service Fees based on the EGI infrastructure usage (mainly to be applied at a later stage)

[2] consisting of the NGIs and EGI.org, in the following text called EGI

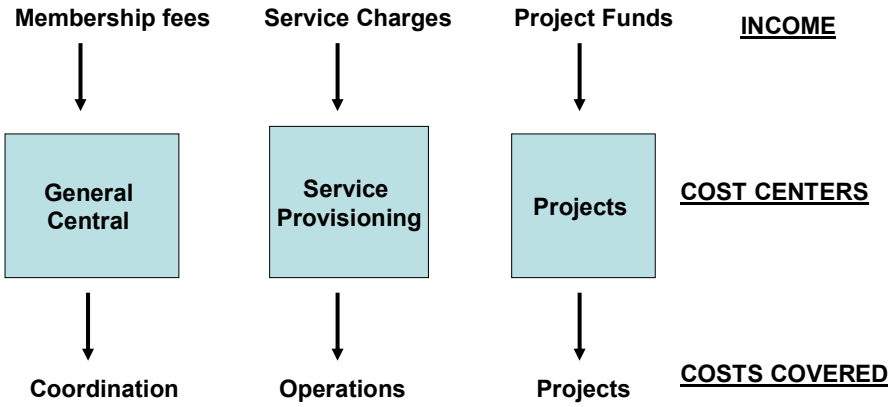


Figure: General Structure of the financial system of EGI.org

8.1.1. The business model of the EGI

EGI computing and storage resources will be provided by the NGIs or other national organizations within the NGIs. The EGI provides a global service which enables the sharing of or access to computing and storage resources together with data and devices across national boundaries to support all kind of collaborative activities of the different application communities. These are in general organised in international research projects or initiatives of various dimensions ranging from teams of few individuals to large collaborations of thousands of scientists.

The availability of the general EGI infrastructure in Europe avoids that each individual project, once set up, has to commit not negligible efforts to constitute its own international e-infrastructure enabling the sharing of the resources made available by the project partners. The model based on n*n negotiation and a new e-infrastructure establishment at each international project set up is considerably less efficient for Europe than making available the general EGI e-Infrastructure to support once for all the sharing of resources at pan-European and international level and provide related accounting information .

The EGI model foresees that each project partner approach the NGI of its country and negotiate the availability of its part of the resources he has to make available to the project. The EGI.org does not provide computing or data storage resources itself. The EGI.org together with the NGIs will provide the e-infrastructure to support the sharing of or access to the NGI resources allocated to an individual

project as a virtual organization, and provide the accounting data on the use of resources by the VO to the NGI.

It is assumed that over time the operation of EGI.org and the NGIs will become more efficient, thereby reducing their operating costs. It is also assumed that in parallel with these increased operational efficiencies will be the development and introduction of innovative services to support international collaboration and projects.

8.1.2. Funding Estimates

Each of the previous chapters in this blueprint have outlined the functionality of aspects of the EGI and provided estimates of the required person effort in FTEs. Those are summarized in the table below for the EGI, broken down into major functional activities for each of the EGI.org and the aggregated NGI contribution.

Nr.	**Costs for**	EGI.org Costs (in FTE/a)	Intl. part of NGI Costs (in FTE/a)	**Section**
1	Operations	16	250-300	5.1
2	Middleware interfaces and final certification	8	100-120	5.2
3	Application Support and training	7	230	5.3
4	External functions	4	60	5.4
5	EGI.org Management and Administration	10	90	6
	Total	45	720-800	

Table: Estimated EGI Costs in FTE/annum

According to this summary, the overall EGI should have 765-845 FTEs, resulting in 76.5 to 84.5 million Euros per year in total, of which the central EGI.org would only consume about 4.5 million Euros per annum (assuming 100K Euro mean yearly salary including overheads)[3]. A rough estimation of the target numbers for the different funding sources is given below per year:

1. Membership fees: Currently 10 FTEs are proposed for the EGI.org central administration. Therefore approximately 1M Euro per year should be covered by the membership fees.
2. Project contributions: 20M Euros/a.

If the approval timing would allow it the 20 M Euros should be made available in the form of a reserved to EGI.org and NGIs call within a paradigm similar to the one adopted for GEANT and the NRENs. The reserved call will cover all major activities (e.g. operations, middleware validation and deployment, etc.), while additional funding can be sought from open competitive calls.

3. National Funding contributions to NGIs

[3] This is a rough assumption. Overheads should be in the order of 100% in the initial period.

Since the EGI.org will consume only a part of the project funding envisaged from the EC, the remainder will be available to support some of the European integration activities of the NGIs. The remaining costs of the NGI will have to be covered by national funding raised by each NGI.

Another correlated issue is the fact that some of the EGI.org construction costs (building, equipment, etc.), may be requested from the EC co-funded call. It is a common practice that the EC covers around 10% of major research infrastructure costs.

The mechanism to be applied to each of these funding routes, and the limitations on what the funds can be used for are described in detail below.

8.1.3. Funding from the EU

The EC support is foreseen in the form of EC co-funded project grants, and applies both to the NGIs and the EGI.org, in a similar way to the support given through the current FP7 Grid infrastructure projects, but adopting a new paradigm equivalent to the one in use for GEANT and the NRENs. Building up the NGI operational budgets for those parts of the infrastructural services which do not need further developments will take at an average 5 years. This makes the EC subsidies essential to get EGI started in its new organizational structure. Co-funding is expected from the participating NGIs, the level of which might vary for the different types of project activities; yet, it is expected that the overall EC support for EGI would be close to the usual 50%-50% principle for pan-European activities. Obviously if the NGIs infrastructure costs including resource provision and national operational costs both of the national e-infrastructure itself and of the resource centres are taken into account in the overall EGI budget calculation, then the EC contribution would become a smaller - but absolutely necessary - fraction of the total costs, vital for the integration at European level.

NGI co-funding will be pursued by each of the participating NGIs through each country's usual practice of providing co-funding to the Framework Programme projects. Co-funding obviously refers to the part of the work that is undertaken by the NGI. If for example an NGI receives 10 FTEs for operating its infrastructure and 5 are funded by the EC, then another 5 are expected to be funded by pure[4] national sources. In other words the NGI should receive the funding for the 5 matching FTEs from its funding agency. In case, there is no such process (of providing co-funding) in the EC FP projects in a given country, then other ways have to be explored to cover for this part of the work. Providing in kind contributions (e.g. from NGI permanent personnel) might be also considered.

As explained above it is expected that the EC will contribute a significant part to the EGI budget (~50%) promoting the creation of a large-scale, production pan-European Grid infrastructure integrating National Grids that are funded by NGIs. The main argument is that EGI should rely on stable (and not decreasing) EC contributions, so as to be able to get EGI off the ground and that the Pan European Grid Infrastructure for research continues to remain at the leading edge of technology. In other words, a similar approach to the one of the NRENs and DANTE/TERENA in the GEANT project is expected.. Without stable EC funding, it will be impossible to get EGI in place and make effective their offer of innovative services.

[4] Pure means that it should not origin from the European Union (e.g. structural funds)

The proposed mechanism foresees that EGI services will be made available and progressively consolidated until they are fully appreciated and adopted by NGIs with the EC support. Once reached a sufficient level of maturity and stability more mature services will be progressively funded from NGIs, while more innovative services will continue to be developed and consolidated with the EC support and under the strict steering from the requirements of NGIs. Relying on a financial model based only on usage service fees from the beginning when services are still not mature enough, known and appreciated by NGIs might scare and drive away user communities in the phase in which they are progressively experiencing and introducing them with some inevitable pain in their daily working procedures and have a very negative effect for EGI.

Since EGI (EGI.org+NGIs) is expected to represent globally the community related to the realization, operation and usage of the European Grid Infrastructure, the paradigm of reserved call which has proven to be successful for the NRENs seems suited also for EGI.

Regarding the duration of the EC support, currently it is foreseen that it should be necessary for 5 years of operation. After 5 years it is expected that the NGIs will have built operational budget for those parts of the infrastructural services which do not need further developments. EC funding is expected to continue at the same level after that, depending also on the technology developments and the EGI success; This will be used to provide innovative and advanced services, ensuring that the EGI stays one generation ahead of the related industrial products, something which can be considered a great challenge for EGI, and the European Union as a whole.

If funding will not be available from the EC in the order described here, either the full costs of the EGI must be born by the NGI, or the EGI is not sustainable in its planned form.

If the EGI is not sustainable, then individual facilities and disciplines will create their own local e-infrastructures at greater overall cost than the EGI, and without supporting interdisciplinary research which is foreseen as one of the major sources of future research breakthroughs.

8.1.4. Subscription from each NGI which is a member of EGI.org

Besides the EC co-funded project grants, the participating NGIs provide their contribution in the form of **membership fees**. The proposed scheme and level of funding will be similar to that of NRENs contributing to TERENA, as explained below. The membership fees are designed in such a way that they mainly cover the EGI.org coordination, administration and management costs.

The subscription to be paid by each NGI that joins the EGI.org will be calculated by a formula based on that currently used by the TERENA[5] organization.

