CHALLENGERS

A Specific Support Action
funded by the European Commission

Interaction of European and International Grid Communities

Conclusions of the first consultation workshop
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www.challengers-org.eu

Whereas the first generation of the Web enabled individuals to buy goods and services from retailers, the first generation of the Grid has enabled the global community of scientific researchers in particle physics and bioscience to share computing and data resources to perform simulations and analyses that no single organisation could do alone.

The first workshop of the CHALLENGERS project held in Pisa in October 2006 considered how to bring these achievements together to provide a global Grid for business by 2020.

The vision: Global Grid for business by 2020

A global Grid for business would enable businesses to make joint use of resources and services in order to exploit new business opportunities quickly, and flexibly. The Grid would be a significant tool where the business opportunity required the sharing of resources for evidence based decision making in the public sector, or the creation of content in sectors such as finance, energy, pharmaceuticals, and engineering design. It would allow small and large businesses across the world to:

- describe their services in a registry like yellow and white pages;
- discover the services that are required to exploit new business opportunities;
- identify potential partners using full supplier qualification procedures;
- negotiate contracts to establish business relationships across national boundaries;
- operate, account for, and manage the most appropriate topology of relationships by monitoring cost, quality and delivery schedules;
- change the business structure & processes, and even partners in response to changing circumstances;
- close down the business relationships when the opportunity has passed.

The business relationships established may be long term design and manufacture, or short term information aggregation; the topology of the relationships may be those of supply chains, hub and spoke etc..; the legal form of the relationship may be supplier contracts, partnerships, or shared risk virtual organizations. The technology to support this vision of a global automated business environment will need to be sufficiently flexible to support all these alternative business relationships; it will need to be consistent with the various international legal environments; it will need to be secure enough to be trusted by businesses and not breach individual privacy; and most of all it will have to provide the correct balance of automated and human roles with interfaces that are usable for each person involved to undertake their role.

The barriers

Before the vision can be achieved, the workshop identified the following barriers that need to be overcome:

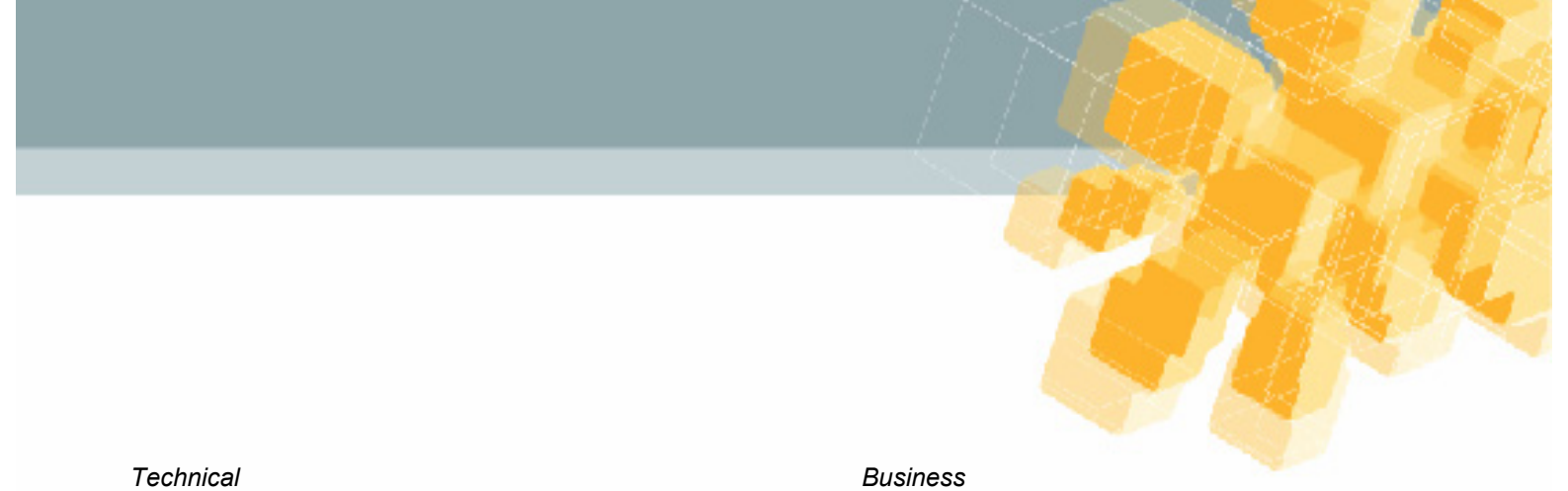
Legal

The main barrier concerning legal issues is the divide between technical and legal experts in the language they speak and their culture. The two communities have had little contact in the past, and their objectives overlap little with the result that they do no know about, or understand the issues of concern to each other.

