APPROACHING THE CLOUD: BETTER BUSINESS USING GRID SOLUTIONS

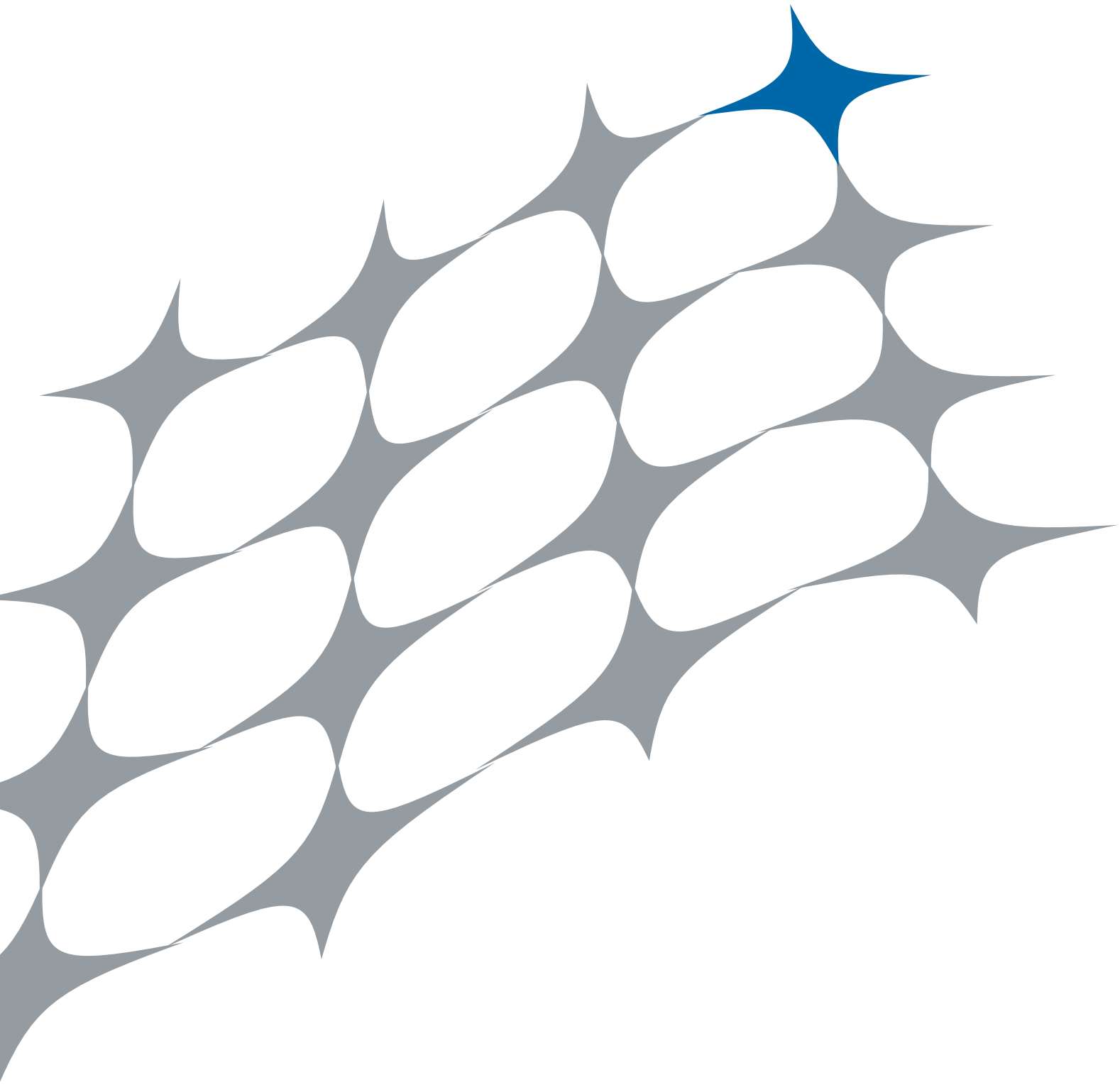
TWENTY-FIVE SUCCESSFUL CASE STUDIES FROM BEINGRID

European Commission

Information Society Technologies

IT-Tude.com

BEinGRID
BUSINESS EXPERIMENTS IN GRID



Jesus Villasante

FUTURE INTERNET, GRID AND CLOUDS

No matter how undefined it might be today, the Future Internet is conceived as the Internet of Services: a multitude of connected IT/telecom/media services offered, bought, sold, used, repurposed and composed by a worldwide network of service providers, consumers, aggregators, and brokers. All this leads to a new way of offering, using, and organising IT-supported services.

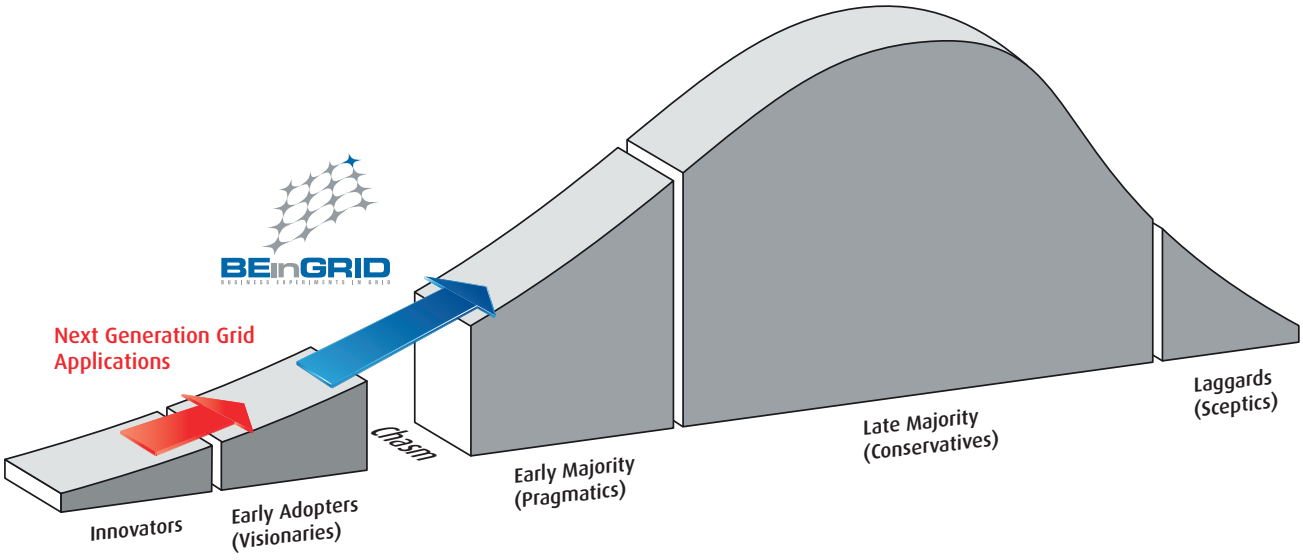
Currently, the prime examples are proprietary platforms that sell services. Some services are related to physical items, for example books. Some, like Google Docs, replace software sold as a package and are known as Software as a Service (SaaS). Amazon also sells computing resources to other organisations as Infrastructure as a Service (IaaS). Together with its proprietary systems, Google offers the Android platform, fully open for the development of open mobile applications and services: Platform as a Service (PaaS).

A broadened concept of a global and open service delivery platform is emerging as part of the Internet of Services. It will support rich mechanisms of global service supply, where third parties have the capability to aggregate services, act as intermediaries for service delivery and provide innovative new channels for consuming services. Cloud computing is an emerging possibility to support this service-based model, as all kinds of service offerings customised to the interests of the individual consumer become available on mass (open) infrastructures. Moreover, the future Internet will also allow for a much broader virtualisation of communication, computing and storage resources over the grid.

Cloud computing is intimately related to Grid computing, from which it traces some of its origins. It implements some of the basic concepts, results and achievements – and faces some of the difficulties – encountered when applying these technologies. The link between these two fields is extremely important to know about, especially for those wishing to drive their current business in this exciting direction.

Jesus Villasante
Head of Unit, Software and Service Architectures and Infrastructures, Converged Networks and Services Directorate, in the European Union Directorate General Information Society and Media (DG INFSO)

TABLE OF CONTENTS



INTRODUCING THE BEINGRID PROJECT

BEinGRID, Business Experiments in GRID, has been successfully conducting real-world experiments to provide, use and validate Grid technologies to meet today's business challenges.

Launched in June 2006, BEinGRID is the European Union's largest integrated project funded by the Information Society Technologies (IST), part of the European Union's sixth research Framework Programme (FP6). A large consortium of 98 partners is what drives the project, diverse in profile – from both industry and academia – as well as scope, where small-to-medium enterprises (SMEs) collaborate directly with the continent's leading R&D centres.

The BEinGRID project has identified clear business needs to be met by Grid technologies. Its 25 business pilots - covering industrial sectors such as finance, architecture, advanced manufacturing, agriculture and health - have focused on solving real problems using different Grid technology solutions for collaboration, performance and enabling new services.

A TECHNOLOGY READY FOR BUSINESS ADOPTION

Grid technology is in a critical transition as it moves from research and academic use to wider adoption by business and enterprise. The use of Grid brings many benefits, such as the greater utilisation of IT resources and increased business flexibility. This consequently reduces overall cost for end users, including costs for security enhancements. Grid enables large, complex systems to be utilised effectively, promoting the sharing of networked resources and supporting new business processes across distributed administrative domains.

It is well known that the point of greatest peril in the development of a market for new technology lies in making the transition from an early stage run by a few visionary customers to a mainstream market dominated by a large block of customers who are predominantly pragmatists. The gap between these two markets is so significant as to warrant being called a chasm. Crossing this chasm must be the primary focus of any long-term high-technology marketing plan.

The lack of business reference cases to persuade potential users to explore the economic benefits hampers commercial exploitation of Grid solutions across the European Union. Increased general deployment of Grid technologies into the market will strengthen the EU's competitiveness and leadership in this key area.

Companies, now more than ever, rightly demand proven case studies that directly relate to their business needs.

BEINGRID MEETS INDUSTRY NEEDS WITH PRACTICAL, TANGIBLE SOLUTIONS

The BEinGRID project exists to establish effective routes to foster the adoption of Grid technologies across the EU and to stimulate research into innovative business models.

The strategic objectives of BEinGRID are:

- To understand the requirements for Grid uptake in the commercial environment involving software vendors, IT integrators, service providers and end users.
- To enable and validate the adoption of Grid technologies by business.
- To design and build a Grid toolset repository with components and solutions based on the main Grid software distributions, including: the Globus Toolkit, gLite, Unicore, Gria and basic Web Service specifications.
- To develop and deploy a critical mass of Grid-enabled pilots, embracing a broad spectrum of economic sectors with their specific needs and requirements.

25 BUSINESS PILOTS ANSWERING TODAY'S CHALLENGES

To meet these objectives, BEinGRID has undertaken a series of 25 targeted Business Experiments (BEs) designed to implement and deploy Grid solutions across a broad spectrum of European business sectors: including advanced manufacturing, media, financial, retail and logistics, environment and e-science, telecom, tourism, agriculture and medical. The results of the first eighteen, launched in June 2006, provided a first edition of this booklet published in the summer of 2008. This updated volume now describes the results of all 25 pilots, relating directly to the specific needs of today's diverse business challenges.

This consortium of 98 partners, led by Atos Origin, is drawn from across the EU and represents the leading Grid research organisations and a broad spectrum of companies - diverse in both size and scope - keen to assess the benefits to their productivity, competitiveness and profitability from using distributed computing solutions.

The partnership of each of the business experiments cuts across the full value chain of the targeted economic sector; from technology providers to different levels of users. Involvement of end users and service providers in the vertical pilots is considered crucial to produce successful case studies, and has been a focal point of BEinGRID's method. This transition of Grid technologies from an academic context to widespread enterprise adoption is done by building on the success of these early adopters of Grid solutions.

In essence, BEinGRID targets a small niche of mainstream organisations for which the deployment of Grid technologies will demonstrate a clear business advantage. The participants of the project's pilots clearly represent this niche, and BEinGRID is designed to support their development and execution through both technological support and business consultancy.

We look forward to sharing the results of these pilots in the detailed case studies that follow, with hopes that your organisation may find the reference sought to adopt these proven distributing computing solutions to *your* business needs.

THE CLOUD MOMENTUM

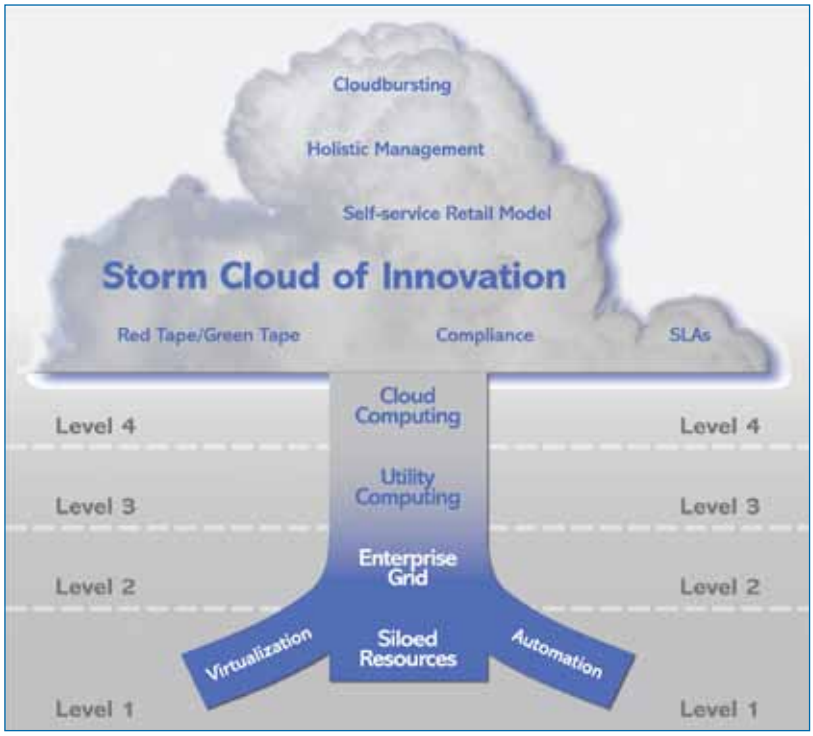
The IT climate is nothing if not dynamic. From a few wisps in the sky in 2007, a Cloud computing system blew into town through 2008. It is now defining the shape and pace of IT adoption and is dictating vendor and service provider strategies. The Cloud momentum is boosted by macroeconomic conditions and the business imperatives driven by them. Cloud computing is a service model with retail discipline. Cloud delivers IT in a way that improves end users' ability to deliver services and is more economic. Cloud computing is one of the hottest terms in IT today and there are no signs that it will be blown away anytime soon.

Cloud computing is another "rev" of distributed computing. Key to its success are tools and techniques such as parallel processing, scheduling and workload management from Grid computing; least-cost routing, time-sharing, chargeback and resource reallocation from telcos, integrators and services suppliers; and software as a service (SaaS). However, innovations in virtualisation, automation, dynamic provisioning, self-service and utility delivery are Cloud's ultimate enablers.

Grid computing isn't dead, but long live Cloud computing. Cloud computing is now seen very much as the logical endpoint for combined grid, utility, virtualisation and automation strategies. Indeed, enterprise grid users see grid, utility and Cloud as a continuum: Cloud computing is Grid computing done right; Clouds are a flexible pool, whereas grids have a fixed resource pool; Clouds provision services, whereas grids are provisioning servers; Clouds are business, and grids are science. And so the comparisons go on, but through Cloud computing, grids now appear to be at the point of meeting some of their promise.

Figure 1 represents the latest evolution of The 451 Group's IT deployment maturity model, which we use to track implementation over time. It provides a view aggregated from, but not limited to, early adopters of grid and virtualisation technology. Users are now leveraging virtualisation and automation to federate internal 'siloed' resources.

Users that are linking resources and supporting multiple applications and services on them typically implement an economic model to provide usage monitoring and chargeback – a utility computing layer. Integration of these elements delivers an internal or on-premises Cloud. "The Storm Cloud of Innovation" is the place where



The Storm Cloud of Innovation

user demands and vendor dynamics meet – in short, what needs to get done to overcome challenges and roadblocks on the journey to adoption.

Coming off the back of our work with some 200+ early adopters of Grid computing (about half of these in the financial services industry), those teams that have successfully established grids, especially within the investment banking operations of financial services groups, are typically being asked to take the utility model and apply it more broadly across the group, and to support other user constituencies, other services and workloads – in short, to create internal Clouds.

The better utility and flexibility offered by Cloud computing means being better equipped for dealing with change. Being able to avoid capital spending on IT and not having to provision for peak capacity will be winning tickets for CIOs to take to the board of directors as they fight for IT budgets.

The commercial sector is dominated by proprietary public Clouds and service providers offering basic infrastructure (IaaS), a predefined platform for development (PaaS), software services (SaaS) or combinations thereof. "On-ramps" can now provide access to multiple Clouds, and start-ups are targeting Cloud exchange and marketplace mechanisms. End users are examining cloudbursting, and internal Clouds are being created. "Guerrilla" Cloud projects already exist in most organisations, and service providers are scrambling to get into the game. Meanwhile, systems integrators are seeking ways to do consulting on Clouds and to position Clouds as complementary to their own offerings.

The 451 Group
www.451group.com

Features from the website www.it-tude.com

IT-Tude.com

Tomorrow's solutions today ...
- Cloud and Grid computing
- virtualisation
- software as a service

Providing you ...
- use cases
- neutral analysis
- technical expertise
- future research

IT-Tude.com connects emerging ICT research with business solutions, and offers your organisation the opportunity to use this new and dynamic online platform for your own outreach.

Started 3 years ago, the BEinGRID project's external repository "Gridipedia" began its journey connecting Grid content to business and research communities, featuring professional and legal expertise, software components, case studies and more. Since then, the site has evolved to include even more IT solutions, such as Cloud Computing, Virtualisation, Software as a Service (SaaS) and other emerging trends and technologies.

The audience of the site has grown as well. Technologies once exclusive to research communities, are now business-ready and offer practical solutions; not just for today's large industry players, but also for small-to-medium enterprises' needs, as well.

With this direction, we felt that a new name representing the broader scope of business and technology offerings was appropriate. "IT-Tude.com" was born, and our re-launch aims high:
- use-cases to relate to your business needs, especially for the SME
- emerging technologies and services to highlight future research
- neutral and dependable analysis to better advise you
- expertise to fulfil your IT side of operations
- and most of all: the link and online visibility that lets your organisation jump onboard

As you submit content related to your organisation's research or business focus, we offer you online visibility that can be updated as you see fit. It is this participation that makes IT-Tude.com distinct from the rest: we connect what's developing today with those involved, providing further service in expanding your network while maintaining the site rich with content, both from our end and yours.

IT-Tude.com draws together a wide community of experts – technical engineers, legal counsel, business strategists and ICT researchers – towards a focal point where ideas and information can interact, spread, evolve and inspire. The site ensures that not only the results of BEinGRID will continue, but that the founding ideas of practical distributed computing-based solutions continue to evolve long into the future.

BEinGRID has provided its results for the here and now. IT-Tude.com provides the means for the next generation of research to build on them, propagate new results, and in turn provide the next layer upon which to build. IT-Tude.com is the gateway to the future of software and services for tomorrow's challenges.

BEINGRID CASE STUDIES FROM FOUR PERSPECTIVES

The BEinGRID Business Experiments can be classified according to four categories: **industrial sectors, Grid middleware, business models** and **technical solutions.**

INDUSTRIAL SECTORS

The Business Experiments cover a set of representative industrial sectors and address concrete business issues representing the main economic actors. Instead of dealing with many specific market sectors, we have grouped the Business Experiments into aggregated verticals based on common and/or similar characteristics:

- **Advanced Manufacturing** comprises Business Experiments that apply Grid technology in order to design products or components that are later manufactured, or to optimise some part of the production processes.
- **Media** is composed of Business Experiments related to managing and processing media content (capture, rendering, post-production, delivery, etc.) and more broadly, the provision of entertainment services.
- **Financial** includes applications of Grid technology by financial organisations to optimise existing business activities and provide new and innovative services to their customers.
- **Retail and Logistics** groups Business Experiments that improve business activities related to managing goods (acquisition, delivery, transformation, etc.).
- **Environment and e-Science** covers Business Experiments relating to the provision of products and services based on processing geophysical data, and the application of computing-intensive algorithms to science in general.
- Other sectors such as **Telecommunication, Tourism, Agriculture** and **Health** are each represented by one Business Experiment providing a Grid solution to specific needs.

GRID MIDDLEWARE

The Business Experiments use different Grid foundation middlewares and evaluate their suitability for solving specific real-world problems. Middlewares can be classified based on those that have been adopted for specific solutions (Globus Toolkit, Unicore, GRIA, etc.).

BUSINESS MODELS

The Business Experiments represent a number of different industrial sectors and their players. Therefore their business models differ depending on the competences of the partners and the characteristics of the industry concerned. Business Experiments have been categorised using a framework suitable for current and future models, based on three distinct criteria. These take into account value propositions, technological and economical incentives, and the future market of Grid services:

- Business Experiments with a clear performance-associated benefit, primarily aimed at addressing problems or limitations (e.g., additional CPU power, a large amount of data, and access to heterogeneous, geographically distributed data processing resources).
- Business Experiments with a highly collaborative benefit, in which the resulting benefit from Grid adoption comes from sharing data, power and resources utilised for a common scope.
- Business Experiments exploiting new software paradigms. This group includes scenarios that exploit software paradigms, such as service-oriented architectures or component-based development, along with new models for providing services, such as PAYG (Pay-As-You-Go) or SaaS (Software as a Service).

TECHNICAL SOLUTIONS

The BEinGRID project has defined a set of technical areas, named clusters, that are key for implementing solutions based on Grid technology:

- **General Security** is fundamental for Grid technology. A perceived lack of security is a substantial obstacle for the use of Grid computing outside the boundaries of a single enterprise in a networked economy.
- **Licence Management** is essential for adopting PAYG business models. But currently its support in Grid environments is less than complete.
- **Data Management** is concerned with the storage, access, translation and integration of data.
- **Virtual Organisation Management** deals with the secure federation of autonomous administrative domains and the adoption of semantic models and languages to improve the processing of resources and services in a virtual organisation.
- **Portals** enhance the business aspect of the Grid and provide a less complicated working environment for the end user. They have become a key enabler for helping business users move more deeply into Grid-based applications where the technology can demonstrate its superior utility.

This booklet classifies Business Experiments in industry verticals according to the target market of their products, as shown by the table on page 11.

Table: Classification of the twenty-five Business Experiments

ADVANCED MANUFACTURING

ABOUT THE SECTOR

The advanced manufacturing sector comprises a wide range of businesses, from aerospace and automotive engineering to electronics and chemical production. The needs across this broad range of industries are similar: companies must find ways to deliver superior designs as quickly as possible in order to get products to market faster (than the competition) whilst keeping development and production costs under control. Computational power is essential for the timely completion of these products.

WHY SHOULD I USE GRID

In this dynamic and competitive sector, getting to market quickly with the right product is essential. Companies are under extreme pressure to design, simulate and test in tight time scales, that signify massive requirements for computing capacity. It is also critical to reduce costly design phases. For instance, in shipbuilding the early design phase only covers the first 1-2 months of the project, but consumes 70% of the total project costs.

Traditionally, large companies have met these increasing demands for computing power through large, continual investments in hardware. This has resulted in huge data centres that are underutilised the majority of the time, but struggle with peak loads.

Industry relationships are becoming increasingly complex. The trend is towards modular sourcing, where manufacturers acquire pre-assembled subsections from suppliers, who in turn use components supplied by several lower-tier suppliers. This model requires extremely close relationships between the manufacturer, the supplier providing the subsection, and the lower-tier suppliers. As relationships grow ever more complex with increased interaction between participants of different tiers, players must have access to complex analyses involving massive data sets and e-business tools, such as procurement and inventory, to automate flows and speed up collaborative processes.

Using Grids can accelerate product development. It improves computing resource availability and maximises the utilisation of IT assets and expensive software application licenses. It also improves workload throughput for more simulations, better testing, and faster model development cycles. This leads to superior products offering new and improved solutions. Companies can take advantage of grid service providers to get flexible computing capacity on demand adapted to their requirements.

Moreover, Grids can be used to provide the secure data storage required by distributed industrial partners in such groupings.

BEINGRID BUSINESS EXPERIMENTS IN THIS SECTOR

BEinGRID includes five Business Experiments in this sector:

- **Computational Fluid Dynamics** provides a new approach for solving design optimisation problems for real industrial applications in the aerospace and automotive industry.
- **Integration of Engineering and Business Processes in Metal Forming** has developed a virtual prototyping service to help SMEs compete in the automotive supplier industry.
- **New Product and Process Development** includes an integrated environment based on the combination of simulation models and process screening tools to automate the creation of new products and processes in the chemical industry.
- **Shipbuilding Integrates Grid Technology** to provide an interactive design and simulation environment for shipbuilding applied to the analysis of fire security and heat transfer in case of accidents.
- **Workflows on Web 2.0** consists of a robust, portable enterprise-quality meta-scheduling framework for executing workflows complemented with a lightweight, user-friendly Web 2.0 toolset for publishing, sharing, executing and monitoring workflow execution. It has been implemented in the aeronautic sector.

GRID IMPACT AND PERSPECTIVES

The advanced manufacturing sector is an early adopter of Grid technology. It has already used Grid technology for simulation and designing components. The major trend is to Grid-enable existing computation- and data-intensive applications to take advantage of their parallelism and offer them via a SaaS (Software as a Service) model.

There is clear potential for the application of Grid technology where CAD, engineering or processes and collaboration procedures are computing or data intensive. The main advantage of SaaS is that centralised applications can be extended and solutions can be applied by companies that don't themselves have a Grid infrastructure, taking into account that hardware requirements can be outsourced to Grid service providers.

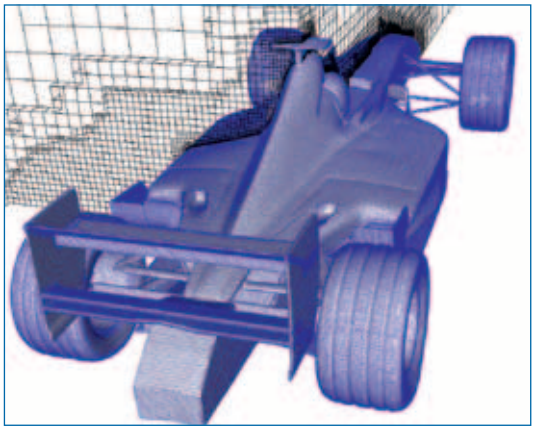
The sector is under increasing pressure from competitors in the Far East and can benefit from Grid solutions that increase competitiveness and enable advantage through innovation. Grid technology can be applied within a single company effectively using internal and/or external bought-in computing resources. It can also support collaboration among a group of companies working together.

Despite powerful competitors, there is market potential for new niche applications that target SMEs as customers. There is also the possibility of a first-mover advantage, as analysis of competitors shows that the advanced manufacturing market players have no Grid solutions yet.

COMPUTATIONAL FLUID DYNAMICS

"ICON is pleased to exploit the benefits of the GRID as an end-user in the BEinGRID Business Experiments. We see GRID technologies as a key enabler for CFD to impact the effectiveness and productivity of SME companies and OEMs alike."

Francisco Campos,
Senior Consulting Engineer at ICON



SITUATION

Computational Fluid Dynamics (CFD) is currently the fastest growing segment in Computer Aided Engineering (CAE) simulation. The adoption of the technology is continually increasing and users have a latent need for access to scalable, cost-effective CFD. Grid-computing (un-related to CFD meshing Grids) is a service for sharing computer power and data storage capacity over the internet*. Grid-enabled technologies can fulfill the latent need by not only increasing the cost effectiveness but accelerating the uptake and application of more advanced CFD.