[5] http://www.terena.org/

NGIs will be put into 8 categories of voting rights and membership fees according to the Gross National Income (GNI) of their countries. The use of the GNI as a measure ensures that the contribution is in general in line with the wealth of a country which has reflected the usage of the EGEE services by countries (with the exception of international facilities) and is expected to reflect the core usage of the EGI.

Membership fees are determined by an allocation of Units to each category of member. The EGI Council will decide on the value of the Unit at the time of adoption of the budget for the following year. The total budget of the EGI supported by membership fees will be divided by the sum of the units of the members to determine the actual fee to be paid.

Example

If there are 20 EGI member NGIs whose units sum to 100, and the costs to be covered in the next year amount to €1,000,000, then each unit will be charged at €10,000. Consequently, the lowest income economies would pay 0.2 units, or a membership fee of €2,000, while the highest income economies would pay 16 units, or €160,000 per annum.

The table below details the proportion of the total funding to be raised distributed to each NGI.

8.1.5. Service Fees

The third potential source of funding is **service fees**. EC project funds are taken in the first years to reduce them drastically – for the innovative services even to zero. **It is proposed at this time that this type of charges be introduced gradually.** Applying service charges to NGIs and international organizations from the EGI day one might jeopardise the whole construct and have negative effect to the EGI uptake, both from the NGIs and the involved user communities.

Member Category	Fee Units	Voting	World Bank GNI -'06	
1 Upper Middle Income	0.4	4	2,317	Montenegro
1 Lower Middle Income	0.3	3	3,744	Moldova
1 High Income	0.5	5	5,491	Malta
1 Lower MIddle Income	0.3	3	6,237	FYR Macedonia
1 High income	0.5	5	13,633	Cyprus
1 High income	0.5	5	15,122	Iceland
1 High Income	0.5	5	15,307	Estonia
1 Upper Middle Income	0.4	4	18,525	Latvia
1 Upper Middle Income	0.4	4	26,734	Lithuania
1 Upper Middle income	0.4	4	29,011	Serbia
2 Lower Middle Income	0.6	6	30,733	Bulgaria
2 Upper Middle Income	0.8	8	32,800	Belarus

2 High income		1	10	35,133	Luxembourg
2 High Income		1	10	37,730	Slovenia
	3	2	20	41,401	Croatia
	3	2	20	53,168	Slovakia
	4	5	30	90,616	Ukraine
	4	5	30	104,382	Romania
	4	5	30	110,079	Hungary
	4	5	30	128,667	Israel
	4	5	30	129,542	Czech Republic
	5	6	40	191,624	Portugal
	5	6	40	191,887	Ireland
	5	6	40	213,626	Finland
	5	6	40	241,042	Greece
	5	6	40	280,677	Denmark
	5	6	40	308,948	Norway
	5	6	40	312,198	Poland
	6	8	50	326,190	Austria
	6	8	50	393,903	Turkey
	6	8	50	394,207	Sweden
	6	8	50	404,730	Belgium
	6	8	50	425,889	Switzerland
	6	8	50	698,555	Netherlands
	6	8	50	822,364	Russia
	7	12	60	1,200,704	Spain
	8	16	70	1,875,641	Italy
	8	16	70	2,297,748	France
	8	16	70	2,425,210	UK
	8	16	70	3,018,036	Germany

Table – categories, votes and GNI (in 2006) of EGI candidate member NGIs.

8.2. RESOURCE PROVISIONING FOR THE EGI

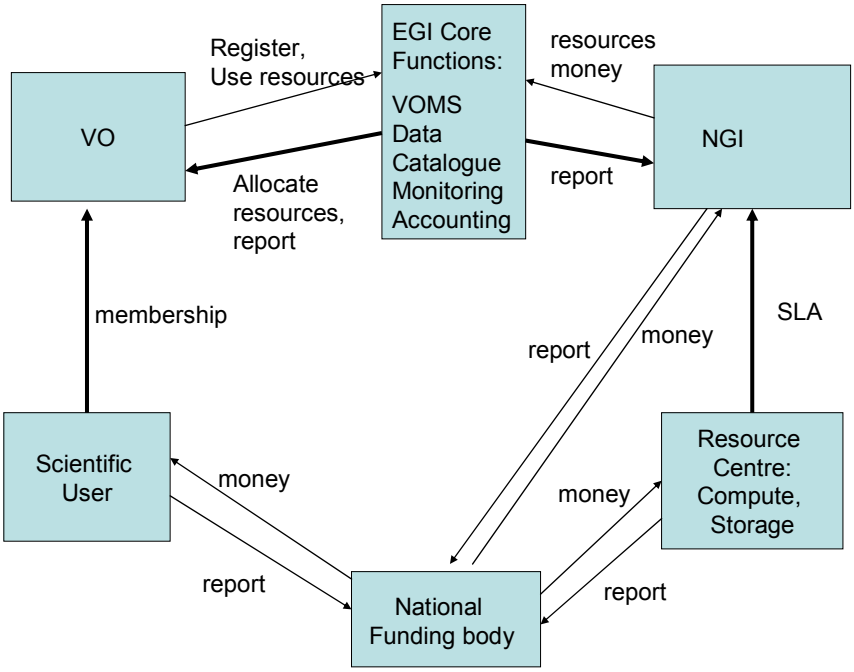


Figure: The actors in the overall EGI.org with their interactions.

8.3. NGI NOTICE OF LEAVING EGI.ORG

An NGI wishing to leave the EGI must provide 12 months notice to the EGI Director. This will allow the resource allocation process to plan for the removal of the resources provided by the NGI from the next resource plan, and for the VO to remove all users with certificates issued by the NGI country from their VO.

8.4. TRANSITION OF THE ACCOUNTING AND RESOURCE SYSTEM FROM EGEE TO EGI.ORG

During EGEE III it will be necessary to modify the existing accounting system to provide accounts based on the service fee measure defined above.

The current monitoring system includes all the information required to produce this output.

The accounting system will have to report to NGI which users are members of which VO.

The accounting system will have to report to NGI which processing resources are used by which VO – as it already does.

The accounting system will have to report to NGI what percentage of each VO their national members are consuming, and the percentage of the total EGEE processing resources that they are consuming according to the algorithm above since this will provide the percentage of the operating costs which they will be required to pay to EGI once it is in operation.

There is the issue of the catch all CA, currently operated in France, for NGI who do not currently host a CA themselves which need to be addressed by the NGI, if they wish to host a CA to overcome this anachronism.

During EGEE III the VO resourcing system will need to be modified to ensure that there are no obstacles to the creation of new VO and the allocation of resources to them, and that there is a clearly understandable process for users to join VOs.

During EGEE III the VO resourcing system will need to be modified to meet the resource allocation and reporting procedure proposed for the EGI.

8.5. EGI.ORG STARTUP RESOURCE PROVISIONING, FUNDING AND CASH FLOW MANAGEMENT

8.5.1. EGI.org start up provisioning

There must be a transfer of the commitments to provide resources to EGEE III to the EGI.org in its first year of operation.

This process needs to be agreed between EGEE III and the EGI.org.

8.6. DOCUMENTS REQUIRED TO MANAGE THE EGI

Templates for the following documents required to manage the relationship between EGI.org and both NGIs and VOs, as described above, will be produced by the EGI-DS project:

- Agreement for a VO to use EGI.org – including policies for users to join the VO
- Agreement for an NGI to join EGI.org – including policies on resource providers.
- Agreement for an International Facility to use and provide resources to EGI.org
- Annual agreement for an NGI or International Facility to provide resources and funding to EGI.org
- Annual report from EGI.org to a VO
- Annual report from EGI.org to an NGI
- MoU with non-European countries

9. ANNEX I - OPERATIONS AND SECURITY, TASK DESCRIPTION

In this paragraph we provide a detailed description of some of the main EGI.org services and NGI tasks for operations and security.

O-E-1and O-N-1: Operation of the central and regional Grid configuration repository

Many aspects of operations rely on a central registry of static information: service nodes, contact details, security contacts, certification status, as well as dynamic information (such as the list of sites in scheduled downtime). The Grid repository provides all such information. Information input is devolved to regions and sites. The current central repository (known as GOCDB in EGEE) needs to be adapted to support the two-tier distributed model. Specifications need to be defined to ensure interoperation.

O-E-2 and O-N-2: Central and regional accounting repository

The accounting repository is responsible of keeping usage records about usage of compute, storage, networking and other types of resource. It is the responsibility of a NGI to collect accounting data, and to keep a master copy of usage records locally. The deployment of standard interfaces between accounting systems in different NGIs, is important to ensure inter-domain interoperability. The current central repository in use in EGEE needs to be adapted to support the two-tier distributed model. Specifications need to be defined to ensure interoperations.

O-E-3 and O-N-3: Operation of a central and regional repository for performance monitoring

Availability and performance of Grid services and sites are important elements of information to check the health of the infrastructure and to verify the Quality of Service delivered to VOs and other NGIs. As SLAs can be established between VOs and sites, VOs and NGIs, NGIs and global VOs, tools need to be available to monitor the level of SLA conformance. This requires the maintenance of the tools available and of the schema for central publishing of site and service status information. Performance information allows the monitoring the Quality of Service delivered by NGIs to global VOs. Development work is already undertaken in EGEE III.