Intellectual Property Rights (IPR) relating to content both contributed into Grid based business and produced by them are a major concern of businesses considering extending from intra-enterprise to inter-enterprise Grids. Commercial confidentiality including separating of roles in a Grid based system are concerns with respect to design data within a value chain, but also privacy of personal data, particularly in the health sector, but also in other sectors where personal information may be shared or aggregated.

The liability of those operating a Grid environment that supports many businesses is a problem that has been solved elsewhere, but the solution needs communicating.

Homogeneity of implementation of relevant directives in Europe, and consistency of legislation across the world are general concerns, although these appear to result from ignorance or fear of novelty rather than legal barriers.



Technical

The Grid cannot achieve the business and global-cooperation goal of becoming a single global infrastructure by 2020 without evolving technically into its next generation. Achieving the vision of SOKU is *necessary*.

The current Grid faces many specific technical barriers before achieving this 2020 goal:

Many technical processes cannot currently be automated, so require *manual labour* per application and/or per actor – which limits scalability. Examples include semantic annotation, workflow design, Grid management, and many more. Wide-scale interoperability, a defining feature of the Grid, remains a challenge.

Virtualisation still greatly hinders security, privacy, Authorisation Authentication Accounting (AAA) in long chains of services from different providers. The automation of the knowledge and experience that many TelCos and Service Providers have is particularly missing here.

The HPC background of Grids, as well as the general and enduring problems of managing distributed/dynamic/heterogeneous/virtual resources makes the Grid much more applicable to large-scale batch jobs. Industrially significant *transactional applications* are difficult to support. The *compactness* of business applications also makes them much more challenging to manage automatically and efficiently.

One can debate whether *production quality* management, and also application development tools are available. For scientific applications the answer is positive, but business software engineering requires much easier-to-use tools, that are lacking.

Finally, current *standardisation* is clearly insufficient. Technically, however, the Grid is not ready for extensive standardisation. Premature standardisation would assist business applications but could damage the technology itself.

Business

The major business barrier for Grid adoption is simply the business case. Currently mature and validated business models are missing from industry and these remain in the consultancy rather than in the services domain.

Business Models need to mature providing win-to-win relationships among different actors in the value chain: *Software* and *hardware vendors* are not yet adapted to pay per use since they are not willing to share business risks, *Service providers* have difficulties in predicting optimum usage of platforms and dynamically adapt applications to platform size providing cost effective solutions.

Grid platforms and services must be *easy to manage and operate* because implies large number of suppliers/users probably with no previous references and potential low confidence about any references that can be obtained.

Industrial applications are conservative, and adopt technologies such as HPC cautiously. There is still a conflict between the technical evolution and the real benefits, financial and not financial.

Creation of the global cyber utility cannot be undertaken by a single business or administrative entity for lack of sufficient ROI. It needs policies similar to those which fostered the development of the railways - piecewise development can provide local business value but more is required for a global infrastructure.

Standardisation

The business models of IT suppliers are based upon some technologies which are standard across suppliers while others are proprietary. In the Grid environment there is pressure from technologists towards open standards higher up the Grid technology stack than current IT suppliers appear to want in order to maintain their competitiveness.

There appear to be many standards bodies (e.g. OASIS, OGF, W3C, industrial consortia) offering some form of *de facto* or open standards, and no pressure for *de jure* standards at this time. This leaves technologists and business analysts confused about the risks of being tied to proprietary solutions.

There is no clear route to the interoperability of the semantics of domain specific controlled vocabularies used in most domains which is required for a functioning global Grid, or indeed Semantic Web.

The result of this confusion about standardisation is a fragmentation of the various solutions of the technical challenges.

Communication

There is still confusion in the commercial world as to whether Grid technology is a public sector utility providing supercomputing and massive data storage to the scientific research community, or whether it is a management technology for service oriented architectures built with Web Services.

There are barriers within companies to the use of Grid solutions, manned by both top managers and end users. Managers don't have the use of the Grid in their solution portfolios because of the absence of any major market for the Grid. Moreover, the license model commercialised by companies (e.g. based on CPUs used) makes the use of much software in Grid environments too expensive. Finally, companies could reject using the Grid because of the lack of trust from end users in the services that use the Grid.

Cultural & Organisational

Cultural and organisational issues particularly revolve around lose of control, potential job reduction and difficulties to set-up a common strategy.

The Grid represents a new way of thinking. There are many fears about the fact of losing control with Grid technologies. Until today the perception in IT people is to have one application, running in one server, owned by one company or division.

Many organisations have created silos of people (network people, storage people, database administrators, application managers, etc…) to allow the managing of complex systems. Grid may introduce high-level automation and some of these jobs may become completely unnecessary.

Once previous barriers have been overcome then we face many challenges about the autonomy of different individual lines of business and the politics between them and a central IT based in grid technology. Who prioritises the assignment of resources? Who pays for them? How are they billed? There is a need to identify the benefits for different stakeholders, a simple migration path, and an acceptable return on investment.