This Business Experiment has developed a Grid-enabled solution for performing CFD design. A new approach for solving CFD design optimisation problems in Grid infrastructures has been achieved for real industrial applications. One such case study relates to the geometry of a cooling duct of the Audi TT** car. The duct is responsible for delivering air from the outside into the under-bonnet region to reduce the temperature of the transmission/gearbox.

CHALLENGES

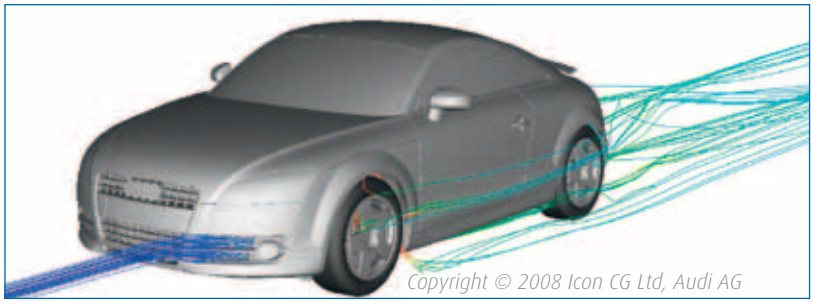
CFD is an example of an application requiring great computational power. Design problems often have very complex geometry and physics which require the use of high resolution computational models and powerful parallel computing. As a result, hardware costs become high to achieve these results. In addition, designers increasingly rely on automated methods to reduce the product development time and stay competitive in the market. These automatic optimisation processes also require many calculations to reach an optimum design.

CFD engineers in small to large businesses in various sectors often express the wish to carry out more sophisticated, larger computational models in a quicker timeframe to impact their businesses. Most are delayed or prevented from doing so by the challenging expense of the hardware but most of all the software. Computer clusters provide an attractive price/performance compromise for high-performance computing. The effort of machine setup and maintenance can however be a deterrent for most SME and occasional users.

SOLUTIONS

Against this backdrop, Grid offers itself as a unique opportunity where computing power, state-of-the-art software and human expertise can be found on demand. Grid computing is an alternative to using in-house hardware resources for performing CFD calculations. The case for Grid computing in CFD simulation is clear: it not only increases the cost effectiveness but accelerates the uptake and application of more complex CFD, which is required in many cases to capture the science influencing product development.

In the case study carried out, the shape of an underbonnet cooling duct was optimised using results obtained running the OpenFOAM CFD toolbox in a remote Grid environment. The process was successfully integrated in the optimisation software modeFRONTIER and all tasks were performed fully automatically, including Grid execution of OpenFOAM and licensed commercial software such as CATIA v5 and STAR-Design. A first investigation has shown that the overall times per calculation in the Grid are comparable to execution in a local server with similar CPU power. Some differences were attributed to data transfer, ADSL internet connection speeds and limited CPU power on the remote cluster. Recommendations were given for performing many concurrent simulations on a large state-of-the-art remote cluster.



"ICON has been promoting its Grid-enabled CFD solution and continues to demonstrate it to potential customers, and is close to secure first customers."

Simon Weston, ICON

BUSINESS IMPACT

The business impacts of the use of Grid in CFD include:

- Improved Productivity: The scalability of the solution allows for 'real-time' solutions (hours not weeks) increasing the value of the solution to the development process.
- Increased Flexibility: payment is only required for the processing required rather than for the ownership of capital intensive hardware and software.
- Reduced Cost: cost structures are transparent and customers only pay for what they require; more effective labour deployment is achieved as engineers receive their answers quicker and can turn their attention to problem solving and analysis; reduced depreciation costs as less hardware investment is necessary.
- Improved Quality: Enhanced solutions are achieved as normal restrictions on analysis e.g. CPU-limits can be lifted and higher resolution models can be deployed.

REFERENCES

* Definition courtesy of CERN

** Continues the original work presented in [1]

[1] F. Campos, P. Geremia, S. Weston, and M. Islam, "Automatic Optimisation of Aerodynamic Designs using CFD-based Methods", 6th MIRA International Vehicle Aerodynamics Conference, Warwick, 25 October 2006

BENEFITS

The benefits for companies wishing to perform such simulations include:

- Availability of more computer processors for time-critical calculations.
- On-demand payment for hardware and software for easier budgeting.
- Ability to perform calculations with larger computational meshes.
- Ability to perform transient CFD calculations more quickly.
- Ability to perform many small runs sequentially for automatic optimisation problems.

PERSPECTIVES

The initial steps for understanding the needs and challenges involved in delivering a feasible process for exploiting Grid technologies at industrial level have been explored with a first industrial CFD case study.

Data transfer and internet connection speeds are being maximised in order to leverage Grid technologies at industrial level. One possible solution is to utilise improved connections that are already available for business use.

Innovative sales models which improve software revenues will also be required from vendors. Even if such business models do not prove popular with software vendors, the necessity for efficiency improvements and cost savings will inevitably make Grid-based Open source CFD solutions attractive to some areas of the CFD market. In particular, customers with a focus on automated design optimisation will find this beneficial.

www.beingrid.eu/be01.html

PARTNERS

The **National Technical University of Athens** (NTUA) leads the consortium involving **ICON**, an independent CAE Technology and Process consultancy and **OpenCFD**, who provide contracted development for the OpenFOAM open source CFD toolbox.

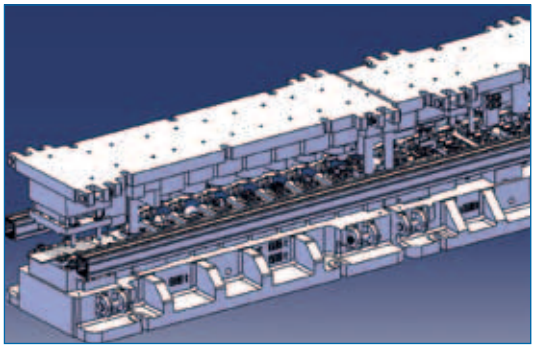
CONTACT

Simon Weston | ICON
Rofel House, Colet Gardens
London W14 9DH, United Kingdom
Phone +44 20 87481100
s.weston@icon-cg.co.uk

INTEGRATION OF ENGINEERING AND BUSINESS

"FIUKA is pleased about the possibility to see in an early stage of the development process the impact of changes in the process. This allows us to reduce the time to market and brings us a cost benefit."

Jürgen Bischopink, Sales Manager at FIUKA



SITUATION

Europe's automotive supplier industry faces constant pressure in the more and more globalised marketplace. The demand for ever-more-complex products in shorter time scales, as well as cost-reductions during the production process, requires new technologies to compete in the market. SMEs in the automotive supplier industry cannot utilise these new technologies, because they cannot afford or operate such highly specialised hardware and software systems.

The technologies provided by BE08 incorporate software systems for virtual prototyping in sheet metal forming. The Grid-computing paradigm allows the on-demand utilisation of computing resources to perform time-consuming calculations while letting the end user concentrate on the core competencies.

CHALLENGES

The automotive supplier industry faces increasing product complexity as well as pressure to reduce costs and development time. Moreover, the big OEMs (Original Equipment Manufacturers) continue to out-source even complete development tasks to the suppliers. Under these pressures supplier companies find virtual prototyping techniques very attractive in meeting the challenges and successfully competing in the market.

Unfortunately, SMEs cannot afford such new virtual prototyping techniques due to high costs of hardware and software as well as experts to operate the simulation environments. Grid technology opens the door for SMEs to utilise virtual prototyping techniques over a network and hence assists SMEs to compete in the market.

SOLUTIONS

The Grid and portal solution INFORM developed within this Business Experiment enables engineers anywhere in the world (with nothing more than a web browser) to access high-end simulation environments including computing power as well as human expertise and consulting from the sheet metal forming domain. In this way the TCO (Total Cost of Ownership) for the SME will be dramatically reduced.

In our case study we checked the design of a multi-stage transfer tool to produce a holder for a shock absorber. The approach of the SME to deep-drawing, punching, stamping, and forming the real part was proofed with a Finite-Element simulation increasing the safety of the real production process. Collisions during the foreseen production process could be detected prior to any real part being manufactured.

The underlying simulation environments based on CATIA V5 and the well known FEM solver INDEED are successfully "gridified" and integrated in the portal solution INFORM. The portal enhances the communication and collaboration between the service provider and the SME by supporting convenient, secure, and efficient data transfers of large CAD data and the invocation of simulation jobs on remote hardware resources.

BUSINESS IMPACT

The business impacts of the use of Grid in the sheet metal forming domain include:

- Improved competitiveness: The ability to access high-end simulations just with a web browser on hand enables SMEs to overcome the various market pressures arising from globalisation.
- Cost effectiveness: End users are not forced to have their own hardware and software systems as well as highly skilled staff to operate the simulation environments. Hence, the TCO for end users will be reduced to the absolute minimum required.
- Improved quality: The utilisation of virtual prototyping techniques improves the product quality and the safety of the associated production process. In particular, the ability to perform Finite-Element simulation-based optimisations by utilising remote cluster resources offers possibilities that go far beyond the capabilities of most in-house solutions.

PROCESSES IN METAL FORMING

PERSPECTIVES

The Grid and portal solution developed within this Business Experiment illustrates the capabilities of Grid technology in the engineering domain. Grid technology has an essential role to play in helping SMEs to overcome the business and market challenges they will face in the future.

What is required now is to build up confidence on the end user's side to utilise a Grid and portal solution to obtain simulation results based on tool designs that might even comprise a company's secrets. To support or boost this adoption process we have initialised a number of marketing initiatives, to convince potential users that Grid is a stable, reliable and secure technology.

The obviously existing benefits of the Grid solution in terms of cost effectiveness, quality and process improvements, and increased competitiveness in the market will convince a wide range of SMEs in the automotive component supply industry to give Grid a chance, because .the optimisation capabilities of Grid are very attractive for many suppliers.

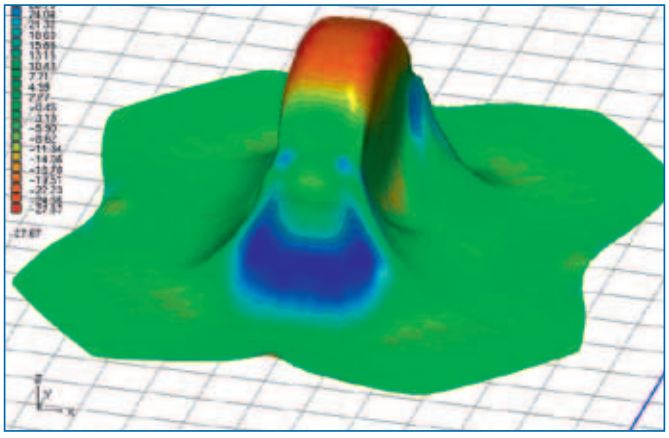
"INFORM Grid and portal solution has been in validation phase with pilot users. Our industry partner Co.Com presented the solution to several industrial partners, and got positive and valuable feedback to improve the solution. The feedback has been used in development activities which are still in progress. INFORM grid and portal solution has been extended to support the realization of an integrated virtual process chain consisting of several virtual prototyping techniques (e.g. blank prediction, process planning, and crash simulation). In addition, it is envisaged to include INFORM into the (planned) automotive centre of South Westphalia, Germany."

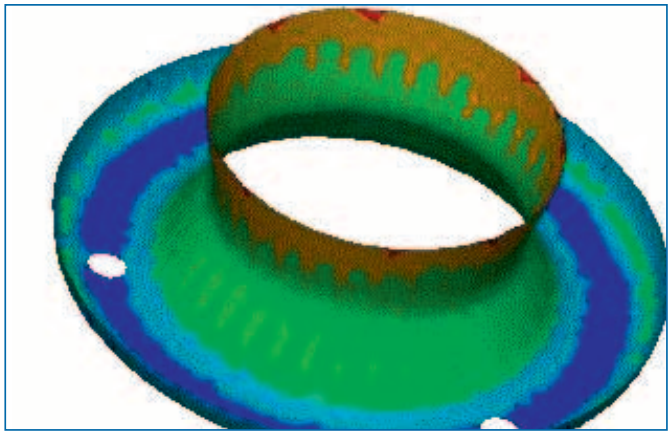
Prof. Dr.-Ing. Manfred Grauer, University of Siegen

BENEFITS

The benefits for companies wishing to perform such virtual prototyping techniques include:

- Access to brand new high-end simulation techniques like the DMU kinematics simulation of transfer systems.
- Ability to optimise multi-stage deep drawing processes on remote cluster resources.
- Cost effectiveness due to not having to spend money on hardware and software systems as well as human resources to operate the simulation environments.
- Usage based charging (PAYG) for hardware and software use for easier budgeting.
- Receiving competent consultancy from a simulation engineer to interpret the simulation results and develop solutions for design problems.





UNIVERSITÄT SIEGEN · Co.Com Concurrent Computing GmbH · Fraunhofer SCAI · T-Systems · Fischer & Kaufmann

www. beingrid.eu/be08.html

PARTNERS

The **University of Siegen** leads the consortium involving **Co.Com GmbH**, an independent CAE technology and process provider, **Fraunhofer SCAI**, a leading Grid and numerical simulation researcher, **T-Systems SfR**, a telecommunication research unit of T-Systems, and **Fischer & Kaufmann GmbH & Co. KG** (FIUKA), a medium-sized automotive supplier.

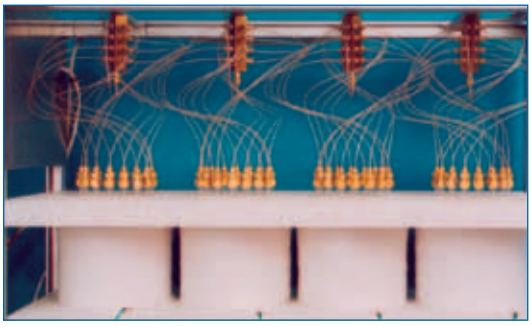
CONTACT

Prof. Dr. Manfred Grauer | Information Systems Institute, University of Siegen
Hölderlinstraße 3 | 57068 Siegen, Germany
Phone +49 271 7402220
grauer@fb5.uni-siegen.de

NEW PRODUCT AND PROCESS DEVELOPMENT

"Thanks to the grid technology we are now able to introduce a new generation of powerful algorithms with applications across the spectrum of engineering."

David Linke, LIKAT



SITUATION

Process industries are capital intensive and depend on innovative designs of products and processes, which are increasingly dependent upon computer aided experiments. These involve a large industrial sector comprising chemistry, materials design (specialty chemicals, design and structure of the materials) and pharmaceuticals. The path to new products and the economical use of in-vitro experiments require computing tools that enable experiments with ideas and alternative products.

A typical product development road map has a sequential number of basic stages required for each design experiment and implies extensive repetition of the procedure, because each experiment recalculates the design with different process conditions, intermediate products, catalysts, and process equipment. A Grid solution is highly recommended in this scenario because a new development methodology would become possible that significantly reduces the R&D effort and also helps to find innovative solutions.

CHALLENGES

In the process industries, catalyst and inorganic materials sectors are growing; however, the chemical/petrochemical industry is undergoing changes owing to the shift away from oil as a raw material. This situation is forcing companies to innovate quickly instead of introducing improvements gradually. A prominent example is the current trend in the transesterification of vegetable oils or animal fats to make biodiesel, which augments and/or replaces petroleum-based diesel.

Process and product development comprise several stages, some of them computing intensive (combination of simulation models with process screening), and with heterogeneous data (databases, computer models, property and cost data). Current development processes involve tackling this problem in a sequential and manual way.

Grids offer a natural environment to exploit all the available computing power but they do not yet have the coordinated environment required by such experiments. Currently available solutions require too much development effort from the end user, which is an adoption barrier for this technology.

SOLUTIONS

Our products focus on the gridification of the process of product development. Sequential independent development efforts are integrated into a common one which saves time and generates synergies that are absent from independent development. The computing power and the integration features of a Grid enable this integration.

PIGridS (Process Industries integrated Grid Solution) offers a novel and innovative approach to systematise product and process development and the creation of patents and new products, while maintaining the competitiveness of the process industry. It is based on GridAD.

GridAD (Grid Applications Development solution) is a complete solution for the development of applications in the Grid, with a high-level programming model (where the Grid remains almost invisible), automatic parallelisation and gridification, and powered by a metascheduler, with advanced scheduling capabilities. GridAD is the result of the integration through the DRMAA OGF standard of two powerful Grid tools: GRIDSs and GridWay.

With the use of PIGridS, large reductions in the time taken by processes and hence product time-to-market are foreseen, from some years to only a few months. This will have a large impact on the business models concerned.

BUSINESS IMPACT

- PIGridS implies a change from the traditional business model where the product was a software license. In the new business case, PIGridS is offered as a service.
  Our business case study shows that a start-up company providing consulting and training services for PIGridS can be profitable with a small investment and with an expected ROI of 50% from the second year of operation.
- Companies can out-source the computational part of the process development (e.g. large companies) or get access to services they do not have available (e.g. SMEs).
- Time to market will decrease thanks to a reduction of the computing time, due to parallelisation and integration of methods.
- GridAD is offered as open source software with a business model based on training, support and consultancy for the development of new Grid-enabled applications. The software is generic and can be applied to a large number of industrial sectors.

PERSPECTIVES

PIGridS is the first product currently available that completely integrates the features available into a user-friendly solution. PIGridS is the first Grid-enabled solution available worldwide to integrate the process and product development in the process industries. It can solve more complex problems than its competitors. This will allow the development of integrated applications with immense opportunities for innovation.

The GridAD solution is a complete solution, with high level programming, automatic parallelisation and gridification, and includes a metascheduler. Currently there is no equivalent solution on the market. The new portal interface will enable GridAD to overcome barriers to Grid adoption. There is huge potential for this solution since it is generic and can be applied to several sectors of industrial applications.

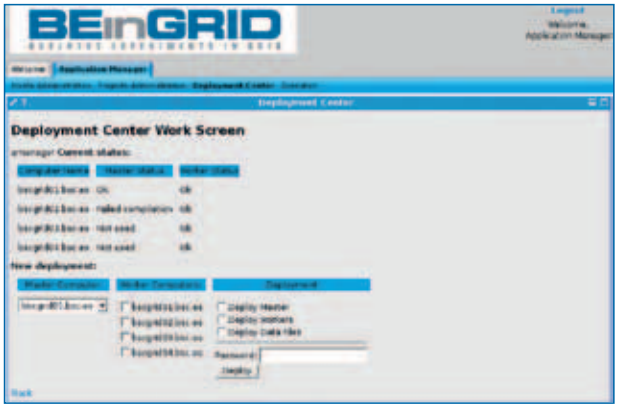
"The demonstrator from the New Product and Process Development Business Experiment was presented to several companies, but more importantly, one of its components, GridAD, is further used, for instance trough an initial contract with Intelligent Pharma, an SME providing computational solutions to pharmaceutical companies and that uses GridAD as middleware to develop their applications."

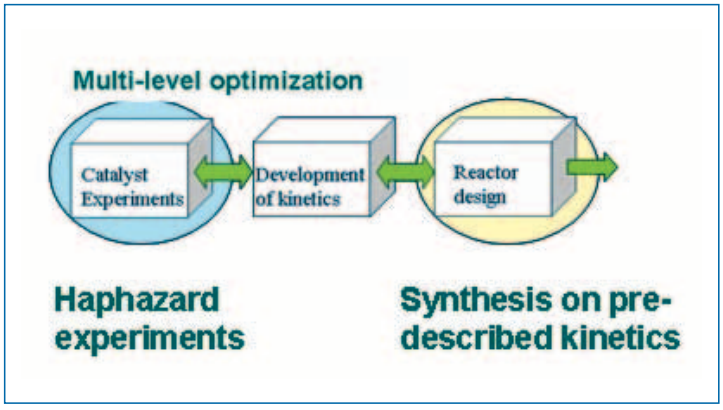
Rosa M. Badia, BSC

BENEFITS

The main benefits for firms interested in using our solution are the following

- Easy grid adoption by means of grid-unaware development tools.
- Use of grid portals to support new and innovative products.
- Enabling of large-scale optimisation and simulation experiments.
- Enabling of high-throughput and rapid design analysis.
- Integration of computing resources across company borders.





www.beingrid.eu/be14.html

PARTNERS

Barcelona Supercomputing Centre (BSC) – Centro Nacional de Supercomputación leads the consortium and provides one of the core technologies (GRIDSs) in GridAD. **Universidad Complutense de Madrid** (UCM) provides one of the core technologies (GridWay) for GridAD. **University of Surrey** (UniS) contributes group expertise in the integration of IT technologies in production manufacturing. **LIKAT** provides expertise in catalysis, reaction and process engineering.

CONTACT

Rosa M. Badia | Barcelona Supercomputing Center
Building Nexus II, Jordi Girona 29
08034 Barcelona, Spain
Phone +34 93 4134075
rosa.m.badia@bsc.es

SHIPBUILDING INTEGRATES GRID TECHNOLOGY

"Ships designed by FSG are tailored to the needs of the customer. Often this results in very special and complex calculations in order to find an optimal technical solution. On-demand computing enables us to solve these special and CPU-intensive calculations in a very short time without the need to invest in an expensive IT infrastructure and specialised software at the yard. It helps us significantly in improving the individual ship designs."

Dipl.-Ing. Thomas Gosch, Head of Basic Design Department at Flensburger Schiffbau-Gesellschaft FSG

SITUATION

Shipyards in Europe cannot compete on price alone against overseas competitors, especially those based in the Far East. Therefore, European shipbuilders need to concentrate on high-quality construction projects that are specially tailored to the requirements of their customers. Consequently each ship is a unique product, produced only once or in a very small type series. To improve their competitive position, it is essential for modern shipyards to be able to harness the most advanced simulation and design tools to produce complex structures cost effectively. The objective is to recognise and reduce the technical and economical risks that are implicit in large and complex shipbuilding projects. The vision is the complete virtual design of a ship.

CHALLENGES

The FSG shipyard continuously improves the design of new generations of ships by introducing innovative concepts and technologies. The trend is to replace traditional steel structures by so called "sandwich structures" to obtain better acoustic, heat transfer and vibration behaviour at less weight. To gain approval from the classification societies, comprehensive material research and tests are necessary. These tests are accompanied by the development of material models that are executed by specialised computer programmes.

Since the shipyard does not yet have practical experience with the sandwich technology, collaboration with the CMT has been established in order to design and optimise sandwich structures for selected ship components. In the case of this experiment the component is the funnel. The SESIS (Ship Design and Simulation System) supports this collaboration by sharing data in a transparent and secure way.

Central challenges of a new funnel built with sandwich structures are the material stiffness and fire security. While structure optimisation is done by conventional FEM programmes available at the shipyard, the computational power required for the simulation of heat transfer is neither available at the shipyard nor the supplier.

SOLUTIONS

The solution is to connect the engineer's workplace with the computing resources of an independent ASP (Application Service Provider) offering hardware and software services via the Internet.

The outcome of this Business Experiment is a Grid interface being integrated into the SESIS environment. A GUI (Graphical User Interface) enables the engineer to configure FDS (Fire Dynamics Simulator) jobs before submitting them to a remote server, owned and operated by T-Systems. The Grid protocols are based on the Globus and UNICORE middleware.

An SLA (Service Level Agreement) regulates the allocation of hardware and software resources to guarantee reliable QoS (Quality of Service) and also determines the prices for these services. After job execution, the simulation results are transmitted back to the engineer's desktop for analysis and evaluation.

BUSINESS IMPACT

The shipbuilding partners are interested in Grid solutions because they have to develop a new ship design in a very short time frame. The design of a big ship is a very complex task and the time allocated to the design phase can be as short as one to two months. Using the benefits of high performance computing resources on demand, the shipyards expect to shorten the design phase further while at the same time reducing uncertainty factors. As a result of the faster and more efficient design process, better ships can be built, cost can be reduced, expenses can be calculated more accurately and the chances of winning a contract in a very competitive industry are improved.

Modern shipbuilding is distributed over several industry sectors. Only one third of the value added is realised by the shipyards themselves. Most of the added value accrues to component suppliers. The results of this Business Experiment apply to all industry sectors involved in shipbuilding.

PERSPECTIVES

This experiment will enable the IT service providers to enter a new market segment where on-demand computing is nearly unknown. The showcases demonstrate the potential of Grid technologies for relevant industrial applications in the maritime sector. It is expected that the results of the experiment will be of interest not only to shipyards, but also to their consultants and supplier industries.

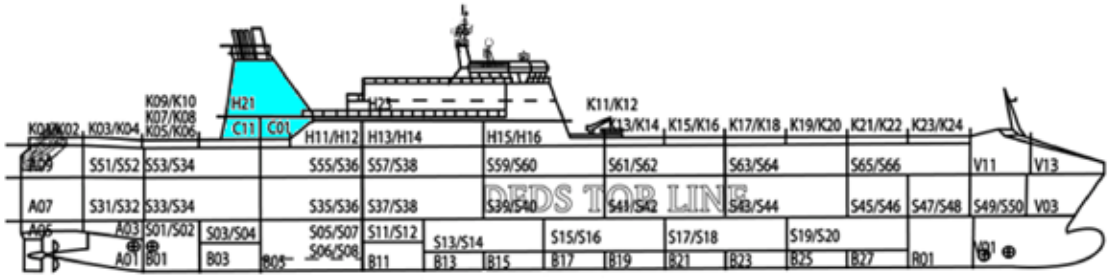
"The RCE software containing the Grid interfaces from the ShipBuilding Business Experiment is actually used in several projects with the goal to establish extended consultancy and simulation services. It is also used in other industries, such as Automotive and Aerospace. The solution will be soon extended to take advantage of Cloud infrastructures."

Ottmar Krämer-Fuhrmann, Fraunhofer

BENEFITS

For the end users the benefit of the proposed solution will be:

- Co-operation and joint development between shipyards and suppliers.
- Access to resources, which are not available locally or which are only needed temporarily on a PAYG (pay-as-you-go) charging model (i.e. reduced cost of ownership).
- Acceleration of the ship design processes.
- Reduction of technical and financial risks in the ship design.
- Co-operation with the IT service provider and technology integrators helping to concentrate on core tasks and competences.



Fraunhofer SCAI · FSG · CMT · DLR · T-Systems

www.beingrid.eu/be16.html

PARTNERS

Fraunhofer SCAI leads the consortium that involves the shipyard **Flensburger Schiffbau Gesellschaft** (FSG) and the **Center for Maritime Technologies e.V.** in a role as consultant for ship design. The **German Aerospace Center** (DLR) together with Fraunhofer SCAI act as technology providers for Grid technologies and **T-Systems** operates as service provider.

CONTACT

Ottmar Krämer-Fuhrmann | Fraunhofer-Institute for Algorithms and Scientific Computing (SCAI)
Schloss Birlinghoven
53754 Sankt Augustin, Germany
Phone +49 2241 14-2202
ottmar.kraemer-fuhrmann@scai.fraunhofer.de

WORKFLOWS ON WEB 2.0

"I can now seamlessly run the sample workflows on our Grid infrastructure. I am now designing and testing our own, internal workflows ... Thank you for all your efforts!"

Basile Clout, Engineer, EADS Innovation Works

SITUATION

Many big companies consist of several units generating a variety of information sets and performing advanced computing calculations. Workflow description offers an attractive approach to formally deal with the complex processes. Unfortunately, existing workflow solutions are mostly legacy systems, which are difficult to integrate in dynamically changing business and IT environments. Grid computing offers flexible mechanisms to provide resources in the on-demand fashion.