Performance monitoring is also important for network quality assurance/reporting and metrics follow up, to ensure the underlying network infrastructure is working properly, that it is efficiently used by the project, and that network providers are respecting their contractual obligations, when SLAs are in place.

O-E-4 and O-N-5: Operations Portal

The central operations portal provides an entry point for various actors to support their operational needs. Different "views" are possible according to the role of the customer (Grid operators, VOs, Grid site managers, Region Operations Managers, etc.). Information on display 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. For the future we expect the central Operations portal

to be the aggregation point of regional information also accessible via regional operations portals. Regional portals currently require development work, which already started in EGEE.

O-E-5 and O-N-6: Operation of the production Grid core services, catch-all services for global VOs, catch-all VO

Note that the term Service used here does not refer to the business model but to the technical infrastructure, i.e. it is a software component that runs typically on a server machine. 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." [GLO]

In particular, core Services are those mandatory 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:

a. VO management service (VOMS),
b. File catalogue and transfer services (LFC and FTS),
c. Job management services (WMS)
d. Information services (Top level BDII, and Grid information repository (GOC DB))
e. Security services (MyProxy server)

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

O-E-6 and O-N-8 Grid operation and Grid oversight for NGIs and first-line support to operations problems in the NGI

Currently, an operations team is responsible of running Grid oversight activities over the NGI infrastructures for detecting problems, coordinating the diagnosis, and monitoring the problems during the entire lifecycle until resolution. This is currently done in cooperation with the relevant Regional Operations Centres (via rotating shifts) according to a two-level hierarchical model [COD]. 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. Regardless of this distributed model, during the transition we foresee the need of performing quality checks of the services provided by NGIs and of taking care of operational problems that can not be successfully distributed to NGIs.

O-E-7 and O-N-4: central and regional Grid User Support and ticketing system

User support relies on a central helpdesk, which is a regional support system with central coordination [GGUS]. It gives access to user documentation and support, and to a problem ticketing system. Support to network end-to-end problems in the Grid is also important, 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 [ENOC].

O-E-8: Triage of incoming problems

For EGI we propose to adopt the ticket workflow model currently in place in EGEE III. Triage of tickets entering the central user support system (also known as ticket processing management), consists in the monitoring and routing of all active tickets in the Grid user support system by Grid and VO experts, who are responsible of addressing the problems to the appropriate second-line specialized support units (who are formed by members that are specialists in various areas of Grid middleware, or regional supporters for operational problems, or VO-specific supporters).

O-E-9 Coordination of gathering of requirements for user support tools

Tools for user support are designed to meet the requirements of VOs. Additional requirements may arise with the evolution of the middleware stacks in use, and with the support of new user communities.

O-N-9 Regional helpdesk

User and application support is an increasingly vital area. The core of the support effort is the central ticketing system, which is used throughout the project for managing problem reports and tickets, for operations, as well as for user, VO, and application support. The system is interfaced to a variety of other ticketing systems in use in the NGIs in order that tickets reported locally can be passed to the central instance or other areas, and that operational problem tickets can be pushed down into local support infrastructures. Each support area requires staff to oversee the tickets – to ensure that all are assigned, and followed up.

O-E-10 Coordination of middleware deployment,

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. Central 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.

O-E-11 Coordination of resource allocation and of brokering support for VOs

Global VOs can specify requirements in terms of resources guaranteed by the overall pan-European Grid infrastructure used. In this case, coordination is needed to ensure that a suitable production infrastructure (Grid core services and resources offered) is in place, to meet the global VO SLAs agreed upon. Development is still needed to provide tools for the automation of the management and the negotiation of SLAs.

O-E-12 Coordination of Interoperations between NGIs and with other Grids

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.

O-E-13 Definition of best practices, operations procedures, operations requirements

Interoperation relies on the definition of best practices and of general operational procedures for daily monitoring activity for sites and federations.

SECURITY (O-E-14 Grid security and incident response coordination, EUgridPMA/IGTF, O-E-15 Coordination of security policy development and maintenance, O-E-16 Security vulnerability)

The character of the security vulnerabilities and risks presented by Grid infrastructures provides a rationale for coordination among the Grid participants at various levels. Firstly, coordination of a team of security people in NGIs is necessary to define standard security policies to ensure that common policies are defined. In addition, coordination of a Grid security vulnerability group is needed to provide a high level of confidence in the security of the software deployed, thus reducing the risk of incidents. Finally, coordination is needed to ensure that common policies are followed for coordinated incident response by Grid participants, whether they are user organizations, sites, or resource/service providers. Participation to EUgridPMA and IGTF work is also necessary [IGTF, EUgridPMA], as a common authentication trust domain is required to persistently identify all grid participants. To ensure interoperability, both at the European as well as the global scale, the EGI will participate and support the International Grid Trust Federation (IGTF), and the EUGridPMA in particular.

10. ANNEX II -ESTIMATE SUMMARY OF COSTS FOR MIDDLEWARE

We summarize here the effort separately estimated for the maintenance and support and development of the three stacks.

ARC

1) Maintenance support and development of the NorduGrid Computing Element

9FTE

2) Maintenance support and development of Grid service hosting and development framework (NorduGrid HED)

4.5 FTE

3) Maintenance support and development of ARCLIB and lightweight intelligent clients

5 FTE

4) Maintenance support and development of the NorduGrid Information System backbone

4.5 FTE

5) Maintenance support and development of the dCache based distributed storage system

6 FTE

Total ARC: 29.5 FTE

gLite

1) Maintenance-support-development of the gLite cluster of components (but the security tools are already common, thus the FTE for security could include possibly also other stacks, not just gLite);

34 FTE

2) Integration & Packaging, Certification & Testing

16 FTEs

3) General build and test system (ETICS)

5FTE

4) Preproduction testbed and pilot grid services", that presently is accounted in the Operation function. It is assumed to be distributed in the NGI's that provide the support of the mw and has to be categorized as providing a "Service", some NGI's will be interested in and some will not. For the gLite components may be evaluated in 6 FTE, with some uncertainty.

6FTE

Total gLite : 61 FTE

UNICORE

1) Maintenance, support, development certification and testing of UNICORE components as described in detailed in the table in appendix

12.45 FTE

Total UNICORE : 12.45 FTE

Total UMT: 103 FTEs + additional components to be identified by NGIs

In addition:

4 FTE to be attributed to EGI.org for the final certification

4 FTE to be attributed to EGI.org for coordination and acceptance criteria specifications

The evaluations reported above and derived from the detailed tables for each Consortium refer to the situation of few months ago and may need to be revised for describing the EGI start time needs. Synergies as e.g. for a common security framework could also be possible but have been not evaluated so far.

The reported efforts will be mainly transferred by the EGI.org development Unit to the current Consortia who will remain the main source for the provision of the related work.

The effort for new developments including integration and testing part is estimated to be about 50% of the total reported effort for gLite.

11. ANNEX II - THE THREE MIDDLEWARE CONSORTIA AND THEIR DETAILED COST ESTIMATE FOR EGI

The middleware components used in the current EU e-Infrastructure are today provided mostly by 3 Consortia: gLite, ARC and UNICORE .

The Advanced Resource Connector (ARC) is developed by the NorduGrid collaboration and associated projects since 2001. It features a decentralized architecture, leading to 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 decentralized deployment of ARC in over 60 sites, with over 20.000 cores. In particular, ARC is adopted by the NDGF (Nordic DataGrid Facility) to support the world's only distributed heterogeneous Tier1 center. Currently, the next generation of ARC is under development, which minimizes dependencies on third-party components, improves extensibility, interoperability and allows portability to non-Linux platforms.

gLite services are the result of a truly pan-European development effort made by the EDG-EGEE project series started in 2001 and co-financed by EC via competitive bids. They are currently deployed in about 250 sites distributed in all EU countries and provide a general, unified and robust access service to ~50.000 compute nodes (largely commodity clusters with some HPC systems) and to very large (>15 PB) distributed storage systems. The gLite middleware consists of an integrated set of components compliant with open standards and covering all the aspects of the Grid infrastructure. It is developed for the Scientific Linux environment, but extensive effort is recently provided to make it operating system independent. The gLite environment is tightly coupled with the ETICS build and test system (also funded by the EC), which provides an automated environment for the integration and validation of new components and their new versions.

UNICORE has a traditional HPC background (since 10 years) and is open source since 2004 (http://www.unicore.eu). 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 also in non-HPC-focused NGIs like 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 a seamless, secure and intuitive access to Grid resources. UNICORE comes with a strong focus on workflow capabilities, security, application support and ease of installation and configuration.