International Coordination

Although some international coordination actions are currently underway (e.g. OGF, EGEE, Grid@Asia, EchoGrid) there is little worldwide coordination among the different national funding agencies dealing with Grid research and infrastructures. Different approaches (if any) are followed by each industrialised country. This is particularly true in Europe, as clearly reported in the document *"Grids research in Europe: An overview prepared by GridCoord*", presented during the Grid Technology Days event held in Brussels on September 2006. This reports shows that significant differences exist in the approaches that are currently applied in the major EU member states. For example, in UK and France there has been a comprehensive national funding programme specifically for Grids. This was not true in other European countries where evolution and coordination of Grid research has been bottom-up through the spontaneous initiatives of the research community exploiting public funds in the ICT domain.

A coordinated approach towards Grid research in Europe and in the rest of the world is crucial to reach critical mass, create the potential for a more visible impact at an international level, and influence adoption in industry and business. It is important to improve the coordination among national funding agencies as well as between them and European Union, on the one hand, and between research and industry, on the other. In order to overcome fragmentation and duplication of efforts a common coordination programme able to align the single approaches is of fundamental importance. Programme alignment could create focus and coordination even among complex organisations making it easier to identify and realise synergies. To address these challenges at the European and worldwide level, new consultative mechanisms need to be proposed and implemented.

The solutions

The workshop proposed solutions to the barriers identified in each area:

Legal

The primary solution to the divide between legal and technical actors is to provide a forum which fosters interaction, either as a conference series or project. Legal-IST and Alive have started to provide legal input into IST research projects and this activity needs to continue. To achieve this objective, benefits need to be identified that will motivate legal researchers to work with technologists at the early design stages of R&D projects.

Legal involvement in ICT projects is small and its impact outside the project where it occurs needs to be maximised. A sustainable text repository should be supported by DG INFSO & Media through Cordis/Europa to preserve text deliverables in the legal area from all projects they fund. Indeed, it has often been suggested that all public deliverables from funded projects should be centrally stored, but whilst legal ones are few and have a potentially large impact across projects, they should be given priority.

The issues of confidentiality, privacy, IPR, international issues and liability all need clarifying to inform technologists and the business actors where there is no risk, and where the legal community identify unacceptable risks that need to be addressed through policy actions.

Technical

Continuing R&D can be called the “baseline” solution for all the identified technical challenges. The challenges of semantic description, security and trust need to be the focus of this funding in the short term. Aspects of a mature technology including the programming model and application framework need to be addressed before commercial adoption is likely. Our concern should be: efficiency of governmental support in reaching sustainable short-term ROI for industrially funded R&D. Significant examples of Grid services for EU citizens must be provided to convince users that the Grid services can become a utility.

Our major guiding conclusion is: the more “non-functional” a requirement is, the more it becomes a *pre-requisite* for industrial interest. Security must be supported before (computational) efficiency which must be supported before applications (high-level technologies). *Management* tools are high priority, however – as fundamental enablers. So are *universally*-useful *low-level* mechanisms (e.g. resource *discovery* is even more important than security).

There is also a major need to assess the level of *maturity* of the Grid’s enabling technologies, and to analyse *interdependencies* between them. At this stage we can give only a basic example:

Knowledge engineering techniques can only be considered mature if supported by considerable manual labour. Automatic semantic generation would remove many of the technological barriers, but is still an open research problem.

The *1st Challengers workshop on Core and Forward-Looking Technologies in January 2007* will focus on these issues.

Business

To move to a sustained Grid utility that is viable both as a public sector service and a commercial business it is essential to produce a number of successful Grid stories with compelling applications from industry to convince the potential early adopters about the opportunities and benefits of using this leading edge technology. In this respect, research projects oriented to business cases can foster the confidence feeling in grid technologies.

In the public sector, social, security and health organisations’ business models developed in research projects may be taken as examples for other organisations to follow. In commercial business, models for both network/Grid service providers and for end users in sectors such as finance, engineering (automotive and aerospace), pharmaceuticals and petrochemicals look promising although they are only at the early stage of development. Business cases based on vertical solutions should be built, always with the guidance of the EU and member states to ensure conformance to both research investment plans and regulation.

Trade organizations may enable and influence on the stakeholders, acting as a mediator, to join forces and find common interest between then, as well as transfer best practices to Grids environment.

R&D activities may also contribute to overcome the lack of trust and security and the complexity of existing business models with the collaboration of the EU, member states for institutional / regulatory efforts.

It is also important to simplify the user interface for the development, deployment and maintenance of Grid application in order to reduce the complexity in finding staff with the needed knowledge.