Our system, Flowify, is a Grid solution managing computationally-intensive workflows used in advanced simulations, for example aircraft design. As a collaborative platform our system offers an easy-to-use Web interface for day-to-day engineering operations on distributed IT resources within and outside enterprise borders.

As a potential user of the Flowify system, EADS Innovation Works has identified a clear need for improved scheduling and workflow management techniques to better utilise its internal computing resources in order to shorten time-to-delivery and retain the edge in highly competitive markets.

CHALLENGES

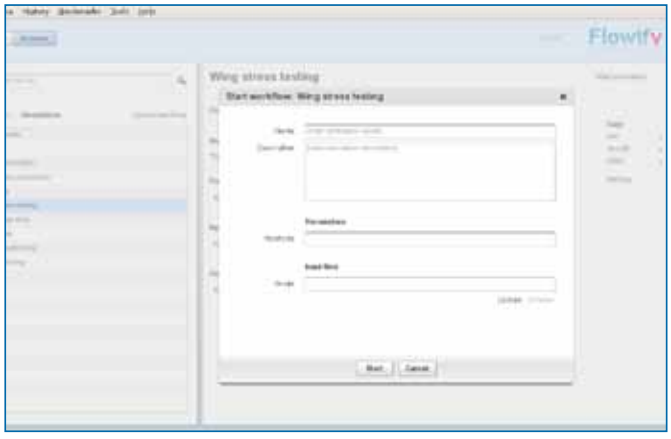
In many complex sectors such as construction, automotive and aerospace we observe so-called information chaos. Each department within a big enterprise or small company in a supply chain:

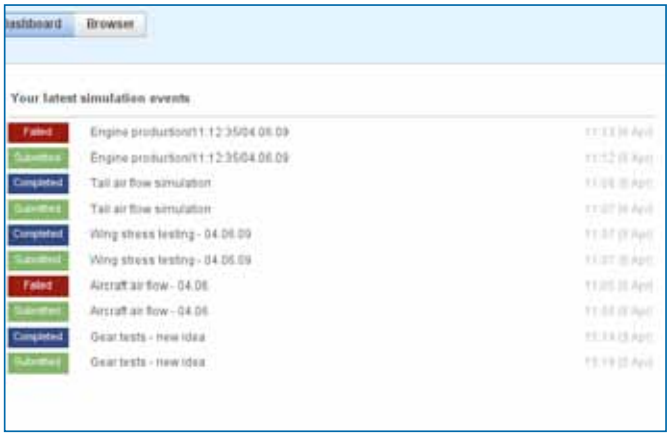
- often performs calculations asynchronously with other departments
- exchanges computing results independently with other project participants, so input data is re-entered in different formats, output data is lost or overwritten
- overloads computing resources during deadlines such as quarterly or annual reports

To make matters worse, many IT systems have been developed as closed and static environments. Yet users, especially those involved in advanced engineering projects, must form working teams dynamically and share analysis results effectively to improve the quality and time-to-market of innovative solutions. Unfortunately, most IT systems cannot adapt to dynamically changing user needs. Therefore, many companies have to maintain expensive internal computing infrastructures even if users generate demanding workloads or exchange a huge amount of data only irregularly.

SOLUTIONS

Flowify addresses problems related to team collaboration and complex computing experiments on a number of fronts. Firstly, it helps users synchronise the data processing for execution and collection of results in an automated fashion. Easy-to-use Flowify workflow interfaces are provided as intuitive Web applications or integrated with commonly used tools. Thus many users can simultaneously form dynamic workspaces, sharing not only data for their computing experiments but also managing the whole process of advanced calculations. Secondly, Flowify provides increased scalability, flexibility, high availability, and true manageability. Built-in meta-scheduling mechanisms provided by Flowify allows IT administrators to perform load balancing automatically among computing clusters and data centres to meet peak demands. Thirdly, the Flowify system fully exploits benefits of new technologies in which IT resources are dynamically provided as needed and scaled out depending on user needs.





BUSINESS IMPACT

Flowify is making a great impact on computing infrastructures in big companies, helping to reduce costs, accelerate time-to-market, better serve growing customer bases and extend competitive advantages. Using an integrated Web platform, IT resources can be efficiently shared and managed on demand, no matter where they are located. Flowify facilitates a collaborative engineering process which maintains visible, prioritised and manageable issues. It is also a good solution for many SMEs sharing IT resources among engineers to occasionally deal with big contracts. Their systems can be easily connected and coordinated via Flowify. Either deployed as a new system or deployed as an extension module, Flowify has a positive business impact on computing engineering.

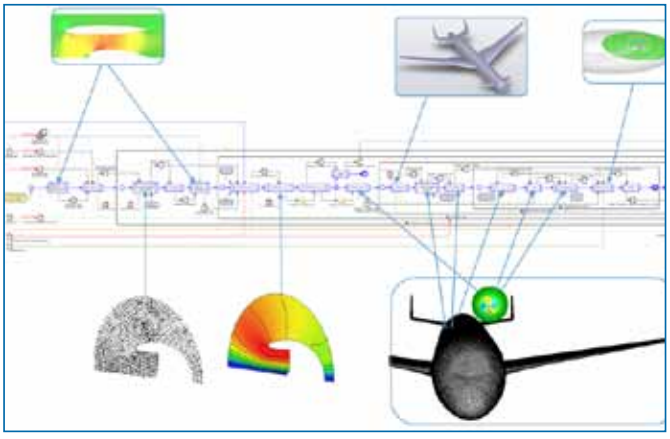
PERSPECTIVES

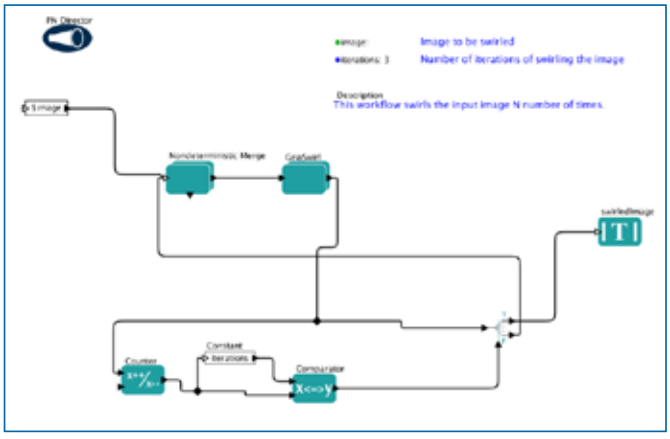
Flowify as an integrated Grid solution demonstrates added value as a synergy hidden in independently-used IT technologies on the market, in particular computing-intensive and workflow engineering applications. A lack of knowledge and expertise in the area of workflow management and Grid computing is a barrier for independent software vendors to offer a competitive solution to Flowify. Earning over $2 billion in revenue in 2010, workflow and business process automation deployment and management software is among the fastest growing IT sectors, according to market research. Following these positive perspectives, Flowify could enlarge the market and open significant new market opportunities.

BENEFITS

With Flowify users are able to:

- Reduce the time required to start a simulation workflow.
- Reduce the wall time of simulations by using both internal and external computing resources more efficiently.
- Reduce the error ratio during the overall complex processes.
- Improve the way engineers build and dynamically share input data and results of complex experiments.
- Facilitate collaborative engineering via an integrated Web platform.





FedStage systems

POZNAN

EADS

www.beingrid.eu/be23.html

PARTNERS

FedStage Systems is the business leader in the Business Experiment. **Poznan Supercomputing and Networking Centre** (PSNC) leads the technical activities. **EADS Innovation Works** develops and maintains partnerships with world-renowned universities and research centres to apply technical innovations in various EADS business units.

CONTACT

Jarek Nabrzyski | FedStage Systems Ltd.
ul. Jonschera 24a, Kicin | 62-004 Czerwonak, Poland
Phone +48 61 6427195 | Fax +48 61 6427104
office@fedstage.com

MEDIA

ABOUT THE SECTOR

The media sector includes companies that manage multimedia content and entertainment products through services or applications for storing, processing, distributing and visualising multimedia assets. Media sector companies are involved in the creation, modification and/or distribution of media content, such as reports, images, motion pictures, video games and music.

WHY SHOULD I USE GRID

This sector groups a set of heterogeneous organisations that share a need to create, store and transfer massive amounts of data. They have access to a huge computing capacity to process these large volumes and deliver contents within real-time flows between geographically distributed points. Applications include film post-production and rendering, multimedia content provision, video on demand, multiplayer online games, virtual and augmented reality, vehicle and aircraft simulators, and e-learning.

The media production process is often performed in a collaborative manner involving many parties. Although there are available tools to support single media production processes, the exchange and integration of multimedia data among collaborating companies is in many cases performed manually, with a disconnection between production and post-production. At any given time, different parts of a media project may be in various stages with multiple operators working independently. The increasingly higher resolution and quality of media content and the improved transmission bandwidth for its distribution require a greater storage and processing capacity. Therefore companies need access to expensive server farms. High-end workstations and existing applications aren't suitable for complex projects that require scalability. These solutions are unaffordable for SMEs.

Grid computing can provide the following benefits to the media sector:

- Shorten time-to-market based on a scalable capacity that allows enhanced multimedia content to be produced in a more effective way
- Integration and automation of workflows and data management in the media product lifecycle, leading to substantial cost savings
- Efficient utilisation of resources: they are not tied to applications or customers, Grid can better cope with unexpected load and variable demand
- Increased resilience: load is distributed among all the servers with no dependence on a single group
- SMEs can focus on their core businesses: utility computing models offer needed capacity on demand.

BEINGRID BUSINESS EXPERIMENTS IN THIS SECTOR

BEinGRID provides three Business Experiments in the media sector:

- **Movie Post-production Workflow** has developed FilmGrid, a software system that improves film post-production workflow.

- **Visualisation and Virtual Reality** provides architects and advertising companies with a service to create 3D renderings in a cost effective way.
- **Virtual Hosting Environment** provides a distributed application-hosting environment that enables application service providers to rapidly deploy and manage services in a secure and accountable way and in compliance with explicit agreements and policies. The targeted application area is high-performance, Internet-based interactive gaming.

GRID IMPACT AND PERSPECTIVES

Grid computing solutions offer good advantages for meeting media sector requirements. The media sector is considered to be a market with huge potential. Some firms in the media sector, such as animation and special effects companies, are already using Grid to shorten the time to produce films or create online virtual games.

As Movie Post-production Workflow shows, the involved parties are not used to working in a collaborative manner. Additionally, they do not have the required Grid infrastructure, and Software as a Service (SaaS) offerings are necessary. In addition to their existing applications, application providers with centralised solutions could provide support for the computing and data-intensive part of the work with an SaaS. Thus application providers get an opportunity to differentiate themselves from competitors.

Architects and advertisers have similar requirements oriented towards visualising and manipulating multimedia data. As Visualisation and Virtual Media shows, these companies can take advantage of new business models, allowing them to offer better quality services to their potential customers while reducing costs. The benefits are then reaped by both the independent software vendors and the client.

The growing online and mobile game industry also has much future potential. Specialised Grid service providers able to provide specific solutions for fast and reliable set-up of online and mobile games may have a first-mover advantage in this developing market. The biggest competitors in this industry are already established Grid service providers. However, so far they only provide basic Grid resources.

Therefore the approach must be to differentiate by adding higher-value services, such as security, to basic Grid infrastructure in order to gain an advantage in the SaaS market as a foundation for a sustainable business model in the future. After initial offerings for Grid computing resources are established in an SaaS manner, consolidation and commoditisation of the services might take place. In this case, serving niche markets or offering differentiating services will lead to a better market position compared to competitors offering generic Grid services.

MOVIE POST-PRODUCTION WORKFLOW

"The FilmGrid system will assist greatly in accurate cost management and real time control of work progress in the post production environment. The fact that we save time gives us additional cost reduction. Communication is vital in the rapidly changing environment in which we work. Again FilmGrid will help us improve our visual methods of communication."

Lester Dunton, Director of Joe Dunton & Company/Hat Factory Post Ltd.

SITUATION

Modern motion pictures can produce up to 100 terabytes of digital picture files, currently generated by scanning film negatives. A movie will typically consist of around 2,000 shots which will go through several post-production iterations on their route to becoming artistically and technically acceptable.

Turning these digital assets – the film footage and related data – into a finished film requires collaboration between geographically distributed companies and individuals, such as visual effects houses, editors and colour-graders. The distribution and management of digital assets in current post-production workflows are largely manual, relying heavily on couriers and supervisors.

For example, imagine the post-production company needs to send some footage to a visual effect (VFX) company for the addition of bullet holes to a wall. The post-production company first saves the footage onto a hard disk drive, then attaches a sticky note describing the contents of the drive and the work required. The drive is then sent to the VFX company by courier. When the VFX work is completed, they send the new version back, again by courier. As VFX work is carried out, the post-production company sends the same footage to a sound effects company for the addition of machine-gun sounds. The post-production supervisor must keep track of who has which version of which assets and how far work has progressed. They will also determine when partners require new versions of footage and send these out when required. Such information is gathered over the phone and tracked on a whiteboard.

In summary, post-production workflows still adhere to processes designed with celluloid in mind, despite the digital nature of the medium. Asset transfer and tracking can be greatly improved.

CHALLENGES

The manual transfer of digital assets between locations via couriers is time consuming, inefficient and insecure. The time of highly skilled personnel is wasted waiting for assets to arrive as well as tracking whether or why the data are still in transit. Delay and confusion ensues if the sticky note describing assets and work to be done is lost. Security can be difficult to maintain, relying principally upon trusted couriers and supervisors. Costs are also associated with the couriering of data.

Tracking assets is important for technical and managerial staff, whose work depends upon knowledge of both the status and the location of footage. Tracking is disconnected from the IT systems of the involved parties. Although all involved have access to high-speed networks and all the work is computer-based, task assignment and completion is signalled through the courier or over the phone, incurring delays and misunderstandings. Versioning of assets is maintained on a whiteboard in an equally detached and error-prone fashion. As an example, applying sound effects to the wrong version of an asset may mean that the bang will be heard after the shot has marked the wall. Great cost, delay and staff unhappiness are associated with reworking the same scene as a result of such miscommunication. Finally, maintaining the list of scenes on a whiteboard does not scale. Rearranging the running order of scenes is error-prone and tedious and communicating these changes can be very difficult.

SOLUTIONS

FilmGrid is a Grid-based software solution developed to address these challenges by supporting effective management of the flow and availability of digital assets.

FilmGrid utilises a distributed architecture where each site in a production is associated with a server holding assets required by that site. The FilmGrid client provides users with a view of the digital assets across all sites in the production. The client consists of the following tools:

- The Asset Manager, a data transfer tool for moving assets securely, reliably and efficiently.
- The Storyboard Manager, which provides a high-level visual overview of the production.
- The Scene Manager, a digital asset management system designed to reduce the scope for confusion in the current manual process. This provides detailed information on the scenes and shots in a film, including what work has been done to them and by whom.

BUSINESS IMPACT

The business impact of FilmGrid includes:

- Reduced cost and time: improved workflows mean time is no longer wasted working on the wrong version of digital assets, attempting to locate assets, or waiting for couriers to deliver them.
- Increased productivity and revenue: efficiency gains afford more time to undertake work that increases productivity and revenue.
- Improved security: couriers are replaced with strongly-encrypted asset transmissions over a network, avoiding potential loss or leakage of digital assets in transit.
- Improved communication: clear communications between partners are enabled.
- Improved progress monitoring: greater speed and accuracy in monitoring changes to shots is enabled.

PERSPECTIVES

Moving to a truly digital workflow marks the beginning of a new era in the film industry, which, to date, has failed to exploit current technology to its full potential. FilmGrid realises this vision by providing digital asset and workflow management software.

FilmGrid uses network file transfer which is more secure, reliable and potentially faster than using couriers. Even if the effective bandwidth of a courier exceeds the network bandwidth between two sites, digital transmission can cut the lead time to near zero, so the receiver can start to work on the data they receive almost immediately after the transfer is initiated.

One timely advantage for FilmGrid is the onset of purely-digital films – as opposed to the well-established film/photochemical route – which has prompted much discussion on workflow methods. In the absence of competition, FilmGrid is well positioned to exploit such opportunities.

The initial phase of developing a usable, proof-of-concept of FilmGrid has been completed on schedule. The software has been well received in trade conferences and fairs. EPCC and JDC are now planning to exploit FilmGrid commercially by targeting the film post-production sector.

BENEFITS

FilmGrid offers the following significant benefits for post-production:

- Efficiency: assets can be transferred quicker. Less time is wasted working on old versions of film footage and ascertaining the status of film shots.
- Visibility: managers can rapidly ascertain the current status of a production.
- Accountability: scheduled, completed and overdue work are all clearly logged.
- Accessibility: assets can be accessed from anywhere.
- Availability: assets are available for work as soon as they are submitted.

"The FilmGrid Business Experiment has been the most visited one on www.beingrid.eu. FilmGrid has generated a lot of interest and enquiries. The demonstrator package has proven to be very effective in showcasing the solution."

Kostas Kavoussanakis, EPCC

epcc

www.beingrid.eu/be02.html

PARTNERS

EPCC, the supercomputing centre at The University of Edinburgh, leads this consortium involving **Joe Dunton and Company Ltd** (JDC), a company specialising in providing state-of-the-art post-production editing facilities for feature films. EPCC performs the technical development work for FilmGrid. Joe Dunton and Company Ltd is an end user of FilmGrid as well as leading the business exploitation of the product.

CONTACT

Charaka Palansuriya | EPCC
The University of Edinburgh | James Clerk Maxwell Building, Mayfield Road
EH9 3JZ Edinburgh, United Kingdom
Phone +44 131 6513595
charaka@epcc.ed.ac.uk

VISUALISATION AND VIRTUAL REALITY

"Thanks to the Virtual Reality for Architects application, we now benefit from unused resources in a simple way. This implies reduced processing time. Saving time during the processing phase actually enables us to increase and concentrate more on the test phase, reducing post-production related issues. We raise the customer's satisfaction and avoid delays which is, at the end, really cost-effective."

Nicolas Hubaux – Art & Build, Architect

SITUATION

These days it's no secret: computing has reached every business. Architects can't avoid this. Their customers no longer expect models of building projects to be made out of wood and paper. They expect computer generated three-dimensional (3D) scenes which clearly visualise the end result. There currently exist many tools to help design 3D scenes quicker and easier. However, despite the need to quickly get results in order to finalise a call for tender, less work has been done to find ways of rendering these scenes faster. Processing the render is time-consuming.

The "Virtual Reality for Architects" application allows architects to upload a scene to be processed to a web site, configure a few settings, and have it rendered within minutes. This is made possible through the use of Grid technology which has been created to address these issues, providing a simple way of drastically reducing rendering time by distributing the work over many computers at once. Grid solutions and software have been used, customised and developed in order to achieve this. It is a huge step forward from the previous situation, where users would often have to wait overnight for their scenes to render.

CHALLENGES

3D graphics have become more and more important as clients try to get the most accurate view of what their building will look like. By distributing the processing over multiple resources, the overall rendering time can be vastly reduced. Current solutions for distributing work in this fashion are very limited, constraining users to a static set of resources within a local network. These solutions require architects to invest heavily in hardware resources in order to be able to handle the peak processing demand during calls for tender.

Architects badly need a simple to use, affordable, flexible and fast solution for rendering high quality images. Waiting hours to render a single scene can cause them to be late when end-users modify even a small requirement (e.g. adding a door or a tree) near a deadline.

SOLUTIONS

Virtual Reality for Architects chose a Grid solution not because Grid computing is a goal, but a way to achieve a goal. It is the way partners developing Virtual Reality for Architects chose to solve architects' issues.

The following steps were taken to arrive at the solution: First, we analysed the architects' needs as to type of rendering and level of performance. Secondly, Mental Images proposed two rendering engines, RealityServer and Mental Ray. These are able to process images by distributing computing load over computers. RealityServer creates 3D landscape scenes which can be navigated in real-time (real-time rendering), while Mental Ray provides still images of realistic quality.

The third step was to allow resources to be dynamically allocated by integrating these engines into a Grid application.

Virtual Reality for Architects provides a web portal through which users can upload designs to be rendered into 3D scenes.

Behind this simplicity, the Grid application successively:

- analyses the complexity of the scene,
- elects the ideal set of resources which can process the job,
- deploys the scene and the rendering engine to these resources,
- and starts the processing.

The resulting images are then transferred to end users.

BUSINESS IMPACT

There were about 250,000 users of architectural CAD and 3D rendering software around the world in 2007, 90,000 in the European Union. There are more than 350,000 architects in the EU. The difference can be largely explained by the cost of image rendering solutions. The cost of computer hardware and software licenses means they are out of reach for small architecture companies.

However, the biggest impact from Virtual Reality for Architects is expected to be with large firms already using rendering software, but facing growing IT purchasing and maintenance costs. Architects in these firms cannot be sure their rendering jobs will complete in time, especially during rush hours of call for tenders, despite heavy investments.

By delivering an inexpensive way of sharing computers across a Grid or using external computing resources, Virtual Reality for Architects will help ar-

chitects to maximise their IT investment and provide them with the rendering resources they need without replacing their IT infrastructure.

PERSPECTIVES

Future work could be done to adapt Virtual Reality for Architects to other purposes. For example, rendering could be provided to fields other than architecture, such as furniture or engineering design.

Our solution could also be modified to apply Grid benefits to other architectural processing jobs such as strength of materials and computational fluid dynamics.

The partners' experience in Grid and rendering could also be exploited by creating consultancy businesses for architecture firms lacking 3D rendering expertise.

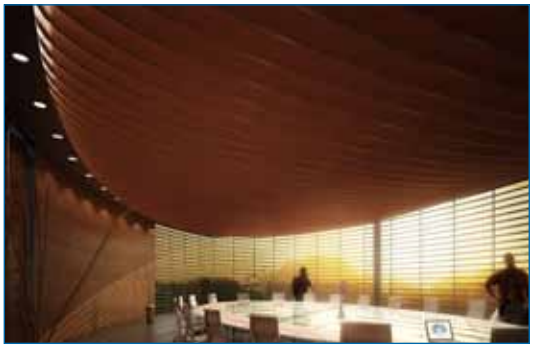
The most innovative and promising prospect is offering real-time rendering, which has only now become possible, thanks to the abundant and inexpensive computing resources that the Grid can supply.

BENEFITS

- Drastically accelerated three-dimensional rendering.
- Submitting 3D scenes for rendering with a few clicks, without the need for specialised knowledge.
- Providing an innovative way to present models to customers with real-time rendering.
- Avoids the need to purchase expensive hardware.
- Processing can be externalised.
- Flexible and scalable solution, thanks to the dynamic nature of the Grid.
- Faster turnaround time for client requests.

"The return on investment for the GridforArchitects Business Experiment is clearly identified, the development continues with the end-users in order to overcome technological challenges."

Stéphane Mouton, CETIC



cetic POLYTECH.MONS art & build mental images®

www.beingrid.eu/be03.html

PARTNERS

CETIC, ICT Belgian research centre, coordinator and development. **FPMs**, Belgian engineering faculty, development. **Art & Build**, Belgian architect bureau, end-user in the experiment. **mental images**, German rendering engine developer, software vendor.

CONTACT

Stéphane Mouton | CETIC
29/3, Rue des Frères Wright
6041 Gosselies, Belgium
Phone +32 71 49 07 26
stephane.mouton@cetic.be

VIRTUAL HOSTING ENVIRONMENT

"Online games are the future of the interactive entertainment industry. They also present a number of exciting opportunities for new business models, new markets, and new growth. The main problem faced is a solution integration issue."

Chris Sharp, IT Architect, IBM

SITUATION

In the past, companies' strategic business planning relied upon forecasts of future market conditions and customer needs over periods of up to 5 years. In the relatively stable business environment that then existed, companies could take their time to plan and develop a suitable IT infrastructure confident in the knowledge that market conditions and customer needs were relatively stable too. But in today's more uncertain business conditions, it is difficult for companies to plan very far ahead. Instead they have to spot trends early and respond more quickly to new opportunities and threats than their competitors. The pace of change has increased and many leading businesses in Europe are already responding by planning for a more flexible future. However many enterprises are finding that their ability to innovate and execute new business strategies is being constrained by a legacy IT infrastructure that cannot change quickly enough to support new strategic initiatives.

Current estimates are that between 50 – 80% of enterprises are anticipating the following benefits from this more flexible approach: loosely coupled systems, service reuse; composite applications built by combining services, enabling response to changing market requirements and first-to-market competitive advantage; optimisation of end-to-end processes; enabling greater flexibility, agility, improved process efficiency, and a higher degree of automation; standards-based end-to-end security offering interoperability; controlled exposure of business functions; guaranteed compliance enterprise policies; implementation of regulatory requirements and ability to prove compliance with these.

CHALLENGES

From a customer perspective, VHE provides a very compelling story, incorporating the attractive aspects of Service Oriented Architecture (SOA) and Grid Computing with flexible, cost effective infrastructure that is based on open standards.

The VHE should enable the customer to adopt a low risk approach to SOA deployment and increased return on investment. The VHE should provide common, shared technologies that enable business process to be added, changed and removed easily. Expensive infrastructure is pooled, decreasing the support and maintenance costs, allowing for a greatly reduced capital outlay, and increasing utilisation of the IT resources. The VHE should also offer common capabilities meeting non-functional requirements such as business collaboration management, service publication, service categorisation and discovery based on high-level Quality of Service (QoS) requirements, process driven service composition, federated identity and access management, SLA monitoring and evaluation, and secure messaging and content validation, content-based routing.

SOLUTIONS

VHE is a new concept that stems from BT's experience with its own 21CN (21st Century Network) Service Oriented Infrastructures and XML / Application Defined Networking.

VHE offers an advanced ICT environment that enables integrating business services across enterprise boundaries over a virtualised ICT infrastructure where these services operate. New reusable capabilities can be exposed as network-hosted services and be seamlessly introduced in the VHE in order to enhance its generic functionality or meet market-specific needs. Such common capabilities range from end-to-end secure messaging, federated identity and access management, to Voice over IP (VoIP) or video conferencing services.

VHE can be understood as a federation of application service gateways interconnecting an indefinite number of application hosting environments and integrating network hosted services that offer reusable capabilities which can be composed with applications deployed on the VHE (see architectural diagram). In addition to exposing business functions and applications as Web services, the gateways in a VHE act as integration points that compose the application or business process with network-hosted Value Added Services (VAS).

At the core of the VHE architecture is an in-cloud federated messaging bus, linked to partner resources through secure and high-performing application service gateways. This core is extended by VAS implementing common capabilities that enable organisations to share ICT resources and to integrate their applications into collaborative business processes.

Underpinning this is a network-centric philosophy asserting that network and IT resources can be packaged as services, with standard interfaces, which can be linked together to support business applications and processes.

BUSINESS IMPACT

The core market relevant to VHE is a segment of the Infrastructure Management services market. The opportunities for Communication and IT services companies such as BT and Atos Origin in this market in Western Europe are predicted to reach € 61.3 billion by 2009. Services in this market empower a wide variety of customers of all sizes in multiple businesses domains, eg

Defense, Engineering, Finance, Media and Entertainment.

VHE offers a strategic advantage to Communications and IT Services companies when competing with SOA platform vendors and IT integration companies. Once the VHE infrastructure is in place, such companies increase their ability to deliver cost effectively, exploit short concept-to-market timescales and also benefit from economies of scale.