Below is reported a table from OMII EU summarizing the main services developed by each stack which need to continue to be co-funded in the EGI/NGI scenario. See:

http://omii-europe.org/OMII-Europe/docs/DJRA20.pdf

OGSA capability	gLite	UNICORE	ARC
Security.AttributeAuthority	VOMS+SAML	WS-UUDB, SAML-VOMS	VOMS+SAM

Security.Accounting	DGAS, APEL	RUS	SGAS, APEL
Data.Management.Storage	StoRM, DPM	SMS	Smart-SE, dCache
			ARC Gridftp
Data.Management.Transfer	FTS	JMS	FTS, gridftp2
Data.Access.Relational			
Data.Access.FlatFiles	GFAL	TSI	ARC Caching
Information.Model	GLUE	GLUE (future)	GLUE, arcschema
Information.Discovery	OpenLDAP		OpenLDAP
Information.Monitoring	GridICE,	LLview, CIS, RSS	NG-Monitor
	R-GMA		
ExecMan.ExecService	GT2 Gram,	TSS, OGSA-BES	Grid-Manager+AREX (BES), gridftp interface
	CREAM+BES		
ExecMan.JobManager	WMS	XNJS	ARC Client
ExecMan.CandidateSetGen			
ExecMan.ExecPlannService			

The cost to continue to support and maintain each one of them and for the developments needed for making each one of those included in UMT fully interoperable with the quality necessary to be deployable in the EGI e/Infrastructure has been independently evaluated for each stack.

COST ESTIMATE FOR gLITE

Here is an evaluation of the FTE needed for maintenance-support-development of the gLite cluster of components (but the security tools are already common, thus the FTE for security are the everybody,

not just gLite) ; the evaluation refers to the situation few months ago and may need to be revised for describing the EGI start time needs

Security tools (already common, not gLite only)	9 FTE
Information system, monitoring, accounting	6 FTE
Computing (exec) Element/ Services	5 FTE
Data Storage and Management Services (DPM, STORM, GFAL, LFC, FTS, Encrypted storage, AMGA)	6 FTE
Job management services	8 FTE
TOTAL	**34 FTE**

To this personnel it has to be added the one needed for Integration&Packaging and for Pre-Certification&Testing (i.e. the activities currently performed in EGEE-SA3, that will be included in the mw function). The following table provide an evaluation valid for the current situation.

Component	FTEs for Integration & Packaging	FTEs for Pre-Certification & Testing
Security.AttributeAuthority – VOMS + SAML	0.5 FTE	1 FTE
Security.Accounting – DGAS, APEL	1 FTE	1 FTE
Data.Management.Storage – Storm, DPM	0.5 FTE	1 FTE
Data.Management.Transfer – FTS, gridftp	0.5 FTE	1 FTE
Information.Model – BDII	0.5 FTE	1 FTE
ExecMan.ExecService – CE CREAM	1 FTE	2 FTE
ExecMan.JobManager - Workload Management System	1 FTE	2 FTE
Logging & Bookkeeping	1 FTE	1 FTE

Integration & Packaging = FTE Total -> 6

Certification & Testing = FTE Total -> 10

TOTAL "SA3" 16 FTE

Note that the Integration&Packaging and the Pre-Certification&Testing will be performed under the control of the mw Consortia, keeping close link with the developers of the relevant components.

The final acceptance test of the components and patches will still be instead a separate activity, very important, albeit light weight, and will require about 4 more people.

Still to be added the personnel for taking care of the Build and Test system and repository; today it is done via the ETICS Project and the evaluation is 8 FTE. It may be reduced somewhat at EGI start.

TOTAL "ETICS" 5 ? FTE

The personnel for "Preproduction testbed and pilot grid services", that presently is accounted in the Operation function must also be accounted for. It is assumed to be distributed in the NGI's that provide the support of the middleware and has to be categorized as providing a "Service", some NGI's will be interested in and some will not. For the gLite components this may be evaluated to around 6 FTE.

Total "Preproduction" 6 FTE distributed service

TOTAL SUM for gLITE : ~ 61 FTEs

COST ESTIMATE FOR ARC

NorduGrid candidate components for the European Universal Middleware Toolkit (UMT)

In what follows, we give an estimate of 5 NorduGrid ARC-based components. We stress the fact that NorduGrid provides a full end-to-end solution, in which case the total funding would be multiplied by roughly a factor of 1.5.

I) NorduGrid Computing Element

A general purpose service (called A-REX) implementing the job execution capability over large variety of computational resources. A-REX interprets standard job descriptions, offers OGF-compliant interface (BES together with community embraced extensions). A-REX offers powerful, transparent and automatic integrated data staging capability. A-REX offers WS-based local information interface

(supporting OGF standard Glue model))and can be connected to information backbone and logging services. A-REX can work together with community approved security frameworks.

1) maintenance and support (multiplatform including popular Linux flavours, MAC-OS and Windows): 3 FTE

2) interoperability and integration with other UMT components including certification process: 2 FTE

3) standard compliance, including the support for community approved best-practices: 2.5 FTE

4) system hardening and development of new features: 1.5 FTE

ARC SUM 1 : 9 FTE

II) Grid service hosting and development framework (NorduGrid HED)

The Next generation ARC services are implemented in a general and powerful hosting environment, the HED component. HED offers a convenient service development platform by taking care all the internal details of the underlying security, network communication and local information system layers.NorduGrid HED offers multilanguage support for server-side grid development (java, c/c++, python). The HED runs on linux, MAC-OS, Windows.

1) maintenance and support (multiplatform including popular Linux flavours, MAC-OS and Windows): 1 FTE

2) interoperability and integration with other UMT components including certification process: 0.5 FTE

3) standard compliance, including the support for community approved best-practices: 1.5 FTE

4) system hardening and development of new features: 1.5 FTE

ARC SUM 2 4.5 FTE

III) General purpose grid library (ARCLIB) and lightweight intelligent clients

ARCLIB offers a transparent access to grid resources through an intuitive and easy-to-use multilanguage API. The ARCLIB comes loaded with plenty of power features such as job description pre-processing, modular brokering library, job submission module to common middlewares, data library. ARCLIB is targeted for grid developers and advanced application integrators and provides a general toolkit for higher-level client side development.

ARCLIB is the core of the highly successful and powerful, nevertheless lightweight ARC client, grid portals and client-side job managers.

1) maintenance and support (multiplatform including popular Linux flavours, MAC-OS and Windows): 1 FTE

2) interoperability and integration with other UMT components including certification process: 1 FTE

3) standard compliance, including the support for community approved best-practices: 1 FTE

4) system hardening and development of new features: 2 FTE

ARC SUM 3; 5 FTE

IV) NorduGrid Information System backbone

A highly scalable distributed system of Information Indexing Services connecting the grid-enabled resources and offering a general platform for resource discovery.

1) maintenance and support: 1 FTE

2) interoperability and integration with other UMT components including certification process: 1.5 FTE

3) standard compliance, including the support for community approved best-practices: 0.5 FTE

4) system hardening and development of new features: 2.5 FTE

ARC SUM 4: 4.5 FTE

V) dCache based distributed storage system

A dCache based storage system offering a transparent highly reliable solution for distributed storage facilities (the Nordic Tier-1 runs on a dCache based distributed storage system operated by NDGF).

dCache is to providing a system for storing and retrieving huge amounts of data, distributed among a large number of heterogeneous server nodes, under a single virtual file system tree with a variety of standard access methods. Depending on the Persistency Model, dCache provides methods for exchanging data with backend (tertiary) Storage Systems as well as space management, pool attraction, dataset replication, hot spot determination and recovery from disk or node failures.

Connected to a tertiary storage system, the cache simulates unlimited direct access storage space. Further, dCache offers all the functionality via WAN enabling a geographically widely distributed storage system, with high degrees of redundancy.

This however needs to be clarified with the dCache team NDGF is part of.

1) maintenance and support: 2 FTE
2) interoperability and integration with other UMT components including certification process: 2 FTE
3) standard compliance, including the support for community approved best-practices: 1 FTE
4) system hardening and development of new features: 1 FTE

ARC SUM 5: 6 FTE

TOTAL SUM FOR ARC: 29.5 FTEs

Total Cost estimate:

If we calculate with 1 FTE at 50 - 80 KEUR, the above presented FTE costs gives lead to 1.5 - 2.3 MEUR a year.
The estimated NorduGrid full-ARC-solution would be approximately 2.2 - 3.4 MEUR a year.
These do not include travel expenses, outreach activities, test hardware etc.

Work on development of the various components above is on-going.

COST ESTIMATE FOR UNICORE

EGI Middleware Function - Cost Estimates for UNICORE 6

cost per FTE	100.000	€					
round	-3						
			4,5	5,7	2,3		
	total		54	68	27	149	12,4
			person months per year				
OGSA capability	**UNICORE component**		Maintenance, Support	Integration, Certification	Standard Compliance	PM	PY