Standardisation

The COPRAS project has initiated interaction between standards bodies in Europe under the aegis of DG INFSO & Media. Such co-ordination needs to continue aimed specifically at Grid technologies to define the roles of the different standards bodies at a global scale.

ICT projects need encouragement to develop technologies that build upon existing standards to climb the technology stack, rather than re-inventing technologies which are already established, particularly in the Semantic Web and Grid semantics area.

DG Enterprise & Industry and DG INFSO & Media need to collaborate in their planning so that standards outputs from ICT research projects and support for European standards bodies are aligned and not in conflict.

A stable Open Middleware Repository needs to be supported by the EC and MS to achieve sustainability, rather than temporary support being given to new ones through different projects – e.g. ObjectWeb, OMII, BEinGrid, and calls for e-infrastructure in FP7.

Communication

A separation of the branding of the scientific research and commercial business applications of Grid technology would permit business managers to identify services that can benefit them.
Business managers need to see the value that Grid services can provide, whilst end users need to perceive Grid services as trustworthy. Then managers will consider aggregated services running on a Grid infrastructure among their solution options.
Management consultants and trade organisations who advise businesses need easy access to case studies and business models which show how services provided on a Grid infrastructure are profitable solutions to business problems both within and between enterprises.

The Way Ahead

Past experience has shown that to move forward from the successful R&D undertaken to build a business around Grid technology will still require co-ordination. This will be needed to limit technical fragmentation and to provide international co-ordination. There are already too many organisations competing to provide this co-ordination, which themselves need to be harmonised.

The success of a business Grid could be measured by economic or social indicators of its uptake and its achievements. These would include measures of adoption such as number of registries or services, or percentage of internet traffic.

Measures of achievement could be economic such as the impact on the increased GDP of countries, or social by measuring breakthroughs in health, security/peace, environment or science, however such achievements would not be available in the short term during adoption.

The workshop considered the following criteria to prioritise the actions proposed:

What is the economic impact of removing a barrier?
Is the barrier newly identified?
Is the action to remove a barrier itself new?
Is the action important in achieving the big vision, or only in progressing a local problem?
Is the cost of the action especially low compared to the benefits to be derived?
Are there a large number of barriers which depend on the removal of the one the action addresses?

The CHALLENGERS project will itself organize future workshops to focus on technical, business and legal barriers to the development, and their will be a second workshop addressing international co-ordination in December 2007.

The first Challengers consultation workshop

The first Challengers workshop was organised by the CCLRC and hosted in Pisa by CNR ISTI. The following experts attended the workshop and contributed to the conclusions reported here:

Algimantas Juozapavicius
Department of Mathematics and Informatics, Vilnius University, Vilnius, Lithuania

Fabio Martinelli
Information Security Group, CNR ITT, Pisa, ITALY

Andrew Richards
Executive Director, National Grid Service, CCLRC e-Science Centre, UK

Oreste Signore
Manager of W3C Office in Italy CNR ISTI, Pisa, Italy

Costis Christogiannis
National Technical University, Athens, Greece

Mercedes Fernández
Atos Origin Research & Innovation, Barcelona, Spain

Konstantinos Dolkas
National Technical University, Athens, Greece

Angelos Giannopoulos
National Technical University, Athens, Greece

Keith Jeffery
IT Director, CCLRC RAL, Oxfordshire, UK

Domenico Laforenza
High Performance Computing Laboratory, CNR ISTI, Pisa, Italy

Eduado Oliveros
Telefonica I+D, Spain

Jarek Nabrzyski
Poznan Supercomputing and Networking Center, Poland

Santi Ristol
Atos Origin Research & Innovation, Barcelona, Spain

Colin Upstill
IT Innovation, Southampton, UK

Theodora Varvarigou
National Technical University, Athens, Greece

Sylvie Vignes
Dept. of Comp. Sci. & Network, Ecole Nationale Supérieure Télécommunications, Paris, Fr

Michael Wilson
Manager W3C UK & Ireland Office, CCLRC RAL, Oxon, UK

The following experts reviewed drafts of the workshop conclusions providing comments which have been incorporated:

Rosa M Badia
Barcelona Supercomputer Center, Spain

Stefanos Campadello
Nokia, Finland

Marco Danelutto
University of Pisa,Italy

Michael Fehse
T-Systems, Germany

Mike Fisher
BT, UK

Bob Jones
CERN

Guy Lonsdale
NEC, Germany

Silvana Muscella
Metaware, Italy

Arne Sølvberg
Norwegian University of Science and Technology (NTNU)

Hailong Sun
BeiHang University, China

Domenico Talia
University of Calabria, Italy

Steve Wallage
451 Group, UK

Further Information

Prof Dora Varvarigou
ICCS
National Technical University of Athens
Heroon Polytechniou 9 str.
GR-157 73 Zographou
Athens
Greece

Atos Origin

CCLRC