As an example, BEinGRID validated the use of a VHE as an enabler for providing collaborative online gaming services. One reason that online gaming was chosen has to do with its market size and growth potential: Its total size is currently approaching $ 4 billion, while in 2007 sales and subscriptions and on-line game advertisements generated respectively $ 353 million and over $ 500 million revenue. In 2007, the market grew more than 60% in China alone, reaching $ 6-12 monthly revenue per user. Responding to such growth, 30% of games developer companies invest on high performance platforms. Another reason is that this is a market where ICT convergence can make a big difference: better choice and superior products can be offered when different players pool their resources (lobby services, game servers, game titles, social networking services, remote presence services, etc.).

PERSPECTIVES

VHE challenges the traditional way IT is organised in the enterprise and the way it is delivered. Instead of building functional solutions by way of discrete projects addressing specific business activities for specific business units (sometimes even in isolation), IT becomes a service provider, playing a facilitating role in improving business operations across the enterprise. Easy-to-maintain networked appliances replace complex software platforms and their high maintenance costs, and much of the complexity is hidden in the cloud where it is tackled by the VHE operator.

Certain elements of the VHE architecture such as the application gateways, the identity and access management services are being validated by BT in large-scale defence pilots where they facilitate secure integration of Operational Support Systems (OSS) between coalition partners. In the entertainment sector, the application gateways (an element of the VHE) are already used by BT's Web 21CN for empowering services such as a recent offering by BT and Sony: an Instant Messaging Service (IMS) on PlayStation Portable (PSP) gaming devices.

VHE also enables small and medium size innovators who offer reusable utility services to pair with the operator and exploit economies of scale. And Axiomatics AG, an access management software vendor, has paired with BEinGRID to validate their product on the VHE.

BENEFITS

- Enhances the provision and operational management of Virtual Hosting Environment (VHE) and supporting infrastructure services that enable the rapid deployment of application services by different Application Service Providers (ASP).
- Reduces the opportunity-cost and the time-to-market for Allocation Service Providers that would like to take advantage of the network
- Maximising Return-on-Investment (ROI) by outsourcing the development of a dedicated dependable hosting infrastructure and infrastructure services. The cost of building and operating such an infrastructure in-house is usually too high for a single ASP.
- Reducing the cost of building a service deployment infrastructure by enabling the use of dedicated application service hosting environments for virtualising one's applications as managed services

"The Virtual Hosting Environment trialled in this Business Experiment has become part of a Cloud Computing proposition discussed within BT Global Services and BT Innovate. BT Global Services is considering to include part of the solution in a new proposition in Identity and Access Management, while BT Design and Operate is evaluating other components in view of the introduction of an enhanced authentication capability in BT's 21C Network. Moreover, concrete discussions are taking place with several companies: Axiomatics, Vordel and Layer7 Techologies."

Theo Dimitrakos, BT

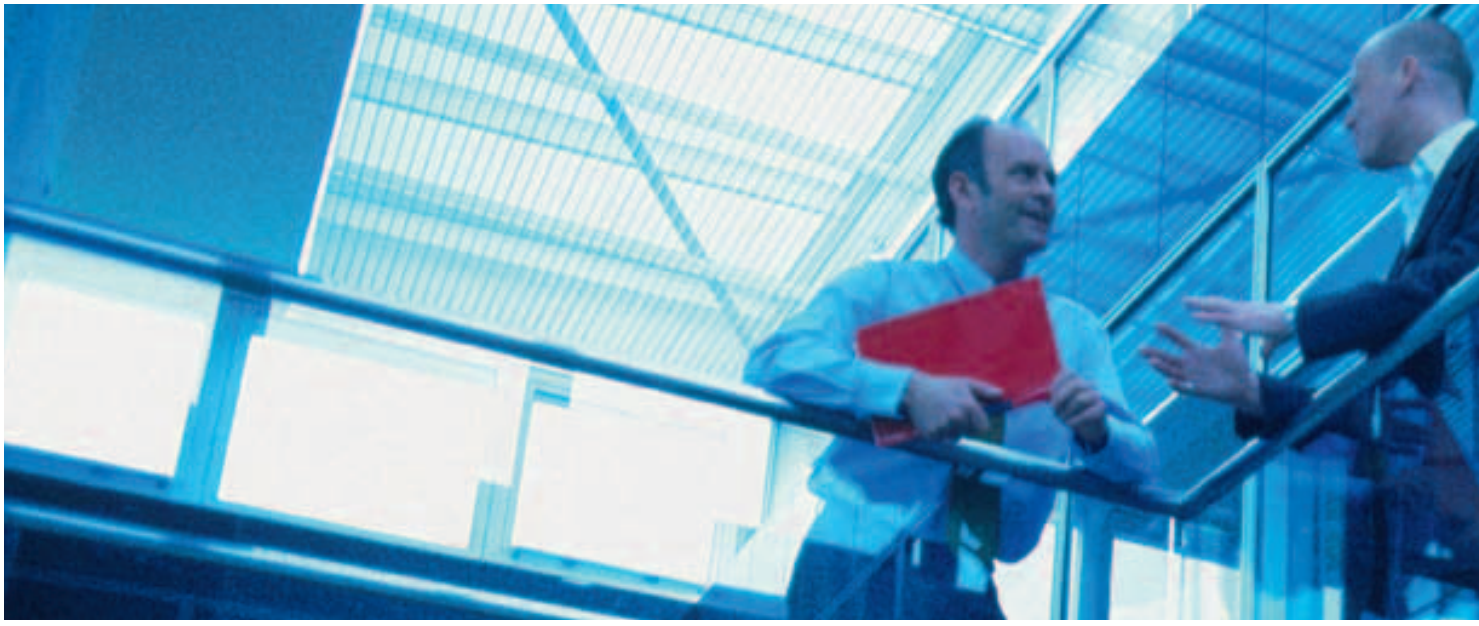
www.beingrid.eu/be9.html

PARTNERS

Andago is a Spanish SME based in Madrid. **Atos Origin** is a leading IT services company providing business solutions. **BT** is one of the world's leading providers of communications solutions. **CRMPA** is an Italian research organisation with expertise in Grid technologies and scalable SOA implementations. **URJC** is a Spanish University with expertise on the online gaming platform and its integration with the VHE.

CONTACT

Theo Dimitrakos | BT
Adastral Park, Martlesham Heath | Ipswich,
Suffolk IP5 3RE, United Kingdom
Phone +44 7918081826
theo.dmitrakos@bt.com



FINANCIAL

ABOUT THE SECTOR

The financial sector is composed of companies involved in activities such as banking, insurance, investment, brokerage and many related services.

The companies involved are usually medium and large enterprises, due to the investment needed to get established. Authenticity, confidence and loyalty are qualities in high demand because the industry deals with very sensitive information that can result in big economic gains or losses. Efficiency and effectiveness are key elements.

WHY SHOULD I USE GRID

Financial markets have experienced great changes in the last decade and there is intense competition between financial organisations to sell new products. That has led to a complexity of products in order to grow revenue and market share while being surrounded by competition and hemmed in by regulations.

Companies have turned to more risky instruments to gain more yield, and players now need better risk-assessment and management capabilities. Portfolio management techniques have adapted to increasingly complex financial instruments and risk scenarios but the growth of financial markets has intensified concerns over the reliability of measuring financial instrument risk exposure. One of the biggest challenges is the need to manipulate huge data volumes in real time. Traders, in particular, need up-to-the-minute information.

The traditional approach of additional hardware doesn't work anymore. The Grid can deliver supercomputer performance capable of running orders of magnitude faster to transform overnight risk reporting runs into near real-time reports. This supports decision making better while delivering the results of complex value-at-risk calculations cost effectively and reliably.

At the same time companies are aiming to lower the total cost of ownership of resources while becoming faster and more adaptable. The Grid provides access to a real-time infrastructure that enables financial organisations to speed up time to market and align with changing business demands by dynamically allocating computing resources to business applications. Companies can consolidate IT components and cut total cost of ownership within an environment where multiple users and applications share computing resources – hardware and software licenses – in virtual pools that adjust and scale to the company's needs.

Grid solutions improve quality of service, lower IT operations costs and reduce application management complexity. They increase server and cluster utilisation. And the cost savings will continue to grow as more applications and users migrate onto the Grid. Financial companies can outsource their processing requirements, either fully or partially, to cope with exponential growth of demand.

Grid computing can therefore benefit the financial sector with improved service levels, reduced costs and thus enhanced overall business performance. These are achieved through:

- running financial applications orders of magnitude faster, giving the business a competitive edge and ensuring that IT is never a bottleneck
- reducing operating and capital costs and securing a large reduction in purchases of new computing equipment
- creating transformational opportunities through new products, new algorithms and new ways of doing business that are just not possible without deploying Grid technology

In summary, in the financial sector Grid computing can provide new decision-making tools that lower risk and decision time, improve IT agility and flexibility, and reduce total cost of ownership.

BEINGRID BUSINESS EXPERIMENTS IN THIS SECTOR

BEinGRID includes four Business Experiments in this sector:

- **Financial Portfolio Management** provides a risk and evaluation infrastructure based on simulations, to support financial institutions in strategic decisions about financial portfolio management problems.
- **Risk Management in Finance** is applied to investment portfolio risk analyses of exotic derivative pricing and of variable-annuity, living-benefit guarantees. The Grid provides a platform integrated with partners' existing systems.
- **Data Recovery Service** proposes a business application that can be brought onto the market as a financial e-service aimed at SMEs, allowing them to store and back up critical company data and applications over a data-grid formed by all the clients of the service.
- **Anti-money Laundering in Grid** takes advantage of the Grid to support the analysis of transactions within a single bank (group) and between organisations in compliance with EU and national regulatory obligations.

GRID IMPACT AND PERSPECTIVES

The financial industry is considered to be one of the first-mover industries regarding adoption of the Grid. Most major investment banks already use Grid computing to varying degrees, and there is a major industry trend towards outsourcing IT functionality. The financial sector is an interesting market for Grid application from three perspectives: as a market for delivering outsourced services on demand (Financial Portfolio Management, partly Risk Management in Finance); by providing new services that can be offered to a broad range of users due to a wide customer base (Data Recovery Service); and to implement business processes (Anti-money Laundering in Grid).

The attractiveness of the financial industry for Grid applications and the overall high volume of IT investment by banks have attracted a lot of competition. Demand is stable and customers require more and more speed in the offered services, while handling extremely complex scenarios analysing heterogeneous data. Efficiency and cost effectiveness are key elements.

The market is highly attractive but also competitive. The major Grid providers are targeting the financial institutions, and providers of existing applications are taking advantage of the opportunity to enhance their offerings by Grid-enabling them. As a result, providers of services for this sector must get the first-mover advantage in order to differentiate themselves from competitors and/or provide niche products. In this market, reliability and security are rated more highly than price competitiveness.

FINANCIAL PORTFOLIO MANAGEMENT

"Financial Asset Allocation models entail extremely complex simulations: thanks to the participation in BEinGRID, Banca Finnat will be able to run new models and update them extraordinarily faster, going even above our expectations. At the same time, the outsourcing solution leads to significant cost savings."

Alberto Alfiero, Head Director – Finance and Markets at Banca Finnat

SITUATION

Rapid growth of financial markets has increased their complexity and volatility. As a result, over the past decades, investment practices had to adapt to increasingly complex financial instruments and risk scenarios. Today, to face these challenges, financial operators need a whole risk and evaluation infrastructure at their fingertips, which implies systems and data. Grid technologies offer this potential, though difficulties for the integration of Grid technologies in day-to-day business are not trivial. Indeed, building and providing a Grid requires a functioning ecosystem of complementary service and software providers and integrators. It is not possible to go to a store and purchase a Grid.

So this Business Experiment doesn't sell the Grid, but creates a "store" which sells Grid-enabled "services". Through an innovative business model and an online Grid portal, financial operators can now run simulations to support their strategic decisions directly from their desktops without any awareness of the advanced Grid computing technologies powering the service.

CHALLENGES

Globally, the major downturn in equity markets since their peak in 2000 has shaken the financial sector and entire economies, undermining also the proper functioning of financial markets as a whole.

To operate in these conditions, it is necessary that the investment industry better understand the market dynamics and employ new tools designed to simulate the markets' behaviour.

Today, financial institutions try to face the growing complexity of financial markets either by using empirical approaches, based on the experience and the expertise of the operators, or by using quantitative tools which imply the adoption of powerful and dynamic computational resources and data management systems. While in the first case the quality and efficiency of the decisional and business processes are subject to obvious limitations, in the second case the challenges are related to the purchase, setup, utilisation, management, maintenance and inevitable constant upgrades of computational resources.

SOLUTIONS

The proposed solution is the introduction of a new market player, so called Grid Service Company (GSC), offering outsourced Grid services to the financial sector. The GSC offers consulting services on a project basis, for the design, customisation and implementation of new Grid-based applications for the financial market; but primarily it offers a Grid service as an Application Service Provider (ASP) using a stand-alone, front-end application accessible through the Internet.

Through an innovative business model and ground-breaking technological solutions, the GSC provides the desired application, customised and easily accessible through a Grid portal. Although several Grid utility providers offer Grid computing on the market, the GSC will differ from them by using different Grid utility providers to power its services. The GSC has in fact the ability, using innovative Grid Resource Broker technologies (GRB), to create a "Grid of Grids", hiding all complexity behind the portal and the front end to enable customers to easily run complex applications as if they were using just their desktops. The key success factors of the new solution are user friendliness, confidentiality and full scalability of the service.

BUSINESS IMPACT

The proposed technological advances and the new business model can have a powerful impact on today's financial sector. The GSC offers the opportunity to use considerable computational resources by outsourcing computation, which entails both the reduction of costs in ICT investment and labour, as well as the achievement of strategic aims and the improvement of efficiency and reliability in the financial business process. In other words, financial institutes can concentrate on their core business and Grid utility providers run and maintain their own computational resources, while the GSC, as an intermediary, integrates these two independent worlds. The impact can be vast, affecting positively financial institutes, banks, insurance companies, retirement funds, governmental administrations and more directly all traders, analysts, brokers, etc.

PERSPECTIVES

It is clear that in a global economy and owing to increasingly volatile financial markets, financial institutions will need more and more computational resources and data mining capabilities to manage complexity. On the other hand we cannot imagine that financial institutes continuously build up their internal computational capacity, spending money in ICT infrastructure and human resources for its maintenance, staying at the same time up to date regarding technological advances and replacing obsolete hardware and software. We believe that the approach will inevitably be the outsourcing of computational resources, migrating the internal systems to external Grids. We have developed the necessary technological building blocks to enable the new service and the business model to implement it.

"The solution of the Financial Portfolio Management Business Experiment is being enhanced with new functionalities, and has been further demonstrated to prospects, drawing strong interest from at least two of them. Despite the on-going difficulties on the financial market, the crisis also demonstrated how operators are not ready to face sudden changes in market conditions. In this context, the adoption of efficient quantitative tools, especially for the risk management, can be a real support."

Italo Epicoco, University of Lecce

BENEFITS

The benefits for financial institutions using our new solution are in terms of improved service levels, reduced costs and thus enhanced overall business performance. These are achieved by:

- Running financial applications orders of magnitude faster, giving the business a competitive edge and ensuring that IT is never a bottleneck.
- Reducing operating costs and capital costs and obtaining a large cutback in purchases of new equipment.
- Creating transformational opportunities through new products, new algorithms and new ways of doing business that are just not possible without deploying Grid technology.

www.beingrid.eu/be04.html

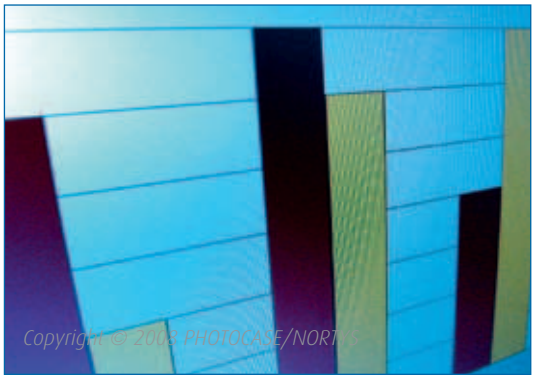
PARTNERS

Innova S.p.A., a consulting company specialised in technology transfer, leads the project consortium involving a university department of **UNICAL** specialised in the development of new applications for financial sector, the research consortium **Southern Partnership for Advanced Computational Infrastructure** (SPACI) specialised in Grid computing solutions and two banks – **MPS** and **Finnat**.

CONTACT

Valerio Grosso
Tecnopolo Tiburtino | Via Giacomo Peroni, 386
00131 Rome, Italy
Phone +39 06 400 40 358-9
Fax +39 06 400 40 364

RISK MANAGEMENT IN FINANCE



SITUATION

AXA is proposing to its customers new Life Insurance contracts: these products are "GMxBs"(Guaranteed Minimum x Benefit where x= Death, Withdrawal, Income, Accumulation, Surrender) so called Variable Annuities.

AXA Life Europe Hedging Services Ltd is the hedging consultancy company within AXA Group, proposing to its Clients (worldwide AXA entities except the US) new hedging strategies regarding GMxBs.

The complexity of the pricing and the hedging of such guarantees, which is a new discipline at the frontier between quantitative finance and actuarial sciences, imply the use of very sophisticated modelling techniques and lots of computing resources.

AXA performs on a daily basis a huge number of stochastic Monte Carlo type simulations to evaluate its book of derivatives regarding one particular GMxB product (evaluation of the GMxB on the whole set of policies). To cope with potentially increasing runtime issues, prices and sensitivities of the products are determined by performing a distributed computation on a set of workers' nodes in our Grid environment. This is highly time-consuming (tests are performed during the whole night) and IT resources-consuming (around 150 servers for 10 products).

The idea of the Business Experiment is to study a particular property of the GMWB (Guaranteed Minimum Withdrawal Benefit) product. This product presents an embedded option to the deferral period. The aim is to be able to price such an option in order to measure its effect in terms of pricing and hedging. In order to achieve that, numerical methods and parallel computations on the Grid are used. The implementation process consists of finding a suitable algorithm with a good convergence property and good performance with expected speed-up and efficiency, and taking advantage of the Grid architecture.

CHALLENGES

Such products are strongly path-dependent, e.g. annual ratchets (the highest value at regular intervals). The pricing of these products is very complex and AXA has to proceed on a daily basis with Monte Carlo-type simulations (evaluation of the payoffs and calculation of sensitivities). The calculation is performed overnight on the Grid.

Every morning, the prices and the sensitivities of the products are analysed, and efficient market trades are determined in order to cover the product against some market movements (e.g. equity, interest rates etc.).

AXA's products may present some embedded options that are difficult to price numerically.

It is crucial for the Insurer to have a clear idea of the impact of such policyholder behaviour in terms of pricing but also in terms of hedging (impact on the distribution of the profits & losses).

SOLUTIONS

In the BE, a "gridified" American/Bermudian Monte Carlo approach has been developed to determine the price of the guarantee by taking into account the hidden option to the deferral period.

First of all, some techniques present in the academic literature have been deeply studied, e.g. Ibanez Zapatero (2002), Picazo (2005), Longstaff Schwartz (2001).

The idea was to choose and adapt to the payoff design a suitable and powerful algorithm to determine the frontier for the optimal exercise.

We then defined a "state vector" of key information for the GMWBDB product. The option value is the key metric that allows a decision at each node of the projection, regarding the definition of the embedded option and the results given by the customised numerical algorithm computed to determine the optimal frontier of exercise. We defined a parallel algorithm to price and compute the embedded option on the Grid.

The Solution process can then be summarised as follows:

- American/Bermudian style high dimension Monte Carlo methods techniques.
- State vector of key information and Option Value.
- Choice of a suitable algorithm to determine the optimal frontier of exercise.
- Pricing and sensitivities calculation for hedging.

BUSINESS IMPACT

To summarise, the BEinGRID project enabled the validation and optimisation of the Grid structure and the deployment of the parallel algorithms is enabling faster response time on the Grid, as well as more precise results.

BENEFITS:

- Optimisation of stochastic simulations.
- Time savings in simulations.
- IT resources savings in simulations.
- Through the savings quoted above, enlargement of the tests' panel.
- Better stability of the Grid calculation process thanks to the optimised algorithms.

The direct business impact of the use of the Grid is the following:

- Better information on the price of the embedded option, through optimised simulations (quicker & more accurate).
- Capability for the hedging to measure the profit & loss impact for a given hedging strategy (business information available in real time for a business plan optimisation).

PERSPECTIVES

The ALEHS Grid solution is in perpetual evolution because of business increasing activities. The daily production process has been split into distinct parts to offer better hedging services to AXA clients, region by region, i.e. Europe, Asia-Pacific.

The new business is requiring an adapted efficient Grid solution to deal with a huge number of daily simulations to be able to deliver suitable hedging recommendations based on prices and sensitivities calculation of the whole book of derivatives.

Some products are very complex and present some risks for the Insurer, because of the policyholder behaviour. Better pricing and hedging of these risks is requiring a larger space of simulation or adapted numerical methods. As a consequence, it is computer resources-demanding.

"With the code developed for "the Risk Management in Finance" Business Experiment, around a major AXA life-insurance product, AXA Hedging Services has been able to reduce the IT resources needed and the computation time. Since it has proved its efficiency, the code is still used for this product. Furthermore, the grid solution developed during the BEinGRID project (based upon a gridified Monte Carlo approach) was used as a basis for the development of a new in-house solution."

According to AXA

"Fininfo was bought by Six Telekurs, to build together the third European data vendor group. Pricing projects have therefore been postponed. With Fininfo probably becoming the group expertise centre for all financial algorithms, it will benefit from the "Risk Management in Finance" Business Experiment's results to enhance the existing Fair Value Pricing Service of Six Telekurs."

According to Fininfo

www.beingrid.eu/be11.html

PARTNERS

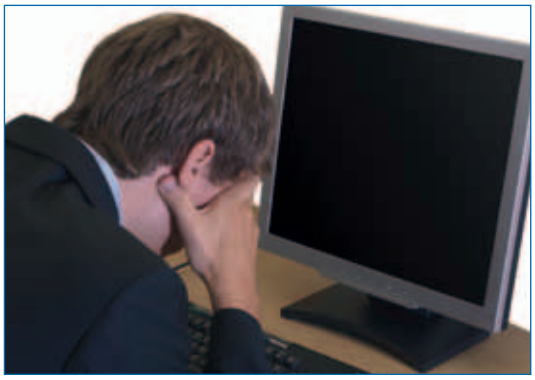
CENTRALE RECHERCHE S.A. (academic support and R&D, Grid expert) leads the consortium involving **AXA**, (quantitative R&D), **Six Telekurs** (Financial Services provider), **Telefonica I+D** (Business Consultancy).

CONTACT

Ioane Muni Toke | MAS Laboratory, Ecole Centrale Paris | Grande Voie des Vignes
92290 Chatenay Malabry, France
ioane.muni-toke@ecp.fr

DATA RECOVERY SERVICE

"Depending on the guarantees regarding confidentiality and recovery, I understand that this may reduce cost considerably. The extra capacity that everyone has on his servers may well be used for this."



SITUATION

Imagine yourself in the following situation. You have a small business, with a number of employees. It is Monday morning and you are on your way to the office. Arriving there, you notice that a window is broken and the place is a mess! There has been a burglary! You call the police and look around to see what's missing. One thing that has been stolen is the computer with all your administration! A disaster! You have no recent backup of your data so this is going to cost you money and customers!

Now this is not at all a completely imaginary situation, this does in fact happen quite often. And this is what the Data Recovery Service (DRS) is about. With the DRS, SMEs like you are able to ensure that they always have a backup of their vital data, no older than one day.

The DRS stores your data daily in safe, encrypted format not in one place, but spread over a data-Grid that is formed by all the clients of the service. The technology ensures enough redundancy to make certain that your data can always be retrieved, even if a number of storage locations are unavailable.

CHALLENGES

Digital data is of vital importance to even the smallest company today, while at the same time being vulnerable to theft, accidents, technology failure, etc. Measures to ensure its continuous availability must therefore be in place. Large disk drives are inexpensive; however, the proper use of those for backup purposes still requires technical know-how and the time and discipline to make regular backups. Furthermore, in a situation like the one sketched above, this would not have helped because the backup drive would also have been stolen.

Current online backup services still require a substantial amount of work on the part of the user. Furthermore, if data is sent over the internet to some provider of online storage, what guarantees do you have that your data remains confidential?

What is required for the SME market is a solution that is easy to use, reliable, confidential and inexpensive. This is what the Data Recovery Service is offering: ease, reliability, confidentiality and very low cost.

SOLUTIONS

The Data Recovery Service is a community-based service in which the users are connected in a data-Grid, while a guarantee is provided by a well reputed bank. Participants in the Data Recovery Grid use a small application that automatically backs up their vital data on a daily basis. The data is encrypted and stored in different locations on the Grid formed by the participants themselves. In this manner, there is no single point of failure. Cost is low, because of the underlying bartering principle: participants contribute storage to the Grid and use storage capacity on the Grid. The necessary redundancy is guaranteed by the number of participants and by the Grid service provider who will make sure enough storage capacity is provided.

The consortium that has developed the Data Recovery Service has done research among a large group of small and medium sized enterprises (SMEs) in The Netherlands. This indicated the need for an easy and inexpensive solution to ensure the continuity of their business in case of (computer) accidents. By choosing a solution based on Grid technology, the main concerns of SMEs are addressed.

BUSINESS IMPACT

The Data Recovery Service fits well in the current trend of online services and social software. This trend, also known as "Web 2.0", is one in which software and hardware is moved from the local environment to the wider Internet with the advantage of savings in investments and maintenance.

For the small entrepreneur, the new Data Recovery Service means that he/she needs to spend less time on data backup and that he/she may even save money on computer insurance.

Being part of the Data Recovery Grid will also have the added advantages of an expanding social network with associated commercial benefits. Even if you share the Data Recovery Grid with competitors, you now have at least one common interest.

BENEFITS

The unique benefits of the Data Recovery Service are:

- the certainty of always having a backup of vital data
- inexpensive backups
- confidentiality - endorsed by a well known and trusted bank
- ease of use
- part of a social network

PERSPECTIVES

The Data Recovery Service will be marketed as both an independent offering and bundled with an insurance package from Rabobank. Other marketing strategies, such as offering DRS as a company internal Grid solution for data recovery are possible and will be investigated.

When the Data Recovery Grid grows in terms of participants, it will deliver even better service to its users. The more users, the better the service. First movers will be the first to benefit from new social software functions that may be provided when the user-base grows.

"AlmereGrid uses the outcome of the Data Recovery Service Business Experiment as a building block for the architecture of the "Digitale Woon-coach" proposed to the Foundation Almere Kennisstad."

Ad Emmen, AlmereGrid

www.beingrid.eu/be15.html

PARTNERS

AlmereGrid is a Grid service operator that has established the first CityGrid in the World. **Rabobank Group**, a triple-A rated institution, is a full-range financial services provider founded on cooperative principles. **Logica** is a leading IT and business services company, employing 39,000 people across 36 countries. **Rotterdam School of Management** is the international business school of the renowned **Erasmus University Rotterdam** in the Netherlands.

CONTACT

Michiel Perdeck | Logica Nederland BV
Laan van Kronenburg 14
1183 AS Amstelveen, The Netherlands
Phone +31 20 5033000
michiel.perdeck@logica.com

ANTI-MONEY LAUNDERING IN GRID (AMONG)

"AMONG takes the next step in providing a holistic view of money laundering activity, and most surprisingly at low cost, securely and regardless of the AML application installed in the bank."

Piraeus Group Chief Compliance Officer

SITUATION

Much debate has taken place and various action plans have been discussed at EU level for tackling the international problem of money laundering. Among the proposed actions is the Third Money Laundering Directive[1]. It aims to combat money laundering (ML) by acquiring information from financial institutions concerning suspicious or unusual activities and extending the obligation to monitor transactions beyond banks to third parties.