Security.AttributeAuthority	WS-UUDB, SAML-VOMS	2,0	3,0	1,0	6,0	0,50
Security.Accounting	OGSA-RUS	2,0	2,0	2,0	6,0	0,50
Data.Management.Storage	SMS	2,0	1,0	0,5	3,5	0,29
Data.Management.Transfer	FTS, UDT, OGSA-ByteIO	2,0	3,0	1,0	6,0	0,50
Data.Access.Relational	OGSA-DAI4UNICORE	2,0	3,0	1,0	6,0	0,50
Data.Access.FlatFiles	TSI	1,0	1,0	0,5	2,5	0,21
Information.Model	GLUE	2,0	2,0	2,0	6,0	0,50
Information.Discovery	CIS-IP, Service Registry	1,0	2,0	0,5	3,5	0,29
Information.Monitoring	LLview, CIS, RSS, SIMON	2,0	4,0	1,0	7,0	0,58
ExecMan.ExecService	TSS, OGSA-BES	2,0	3,0	2,0	7,0	0,58
ExecMan.JobManager	XNJS, TSI	3,0	6,0	3,0	12,0	1,00
ExecMan.CandidateSetGen	ServiceOrchestrator	3,0	4,0	2,0	9,0	0,75
ExecMan.ExecPlannService					0,0	0,00
Additional Components	**UNICORE component**					
Workflow.WorkflowEngine	Workflow Engine	3,0	6,0	1,0	10,0	0,83
Client.RichClient	Eclipse-based rich client	9,0	12,0	3,0	24,0	2,00
Client.ApplicationClient	GPE app client	2,0	2,0	0,5	4,5	0,38
Client.Commandline	UCC, DESHL	2,0	2,0	0,5	4,5	0,38
Client.ProgrammingAPI	GPE API	2,0	2,0	1,5	5,5	0,46
Client.HighLevelAPI	HiLA, DESHL-SAGA	2,0	2,0	1,5	5,5	0,46
Client.ApplicationSpecific	GridBeans	6,0	2,0	0,5	8,5	0,71
Client.Portal	GridSphere4UNICORE	2,0	3,0	0,5	5,5	0,46
Security.Authentication	Gateway	1,0	1,0	0,5	2,5	0,21
Security.Authorization	UNICORE/X	1,0	2,0	1,0	4,0	0,33

TOTAL SUM FOR UNICORE : 12.45 FTEs

Assuming 100K€/FTE per year
TOTAL COST UNICORE : 1.245.000 €

TOTAL SUM FOR the EGI Middleware function : 103 FTEs
+ additional components to be identified by NGIs

+ 8 to EGI.org for final component certification (4) and coordination and acceptance criteria specifications

It should be noted that current estimates correspond to the sum of independent evaluations made by each of the 3 stacks.

12. ANNEX III – PROPOSAL FOR A COUNCIL REGULATION ON THE EUROPEAN RESEARCH INFRASTRUCTURE (30/04/2008)

Proposal for a

COUNCIL REGULATION

on the Community legal framework for the establishment and operation of European Research Infrastructures

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 171 thereof,

Having regard to the proposal from the Commission[6],

Having regard to the opinion of the European Parliament[7],

Having regard to the opinion of the European Economic and Social Committee[8],

(1) Whereas the idea of a common ERA has been the guiding principle for all Community R&D measures and a central pillar in realising the research goals of the Lisbon Strategy for growth, jobs and a dynamic and knowledge-based European economy[9], and whereas, in this context, developing an EU policy for research infrastructures has been the subject of high level discussions and reflections over the last few years;

(2) Whereas these European facilities aim at the advancement of fundamental and applied knowledge by providing efficient and world-class scientific access and research services to large communities of researchers and users, and significantly increase the attractiveness of the European Research Area for researchers;

(3) Whereas Member States made an explicit request from the for the Commission to act in this domain, following the publication, in October 2006, of the ESFRI roadmap[10] identifying 35 major research infrastructure projects to be developed in the next 10 to 20 years;

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6 OJ C […], […], p. […].

7 OJ C […], […], p. […].

8 OJ C […], […], p. […].

9 Communication of the EU Commission "*Towards a European Research Area" (ERA)* of January 2000

10 The ESFRI roadmap for Research Infrastructures (http://cordis.europa.eu/esfri/roadmap.htm) deals with facilities, resources or services of a unique nature that have been identified by European research communities to conduct top-level research activities.

(4) Whereas, in the context of the EU strategy to improve the framework conditions for research and innovation a modernised Community framework for State aid for research and innovation[11] and guidance for a more effective use of tax incentives for R&D[12] were adopted in November 2006;

(5) Whereas the institutional and public debate following the 2007 Green Paper *The European Research Area: New Perspectives*[13], identified a number of key areas, of which the development of "world class research infrastructures", where effective action in partnerships between Member States would have the potential to deliver significant gains for Europe's research system and help to create a "fifth freedom" in Europe - the freedom of knowledge;

(6) Whereas, at the Competitiveness Council of 21-22 May 2007[14], the Research Ministers noted that Europe's main global partners are strongly investing in modern large-scale research infrastructure, stressed the importance of starting the *implementation* of projects such as those contained in the ESFRI roadmap, and recommended them to coordinate their future activities, thereby generating economies of scale and enabling a more efficient development.

(7) Whereas the European Council, in its meeting of December 14, 2007[15], considering that research infrastructures are becoming *increasingly complex and more expensive*, often placing them beyond the reach of a single research group, region, nation or even continent, reiterated its invitation to Member States and urged them to participate *more actively* to the implementation of European Research Infrastructures, in the context of the Lisbon objectives.

(8) Whereas the work carried out by ESFRI and the European Commission has recognised the limitations of existing legal instruments and identified a need to develop a new dedicated Community legal framework for setting-up European research infrastructures [16], [17], [18].

(9) Whereas the European Commission has proposed the development of a "Regulation on a Dedicated Legal Framework for the Construction and Operation of new European Research Infrastructures", which is included in the Commission Legislative Work Programme 2008 [19];

(10) Whereas the Council acknowledges a clear and strong commitment of the Commission and Member States to further develop research infrastructures on the basis of, among other things, an

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[11] OJ C2323, 30.12.2006

[12] COM (2006) 728 of 22.11.2006

[13] COM(2007) 161, GREEN PAPER - The European Research Area: New Perspectives http://ec.europa.eu/research/era/progress-on-debate_en.html

[14] Presidency conclusions of the Competitiveness Council of May 2007

[15] Presidency conclusions of the European Council of 14 December 2007

[16] http://cordis.europa.eu/esfri/policy.htm.

[17] *ECRI 2007Conference*, Hamburg, 5-6 June 2007: https://www.ecri2007.de/documentation/conclusions

[18] http://ec.europa.eu/research/era/progress-on-debate/stakeholder-consultation_en.html.

[19] Commission Legislative and Work Programme 2008 COM(2007) 640 final, Brussels, 23.10.2007

appropriate legal framework, in a coordinated manner[20] and whereas this regulation aims to facilitate the formation of European consortia for the construction and operation of research facilities of pan-European interest, complementing national, other European or inter-governmental schemes;

HAS ADOPTED THIS REGULATION:

Article 1
Nature of a European Research Infrastructure

1. A European Research Infrastructure (hereinafter referred to as "ERI") may be created under the conditions, in the manner and with the effects provided for in this Regulation.

2. The primary objective of an ERI shall be to establish and operate a research infrastructure of European interest.

3. The research infrastructure shall be deemed to be of European interest if the following conditions are met:

   (a) it is necessary for the efficient execution of Community research, technological development and demonstration programmes;

   (b) its use is effectively open to the European research community, composed of researchers from Member States and of countries associated to the Community research, technological development and demonstration programmes;

   (c) its use would bring significant improvement in the relevant scientific and technological fields as compared with national available facilities.

4. An ERI shall pursue its primary objective on a non-economic basis. It may however carry out certain economic activities closely related to its primary objective provided that the achievement of the primary objective is not jeopardised, using separate accounts and market prices.

Article 2
Application for establishment

1. The founding members shall submit an application to the Commission. The application shall be submitted in one of the official languages and shall contain the following:

[20] Conclusions of the European Council of 14 December 2007

(a) evidence that the criteria set out in Article 1 are fulfilled;

(b) demonstration of the contemplated financial contributions of the members;

(c) proposed Statutes of the ERI;

(d) designation of the entities referred to in Article 5(1)(c);

(e) summary information using the template in the Annex.

2. The Commission shall assess the application; in doing so it may obtain the views of relevant independent experts. The result of such assessment shall be communicated to the founding members who shall be, if necessary, invited to complete or amend the application in a reasonable time.

Article 3
Decision on the application

3. The Commission shall adopt the decision establishing an ERI according to the procedure provided for in Article 13 after it has satisfied itself that the requirements laid down in this Regulation are met.

4. The summary information contained in the application shall be annexed to the decision establishing an ERI.

5. The Commission shall adopt the decision rejecting the application if it concludes that the requirements laid down in this Regulation are not met even after it has given the founding members a reasonable time to complete or amend the application.

6. The decision on the application shall be notified to the founding members. The decision establishing an ERI shall also be published in the L series of the *Official Journal of the European Union*.

Article 4
Amendments of the Statutes

7. After the decision establishing the ERI has come into effect, the Statutes may be amended in compliance with the requirements laid down in this Article.

8. Any amendment of the Statutes which requires an amendment of the summary information shall be approved by a decision adopted according to the procedure provided for in Article 13. The Commission shall act upon an application submitted by the ERI or on its behalf and containing the following documents:

(a) amended consolidated version of the Statutes of the ERI;

(b) amended summary information.

The amendment of the Statutes shall not take effect before the decision approving it has come in force.

In assessing the application the Commission shall apply, *mutatis mutandis*, Article 2(2) and Article 3(2), (3) and (4).

9. Any other amendment of the Statutes shall be notified to the Commission. The notification shall contain the following:

(f) a concise summary of the amendment;

(g) the date on which the amendment takes effect;

(h) the website and/or address at which the text of the amendment and of the consolidated version of the Statutes can be obtained.

The Commission shall publish the notification in the C series of the *Official Journal of the European Union*.