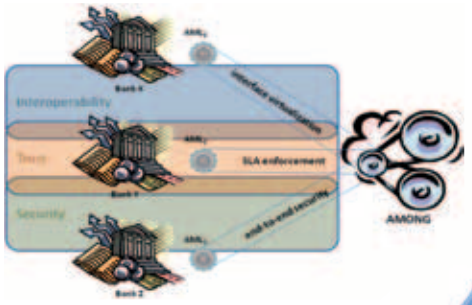
The AMONG project exploits advances in grid technologies and infrastructures for the business purposes of anti-money laundering (AML). A grid-based platform enables banks to share a limited amount of data, thus improving their AML operations so as to meet new regulatory obligations.

CHALLENGES

The scale of the problem can be depicted by recent reports, showing that approximately $ 1 trillion is being laundered annually worldwide[2], resulting in huge fines and related reputation risks for the banks involved. The structural changes that financial systems have undergone during the last years have deep implications for how banks tackle the challenges of AML and counterterrorist financing. The starting point for current AML measures is accurate and cost-effective monitoring of transactions at a very large scale. However, current AML products prove to be inefficient, operating in isolated banking environments and providing no collaboration between banks. Each financial institution tries to solve such problems independently with low ML detection percentages and huge loads of suspicious transactions reports (STR). The Third Money Laundering Directive, though, implies that a trusting collaboration platform should be created in the future to prevent ML.

SOLUTIONS

AMONG enables banks to cooperate with each other so as to provide a holistic, automated AML capability using Grid technology. Grids support the provision of AML services in a cost-efficient, secure and trusted way, so as to monitor suspicious customers across various financial institutions. In this way the solution surpasses contemporary isolated AML procedures. It allows compliance officers to construct more concrete profiles of suspicious clients and thus increase the true positive rate of cases disclosed to financial intelligence units. By increasing ML detection accuracy, compliance and reputation risks will fall and resource utilisation for producing STRs will drop, enabling more effective ML detection. Pairs of financial organisations can choose to collaborate using the AMONG software, establishing trust with bi-partite grid service level agreements. AMONG can potentially integrate with the AML software from any provider, allowing a wide variety of financial organisations to collaborate regardless of their current systems.



Money laundering stages

AMONG capabilities

BUSINESS IMPACT

AMONG exploits Grid in order to bring a new, widely adoptable solution to the market that can enable the exchange of essential information on suspicious customers. This will enable more reliable service delivery to the bank cus-

tomer, improving the bank's reputation and market share. Through this process banks will be able to evaluate ML alarms more accurately, thus increasing ML detection percentages (the industry standard is 5-7%) and reducing the burden of STR production. Preventing ML-related transactions will protect the banks from huge fines and related costs of millions of dollars[3][4]. The process described takes place in a secure and trusted environment that protects sensitive customer data and does not expose data that could be exploited by competing institutions.

PERSPECTIVES

It is expected that in an era of economic uncertainty the fines for failing to detect and disrupt ML in time (e.g. because of faulty internal money laundering controls) will drive customers to safer and more efficient solutions such as AMONG. Banks, and eventually insurance companies, accountants and others (as mandated by the Third AML Directive), will receive a faster and more efficient AML solution. The solution will contribute significantly to both avoiding compliance penalties and decreasing reputation risk. It will also cost less than current AML products. The AMONG team has taken all precautions to protect the proposed platform from risks deriving from the exposure of personal customer data, as well as from misuse of data for competition purposes.

AMONG benefits

BENEFITS

Secure, effective, cost-efficient and fully compliant: AMONG represents the next generation in AML solutions. By installing AMONG customers enjoy:

- A holistic view of the AML environment.
- Enhanced ML detection.
- A low-cost innovative solution.
- The exchange of AML information using Grid trust and security.
- Interoperability: the solution can be used between different AML core applications.

AMONG portal screenshot

REFERENCES

[1] Official Journal of the European Union, "Directive 2005/60/EC of the European Parliament and of the Council on the prevention of the use of the financial system for the purpose of money laundering and terrorist financing", 26 October 2005, http://europa.eu.int/eur-lex/lex/LexUriServ/site/en/oj/2005/l_309/l_30920051125en00150036.pdf

[2] KPMG, "Global Anti-Money Laundering Survey 2007 – How banks face up to the challenge", 2007

[3] http://www.amlcft.com/fortent union bank sep 07.pdf

[4] http://www.world-check.com/articles/2007/06/29/bank-reserves-60m-money-laundering-investigation/

www.beingrid.eu/be19.html

PARTNERS

The **National Technical University of Athens** (NTUA) leads the consortium. Other partners are **IT Innovation Centre** (technical leader), **EXODUS** (AML application provider) and **Piraeus Bank**, the end-user.

CONTACT

Giorgos Panousopoulos | EXODUS S.A
Farantaton 6-10 | 11527 Athens, Greece
Phone +30 210 7450316
gpan@exodus.gr | www.exodus.gr

RETAIL AND LOGISTICS

ABOUT THE SECTOR

The Retail & Logistics sector includes companies whose activities are related to management of goods (acquisition, transformation, delivery, etc.). It is composed of a huge and heterogeneous set of companies (more than 3 million in Europe) that rely on a collection of suppliers to deliver the product they need to the right place when they need it.

WHY SHOULD I USE GRID

The activities in this sector are mainly concerned with the physical movement of goods, some of which may be perishable (e.g. fresh vegetables, meat) or have a limited shelf life for other reasons (e.g. fashion, seasonal items). Therefore, the movement of goods in a prompt and efficient manner is essential and should also minimise stock holding and wastage. The main products to be offered in this sector are services to improve the efficiency of the supply chain, and the resources and process planning.

ICT systems have been shown to increase efficiency in supply chains, improve transaction efficiency and reduce waste. Most of the extended and popular solutions in the Retail & Logistics sector suffer from heavy performance problems. This forces final industrial customers to buy, rent or reserve space on very powerful yet expensive hardware and software platforms at service providers' server farms. Moreover, service providers implement customer-specific solutions that are difficult to maintain, evolve and reuse, and pose a hurdle for sharing information in the value chain.

This has a direct negative consequence on business. There are hundreds if not thousands of enterprises (mainly SMEs) that need these services. But with traditional architectures, the high entry-level barrier of huge investments in hardware, software and maintenance are an almost insuperable obstacle for many potential users, SMEs in particular. In addition, it is extremely difficult for the existing solutions to meet more and more demanding performance requirements because of their traditional centralised architectures.

Grid technology can overcome these technical and business hurdles by relieving end customers of heavy infrastructure investments, while preserving, if not improving, system performance to gain competitive advantage without increasing costs.

BEINGRID BUSINESS EXPERIMENTS IN THIS SECTOR

In BEinGRID there are five Business Experiments in this sector:

- **Retail Management** provides an application to manage and optimise the trade of goods and products at points of sale. It includes sales forecasting, product assortment planning and goods replenishment optimisation.
- **Collaborative Environment in the Supply Chain Management for Pharmaceutics** concerns the efficient management of the centre value

chain, from the suppliers to the manufacturer and the arrival to the retailer and final customer. The impact results in reducing inventory and boosting the transaction speed by exchanging data in real-time.

- **Sales Management System** includes two cases:
  - Sales management in the food services sector provides a distributed application that enables the centralised management of food distribution chains.
  - Enterprise Resource Planning management for SMEs.
- **Textile Grid Portal** integrates a collection of powerful and high-end textile services (production scheduling, global resource scheduling and virtual retailing) in a portal for textile companies.
- **Logistics & Distribution Optimisation** addresses the creation of a scheduler/planner applied to logistics and transportation that integrates Enterprise Resource Planning systems to reduce distribution costs.
- **Grid Technologies within B2B Networks** provides to SMEs an easy and affordable way to integrate legacy systems with a B2B platform in order to improve their business capabilities, reduce costs and take advantage of B2B services.

GRID IMPACT AND PERSPECTIVES

The Retail and Logistics sector is a commercial sector that is under high competitive pressure within the regional markets and also subject to the trend towards globalisation. In addition, major innovation based on new technologies, such as RFID, is expected.

The industry is, furthermore, dependent on efficient collaboration among a number of partners in the supply chain. All these trends together provide favourable conditions for efficient information technologies and technological solutions that can help to reduce costs and optimise flows and processes. Given this, Retail & Logistics is considered as an industry where Grid technology can meet high demand.

The negative aspect of the potential Grid market in retail and supply chain management is the high competition. The market can be approached by new Grid service providers; established online providers offering B2B platforms targeted to supply chain management; existing ISVs that offer ERP, SCM or CRM; or other types of specialised software providers. Many of the above-mentioned technology providers have already announced effective solutions based on Grid. Also, new specialised solutions targeting SMEs are increasing the competitive pressure.

In this highly competitive environment, there is only room in the market for niche application providers and existing providers in niche regional markets, which can enhance their offerings by adding Grid technology. While Grid enhancements do not always lead to new markets, in the future it may become the only option to stay competitive.

RETAIL MANAGEMENT

"Advantages for the users of the Grid version of the TXTDEMAND application: a better performing application in turn requires lower infrastructure investments."

SITUATION

Current Industry & Retail (I&R) platforms are both expensive and difficult to maintain and solution developers are struggling to meet the increasing demands on performance with traditional centralised architectures. Grid-based architectures are the ideal solution. End users will be relieved from the need to invest in infrastructure. Solution providers will be freed from code optimisation details, allowing them to concentrate on the value-added aspects of their applications i.e. interoperability, maintainability and re-usability features of the code. The mission of the experiment was to demonstrate the technical feasibility and the business convenience in introducing Grid technologies in I&R sectors.

The benefits are for the ICT service providers, the Retail Management (RM) solutions vendors' community and the RM community at large. The Grid in RM enjoys a unique status as it is based on innovative technologies - a radical paradigm shift from what is known today in RM. Although there are some RM decision making tools, these provide partial solutions but none provide the kind of comprehensive solution that can be offered by a Grid-based application.

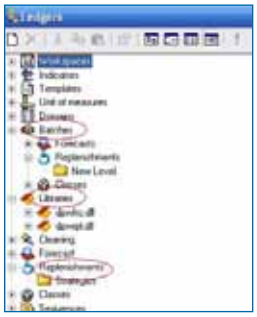
CHALLENGES

Some of the most used and popular I&R solutions suffer from heavy performance problems due to large volumes of data. The retail chains' optimisation requires consistent computational power and is subject to strict time deadlines. Existing solutions constrain customers to buy/rent or reserve from their service providers' powerful and expensive platforms. Engineers have to design and implement customer-specific solutions difficult to maintain, evolve and reuse.

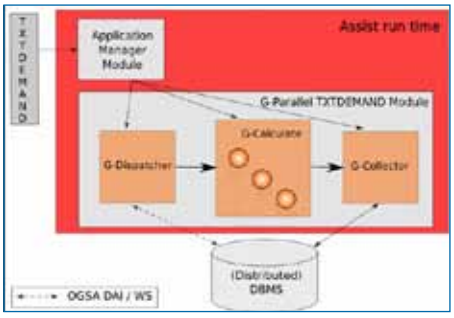
These are direct, negative consequences for business. Even though hundreds or thousands of enterprises would need I&R services, only a few can actually afford them due to high investment costs required for buying or renting hardware and software resources. At the same time, service providers are unable to conduct solid infrastructure development and develop maintenance policies needed to create a "reference system solution". Instead, each solution is specific in terms of hardware and software architecture, different from the others and rigidly tailored and tuned to the needs of a client.

SOLUTIONS

ASSIST, the Grid application development environment supplied by the University of Pisa, has been designed to achieve dynamic resource allocation, heterogeneous, adaptable and autonomic behaviour, as well as dynamic QoS control features. It allows for parallel, distributed application development where resource management and QoS can be largely automated by means of parallel programme structures which simplify application development, increase software reuse and shorten the software development cycle. By means of mathematical QoS models, the ASSIST run-time support controls resource allocation and steers it to match the assigned SLA.



TXTDemand Main Interface



System architecture

The retail management application supplied by TXT e-Solution has a portion of the computational tasks severely limited by I/O bottlenecks, memory size and CPU power constraints; a consequence of a centralised architecture typical of conventional I&R systems. Within this Business Experiment, the chosen RM solution redesigned part of the application to fully exploit the Grid platform. The most critical modules of the application in term of performance needs, I/O demands, and strictness of QoS requirements have been re-implemented. The new implementation exploits the core sequential code of the existing one, within the structured parallel approach provided by ASSIST.

BUSINESS IMPACT

The European consumer goods industry has a manufacturing turnover of € 530 billion (combined estimated turnover of major European food, clothing and media manufacturers in 2003) and touches the everyday lives of every European citizen. Moreover, the European retailing sector (including other household goods in addition to food, clothing and media) has a total turnover of € 1.609 billion and employs over 13 million people (Eurostat).

We can identify the target market by considering just the most advanced retail networks (10% of the total) and an average expenditure for ICT infrastructures of 3%: in this case we have a potential market of € 4.8 billion. Assuming a penetration rate of 1%, the total market potentially addressed is in the order of € 50 million.

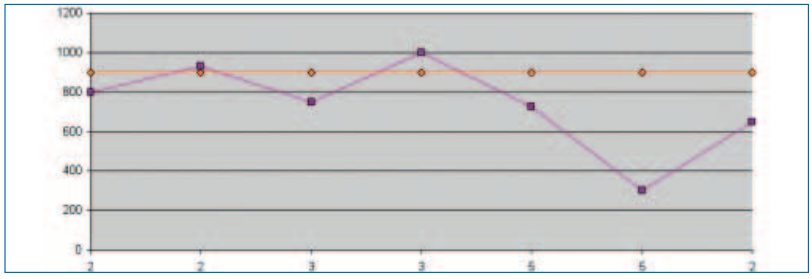
PERSPECTIVES

TXT with its new product line, TXTPERFORM2008, is offering its products as intelligent SOA-based solutions, with some of them (specifically those related to Retail Management) also as Grid-based applications. This Business Experiment's results proved this to be convenient and attractive from technical and business perspectives. TXT intends to incorporate Grid technology into the TXTPERFORM2008 product suite.

For ENGINEERING.IT, the results obtained by this Business Experiment are by far the best way to demonstrate the benefits that may be obtained from Grid technology. Furthermore, the ASSIST dynamic QoS control feature is of particular interest to a Grid service provider.

"The Retail Management Business Experiment allowed to validate the concept and to measure the actual performance benefits. The last steps before going to operation are to answer some legal questions raised by the service provisioning and negotiate optimal communication costs related to large scale deployment. Now we also must take into account the global economic situation that has a negative impact on supply-chain related activities including a slow down of investments."

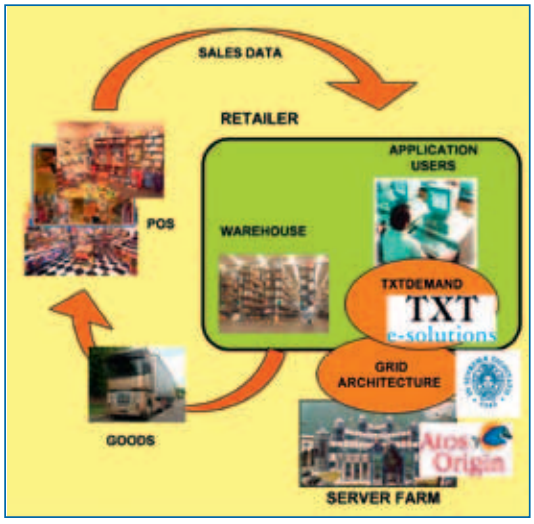
Andrea Manieri, ENGINEERING.IT S.p.A



Measured performance vs SLA contract

BENEFITS

- Retail Management application providers can boost the performances of their I/O and computation bound applications thanks to the Grid-based architecture proposed by this Business Experiment.
- ASSIST programming environment can help them to reduce the effort required to adopt such architecture.
- RM Application end-users (customers) can benefit from better performances and QoS features at reduced cost of hardware infrastructure.
- Resource providers can optimise their internal infrastructure costs thanks to the adaptive features of the ASSIST run-time support.
- The solution is interoperable with the state-of-the-art, such as web services, easing its integration within existing systems.



Grid-enabled Supply Chain

ENGINEERING INGEGNERIA INFORMATICA · TXT e-solutions · Università di Pisa

www.beingrid.eu/be05.html

PARTNERS

ENGINEERING.IT leads the consortium involving **TXT**, the end-user providing the TXTDEMAND application, and **University of Pisa** provides assistance with the Grid-based platform.

CONTACT

Marco Bellone | ENGINEERING.IT S.p.A.
Viale Carlo Viola, 76
11026, Pont St Martin (AO), Italy
Phone +39 125 810 772
marco.bellone@atosorigin.com

COLLABORATIVE ENVIRONMENT IN THE SUPPLY CHAIN

"We, as the service providers in the BEinGRID Business Experiment, see Grid technologies as a profitable, and yet affordable, way for filling the missing pieces of reliability, performance and scalability for current and future SCM intensively collaborative environments."

Rea Varvarigou – Operations Supervisor – Service Offering – Business Exchanges S.A.

SITUATION

SCM (Supply Chain Management) comprises a rapidly growing market with its main emphasis being on supplier collaboration opportunities coupled with inventory optimisation and process efficiencies across the supply chain. Any supply chain today – regardless of the sector it serves – is made up of an increasingly labyrinthine network of materials, equipment and services suppliers requiring efficient management for its smooth, cost effective and successful operation.

The Grid offers a unique opportunity for providing a reliable, scalable and robust infrastructure able to support efficient inventory management and fast order processing and scheduling. One such case study involved inventory management and order processing in the pharmaceutical business sector. This Grid product resolves service providers' struggle with infrastructure and operational delivery issues in their quest to remain profitable while they focus on customer demands for ever-increasing service levels.

CHALLENGES

SCM comprises an example of a strongly collaborative environment. A complex network of geographically dispersed trading partners (suppliers, distributors, retailers, manufacturers, and customers) with different needs but all following a 4Rs rule – right quantity, right quality, right time, right price – has to be served. Effective inventory management, efficient production scheduling and fast order processing comprise inter-related problems and all rely on one important thing; real-time (or near real-time) information exchange within the enterprise as well as with trusted trading partners. Hence, an efficient procurement operation through reliable and scalable infrastructure provides opportunities to drive down costs and increase profits. Even if all the parties engaged in a business collaboration model (especially SMEs) agree upon the need of a web-based integrated solution, they often fail to smoothly integrate their enterprise systems to work effectively with each other. The reasons are usually long deployment cycles, high costs, complicated upgrade processes and IT infrastructure demanded by traditional software applications.

SOLUTIONS

One of the primary features of next-generation SCM is demand-supply synchronisation. The Grid comprises a promising infrastructure which aggregates and coordinates various resources, from computing power and storage to applications and human expertise, serving users with different QoS (Quality of Service) requirements. Through the optimised use of the existing infrastructure it offers, productivity is increased since all the parties can access the resources they request when they actually need them. And most importantly, data sharing across the enterprise and with trusted trading partners is enabled allowing for the collaboration among different entities – organisations or businesses.

The case study focused on the pharmaceutical business sector. Different entities (suppliers, distributors, pharmacies) accessed information related to their role in the supply chain and their network of collaborating companies. A customised portal offered per role access to the Grid e-procurement services to the different users of the system through which stock management and order processing capabilities were validated.

BUSINESS IMPACT

The business impact stemming from the adoption of Grid in SCM procurement operations includes:

- Improved quality: faster execution of operations, supply-demand synchronisation, access to the information each trading partner is interested in through customised portals and collection of real-time business data.
- Increased affordability and flexibility: trading partners do not have to invest capital for owning the application, but rather pay based on their level of participation in the collaboration and resource usage, resulting in reduced depreciation costs because less hardware is required.
- Increased reliability: failure points creating a service outage (such as rush hours system overloading, system being down for application upgrades or hardware failure) are handled through workload balancing and replication techniques offering greater operational confidence.

MANAGEMENT FOR PHARMACEUTICS

PERSPECTIVES

A first analysis of the requirements, the risks and the challenges concerning the development of an e-procurement product exploiting Grid technologies at business level has been performed in the context of this first business case study.

Growing Internet penetration into business and the rapid improvement of network quality and speeds have created the necessary infrastructure for the adoption of Grid-based collaborative environments in the business world.

Even among SMEs with a proven reluctance to adopt new technology, this Grid-based e-collaboration-enabling product for SCM among trusted trading partners will comprise an attractive and affordable solution based on reliability and scalability and thus create the opportunity for enterprises to maintain their market share and improve their standard of service.

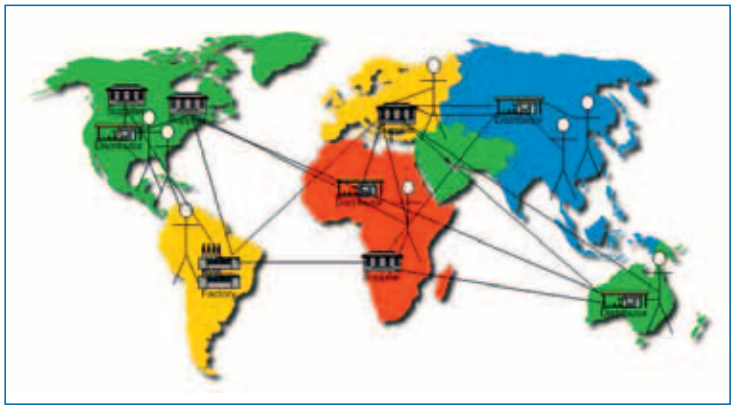
"The solution from the Collaborative Environment in the Supply Chain Management for Pharmaceutics was further developed, and focus has been made on an enhanced data replication mechanism which is being implemented as it is of great significance for the operations. The company Business Exchange is already providing the service to Wyeth and to FAMAR, with new customers expected."

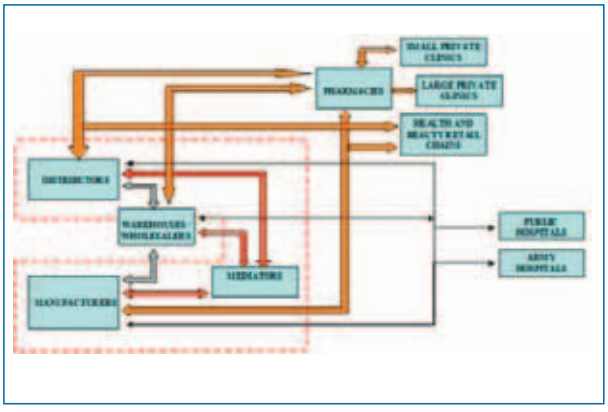
Vassiliki Andronikou, NTUA

BENEFITS

The benefits for companies that adopt this Grid solution include:

- Real-time e-collaboration among people and technological resources.
- Minimised cost for faxing requests to suppliers.
- More efficient stock management, through electronic stock monitoring.
- Ability to process and fulfil orders faster.
- Ability to analyse real-time business data to accelerate decision making.





www.beingrid.eu/be10.html

PARTNERS

Business Exchanges S.A., a subsidiary of EFG Eurobank specialising in the area of e-commerce services, leads the consortium which includes the **National Technical University of Athens** (NTUA) – an academic institution with an extensive R&D activity offering technical expertise; and two end-users – **FAMAR** and **Wyeth Hellas S.A.**, both specifying the product requirements and validating the Grid solution.

CONTACT

Rea Varvarigou | BE – Business Exchanges S.A.
6 Siniosoglou & Panagouli Str.
14234, N. Ionia, Athens, Greece
Phone +30 210 35 23 551
rvarvarigou@be24.gr

SALES MANAGEMENT SYSTEM

"Thanks to the implementation of Grid technologies inside our CERERE product, the potential market of our customers has really expanded, allowing us to propose our solution to refreshment chains. Before this project this was just a dream in our minds."

M. Mastacchi – Tecnocassa

SITUATION

The Italian food/take-away and tourism market is increasingly interested in new software solutions, which are still considered quite expensive for SMEs.

The Sales Management Systems (SMS) are typically deployed at the level of the single point of sale. There are few ASP (application service providers) in the field of the SMS and they are using the traditional web technologies to provide services to SMEs.

Tecnocassa and Dominio Italia have integrated the Grid technology in their traditional products. The ability of the Grid middleware to convey standardisation and easy access to the existing software reduces dramatically the costs for the integration of existing infrastructures with the database federation. This can be utilised by SMEs that have specific needs, such as increased efficiency and real-time solutions.

CHALLENGES

The Sales Management System is typically deployed at the level of the single point of sale. In the SME's context, the economic and human resources are insufficient to allow a deep change within the software infrastructure. The commercial activities to which the Cerere-Grid and Dominio8 are addressed are pizzerias, pizzeria chains and tourist harbours with services such as ticket distribution, restaurants, parking boats, etc.

These activities currently use management tools with manual activities or with a low technological level. The introduction of management solutions allowing complete control of the processes, receipts and orders is valuable and increases the technological level of these activities.

SOLUTIONS

The main issue is the "federation" of remote data sources, primarily relational databases. Currently there are some traditional technologies in both Dominio8 and Cerere in order to perform the interoperability. However, the standardisation and virtualisation layer offered by OGSA-DAI allows federation of data in a more efficient and simple way. Moreover, the security infrastructure offered by the Grid middleware is one level over the traditional web technologies.

The user-friendly Grid installer tool developed by the Business Experiment provides the benefits of the Grid technology with no additional installation and maintenance effort. Definitively, the technology excellence of the proposed approach is the seamless integration of the existing software (Cerere and Dominio8) with the OGSA-DAI Grid technology in order to:

- simplify the access to remote heterogeneous databases,
- simplify the transaction security management through the Grid security infrastructure,
- improve the modularity and interoperability of the applications through the adoption of Grid standards,
- exploit the Grid solution in many different application fields with similar data challenges.

The presence of two different pilot applications for the same technology shows the flexibility of OGSA-DAI.

BUSINESS IMPACT

Thanks to the improvement of the existing applications (Cerere and Dominio) with the Grid technology, the software providers are going to offer their products and services to new clients such as medium and big companies, also in the new market sector. For example:

- Tecnocassa is opening to a new market sector related to the food chain distribution companies needing constant data access for an efficient use of SMS tools.
- The Grid-enabled solution will allow provision of advanced services to the tourist spot customers in the harbour, thanks to the connection of the ERP database with the ticket distribution and reservation databases that currently are not available with the traditional technology.
- Dominio Italia S.r.l. is planning to support the SMEs' growth via the reinforcement of their partner relationships.

PERSPECTIVES

The first step has been to test the two Grid-enabled software products with a pizza chain and to more than seventy tourist spots in the harbours. The second step will be to distribute the final version of the implemented products to the market.

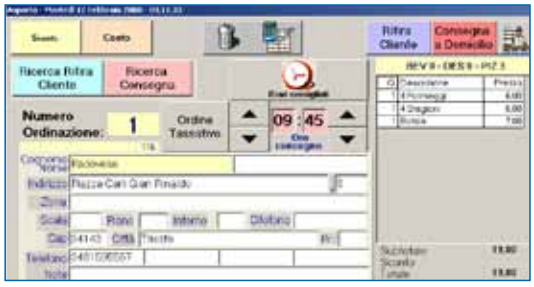
At the moment the applications are ready for a niche market. However, both solutions are unique for their characteristics and it will allow reaching new sector markets that have similar requirements of food and tourism sectors such as logistics companies or stores.

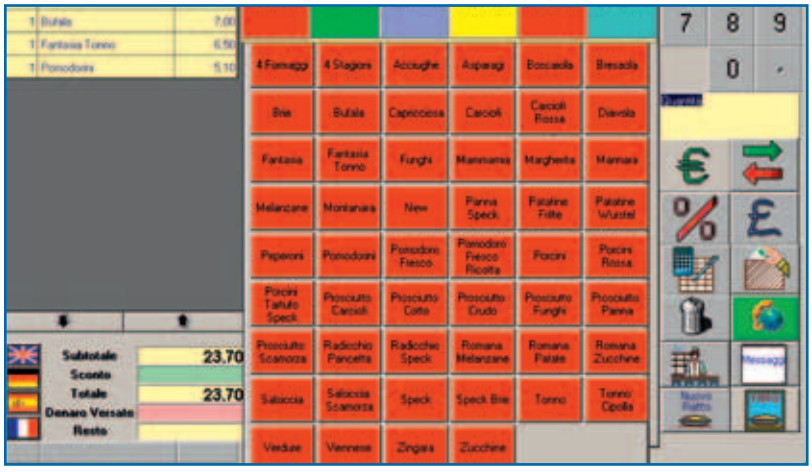
"The Grid-enabled CERERE software developed in the Sales Management System Business Experiment has been successfully implemented by Pizza New. Now Dominio and Tecnocassa are testing the product with tourist spots in the harbours with the objective of soon distributing the final version of the implemented product to the market."

Massimo Busuoli, ENEA

BENEFITS

- To allow the pizza chain owner to have remote control over the single point-of-sale activities, with the capacity to take corrective actions if necessary.
- To reduce the personnel cost for the management activity at the single point-of-sale by providing to its affiliates a remote administration and control service.
- To reduce the delivery time thanks to the capacity to set up a unique call centre for the reception of orders.
- Capacity to perform a centralised statistical analysis over the whole points of sale.
- Capacity of the chain manager to automatically collect the fiscal data from all the points of sale.





www.beingrid.eu/be12.html

PARTNERS

ENEA coordinates the Business Experiment and supports the technology transfer of the experiment, involving **CINECA** for all the technical aspects. CINECA is in charge of the technical management and is supporting the two technology providers, **Tecnocassa** and **Dominio**, in the integration of the Grid technology in their software. **Pizza New** has successfully tested the Grid-enabled Cerere software.

CONTACT

Massimo Busuoli | ENEA – EU Liaison Office
Rue de Namur 72 | 1000 Bruxelles, Belgium
Phone +32 2 5120448
massimo.busuoli@bruxelles.enea.it

TEXTILE GRID PORTAL

"Competitiveness must create value, not undermine wealth. Grid solutions are compatible with these facts."

Gustavo Cametti, Domina

SITUATION

The textile industry is facing several issues: the need for increasing competitiveness, cross-company collaboration and innovation. The low investments in IT technology mean that most of the companies rely on old software for which maintenance is always more difficult and expensive. Domina has developed a Grid portal with the aim to improve and give a single web interface to three applications:

- Production planner: software able to automatically create GANTT production schedules to lower production costs.
- Global resource scheduling: a way to enable companies to collaborate, sharing their production facilities.
- Fabric rendering: strictly connected to the Domina's CAD software, a tool that produces and shares accurate rendering of the fabric in electronic format.

This new model of IT infrastructure will be the beginning of a new kind of relationship between Domina and its customers.

CHALLENGES

The antiquated system imposes many constraints: the customer must pay the costs of the IT infrastructure; there's no collaboration between companies; software maintenance is expensive both for the customer and the supplier. With the Grid portal, the costs are shared: a single hardware and software provider may supply more customers that will take advantage of sharing the infrastructure. But the distributed approach may also give the customer the ability to supply resources, such as databases, if the location of data is considered a serious security issue.

SOLUTIONS

The solution is a Grid portal that supports our three applications. The portal, to the end-user, is nothing more than an Internet site. After logging in, a user will find the applications, a collaborative area, online support and a simple interface that gives him access to the production planner, the global resource scheduler and the fabric rendering software.

With our solution, the barriers (costs, complexity) to running computing-intensive applications will be broken, giving the user the simplicity of a web portal access where he will find his applications in a single environment, in combination with collaborative areas and online support.

Domina, as a supplier, takes care of setting the portal access and interface to new applications. It takes care of buying new hardware in case of necessity or creates contracts to external suppliers. All these actions are invisible to the end user, whose only task is to access the portal's functionalities.

BUSINESS IMPACT

The T&C industry is one of the longest and most complex industrial chains in manufacturing. It is composed of a wide number of sub-sectors, covering the entire production cycle, from the production of raw materials to semi-processed and final products. Benefits to SMEs from focusing on the "core business" are remarkable, as is proved by the experience of large companies. This avoids investments in machinery and assets that are few and not cost-efficient.

Thanks to the experiment's results the end user can better organise his production facilities and increase the level of services in terms of final product delivery. The company will have the opportunity to better collaborate and enhance its production power, lowering its costs in the process, and from the virtual retailing point of view, the final client will enjoy a high level of service.

PERSPECTIVES

The future of the Grid solution will focus on the implementation of the results tested by two end users in textile firms which are already clients of Domina.

This is because for the first time the textile industry can take advantage of Grid-enabled applications for improving business. The three issues on which the experiment was focused were Grid services offered by an extensible portal based on the research projects on Grid technology, such as UNICORE. Grid-enabling textile industry applications may give undiscovered benefits.

The real strategic and financial objectives are to make Domina grow from a small sized software house to a medium enterprise that can offer products, services and consulting specific to textiles.

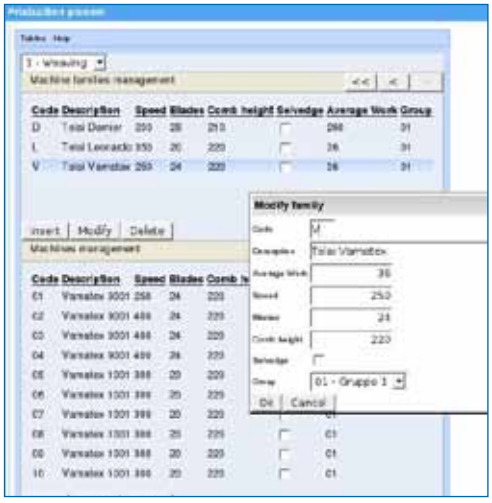
"The application of the Textile Grid Portal Business Experiment was successfully deployed in several textile firms, leading to successful testing and improvements. DOMINA considers taking this opportunity to broaden with new services and consulting activities and new advanced technologies to be integrated into its package."

Gustavo Cametti, DOMINA

BENEFITS

The main benefits for textile firms are the following:

- Reduction of costs and more flexibility, as well as increased quality of production planning and internal MRP due to intelligent and highly flexible production planning and manufacturing systems based on affordable, user-friendly and compatible IT solutions that allow integration with business management systems (internal and external).
- More specialised industrial products as well as personalised consumer goods thanks to efficient management of small orders and production batches, reduction of lead times and control of rapidly changing product parameters.
- More choices for external production, avoiding investments on expensive machinery.
- Ability to find cheaper external resources.
- Reduced number and costs for patterns.



www.beingrid.eu/be13.html

PARTNERS

ENEA – Italian National Agency for New Technologies, Energy and the Environment, in charge of the experiment management, **MARCHI & FILDI SPA** – end user, **LANIFICIO COLOMBO SPA** – end user, **DOMINA SRL** – technical management: implementation of the experiment work.

CONTACT

Massimo Busuoli | ENEA – EU Liaison Office
Rue de Namur 72 | 1000 Bruxelles, Belgium
Phone +32 2 5120448
massimo.busuoli@bruxelles.enea.it

LOGISTICS AND DISTRIBUTION OPTIMISATION

"I was very sceptical but the evidence stated I saved a lot of money by scheduling my production in such an innovative and simple way! Many customers asked me if I had enlarged my fleet because they detected a reduction of delivery time but my secret was this new routing application. I have some ideas in mind, and will talk to Sogea about this very soon."

Francesco Zanna, CFO Felicetti

SITUATION

High efficiency, customised logistics, cost saving and production optimisation are the main challenges that the Small and Medium Enterprises (SMEs) are going to face in the near future as a consequence of global competition. The search for an IT panacea is still going on but these days there are much more advanced tools than in the last decade.

Logistic (L) and Production Optimisation (PO) are assuming more and more importance in the supply chain, but neither frontier technologies nor advanced middleware have been applied so far. The public-private partnership that shook hands within this Business Experiment, led by an Italian software provider, applied new technologies – namely, the Ant Colony Optimisation (ACO) methodology and the Grid middleware, to solve complex problems in avoiding overuse of computing resources, time constraints and best-solution evaluation. The deliverable of this joint initiative is an extremely flexible application that can work with any ERP in ASP functionality and with a wide range of commercial offers (software-as-a-service, pay-per-use, customised Service Level Agreement).

The evident benefits of such applications are:

- [L] Reduction of delivery time
- [L, PO] Reduction of elaboration time by more than 80%
- [L] Cost reduction (vehicle consumption, resources, etc.) by more than 20%
- [PO] Cost saving (machine start-up, lead time, energy consumption, etc.) by more than 25%
- [PO] Increase in the number of best possible solutions

CHALLENGES

The best solution search is generally recognised as a complex process that involves huge computational resources and high-end, costly technology that might require a far-from-the-user application. Most of the applications on the market have a low cost/benefit ratio and are still using deterministic algorithms but no specific methodologies to address the computation power problem. The production and logistic sectors addressing SMEs (even if in outsourcing or in off-shore management) are very particular and in need of applications that are simple, flexible, dynamic, multi-platform, efficient, (clearly) time- and cost-saving, user-friendly and computation-problem free.

Most of the current solutions are proprietary or address few of the above-listed priorities. The production sector challenges are increasing day by day (networked production, lean manufacturing, push-pull material planning approach) and are becoming more and more important for efficiency and speed: the logistic sector is going to assume vital importance in this changing process and has been demonstrated to be a leading cost-saving factor if combined with efficient production planning (e.g., ZARA is one of the most famous cases).

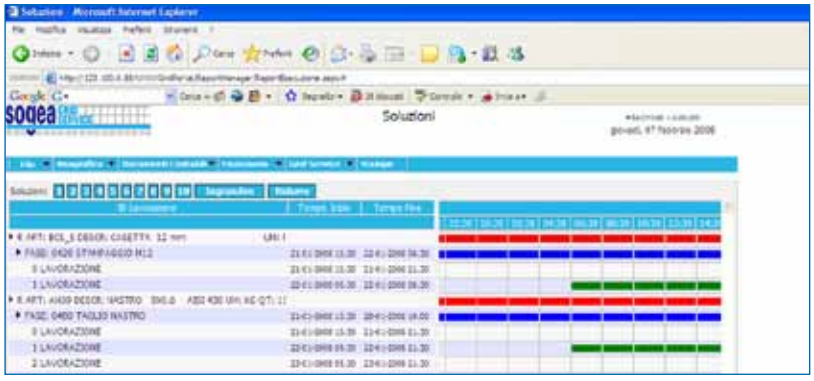
SOLUTIONS

The Business Experiment primarily faced two challenges: finding and adapting an intelligent sort engine that could guarantee robustness, efficiency and best solution search; adopting methodology and tools to avoid the computation resources problem and applying the distributed computing approach.

Each of the partners was engaged in a specific task: Cineca on Grid middleware and distributed computation; University of Bologna on ACO and industrial refinement; Sogea on overall product/service as well as business application and module development. The team's work was then validated by the two pilot users.

The results can be seen and evaluated from different points of view:

- Research: application of ACO to the Enhanced Vehicle Routing Problem and, for the very first time, to the production planning problem.
- Industry: creation of a module/service that can allow customers to be free of computational resource constraints, but instead able to access state-of-the-art technology.
- Business: application developed in Open Source with therefore minor licensing costs; and the commercial offer is service-driven and can be modular.



BUSINESS IMPACT

The business impact can be quite evident in terms of:

- Delivery time: an efficient logistic service is characterised by a fast delivery time to final customer (expected to be reduced by at least 15%).
- Elaboration time: a dramatic reduction of time (80% +) for the scheduling and routing process.
- Cost saving: reduction of more than 25% on production cost (in front of less lead time per product).
- Indirect benefit: the access to advanced technologies with low entry cost and budget, the chance to evaluate different possible solutions before implementation.
- Infrastructure: no investment required on IT platforms or hardware and no need to change IT solution provider.

BENEFITS

Try this new solution and confirm what other companies experienced:

- Elaboration time reduction
- Production cost saving
- Logistic cost reduction
- Hardware and software infrastructure fee
- New technologies and middleware for cheap!

PERSPECTIVES

The first application of such technologies needs a consensus building process. The evolution scenario is quite wide including new features and services for mobility or extended supply chain management. "The customer is always right" and, in many cases, his needs can be easily matched with advanced methodologies in a simple, efficient and user friendly way without big investments. After conventional applications, the one specifically addressed by the project (i.e. production planning and logistic), the near future might see introduction of such service into new fields like Public Administration, Health and Domotics. The soundness of such products shall be evident by industrial cases' feedback and by a good marketing action.

"Sogea's SAI PRO ERP has been further extended with increased functionalities as a result of the Logistics and Distribution Optimisation Business Experiment. A new company was just created, together with the University of Bologna. IPR agreement and alliances are on-going for take-off as soon as market conditions get better."

Anilkumar Dave, Sogea

www.beingrid.eu/be17.html

PARTNERS

Sogea srl – software provider and technical leader of the experiment, **Cineca** – supercomputing centre for public and private research activities, **University of Bologna** – academic institution, **ENEA** – Italian National Agency for New Technologies, Energy and the Environment. Two industrial partners (pilot users) – **Fornara e Maulini** and **Felicetti**.

CONTACT

Anilkumar Dave | Sogea srl
Via E. Reginato, 22 | 31100 Treviso, Italy
Phone +39 0422 2115
anildave@sogeasoft.com

GRID TECHNOLOGIES WITHIN B2B NETWORKS

"Our B2B platform with most suppliers only interacting via browser is like having a very powerful motorbike that can only go at 30 km/hour. Thanks to the GRID2(B2B) project results, we finally see how to drive our motorbike at the very high speed that we need."

Elio Roversi, Supplier Planning Manager at Ducati Motor

SITUATION

B2B networks are formed by a medium-large company, called the starter, that invites its business partners to join its selected B2B IT solution, called the platform. This allows the starter to better manage its supply chain by providing a mechanism to electronically exchange information between network members.

In B2B platforms, browser-based access co-habits with electronic data exchange. The weak point of the currently available B2B platforms is that SME partners invited to join a platform usually connect only through a browser connection, without putting in place any electronic data exchange. This makes the interaction slow and allows frequent human errors. In addition data is updated infrequently, typically only 1-2 times a day, even when some form of automation is available.

GRID2(B2B) addresses the B2B platform market. It has developed a Grid-based solution that significantly empowers existing B2B solutions. The major result, for all companies and especially SMEs, is an easy-to-use kit that can be integrated with B2B platforms and the IT systems of starters and partners. This kit offers near real-time electronic data exchange between the starter and its partners at an affordable price.

CHALLENGES

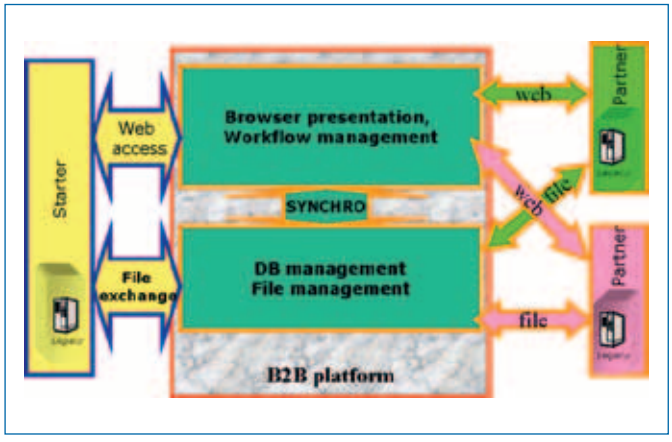
The degree of outsourcing in all industrial sectors has steadily increased in the past 15 years. This makes supply chain coordination requirements very important (especially in manufacturing). The adoption of electronic data interchange (EDI) mechanisms is mandatory in order to effectively manage modern supply chains.

This has driven a wide adoption of B2B platforms especially for supply chain management. Although significant players operate in this market, the great majority of SMEs invited by a starter to join a B2B platform avoid putting in place an electronic data interchange with the platform, due to the high cost of integration and the implied tie-in to one customer only. The result is that the B2B network can't achieve the supply chain coordination objectives because data provided by SMEs are provided with delays, inconsistently and with mistakes. This is the main problem with B2B networks today.

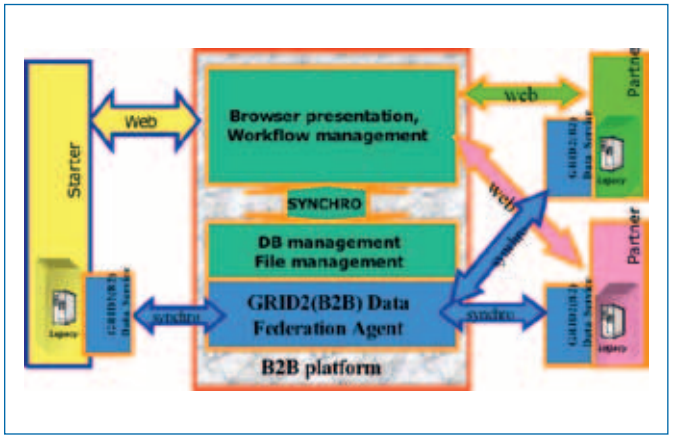
SOLUTIONS

Production planning for a manufacturing plant that is strongly dependent on suppliers is a particular case of Grid computing. Calculation of the optimal customer production plan requires information which is stored across the starter and partner databases. GRID2(B2B) can enhance a B2B platform to directly access data from the databases of the IT systems of all players. This dramatically improves the frequency of data exchange and eliminates data-input errors. It also accelerates the integration of the partner legacy systems with the platform, thus reducing costs to as little as 30% of their current amount. Another benefit of GRID2(B2B) is that it requires no modification to the legacy system user-interface (limited development), thus facilitating adoption of GRID2(B2B), with impact on time-to-market.

The GRID2(B2B) software is deployed as the data federation agent on the B2B platform, and the data service for the end-user legacy systems. The components exploit the capabilities of the OGSA-DAI Trigger BEinGRID component. These components are configurable and give each member of the B2B network total control over what information they share.



Current interaction between B2B network participants



GRID2(B2B) deployment on a B2B network

BUSINESS IMPACT

The business impact of the use of GRID2(B2B) in supply chain management includes the following capabilities and benefits.

Capability for the B2B platform providers to:

- **Increase market share** by offering advanced electronic data interchange.
- **Increase revenue** by selling a new, very desirable, added-value service.

Capability for the starters to:

- **Improve efficiency** through more frequent production reschedules, so as to follow the demands of the market more closely.
- **Cut costs** by automating very time-consuming processes such as goods reception and invoice registration.

Capability for the partners, including SMEs to:

- **Satisfy customer integration** requests at an affordable cost.
- **Cut costs** by automating the import and export of electronic documents, such as orders and plans.
- **Invest in a mechanism** that can be configured to support electronic integration with multiple different B2B platforms simultaneously.

BENEFITS

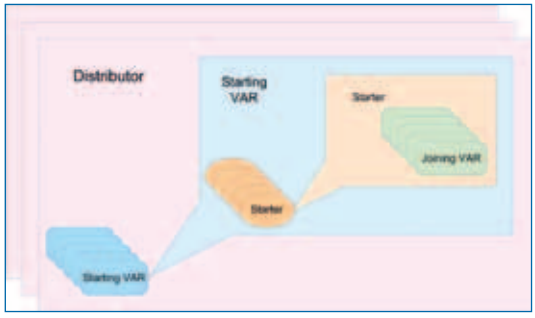
- GRID2(B2B) allows starters to reschedule production and ordering to meet market needs and accelerate goods reception and invoicing.
- GRID2(B2B) is available to partners at an affordable price, with no tie-ins to the platform, and without changing their existing legacy systems.
- Extensive partner integration will attract new starters to the starting VAR platform and increase customer profitability and retention. GRID2(B2B) can offer return on investment in one year for what is already core business for the platform provider.

PERSPECTIVES

The GRID2(B2B) solution consists of applications provided in the form of kits and related support services. The target market is IT companies that already own a B2B platform for supplier management. The kits solve the crucial problem for B2B platform owners of having all suppliers including SMEs electronically connected to the platform, and the kit price is very appealing to SMEs.

The GRID2(B2B) partners are putting in place distributors and value-added resellers (VARs) in major European countries, starting with Italy, Spain and Hungary. GRID2(B2B) is ready to support all distributors and VARs in order to promote the kits in their markets. A viable business model has been developed for the distributors and the VARs, which should help penetrate the market.

We see two types of VARs. Starting VARs are B2B platform owners looking to extend their offering to include electronic integration. They are the distributors' key customer. Joining VARs are IT companies that supply legacy systems to the SMEs. They will be offered free access to their kit, so as to accelerate SME uptake of GRID2(B2B).



The GRID2(B2B) distribution network

www.beingrid.eu/be24.html

PARTNERS

The **Edinburgh Parallel Computing Centre (EPCC)** is expert in data management Grid technologies. **CINECA** is the largest Italian computing centre. **Joinet** is an Italian company whose core business is to provide an ASP B2B platform. Other partners include **Ducati Motor**, the famous Italian sport motorbike manufacturer and its strategic suppliers, **Bentivogli** and **PM**.

CONTACT

Bruno Mussini | Operations Director, Joinet Srl
Via Brini 45 | 40128 Bologna, Italy
Phone +39 0514217511 | Fax +39 0514217550
bruno.mussini@joinet.eu | www.joinet.eu

ENVIRONMENT AND E-SCIENCE

ABOUT THE SECTOR

The Environment and e-Science sector comprises organisations whose products and services are based on the processing of geophysical data. Examples include seismic data to support decisions in drilling for oil and gas field exploration, or atmospheric data captured by satellites to produce daily particulate matter maps.

Other organisations use science applications that perform complex algorithms based on optimisations and simulations with large amounts of data. Examples of such applications include bio-informatics and particle physics.

WHY SHOULD I USE GRID

The main characteristic of this sector is the use of complex algorithms to process massive amounts of data obtained from sensors and other devices. These devices are normally located remotely, necessitating the transfer of data over large distances. Therefore, the products and services required by the sector are data intensive and need large communications capacity to transfer the captured data. In order to meet these requirements, large investments must be made in data processing centres. Typically, these centres are placed as close as possible to the data source to reduce the amount of long distance communications. Despite their high cost – which is beyond the reach of many SMEs and small research centres – these data centres often fail to meet peak load.

For many years, academic environments have been using cluster and Grid computing to perform these kinds of calculations. These solutions often have the ability to dynamically add distributed computing resources owned by associated organisations. This provides a scalable solution which can increase capacity when required to allow mission-critical work to be completed in a fraction of the time it would take at a stand-alone dedicated data centre with limited resources.

The key advantages that Grid technology provides are:

- Increased computing capacity, reducing the time to process and analyse data. Accurate operational and production decisions can be made earlier, product development is accelerated and higher quality results are achieved.
- More effective management of IT assets: optimised use of computing resources and application licenses reduces total cost of ownership.
- New business models, such as SaaS (Software as a Service), allow small organisations access to resources that were previously beyond their budgets.

BEINGRID BUSINESS EXPERIMENTS IN THIS SECTOR

BEinGRID includes three Business Experiments in this sector:

- **Groundwater Modelling with FEFLOW** adds mathematical optimisations to an existing application designed to support decision making in groundwater management and protection.
- **Earth Observation** provides a service to generate global Earth coverage products in near real time and on demand. It is based on GlobAEROSOL, which produces daily global aerosol maps to respond to emerging science and institutional environmental needs.
- **Seismic Processing and Reservoir Simulation** supplies a data processing service to oil and gas SMEs for seismic and reservoir simulation based on the EGEODE VO (Expanding GEOsciences on DEmand Virtual Organisation).

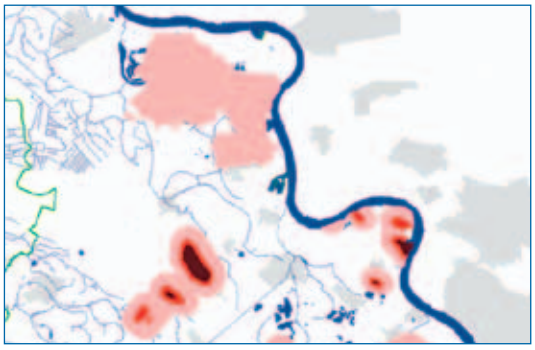
GRID IMPACT AND PERSPECTIVES

The Environment and e-Science sector provides specific services and products based on scientific methods to industrial and research institutions. The value chain is composed of SMEs, large companies and public entities. Because of the need for large investments, in some cases public entities (such as government agencies) act as significant investors and also as customers of the service offered. Given the specific services and products offered, this sector has specific target customers – mainly government agencies, scientific institutions and specialised companies.

Owing to the small and specialised market, it is highly advantageous for companies offering new services to be already established in the industry. This provides a good basis for a profitable market position: companies offering services are able to exploit the lack of commercial competition within the sector. The current concerns over the environmental consequences of climate change are driving interest in preparing for and managing environmental disasters. This is why improving response times and accessing more accurate information have become a focus for the scientific and industrial community. Companies in this sector could also offer access to information not previously available (or affordable) to smaller organisations. However, they will have to compete with other information providers, some of whom freely distribute their results.

GRID-BASED GROUNDWATER MODELLING WITH FEFLOW

"In the past, clients refrained from changing their existing control facilities, because of time and expenses involved. They now get the opportunity to solve such tasks much faster by using Grid technology. The optimised structures can now become practically useful much faster than before."



SITUATION

FEFLOW, the modelling system for subsurface flow, mass and heat transport problems is already used by more than 1000 clients worldwide. It is used for several tasks, such as dewatering, water management, contaminant transport simulation and much more. When it comes to optimisation tasks, a lot of different calculations must be done to get a set of results which can be used for the optimisation. The present hardware and license model provides only very small possibilities. A client can use its own license and do the calculations step by step. This is very time consuming and the optimisation must be done manually. The idea is to use a Grid for solving all the tasks that can be done in parallel.

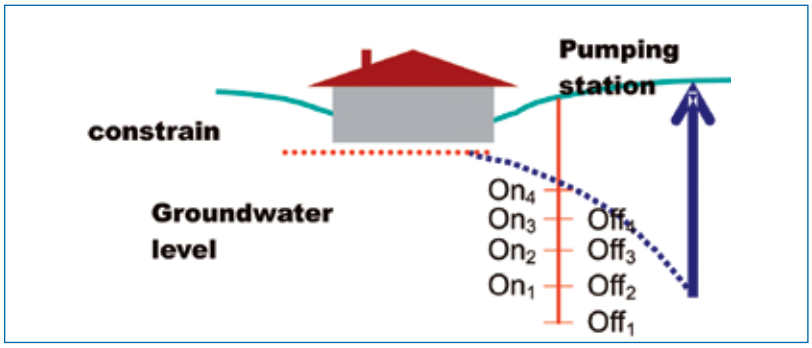
CHALLENGES

The mining industry in particular uses groundwater modelling software for managing the water problems during mining and to reduce the environmental consequences of mining activity. The indirect environmental changes result in high costs even after the mines have closed. The permanent rising energy costs require dewatering regimes with optimised well location and pumping regimes. Every benefit possible from optimisation will generate cost savings year after year.