Article 5
Status of the ERI

10. An ERI shall have legal personality as from the date on which the decision establishing the ERI takes effect.

11. An ERI shall have in each Member State the most extensive legal capacity accorded to legal entities under that Member State's law. It may, in particular, acquire, own and dispose of movable, immovable and intellectual property, conclude contracts and be a party to legal proceedings.

12. An ERI shall have a statutory seat, which shall be located on the territory of one of the States, referred to in Article 6(1), which is a Member State [or a country associated to the Community research, technological development and demonstration programmes].

13. An ERI shall have a name containing the words "European Research Infrastructure" or the abbreviation "ERI".

14. The ERI shall be considered, as concerns its non-economic activities, as an international body within the meaning of Article 151(1)(b) of Council Directive

2006/112/EC[21], and as an international organisation within the meaning of the second indent of Article 23(1) of Directive 92/12/EEC[22] and of Article 15 point (c) of Directive 2004/18/EC[23].

15. Member States shall take all possible measures to accord the ERI the most extensive exemption from taxes other than those referred to in paragraph 5.

Article 6
Membership

16. The following entities may become members of an ERI:

(i) Member States;

(j) third States and international organisations, including/excluding the European Community [RTD];

(k) public or private primarily non economic legal entities designated by a State (hereinafter referred to as "designated entities").

17. An ERI must at all times have at least three States or international organisations as members. At least one member shall be a Member State.

18. An ERI shall include Member States which shall directly as members, or indirectly through their designated entities, jointly hold the majority of the voting rights in the assembly of members.

19. Third States and international organisations referred to in paragraph 1 shall recognise that the ERI of which they are members shall have legal personality and capacity in accordance with Article 5(1) and (2) and that such ERI shall be subject to rules determined in application of Article 10.

20. A country associated to the Community research, technological development and demonstration programme where the ERI has its statutory seat shall accord to such ERI a treatment equivalent to that referred to in Article 5(5) and (6).

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Article 7
Statutes

The Statutes shall contain at least the following:

(l) objectives and activities of the ERI;

(m) identification of the members, their rights and obligations, and the conditions of and procedure for changes in membership;

(n) identification of the organs of the ERI, their competencies and the manner in which they are constituted and in which they decide, including upon the amendment of the Statutes in compliance with Article 4;

(o) statutory seat;

(p) duration;

(q) basic principles of financial management, contributions of members, accountancy and control;

(r) basic principles of employment;

(s) basic principles of access;

(t) basic principles of scientific evaluation policy;

(u) references to rules implementing the Statutes;

(v) identification of the working language; and

(w) other elements required by this Regulation.

Article 8
Organs

The Statutes shall identify at least the following organs and their competencies:

(x) an assembly of members as the organ having full decision-making competency, including the adoption of the annual budget;

(y) a director or a board of directors as the executive organ and legal representative of the ERI.

The Statutes shall identify the manner in which the members of the board of directors legally represent the ERI.

Article 9
Liability

21. An ERI shall be liable for its debts, arising from contract or otherwise, with all its assets.

22. The financial liability of the members shall be limited to their respective contributions to the ERI.

23. The Community shall not be liable for any debt of the ERI.

Article 10
Applicable law and jurisdiction

24. An ERI shall be governed:

(z) by Community law, in particular this Regulation and the Commission decisions referred to in Articles 3(1) and 4(2);

(aa) by the law of the State, including that of its territorial entity having legislative competence in the matter, where the ERI has its statutory seat in the case of matters not, or only partly, regulated by acts referred to in letter (a);

(bb) in derogation from letter (b), by the law of the States in which the ERI operates as regards public and occupational health and safety, environmental protection, treatment of hazardous substances and delivery of permits required for such operation; and

(cc) by its Statutes, adopted in conformity with sources of law referred to above , and by its implementing rules adopted in conformity with its Statutes.

25. Community legislation on jurisdiction shall apply to disputes involving an ERI. In cases not treated by such Community legislation, the law of the State, including that of its territorial entity having legislative competence in the matter, where the ERI has its statutory seat shall determine the competent jurisdiction for the resolution of such disputes.

Article 11
Winding-up, insolvency

26. The Statutes shall determine the procedure to be applied in case of winding-up of the ERI following a decision of the assembly of members.

27. Without undue delay after the adoption of the decision to wind up by the assembly of members, in any case within ten days after such adoption, the ERI shall notify the Commission thereof. The Commission shall publish an appropriate notice in the C series of the *Official Journal of the European Union*.

28. Without undue delay after the closure of the winding-up procedure, in any case within ten days after such closure, the ERI shall notify the Commission thereof. The Commission shall publish an appropriate notice in the C series of the *Official Journal of the European Union* announcing the date on which the ERI ceased to exist.

29. In case the ERI is unable to pay its debts, it shall immediately notify the Commission thereof. The Commission shall publish an appropriate notice in the C series of the *Official Journal of the European Union*.

Article 12
Reporting and control

30. An ERI shall produce an annual activity report, submit it without delay to the Commission and publish it on its website.

31. An ERI shall inform the Commission of any circumstances which threaten to seriously jeopardise the achievement of its objectives.

32. Where the Commission obtains indications that an ERI is acting in serious breach of this Regulation or the decisions adopted on its basis, it shall request explanations from the ERI and/or its members.

33. If the Commission concludes, after having given the ERI and/or its members a reasonable time to provide their observations, that such ERI is acting in serious breach of this Regulation or the decisions adopted on its basis, it may propose remedial action to the ERI and its members.

34. If no remedial action is taken, the Commission may repeal the decision establishing the ERI. Such decision shall be notified to the ERI and published in the L series of the *Official Journal of the European Union*.

Article 13
Comitology

35. The Commission shall be assisted by an advisory committee.

36. Where reference is made to this Article, Articles 3 and 7 of Decision 1999/468/EC shall apply.

Article 14

This Regulation shall enter into force on the third day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, […]

For the Council
The President
[…]

ANNEX

SUMMARY INFORMATION

(2) Name of the ERI: [name according to the Statutes, including the words "European Research Infrastructure" or the abbreviation "ERI"]

(3) Objective(s) : [objective(s) according to the Statutes]

(4) Membership: [membership according to the Statutes]

(5) Organ that is the legal representative, including the manner in which it legally represents the ERI: [e.g. "one director who signs on behalf of the ERI" or "a board of three directors; signature of two of them shall suffice to bind the ERI" or "a board made up of one chairman, one vice-chairman and three other members; a signature of the chairman or vice-chairman and another member shall suffice to bind the ERI"]

(6) Statutory seat: [reference preferably to the smallest administrative or self-governing territorial unit, such as a commune]

(7) Duration: [e.g. "indeterminate", or a final date or number of years from establishment]

(8) Basic principles of access

(9) Basic principles of scientific evaluation policy

(10) Basic principles of procurement policy

(11) The text of the Statutes can be obtained at [website of the ERI and the address of its statutory seat]

13. ANNEX IV – DRAFT CALL FOR TENDER FOR THE LOCATION OF THE EGI

- European Grid Initiative -

Call for tender

for the Location of the EGI.org

This call is launched by the EGI_DS Policy Board (PB).

The EGI Design Study is a project funded by the European Commission's 7th Framework Programme. Its ultimate objective is to establish a sustainable grid infrastructure in Europe. (www.eu-egi.org)

To this end EGI-DS has to identify processes and mechanisms for establishing EGI organisation (EGI.org), to define its legal form, and ultimately to initiate the establishment of EGI.org which will carry out the following activities:

The EGI.org shall operate the European level of the production Grid infrastructure for a wide range of scientific disciplines linking National Grid Initiatives. The national level of operation is ensured by the National Grid Initiatives.

The EGI.org shall provide Grid services and support at the pan-European level, complementing and coordinating national services.

The EGI.org shall coordinate middleware development and standardization to enhance the infrastructure

The EGI.org shall integrate, test, validate and package software from selected Grid middleware providers and make it widely available.

The EGI.org shall coordinate and implement a security policy.

The EGI.org shall liaise with other e-infrastructure projects and standardization bodies in Europe and elsewhere.

The EGI.org shall support the National Grid Initiatives in matters of training, dissemination and outreach.

The main foundations of EGI.org are the National Grid Initiatives (NGI), which operate the grid infrastructures in each country. EGI will link existing NGIs in Europe and will actively support the setup and initiation of new NGIs.

It is clear that EGI.org needs a central place where most of the staff (up to 50 people) would be located.

The aim of this call for tender is to find a location for the EGI.org central office which would be located within the European Union.

The legal form of the future EGI.org to be adopted depends on the location. Bidders are thus required to describe one or several types of legal entities existing within their national legal framework and satisfying the EGI.org requirements. In describing the legal entities bidders should assume that the future EGI.org will be based on the draft statutes attached to this call for tender.

I. Scope of the call for tender

Interested and eligible entities are invited to bid for the long-term accommodation of the EGI.org central office which will permanently host up to 50 people. The office must be located in an EU Member State and be available by January 2010.

Furthermore, the bidder shall propose a legal form that will satisfy requirements defined in section III below.

Given the international nature of the EGI.org, its central office should be easily reachable from most points in Europe and should also provide meeting facilities.

Bidders are also invited to provide an overview of the applicable employment conditions, bearing in mind that staff will be recruited throughout Europe (EU Member States but also other European States).