SOLUTIONS

The implementation of the FEFLOW Grid toolkit is based on the Globus Toolkit 4 (GT4) and can be divided into two major parts. The first part covers the Grid setup. Several SOA services were implemented which enable Grid-based optimisation workflow, simulation and result evaluation. The Grid infrastructure has to be set up once. Afterwards it can be used for different optimisation tasks, because the optimisation problem (including parameters to be modified or methods to evaluate the results as well as license managers) can be configured dynamically. Even simulation resources can easily be accessed via the Grid Resource Allocation and Management (GRAM) without installing any additional services; the availability of FEFLOW supposed.

The second part is the client component. Currently implemented as FEFLOW Interface Manager (IFM) module, a graphical user interface (GUI) can be used



to configure, monitor, and control the Grid job. The GUI can easily be accessed from the FEFLOW user interface and provides access to all Grid job related information. For the next Qt-based FEFLOW Version 6, we aim for the complete integration of access to the FEFLOW Grid.

BUSINESS IMPACT

Many of the clients are already using FEFLOW and they know the advantages of the modelling system. We provide a new facility to all FEFLOW users by offering a middleware and FEFLOW core license which can distribute an optimisation task over a Grid. We can use this solution to enter new markets for groundwater modelling.

Our solution parallelises the very time-consuming calculations and can provide results in a very reasonable time. The results of the optimisation can be used much faster and the savings which can be achieved are much higher than the cost of Grid usage.

To set up FEFLOW via a Grid toolkit means to provide the FEFLOW simulation kernel as SOA (Service Oriented Architecture) to conform as a Grid service including an appropriate user interface. This should simplify the setup of Grid resources and enable the end user to allocate available resources without specific knowledge. Distributed Grid resources – providing the FEFLOW grid service - can easily be used to extend the available resources (hence the scalability) for large optimisation tasks, e.g. by buying temporary Grid computation resources and licenses.

This optimisation can be ordered as a service from a provider, which leads to a remarkable reduction of investment in hardware and software. The client has to pay for a specific service only and these costs totally belong to the specific project. This makes it easy for the client to calculate the costs and he can directly compare the costs with the expected and calculated savings caused by the optimisation.

PERSPECTIVES

The available technology is mature enough to start commercial activities and begin experiencing this complete new market of groundwater modelling. The next FEFLOW major release should have optimised interfaces and licensing facilities for easier and more accurate license handling.

When the solution is developed in an enhanced state and completely documented, it can be distributed as a "box product" involving other Grid service providers.

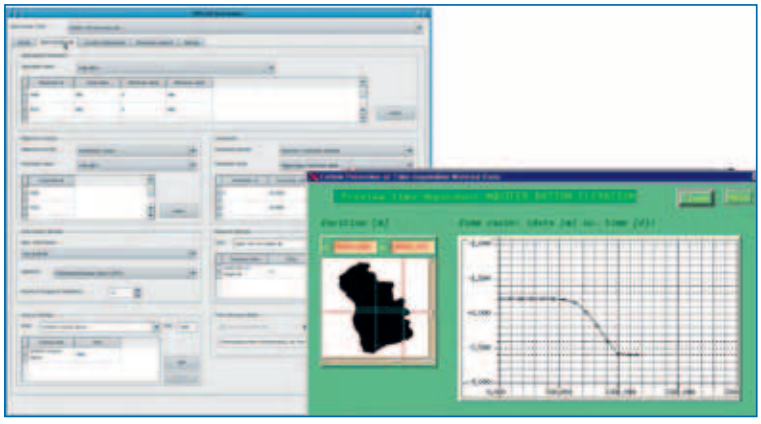
The project will be driven by ever-rising energy costs (petrol, power, etc.) because every rise in energy costs will require even more optimised handling of energy-consuming groundwater management facilities.

BENEFITS

- Time saved in the modelling process.
- Costs reduced during the optimisation.
- Structures optimised for faster production.
- Energy costs reduced.
- Environmental impacts reduced.

"The Grid-based Groundwater Modeling's anticipated business plan has been delayed due to the integration of WASY into the DHI group. DHI-WASY is focusing on a new software release of FEFLOW, and will then integrate Grid and especially new distributed license management functionalities. Prospects for the Grid-based FEFLOW are already identified."

Stefan Wesner, HLRS



HLRS UNIVERSITÄT SIEGEN DHI WASY LINEG BHRI **www.beingrid.eu/be06.html**

PARTNERS

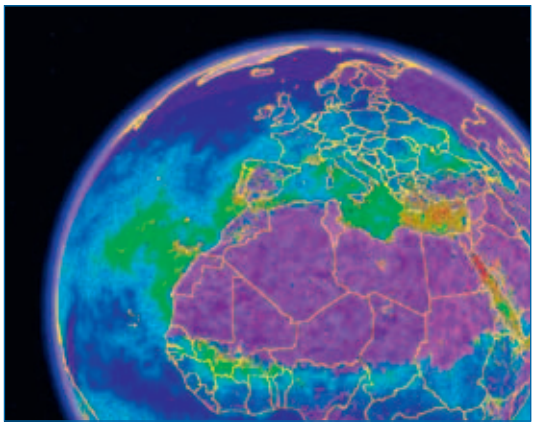
The **University of Stuttgart** – High Performance Computer Centre. The **University of Siegen**. The individual partners (end users) are: **DHI-WASY GmbH**; **LINEG** – Linksniederrheinische Entwässerungsgenossenschaft; **BWA** – Beijing Water Authority.

CONTACT

Peter Schaetzl | DHI -WASY GmbH
Waltersdorfer Str. 105 | 12526 Berlin, Germany
Phone +49 30 679998 0
mail@dhi-wasy.de

EARTH OBSERVATION

"Thanks to our Grid-based solution and to the fusion of EO information, aerosol maps are now available for air quality forecasting and long-term pollution trends, and it is no longer a question of missing information. Now, aerosol maps are promptly generated with the right quality and with operational warranties."



SITUATION

The Earth Observation (EO) domain is characterised by the acquisition of large amounts of data (terabytes) from satellites. This data is used in global, regional or local applications for various uses at different resolutions. These applications often require near-real time access to data for processing of value-added products and dissemination. There is therefore a clear interest in distributed computing and "on demand" computing.

In particular, GlobAerosol measures aerosols at global scale over the world. Aerosols are tiny particles suspended in the air. Aerosol distribution and monitoring is essential to improve the accuracy of air quality forecasting and provide long-term air pollution trends. This information is important for public health and climate change assessment.

This Business Experiment has developed a Grid-enabled solution for producing aerosol maps using the Grid to speed up processing of the huge amount of satellite-generated data necessary to create maps of aerosols.

CHALLENGES

GlobAerosol is an example of an application requiring distributed data access, large computing and storage capability. Computing the aerosol maps requires complex algorithms and information coming from different sources. These algorithms may be tuned at any time, requiring the reprocessing of data.

The EO data is acquired from different satellites with different acquisition modes,creating a challenge for the data storage and availability for processing. Additionally, the data should be generated as soon as possible to generate the near-real time products. The complexity and time execution of the algorithms makes it particularly challenging.

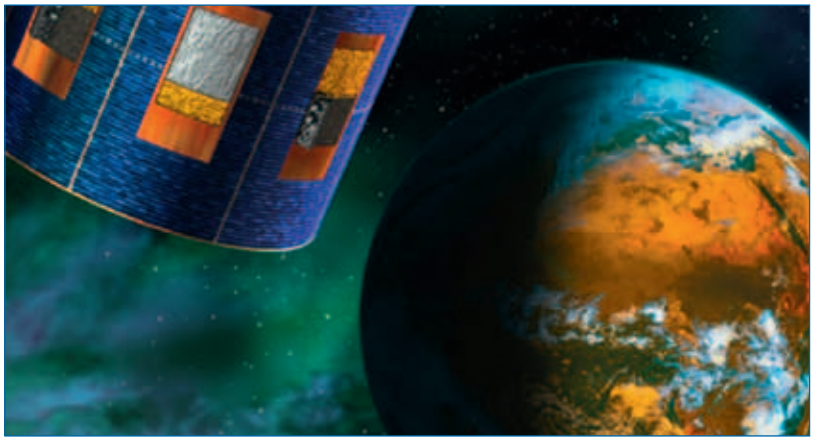
The last problem is the storage and dissemination of the resulting aerosol products; these must be accessible for the end users for long periods.

SOLUTIONS

The use of distributed computing allows for a seamless allocation of required resources. The adoption of parallel service execution made a major difference in performance. Different resources compute different algorithms at the same time allowing the removal of processing bottlenecks with better task management.

Existing SMEs involved in the Earth Observation business can benefit from our experience, lessons learnt and knowledge to increase the performance of their EO services and to develop a more flexible infrastructure.

Grids provide an attractive price/performance compromise for high-performance computing. The effort of machine setup and maintenance can, however, be a deterrent for most SME and occasional users.



BUSINESS IMPACT

The business impacts of the use of Grid in GlobAerosol include:

- Improved Productivity: Results are delivered when they are required through throttling of computational resources. This means urgently required processing can be assigned more resources and turned around in a short time-frame.
- Increased Flexibility: Reprocessing of the maps already generated can be now considered in parallel with the generation of new maps when in the past only one task could be done at a time.
- Increased Reliability: Whenever provision of results depends on one

single node there is a clear concern about disruption of the service. Using the Grid it is possible to warranty that, even in case of failure of some resources, results will be still available.
- Reduced Complexity: Once the Grid is set up, new resources can be added without stopping the complete service chain.

PERSPECTIVES

The GlobAerosol service has been successfully integrated and deployed into a GRID infrastructure and the analysis of the industrial exploitation of the service has been evaluated, making possible an operational service freely accessible to end users and financed by public initiatives such as the Global Monitoring Environment and Security, a joint initiative from the European Commission and European Space Agency implementing public policies at European or national levels that deal with agriculture, environment, fisheries, regional development, external relations, and security.

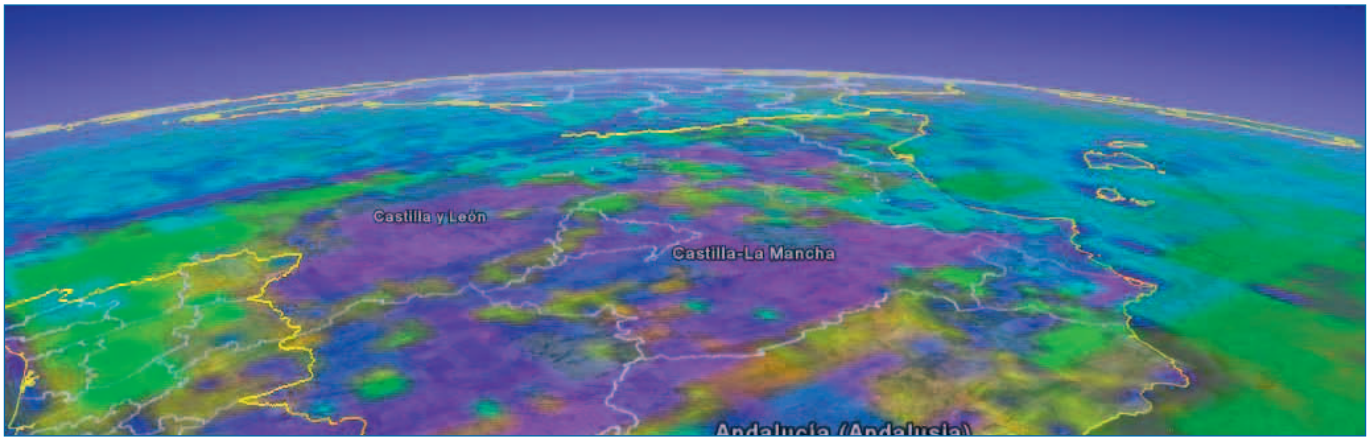
The plan to transfer the business case from a research point to a commercial point presents some barriers mainly associated with the reluctance of users to adopt new technologies.

BENEFITS

The benefits of the gridded GlobAerosol include:
- High quality maps achieved from the fusion of different sources.
- Improved market framework conditions.
- Enhanced end-user choice with the availability of a more complete product.
- A platform to broaden business engagement through extended applications of the maps.

"The data processors used for the Earth Observation Business Experiment have been improved together with an increment in the performance figures due to the use of the Grid. The partners are in a better position to provide real results to end users proving the benefits of using Grid within their business area and therefore can be more competitive providing value added products. Plans to broaden the applicative scope, leveraging on the technology developed, are elaborated."

Antonio Tabasco, GMV



www.beingrid.eu/be07.html

PARTNERS

GMV leads the consortium involving the well-known **European Space Agency**, **Terradue** as Technology Provider, **Atos Origin** providing business consultancy and the Italian **CNR** supporting the evaluation of the results.

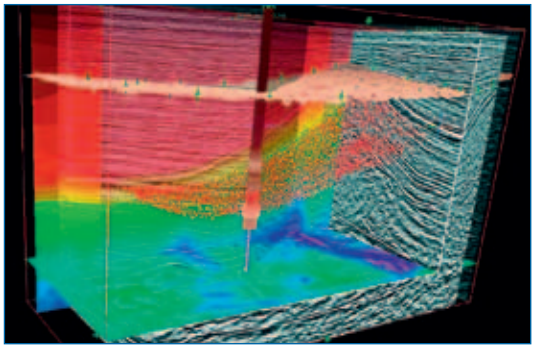
CONTACT

Antonio Tabasco | GMV Aerospace and Defence
Isaac Newton, 11, 28760 Tres Cantos
Madrid, Spain
Phone +34918072100
atabasco@gmv.es

SEISMIC PROCESSING AND RESERVOIR SIMULATION

"The use of Grid tools allowing collaborative work through the Internet appeared to be really valuable for geosciences studies. The online geosciences services allow fast quality control of results and therefore minimise project time."

Thierry Cadoret, TOTAL



SITUATION

World events influence the oil and gas markets and, therefore, the supply and demand of natural resources. Pressures on the markets include the depletion of the North Sea fields and increasing demand from Asian countries. Improved access to unexplored but more difficult to reach regions such as the Arctic zones means oil and gas companies have the opportunity to exploit marginal reserves. Interested petrochemical and exploration companies have to explore promising locations and take rapid decisions. Seismic data processing and reservoir simulations are essential tools in this activity. Seismic data processing delivers images and properties of the subsurface, while reservoir simulations help optimise oil resources.

This Business Experiment has developed geosciences services using Grid technology and the Internet. These services help teams of geoscientists to collaborate and provide easy access to computing resources, the result of which is accelerated problem-solving in geosciences sector. Users of these services in any given location can perform a seismic study using remote computing resources whilst collaborating with geoscientists in a third location.

CHALLENGES

Finding new oilfields, monitoring resource recovery and practicing sustainable development are all incredibly complex tasks. Worldwide collaboration, huge computing power, continuing innovation and cutting-edge geosciences software require large financial investments. Building huge processing centres (each consuming thousands of megawatts each day to process tasks in the thousands of TFLOPS) is an industrial challenge in itself. It is difficult for small companies to make the required investments. In addition, if two geophysicists presently working in different locations were required to work together on the same geosciences project, one of them would have to move to a new location. To improve how they carry out their day-to-day tasks, geophysicists have some fundamental requirements:

- Access to state-of-the-art geosciences software.
- Potential to process seismic data in a shorter timeframe.
- Ability to collaborate with colleagues on the same project, regardless of their physical location.

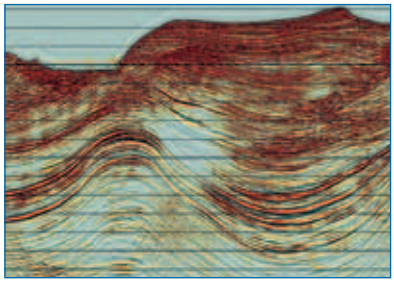
SOLUTIONS

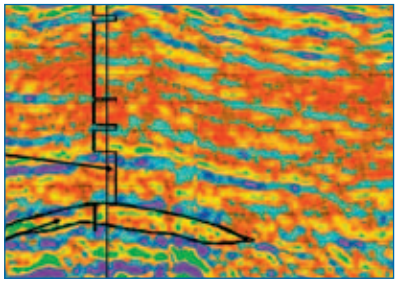
The solution developed by this Business Experiment would be of interest to many geoscientists. Thanks to Grid-based technology, geoscientists have the power to access remote computing resources on demand and create a framework for sharing data and project resources. The same technology allows colleagues at any given location through collaborative tools to work together and make use of the seismic processing software, Geocluster, and generate reservoir simulations with the Dynamo application.

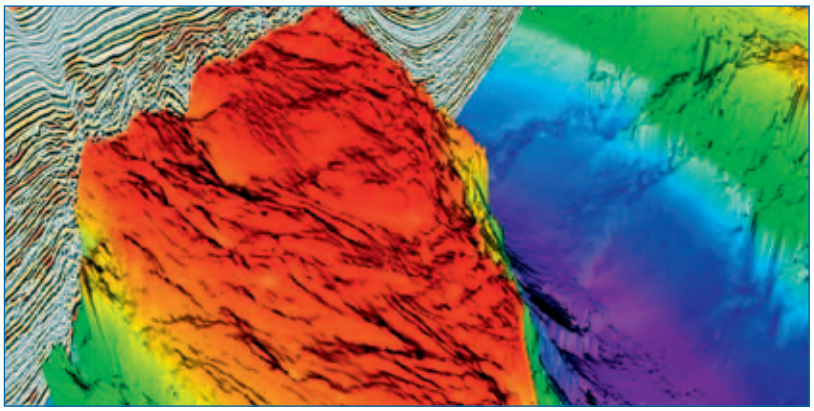
To carry out a reservoir simulations or seismic analysis the user first registers with the geosciences services portal. He transfers his data to the nearest processing centre of the geosciences services provider, across a secure internet connection or traditional swappable storage devices such as disks or tapes.

Using a standard Web browser, the end user can work on his data, use the geosciences Grid-programmes that are available on the Internet portal, and launch processing jobs.

Alternatively, he can delegate his seismic study to a geoscientist and then monitor the process from his portal. At the end of his geosciences tasks, he retrieves the processing results.







BENEFITS

- Enables faster data processing through Grid-computing.
- Provides access to the most advanced software and powerful computing resources.
- Facilitates the exchange of information, and allows for geographically distant colleagues to collaborate on projects.
- Allows pay-per-use for easier budgeting.
- Frees the user from the burden of managing IT.

BUSINESS IMPACT

- Capacity to meet market shifts
- Geosciences services, combined with Grid computing, increase flexibility for organisations by aiding more sophisticated analysis of oil and gas reserves but in a cost-efficient manner. The new technologies improve response time on projects, which shortens customers' time-to-market and allows them to obtain a greater market penetration.
- Simplified administration
- Collaborative tools strengthen data exchange and communication both within and outside the customer infrastructure. They accelerate the decision-making process.
- Cost reductions
- In contrast to a classical IT resource centre, Grid-computing does not require long term IT investments and remove the need for more IT resources. The pay-per-use model enables the customer to consume geosciences services, as needed, without the investment overhead of expensive computer hardware. This model allows companies to adapt to changing requirements and to easily scale as the business grows.

PERSPECTIVES

This Business Experiment profits from the close relationship established between the 4 partners and the early adopters like RWE Transgas (Czech Republic) or Euro-Geologic (Slovak Republic). Our services and underlying technology are continually being improved using customer feedback.

Sending large amounts of data over the Internet can be slow and costly. The solution is to transfer data via the dispatch of removable disks or tapes.

Even if some potential clients may prefer more classical solutions for IT and geosciences needs, they may still be interested in collaborative workflow tools. The geosciences services using Grid technology are aimed at the SME market segment which requires solutions that combine cost savings and flexibility.

"CGGVeritas' gLite infrastructure is maintained and enhanced. The company waits for better market conditions before massively redirecting customers from the existing environment. Currently, CGGVeritas and Petrosoft are marketing the Grid solution to big customers, with an access through the portal developed by this Business Experiment on Seismic Processing and Reservoir Simulation."

Gael Youinou, CGGVeritas

CGGVERITAS TNO NICE PetroSoft **www.beingrid.eu/be18.html**

PARTNERS

CGGVeritas leads the consortium involving **TNO** (reservoir simulation specialists) **NICE** (Grid know-how) and **Petrosoft** (Geosciences software toolbox developers).

CONTACT

Gael Youinou | CGGVeritas
1 rue Léon Migaux | 91341 Massy, France
Phone +33 1 6447 4087
gael.youinou@cggveritas.com

TELECOMMUNICATION

ABOUT THE SECTOR

The companies in this sector provide telecommunications and related services, such as transmitting data, sound, text, voice and video via different channels (fixed line, mobile and wireless, cable, etc.). They can be classified into network operators or carriers (which own their own networks or resell acquired transmission capacity), and service providers (which provide products and services over networks) or both (often the larger companies). Network operators can also be divided into incumbent and alternative network operators. The former are usually long established and offer their customers a wide range of products and services. The latter are often newer and may focus on one particular market segment as a niche player.

Competition in the sector is intense. Companies are under strong pressure because of falling prices for core transmission services and the arrival of new competitors due to the convergence of telecommunications, IT and media. Many of the older companies in the sector have legacy systems and they may not have the speed and flexibility to compete head-on with the new entrants in niche markets.

WHY SHOULD I USE GRID

The telecommunications industry has a double role with ICT, as both user and supplier.

Core business processes and most product and process innovations are enabled by ICT. Therefore, an important part of investment is spent on ICT. Telecommunications carriers have to process massive amounts of data and part of this processing has real-time constraints. These processes, such as network management, traffic control and analysis and billing, consume vast quantities of computing power and lead to sharp increases in demand at peak times. Therefore, they are clear candidates for the internal implementation of Grid technology. Grid technology can significantly increase the performance of intensive computational systems. Other potential applications of Grid are business intelligence applications to analyse customer profiles and support decision-making processes.

Because of the traditional incompatibility of different solutions, the continuous pace of technological innovations, and the high costs of platform investments, operators can find themselves with a diversity of disparate systems. Some of these are under-utilised because they are dedicated to a specific service or application and there is no capability to balance load and easily exchange information across the disparate systems to optimise the use of available resources. If done according to well-defined policies and SLAs, virtualising business-critical applications across a Grid with shared resources can cut costs, achieve greater scalability and flexibility, and increase business agility without losing reliability.

In addition, telcos are looking for new opportunities in the converged markets to transform their business models by moving up the value chain. Taking advantage of a trend towards outsourcing ICT, telcos already offering voice, data and hosting services could provide next-generation infrastructure and services to this emerging market (for instance, virtual private computing resources, on-demand computing or SaaS solutions). As a logical scenario, an internal deployment of Grid should precede the offering of these services to the customers in order to assess its potential.

In summary, Grid computing is a solution that can help telecommunications operators improve their business and solutions in a cost-effective way.

BEINGRID BUSINESS EXPERIMENTS IN THIS SECTOR

BEinGRID includes one Business Experiment in this sector:

- **Telecommunication Anti-fraud Grid-based System** provides an advanced and resource intensive, real-time, inter-enterprise, telecom anti-fraud system in which mobile customers' roaming usage records are exchanged, captured, stored and analysed. Decisions are issued (i.e. alarms, stop service, etc.) automatically after the analysis is evaluated with the aid of fraud detection rules and patterns.

GRID IMPACT AND PERSPECTIVES

Telecommunications operators can play an important role in the Grid market. They own networks and computing resources, have established customer relationships and have accounting and billing expertise. The incumbent telcos have traditionally owned large R&D facilities to implement part of their systems in-house and they know Grid technology because of their participation in Grid research projects over several years. These facts enable telecommunications operators to play several roles in the Grid services value chain. For example, as providers of Grid resources, software or services, or as brokers, consultants or providers of services for billing or authentication, authorisation and accounting (AAA). To complete their offerings, telecommunications operators may need to establish partnerships with other companies, such as independent software vendors and application virtualisation experts.

TELECOMMUNICATION ANTI-FRAUD GRID-BASED SYSTEM

"In confronting the ever-more sophisticated fraud attempts at illegitimate manipulation of telecom services, the early adoption of innovative counter-measures is vital for every telecom company today. TAF-Grids is an attractive package of roaming data exchange and FMS bundle that promisingly addresses persistent, loss-incurring mobile fraud."

Costis Kontopoulos, Research Engineer,
Vodafone Greece

SITUATION

In the competitive telecommunications market, one of the most significant ways for a telecom operator to assure revenue is by controlling revenue leakage. Fraud is a major cause of revenue loss and much of this consists of roaming fraud: when roaming services are used with no intention of paying. Roaming fraud succeeds mainly due to the delays in the cycle of information exchange between roaming partners.

This Business Experiment exploits Grid's ability of sharing resources across different administration domains. Protection is based on online (i.e. real-time) collaborative fraud detection between the partnered mobile operators. Drawing upon the unique features of Grid computing, it provides an attractive solution via a Software as a Service (SaaS) business model.

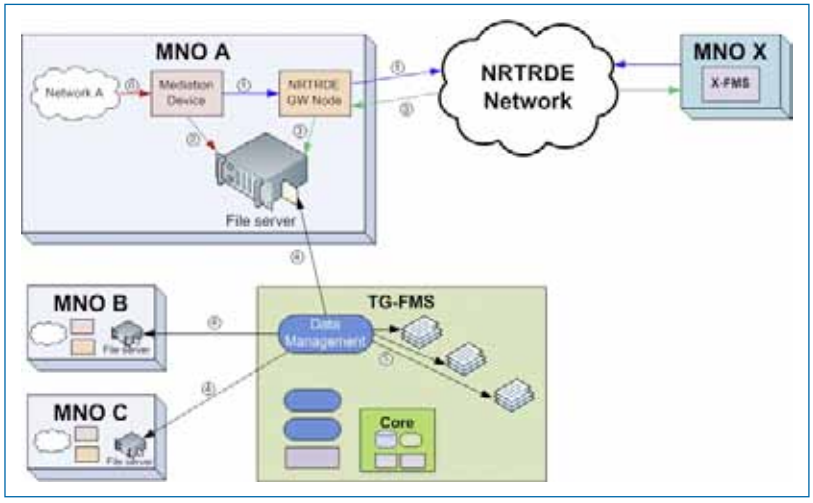
CHALLENGES

Roaming fraud has a significant impact for the following reasons:

- a long delay between the time the fraud is committed and its successful detection by the home network
- higher tariffs for international calls
- real currency loss, as the mobile operator must pay the roaming interconnection operator

Compared to other types of fraud (e.g. access reselling, or use of premium-rate services) it is very attractive to fraudsters, since owing to detection delays they often get away with it. Hence, minimising the time cycles in which roaming partners exchange reports on subscribers' roaming activities is key for tackling this fraud type.

In the face of this global problem, an emerging solution is the Near Real-Time Roaming Data Exchange (NRTRDE) standard, which limits delays in the detection of roaming fraud to four hours. However promising, this still leaves a significant exposure window for fraudsters to manipulate.



Data flow overview

SOLUTIONS

The outcome of TAF-Grids is TG-FMS. Combining a roaming data exchange mechanism and a fraud management system (FMS) in the same service, it is offered to mobile network operators (MNOs) as an SaaS solution.

For an MNO choosing to employ TAF-Grids (with its SaaS advantages) rather than invest in an in-house FMS, the solution addresses all fraud management needs: data collection, fraud detection, monitoring of suspicious activities, rules management. The system is also targeted at groups of operators in partnership, or those affiliated with a larger network spanning a continent.

The innovation of TG-FMS is applying Grid technologies to share data resources across different administrative domains and SLAs – with one goal: real-time fraud detection.