Given that EGI.org will have important cash flows within Europe, bidders are invited to provide details regarding the fiscal environment in which the EGI.org will operate.

II. Eligibility

Only entities established within the European Union may place bids.

III. Proposal for Legal Form of EGI.org

Bidders are required to describe one or several types of legal entities existing within their national legal framework and satisfying the following requirements:

- autonomous legal entity
- membership open to public and private entities established in different countries (not only EU)
- not-for-profit status
- limited liability of members,
- fast to create.

In describing the legal entities bidders should assume that the future EGI.org will be based on the draft statutes attached to this call for tender.

Bidders should again describe in detail the fiscal environment for the suggested type of legal entity.

IV. Procedure and Timeline

The bidder shall send his bid to the contact point indicated in section VII on_xxxxxx_ 2008. The bid shall be sent by registered mail, bearing the reference of this call for tender in a visible and legible

manner. The postmark shall be proof of the sending date. The PB reserves the right to reject bids which have been posted after the closing date. In addition the bidder may send his bid in electronic format.

To be conforming, a bid must comprise Annex I and II duly completed in English.

Any alternative proposed by the bidder in addition to the conforming bid shall be accompanied by all technical and financial information necessary for the PB to evaluate it fully.

The bidder shall forthwith notify the PB in writing of any change of the information provided in his bid.

The PB may reject any bid which turns out to be incorrect or incomplete at any time.

The PB may, after receipt of a bid and during its validity period, request the bidder to substantiate any information contained in his bid. The PB may request the bidder to provide any additional information which it deems necessary for the purposes of evaluating the bid. The PB reserves the right to reject a bid if the bidder fails to provide such evidence or additional information.

The bids will be evaluated in accordance with the criteria set out in section V by an Evaluation Group composed of members nominated by the PB. The Evaluation Group will shortlist the most competitive bids and will then enter into negotiations with the short listed bidders.

The timeline for the evaluation of bids is as follows:

Launch date: July 14th 2008

Final date for reception of expression of interest: October 31st 2008

Announcement of short-listed candidates: December 15th 2008

Announcement of selected location: March 2nd 2009

Any decision in relation to the tender procedure or the award of a contract shall be at the sole discretion of the PB, without any right of recourse by the bidder.

The bidder shall bear all costs associated with the preparation and submission of his bid including his costs for attending meetings of the Evaluation Group whether compulsory or not. There will be no reimbursement of costs.

V. Award criteria

Bids will be evaluated in accordance with the following criteria:

- **Cost**
- **Ease of access to the location**
- **Fiscal environment**
- **Employment conditions**
- **Technical infrastructure**
- **General environment**

VI. Validity of the bids

The bidder's offer shall be valid for xxxx months from the closing date.

Prior to the expiry of the original validity period, the PB may request in writing to all bidders that they extend the validity of their offers by a period of no more than three months from the original expiry date.

The bidder shall not be allowed to modify his offer during the validity period save where he is requested by the PB to do so.

VII. Contacts

Each party shall be represented exclusively by, and all notices and correspondence concerning the invitation to tender shall be communicated exclusively by and to, its contact person(s) or unit(s) appointed to deal with the matter concerned. Any communication by or to any other person(s) or unit(s) shall have no effect under the invitation to tender.

The bidder's contact person(s) or unit(s) shall be named in the offer.

Name and address of PB contact point: (?)

Secretariat appointed by PB and EGI_DS Project Office.

13.1. ANNEX – BID

Name of entity :

Contact person:

Address:

Country:

Telephone:

E-mail:

You may use separate pages.

Describe the accommodation :

Describe the environment (cultural environment, schooling…) :

Costs linked to the accommodation (rent, overhead/charges, local taxes…) and terms of contract:

Fiscal environment (Profit rules, capital taxes, corporate taxes, local taxes, VAT issues, privileges, rate exchange conditions…) **:**

Employment conditions (salary costs, minimum wage, legal working hours, income tax, social security, pension, health insurance, dismissal rules, labour flexibility, availability of temporary staff, local skills, work permits, types of contracts, conditions for spouses…)**:**

Additional benefits :

I above mentioned _____ certify that the information provided is correct and that I have the power to guarantee the commitment of my entity to the above and the availability of the described accommodation for EGI.org, were it to be selected.

Done on _____/2008, in_____.

Stamp and signature.

13.2. ANNEX – LEGAL FORM

ENTITY NAME	
REFERENCE TEXTS	
OBJECT OF THE STRUCTURE	
LEGAL ENTITY	
ADMINISTRATIVE REQUIREMENTS	
MEMBERS Required minimum -maximum number Liability of members	
CAPITAL	
NATURE AND MNIMUM AMOUNT OF CONTRIBUTIONS	
SHARE TRANSMISSION	
IINVESTEMENT FINANCING (Cotisations, contributions, staff contribution...)	
MANAGEMENT BODIES	
NOMINATION AND REMOVAL OF THE DIRECTOR	
HUMAN RESOURCES **(procedure of employment…)**	
ACCOUNTING CONTROL	
TAXES	
INDUSTRIAL COOPERATION	
DURATION	
DISSOLUTION	
ADVANTAGES OF THIS STRUCTURE	

14. ANNEX V – CALCULATION OF MEMBERSHIP FEES AND NGI VOTES IN THE EGI COUNCIL

14.1.1. The calculation of membership fees

Alternative national measures to the Gross National Income (GNI|), such as land area or population are inconsistent with usage, wealth or ability to pay. There are various precise measures of the wealth of a country available including GNP, GDP and GNI. For operational and analytical purposes, the World Bank's main criterion for classifying economies is gross national income (GNI) per capita. Following a comparison of these measures and the example of TERENA, the EGI will use the GNI data as published by the World Bank using the Atlas method of calculation, even though these are generally (like other statistics) at least a year old. The EGI Director should check the GNIs of the countries of the EGI NGIs once a year – the figures used in this blueprint refer to 2006, and were published in April 2008[24].

Following the example of organisations such as TERENA and W3C, the categorisation chosen has been adjusted to reduce the fees of the smallest economies in order to encourage their participation, thereby making the EGI more representative of Europe as a whole. A system based simply on the GNI of a country, does not take into account the differences in wealth and size that exist between countries.

This is a particular problem for countries that do not only have a relatively low per- capita income but that also have a small economy in absolute terms, since they cannot benefit from the economies of scale that larger countries enjoy. The World Bank classifications will be used to further refine the category one members into subcategories[25].

Economies are divided by the World Bank according to 2006 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income, $905 or less; lower middle income, $906 - $3,595; upper middle income, $3,596 - $11,115; and high income, $11,116 or more.

To overcome this problem, the membership fee for countries that are in Category 1 and 2 will be reduced by 25% if they are classified by the World Bank as Upper- middle- income economies and by 75% if they are classified by the World Bank as Lower- middle- income economies or Low-income economies.

[24] http://siteresources.worldbank.org/DATASTATISTICS/Resources/GNI.pdf (World Development Indicators database, World Bank, 11 April 2008)

[25] http://siteresources.worldbank.org/DATASTATISTICS/Resources/CLASS.XLS (World Development Indicators database, World Bank, 11 April 2008)

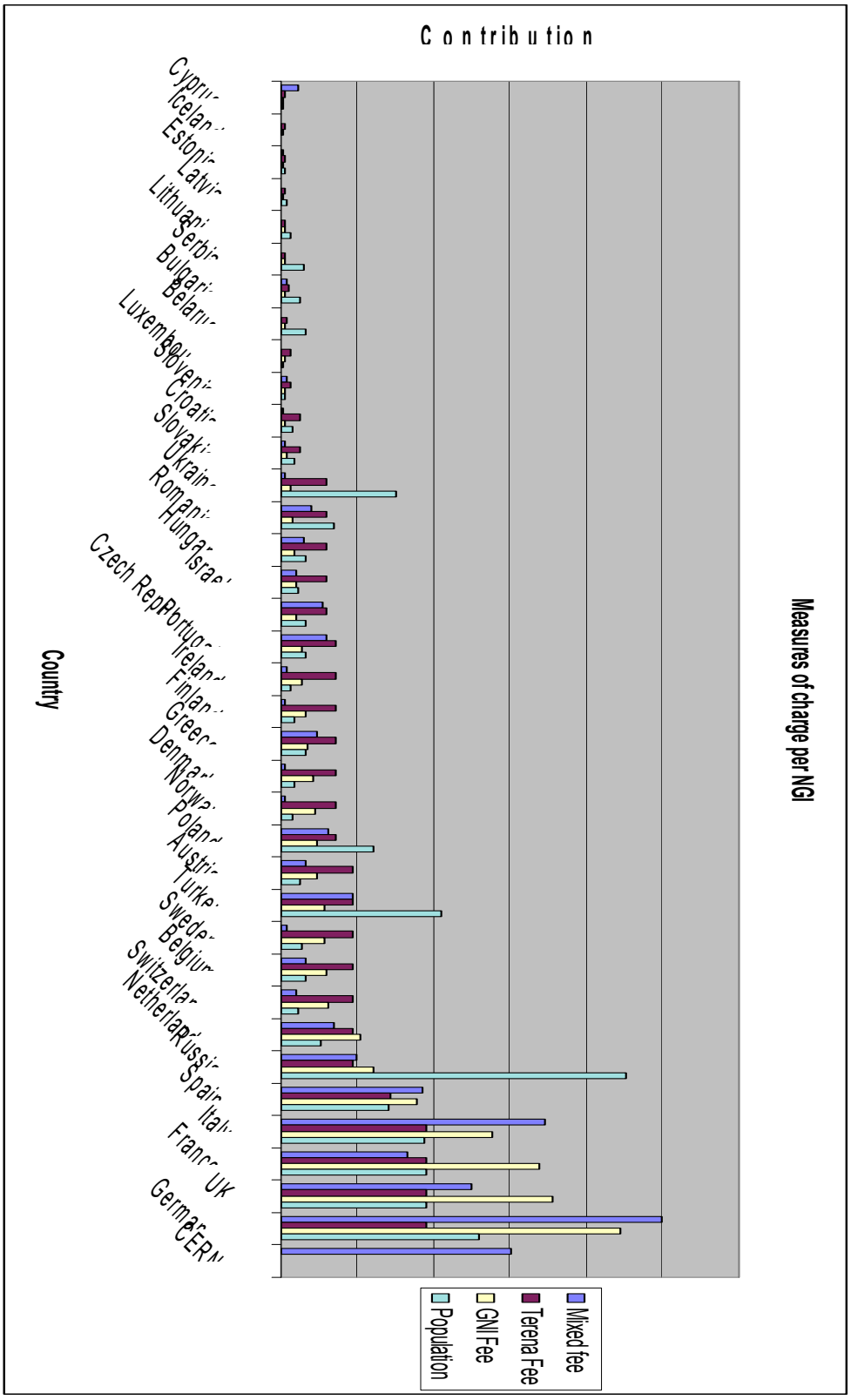
Contribution
Country
Measures of charge per NGI
Population
GNI Fee
Terena Fee
Mixed fee

Figure: Relative NGI contribution for possible measures for sharing EGI costs across NGI

NGIs will be put into 8 categories of voting rights and membership fees according to the Gross National Income (GNI) of their countries. Members that believe to be in the wrong category can apply to the EGI Director for a change of category. The EGI Director will put applications to the EGI Council once each year to make a decision where changes of members' categories in the case the GNI figures indicate that this could be justified. This will mostly be the case when the GNI of a given country overtakes (in positive or negative sense) the GNI of a country in a neighbouring category.

The categories of membership fees shall be:

The fee for members in category 1 shall be 0.5 Unit if their country is classified by the World Bank as a 'High-income economy', 0.4 Unit if their country is classified by the World Bank as an 'Upper-middle-income economy', 0.3 Unit if their country is classified by the World Bank as a 'Lower-middle-income economy' and 0.2 Unit if their country is classified by the World Bank as a 'Low-income economy'.

The fee for members in category 2 shall be one Unit if their country is classified by the World Bank as a 'High-income economy', 0.8 Unit if their country is classified by the World Bank as an 'Upper-middle-income economy', 0.6 Unit if their country is classified by the World Bank as a 'Lower-middle-income economy' and 0.4 Unit if their country is classified by the World Bank as a 'Low-income economy'.

The fee for members in category 3 shall be two Units, the fee for members in category 4 shall be four Units, the fee for members in category 5 shall be six Units, the fee for members in category 6 shall be eight Units, the fee for members in category 7 shall be twelve Units, the fee for members in category 8 shall be sixteen Units.

The yearly contribution is related to the voting categories as set out below.

1. Requirements for a formula or algorithm to categorise member nations

A remaining problem is the need for formula to assign countries to categories, and regulate their change of category.

Suppose this year country A is in category (n+1) and country B is in category (n), but according to more recent World Bank figures country B's GNI has become higher than that of country A. Will then country B be promoted to category (n+1) because it has overtaken country A in the positive sense, or will country A be demoted to category (n), because it has overtaken country B in the negative sense?

Any formula or algorithm to determine the boundaries between membership categories must fulfil the following requirements:

- it must be simple and objective;
- it must be stable (in the sense that changes in categories must be caused by countries getting really richer (relative to other countries) or getting really poorer (relative to other countries), not by artefacts changing the boundaries between categories) ;
- it must cause no more changes of category of members than really justified.

Taking into account these requirements it is not possible to develop a mathematical formula to calculate the boundary between categories. Any formula that has as its output a boundary expressed in billions of USD will need to have as its input the combined GNIs of countries expressed in billions of USD. Since GNIs change a lot and any average of GNIs will also be changing in unpredictable ways, such a formula would never be stable. For instance, such a formula could result in a country having to go to a higher or lower category because a completely different country of a completely different size has seen a large fall or growth of its GNI.

Or, as another example, such a formula could result in a country going to another category because a completely different country has left EGI or has joined EGI. Clearly such artefacts are undesirable.

Instead, an algorithm will be used to formulate proposals to the EGI Council for changes of membership category of certain members.

2. Algorithm to formulate proposals for changes of membership category

Each year in the preparations for the EGI Council meeting the latest available World Bank statistics will be used to find the GNIs of the countries of EGI's National Members, expressed in billions of US dollars. The amounts will be rounded off to the nearest integer (amount of billion US dollars) and those figures will be called the "current GNI" of each country. The same procedure having been applied one year earlier has produced the "previous GNI" of each country.

A change of membership category will be proposed to the EGI Council only if the following holds:

There are two countries A and B, last year country A was put in category (n+1) and country B was put in category (n), and the current GNI for country B is higher than or equal to the current GNI for country A.

Then there are three possibilities:

1. The current GNI for country A is higher than or equal to the previous GNI for country A (and consequently the current GNI for country B is higher than the previous GNI for country B). *In this case it will be proposed to promote country B to category (n+1)*

2. The current GNI for country B is lower than or equal to the previous GNI for country B (and consequently the current GNI for country A is lower than the previous GNI for country A). *In this case it will be proposed to demote country A to category (n).*

3. The current GNI for country A is lower than the previous GNI for country A while the current GNI for country B is higher than the previous GNI for country B. In this case a boundary point needs to be set to determine promotion/demotion. P is defined as the average of the highest previous GNI in category (n) and the lowest previous GNI in category (n+1).

a. *If the current GNI for country A is lower than P, it will be proposed to demote country A to category (n).*

b. *If the current GNI for country B is higher than or equal to P, it will be proposed to promote country B to category (n+1).*

Notwithstanding the above, it will never be proposed to promote a country by more than one category in a single year.

All promotions and demotions will have effect from January 1st following the GA meeting in which these decisions have been taken.

In addition, the overall picture of all GNIs and categories of countries should be revisited once every four or five years, to check that the repeated application of the algorithm has not introduced any unfairness.

14.1.2. Voting in the EGI Council linked to national subscription

It is intended that decisions made in the EGI Council should be reached through consensus of all members. However, in practice a voting scheme is required when there is irreconcilable division.

Voting should reflect the financial contribution and usage of the EGI whilst also allowing a voice for the smaller economies which could make great advantage from the initiative. If the higher income economies have a simple majority of the votes between them, then the smaller countries only have power by splitting the higher income economies. On the other hand, unless the higher income economies have significant voting power, then they are disadvantaged with respect to their funding of the EGI.

Weighted voting is applied as operated in the TERENA organization, in a system refined over several years to address the requirements outlined above. The voting structure consists of 8 categories that are broadly based on the GNI of the country as classified by the World Bank (see table 1). Members shall have votes as follows:

category 1 NGI countries

- five votes if their country is classified as a High income economy
- four votes if their country is classified as an Upper- middle- income economy
- three votes if their country is classified as a 'Lower-middle-income economy'
- two votes if their country is classified as a 'Low-income economy'.

category 2 NGI countries

- ten votes if their country is classified as a High income economy

- eight votes if their country is classified as an Upper- middle- income economy
- six votes if their country is classified as a 'Lower-middle-income economy'
- four votes if their country is classified as a 'Low-income economy'.

category 3 NGI countries - twenty votes
category 4 NGI countries - thirty votes
category 5 NGI countries - forty votes
category 6 NGI countries - fifty votes
category 7 NGI countries - sixty votes
category 8 NGI countries – seventy votes

The consequences of the voting balance are hard to model without knowing which NGIs may or may not chose to be members of the EGI. It is unreasonable to draft a basis for an organization which will change dramatically if one country joins or leaves, so the collegiate approach taken in general balances the requirements stated above.

Example

If there are 10 EGI member NGIs (2 from category 8; 2 from 6; 4 from 5; 1 from 3; 1 from 2) where the total votes would be 450, then a simple majority would be 226. The votes of the four category 8 & 6 NGIs would total 300 while the votes of the other six members would sum to 150. For the NGIs from smaller economies to carry a simple majority vote they would need to attract three of the category 6 members (a total of 270 votes) or 2 of the category 8 countries (a total of 290 votes) or one of the category 8 countries and one of the category 6 countries (a total of 260 votes).

Many more counties may chose to join the EGI than this example assumes, from different categories, however, the example is intended to convey how a combination of a few of the counties with larger economies combining with the smaller counties can overcome the wishes of the majority of the larger countries when the commitment exists.