BUSINESS IMPACT

The key business advantages of using the TAF-Grids solution include:

- High FMS performance: a competent fraud centre ensuring highly-efficient and timely detection of roaming fraud threats.
- Powerful technology: fast handling and processing of vast volumes of call event data, based on Grid computing features.
- Adaptability: adaptation to the changing needs of the operators with minimum effort.
- Flexibility: with no overheads for solution maintenance and operation, operators focus only on fraud-protection tasks.
- Attractive TCO: a pricing policy based on a recurring OpEx model and minimal upfront CapEx investments.
- Guaranteed QoS: established by a B2B SLA negotiation.
- Return on investment: predictable, more favourable and more quickly achieved.

BENEFITS

A switch to TG-FMS for a roaming data exchange and anti-fraud needs means joining a winning team that already enjoys:

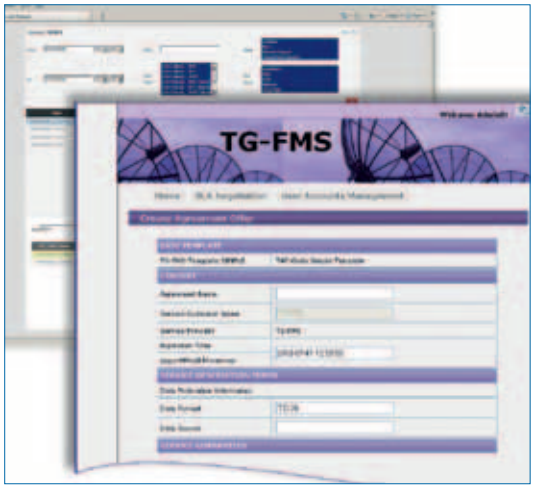
- Real-time and accurate fraud detection of roaming traffic.
- Full NRTRDE compliance.
- Lower cost of ownership and operation through the SaaS model.
- Reduced revenue loss from roaming fraud.
- A better brand image leading to increased customer loyalty.

PERSPECTIVES

The vulnerability of mobile operators to fraud leaves an open space for the introduction of novel FMS solutions that can better secure the interests of mobile operators. This is exactly what TAF-Grids aims at. Despite entering an already competitive market, the TAF-Grids solutions offers several advantages. These include a highly efficient protection system guaranteeing near real-time fraud detection, a versatile SaaS business model in the FMS sector, and novel grid-based technology with all its unique benefits.

Focusing more and more on their core services, mobile operators are shedding the burden of keeping complex and expensive internal systems. Taking into account this trend, as well as the high investment and maintenance expenses of an internally operated FMS, the proposal of a centralised SaaS FMS becomes the best choice for revenue assurance.

The successful story of the initial deployment of TAF-Grids into the telecom market will be a decisive factor for ensuring its attractive competitive offer.



TG-FMS and core application management interfaces

EXODUS e.SOLUTIONS | Atos Origin | vodafone

www.beingrid.eu/be20.html

PARTNERS

EXODUS leads the TAF-Grids Consortium and is developing the TG-FMS application. **Atos Origin** provides the Grid infrastructure. The Greek branch of the **Vodafone Group** is the industrial partner, undertaking the end-user role.

CONTACT

Dr. Dimitris Vassiliadis | EXODUS S.A.
6-10 Farandaton Street | Athens, 11527, Greece
Phone +302107450321 | Fax +302107450399
dvas@exodus.gr

TOURISM

ABOUT THE SECTOR

Tourism is the provision of products and services for people travelling and staying outside their usual environment for less than one consecutive year for business, leisure or other purposes (excluding activities remunerated from within the place visited). These services are classified into four sub-sectors: transportation (airlines, trains, ships, etc.), accommodation (hotels, resorts, etc.), entertainment (galleries, museums, parks, theatres, etc.) and intermediaries (tour operators and travel agencies). The tourism industry contains a large number of SMEs that need a wide range of local support services (entertainment, leisure, restaurants, sport, etc.), usually provided by other SMEs.

In the tourism sector the Internet has had two effects. It has enabled service providers to interact directly with consumers, bypassing traditional intermediaries, such as travel agencies and brokers (disintermediation). On the other hand, it has also provided new opportunities for traditional players to offer value-added services and foster new intermediaries that operate exclusively on line.

WHY SHOULD I USE GRID

The tourism sector has been one of the first to make large-scale use of ICT to reduce costs and generate value. Its application has been focused on reservation and distribution systems to create, develop and globalise the availability of basic tourist services. In the aviation sub-sectors, ICT has been heavily adopted to reduce costs: e-ticketing to avoid paper tickets, customer self-service check-in, bar-coded boarding passes on the passenger's cell phone and RFID for luggage handling. Air travel comprises by far the largest volume of online sales. Airlines can track sales for each service very efficiently and define pricing strategies to maximise revenues.

Other applications, such as ERP, CRM, SCM and knowledge management solutions are used only by a minority of tourism businesses. This is because most of these solutions are costly and tailored for larger companies, and require maintenance skills small companies lack. Therefore, most SMEs in the

sector still perform their internal operations manually.

Despite this low usage, such solutions offer high benefits for the industry. For instance, business intelligence applications can help discover client behaviour patterns, then adjust marketing strategies to their needs and tailor offerings to improve customer satisfaction.

Grid technology can help SMEs in the tourism sector (where the outsourcing trend is strong) to adopt these solutions to automate internal business processes, using flexible and cost-effective business models such as SaaS (Software as a Service). Bigger enterprises can also implement internal Grids to create new infrastructures or consolidate existing ones, lowering IT operations costs and reducing application management complexity.

BEINGRID BUSINESS EXPERIMENTS IN THIS SECTOR

BEinGRID includes one Business Experiment in this sector:

- **Travel CRM** provides CRM and business intelligence tools in an SaaS model for independent travel agencies within a group. The solutions help capture new clients and improve existing relationships, based on better market knowledge through sharing customer preferences across the group.

GRID IMPACT AND PERSPECTIVES

The supply of global reservation and distribution systems is presently highly concentrated in a few global suppliers owned by airlines. Any Grid offering in this sector must be targeted to niche markets with lower ICT adoption levels, mainly SMEs. Tourism companies that don't adopt ICT won't be able to face global competition and might even be forced out of the market. e-Procurement solutions and innovative CRM applications that exploit existing customer databases for marketing purposes will allow Grid providers to implement new business models that can help tourism companies gain a competitive advantage.

TRAVEL CRM

"With TravelCRM, we foresee a tool that will help us manage the data from our clients and providers, converting it into a valuable knowledge bank for us. This tool will definitely help our travel group improve our modus operandi for our members' benefit, linking knowledge of our data. In this case, one plus one is more than two."

Santiago Piña, Viajes Sta Ponsa

SITUATION

Travel & Tourism is a key sector in today's world economy. According to the latest annual research by the World Travel & Tourism Council, the sector generated 9.6% of global GDP in 2008. But competition from Internet travel sites is seizing some of the already small profit margins from travel agencies. Fortunately, there is a gap in the services these sites can offer. Online travel services cannot yet replace the experienced knowledgeable travel agent who, acting as a travel advisor, provides an individually tailored solution to all personal or business travel needs.

Among travel agencies, the ones losing the most to competition from the Internet are the independent travel agencies (ITAs): small travel agencies with one or two offices and a limited number of employees. These ITAs, when they have similar interests, often join together to form a Travel Agency Group (TAG) in order to have better leverage when negotiating contracting conditions with service providers. But even ITAs that belong to TAGs are losing market share to Internet-based travel services.

There are applications on the market that can help businesses analise their processes, improve decision making, maximise profits, and offer in-depth understanding of business operations. ITAs would like to implement such business intelligence (BI) tools but they lack the financial freedom and capability to invest in the new technologies. Also, these tools are of limited use with the small quantities of customer information (CRM data) that a single agency typically owns. CRM data is an agency's most important asset, so agencies are understandably wary about sharing it.

Nonetheless, as ITAs form TAGs to unify their negotiating force, consolidated data in the trust network could achieve the critical mass needed by business intelligence processes to produce valuable analytical reports. The main purpose, then, behind TravelCRM is to create a platform for pooling data from different ITAs, performing massive and secure processing of it, and generating valuable BI for the agencies. This CRM + BI solution, based on federated data, will be marketed in a Software as a Service (SaaS) model.

CHALLENGES

Proprietary CRM solutions can be rather expensive, and the few that are open source require technical staff to deploy them. This is beyond the budgets and expertise of independent travel agencies. Today, only big corporations can make intensive use of existing CRM tools by deploying them in the corporate data centre and using them internally.

Moreover, CRM tools are usually generic solutions that do not take into account the peculiarities of each sector. The few that are customised for Travel & Tourism, like OpenTravelCRM, do not take the ITA/TAG network structure into consideration, and none fully addresses the needs of TAGs.

On top of that, to maximise their usefulness BI tools require large sets of data for data-mining and statistical and predictive analytics. Currently, travel agencies are overprotective about their customer information – their most coveted asset – and do not allow their competition (other agencies) access to it. Nor does there currently exist a solution that would facilitate this by allowing the secure integration of heterogeneous data from several independent travel agencies. In that respect, then, there is little interest from ITAs to invest in these tools when they can only be applied to data that belongs to a single agency.

SOLUTIONS

In summary, TravelCRM aims at enabling data sharing among trusting ITAs under the right guarantees and for the greater common good. The goal is to deploy, on top of a Grid infrastructure, an e-commerce travel solution service capable of integrating and pooling customer data from ITAs in the same TAG group. The solution could then perform massive and secure processing of these data to generate valuable BI for the TAG members. Plus, the solution would be an affordable service offered through a easy-to-use interface requiring no technical expertise from the end user.

Technically speaking, grid technology has met all the challenges. A grid platform can integrate heterogeneous solutions, data sources, and computing resources. It can pool together data from various independent travel agencies (usually, kept in different storage providers), apply the necessary security mechanisms, efficiently run BI processes, and deliver the results. In addition, the affordability of the SaaS business model is a proven natural fit for grid services and meets the financial circumstances of travel agencies (i.e. PAYG).

The TravelCRM grid technology has been developed by the IT Innovation research centre and the company GridSystems. GridSystems brings its Fura platform with optimised distributed computing and data transforming processes, and easy virtualisation and dynamic management of software and resources. IT Innovation's speciality is supporting the infrastructure for B2B collaborations through service provision across organisational boundaries.

TravelCRM is deployed as part of the Valadis travel management solution, which Versys offers through its portal. Valadis and Versys will negotiate with the TAG managers. Locally, TAG managers will be responsible for promoting TravelCRM and persuading their member ITAs to subscribe to the service and allow their CRM information to be used.

BUSINESS IMPACT

Focusing on their core business, small and medium sized travel agencies will be able to profit from the competitive advantage of distributed processing offered at an affordable price, without investing in licenses, equipment or technical know-how. The resulting BI reports will help managers decide what or how to buy from wholesalers. Or run "intelligent" marketing campaigns, announcing offers aligned with expected behaviour based on customer preferences, as well as seasonal or other cycles. This will give agencies the opportunity to learn more about their customers, optimise processes and strategies, and offer high-value personalised travel services, while cutting costs and increasing revenue.

PERSPECTIVES

TravelCRM addresses a very specific market whose needs are not adequately served at the moment by the general, traditional, and proprietary software solutions. Fortunately, the Travel & Tourism sector has traditionally encouraged the adoption of new technologies, and agencies want to offer value-added services to their customers. The market is ready to welcome this solution because it is needed and no other product offers its range of capabilities to SMEs. Today, only big corporations make intensive use of existing CRM tools: they produce enough data and have the financial freedom to afford them. Moreover, existing CRM solutions are not tailored for the travel sector in general and definitely not towards small travel agencies that belong to travel groups.

BENEFITS

- Sharing data will allow the implementation of marketing actions customised for ITAs.
- Sharing data will allow the analysis of the contracting turnover and behaviour of the whole group, improving commercial conditions for ITAs regarding their product providers.
- Customer data will remain confidential, safe and anonymous when included in the BI analysis for developing TAG common strategies.
- TravelCRM will help in the design of marketing campaigns that focus on specific customer needs. The campaigns will be cost effective, as they will target only the customers most likely to respond favourably.
- BI will help decide which new products and services are needed and should be developed.
- TravelCRM can help tourist sector staff to better understand what channels and packaging schemes are most demanded.
- The SaaS business model is attractive and sustainable for all players: Grid providers, technology providers, travel wholesalers, travel agency groups and travel agencies.

www.beingrid.eu/be21.html

PARTNERS

GridSystems and **IT Innovation** are responsible for creating the optimised and Grid-enabled version of CRM+BI processing. **Valadis** is a technology and service provider. **Versys Travel** is an online travel wholesaler that provides services to travel agencies. **Avantours** is a travel agency group (TAG) and our end-user distributor.

CONTACT

Antonio Peña | CEO of Valadis
Edificio Generium | Gremio Cirujanos y Barberos, 25
07009 Palma de Mallorca, Spain
Phone +34 871 949 762 | Fax +34 871 949 763
apenya@valadis.com

AGRICULTURE

ABOUT THE SECTOR

Agriculture comprises the production, processing and marketing of food for human consumption and animal feed. The value chains in the agriculture sector are static and highly diverse, with many SME primary producers as well as large enterprises in industrial food production.

The emerging field of e-agriculture focuses on the improvement of agricultural processes by applying ICT in innovative ways. It faces the problem of distributed systems, high data asymmetry and non-existing standards. The goal is to help stakeholders perform their activities more efficiently by providing them with the tools to manage, process and exchange information and knowledge in a cost effective way.

WHY SHOULD I USE GRID

The main ICT application areas in the agriculture sector are automating internal processes, availability of information systems and creating decision-making tools. These areas are frequently linked.

- The automation of internal processes aims at reducing the resources required to perform tasks and at improving service quality. Examples include the adoption of RFID and the use of software to perform complex data processing requirements.
- Information systems manage the creation, storage and distribution of knowledge to the stakeholders (for instance, through e-commerce services or e-learning platforms).
- Decision-making tools gather information from heterogeneous sources and help farmers decide, for instance, the best use of land, what crop to plant and when, the right amount of fertiliser to use and when, and the best time to harvest the crop. These systems gather data from external sources (weather data, aerial images), internal sources (crop data, soil data, topography, etc.) and sensors (rainfall, climate conditions, etc.).

Grid technologies can provide players in this sector with a high capacity solution for storing and processing information, while preserving data access policies. In agriculture, data resources are normally heterogeneous, small-scale, site-specific and stored in different locations with different owners. This prevents centralisation. Grid maximises data and application usage without data centralisation and eases its update and integration, resulting in time and cost savings.

BEINGRID BUSINESS EXPERIMENTS GRID IN THIS SECTOR

BEinGRID includes one Business Experiment in this sector:

- **Grid Technologies in Agro-food Business (AGROGRID)** offers dynamic services for demand-driven product sourcing to the agriculture value chains, from farm to fork, according to an expressed production need in agreement with announced production capacities.

GRID IMPACT AND PERSPECTIVES

The commercial application of ICT to agriculture in the primary steps of the value chain is at a very early stage. This means there are opportunities, as well as barriers to overcome. The market must be developed. Many potential areas of ICT application are not served by existing commercial solutions. And since many of the companies in the sector are SMEs, they can't afford general purpose solutions not specifically tailored for agriculture. Grid providers can take advantage of this situation to target these niche markets.

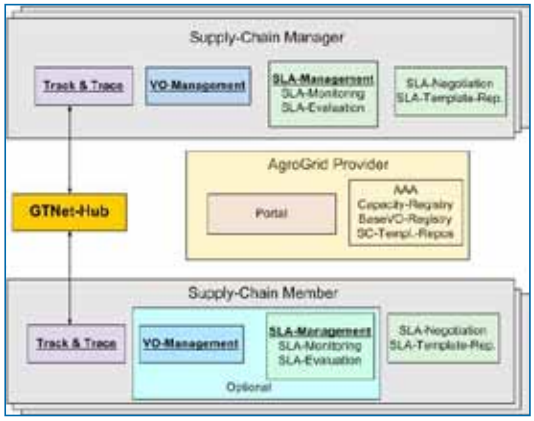
GRID TECHNOLOGIES IN AGRO-FOOD BUSINESS

"TraceTracker is very keen to exploit the service offering based on AgroGrid functionalities. We see significant synergies in combining our core solutions on traceability with components such as automated SLA monitoring and evaluation services, or an offering and negotiation platform. The utilisation of Grid components will help the industry to realise cost reductions while improving product safety and consumer confidence."

Dr. Ulrich Heindl, COO, TraceTracker AG

SITUATION

How can food companies exploit their resources and capacities in a cost effective way? Adopting concepts developed in the field of Grid computing, AgroGrid takes care of this crucial business need and offers a solution for sharing real-world capacities in new dynamic supply chains. Using AgroGrid, a company is now able to publish its own capacities and request other companies' capacities to reach its business goal. A full lifecycle solution,



AgroGrid also enables tracking and tracing of food products along the supply chain.

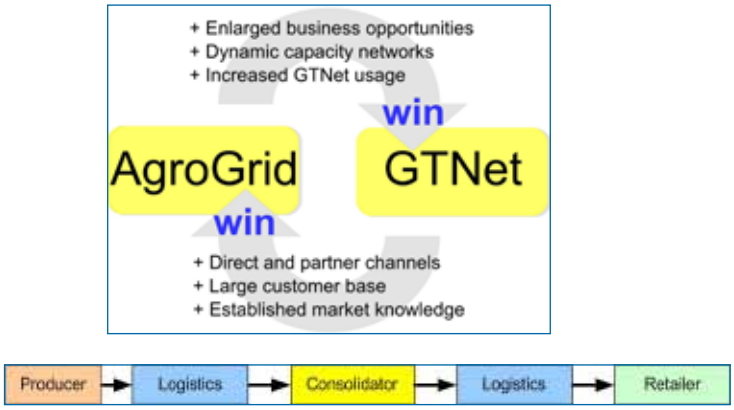
AgroGrid supports its users in all aspects of collaboration, from the early stage of searching a partner, through automated capacity negotiation, monitoring and evaluation of Service Level Agreements (SLAs), to tracing goods during shipment, as well as tracking goods back to their origins. All AgroGrid services are accessible using a standard web browser.

Based on well-engineered Grid service components, AgroGrid was developed by international experts with impressive track records. The University of Zurich provided expertise in Grid security and architectures. The High Performance Computing Centre of Stuttgart contributed to SLA handling. And the University of Hohenheim dealt with the management and coordination of dynamic supply chains. The industrial partner TraceTracker has provided its market-leading tracking and tracing system GTNet®.

CHALLENGES

Today, enterprises in agribusiness supply chains mainly interoperate in fixed partner structures with long-term contract relations. As a result, short-term peaks in supply and demand cannot be accommodated by using supply chain management systems involving all market partners and providing a full lifecycle concept. Thus, today's capacities cannot be exploited in an economically efficient manner, leading to higher levels of wastage in the food chain than is strictly necessary.

Additionally, a trend with changing consumer demands can be observed over the last decade. Besides focusing on price, quality, variety, and delivery time, consumers pay increasing attention to product innovation, individualised food, and food safety. To be able to satisfy these consumer demands, a marketplace is required that brings market players of different background and size together, imposes only a minimum level of entry barriers, facilitates electronic interchange across business boundaries, improves food chain management, and enables tracking and tracing of food products from one end of the supply chain to the other.



SOLUTIONS

AgroGrid establishes a Grid-enabled marketplace that allows companies operating in agriculture food markets to offer and source capacities, negotiate SLAs and create dynamic supply chains. It also provides the means to monitor quality and safety of food products delivered across supply chains, based on the distributed tracking and tracing capability of the GTNet® platform. The monitoring information is automatically compared against negotiated SLAs and SLA evaluation reports are generated.

(AGROGRID)

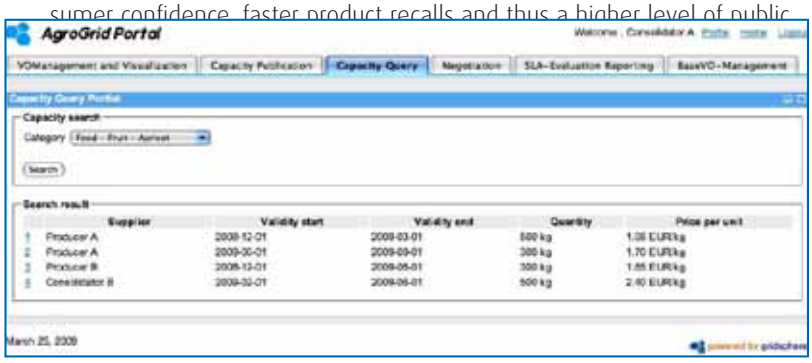
AgroGrid services can be accessed via the AgroGrid web portal. This provides a common user interface and personalised access to manage dynamic supply chains, negotiate SLAs, and access monitoring information and SLA evaluation reports. AgroGrid strictly follows the software-as-a-service paradigm. This means no local software installation is needed, the software is platform independent and it requires only a standard web browser on the client side.

The AgroGrid platform enables companies to deploy unused resources in a profitable way and lowers the transaction costs of collaboration in dynamically formed supply chains. At the same time, it enables gap-free tracking and tracing of food products to support quality assurance and to ensure food safety.

BUSINESS IMPACT

When fully implemented and utilised, AgroGrid services will result in the following business impacts:

- Enable companies in the food industry to profit from a solution that manages dynamic production capacity markets in the agricultural segment, with integrated tracking and tracing, automated SLA-monitoring and evaluation components.
- Establish a platform for AgroGrid users to offer, negotiate, and book available production capacities.
- Enhance complicated traditional business processes through dynamically creating VOs to rationalise processes and reduce the overall costs of providing services for various market levels.
- The AgroGrid service provider combines the strengths of dynamic capacity networks with a leading solution for tracking, tracing and collaboration in food markets.
- The utilisation of the AgroGrid services leads to a positive impact on consumer confidence, faster product recalls and thus a higher level of public



BENEFITS

The benefits for companies using AgroGrid services include:

- On-demand visibility of available production capacities.
- An efficient tool to manage product offering, transaction negotiations and actual purchase of available production capacities.
- Cost reductions for sourcing and quality management.
- Improved ability to manage product recalls.
- Tool to drive differentiation and consumer confidence.

PERSPECTIVES

The AgroGrid service in combination with the GTNet® traceability solution creates an innovative approach to the industry. In the initial phase of market introduction pre-selected companies will be approached. For successful commercialisation it is important to win members in a value chain who can drive the utilisation of the services offered. The most promising strategy is to launch the product with brand owners or private label owners.

The AgroGrid solution is suitable for any market reflecting a full supply chain for an agricultural food product. This includes logistic providers qualifying for a proof of concept project as well as for subsequent commercialisation. A focus on food manufacturers and on market segments with sourcing problems, such as product quality issues or raw material availability, is considered decisive for a successful market introduction. The main objective for the early commercialisation phase is to establish a proof of concept project with a leading industry partner.

University of Zurich
Department of Informatics

H L R S

tracetracker®

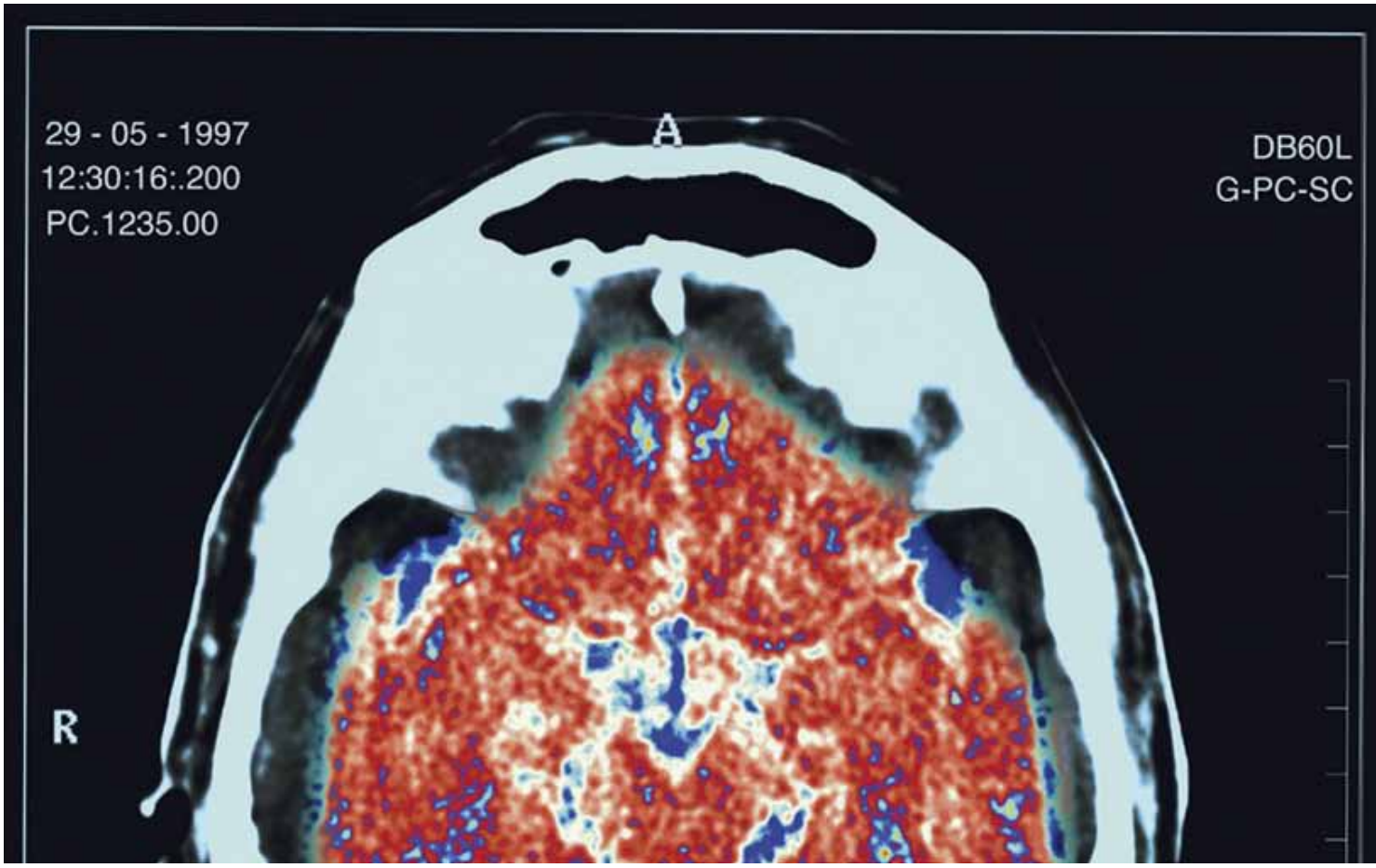
www.beingrid.eu/be22.html

PARTNERS

Consortium leader **University of Hohenheim** is handling the VO integration. The **University of Zurich** is integrating the portal. SLA management and evaluation is being managed by the **High Performance Computing Centre Stuttgart**. The industry partner **TraceTracker AG** is integrating its GTNet® solution.

CONTACT

Ansger Jacob | University of Hohenheim
Schwerzstr. 35 | 70599 Stuttgart, Germany
Phone +49 711 45924044 | Fax +49 711 45922961
ansger.jacob@uni-hohenheim.de



HEALTH

ABOUT THE SECTOR

The health, or medical, sector deals with the detection and treatment of illness. The cost of health care is expected to significantly increase in the next years. This is due to demographics (according to the European Commission, in 2051, almost 40% of the EU population will be over 65) and the higher complexity of medical interventions, technology and treatments.

ICT must play a key role in reducing treatment delays and improving service quality and affordability. eHealth services are cost-effective solutions for prevention and continuity of care, supporting mobility and patient autonomy.

WHY SHOULD I USE GRID

In the medical and health sector, the most important areas of ICT application are information systems, imaging systems, biomedical research, and treatment planning.

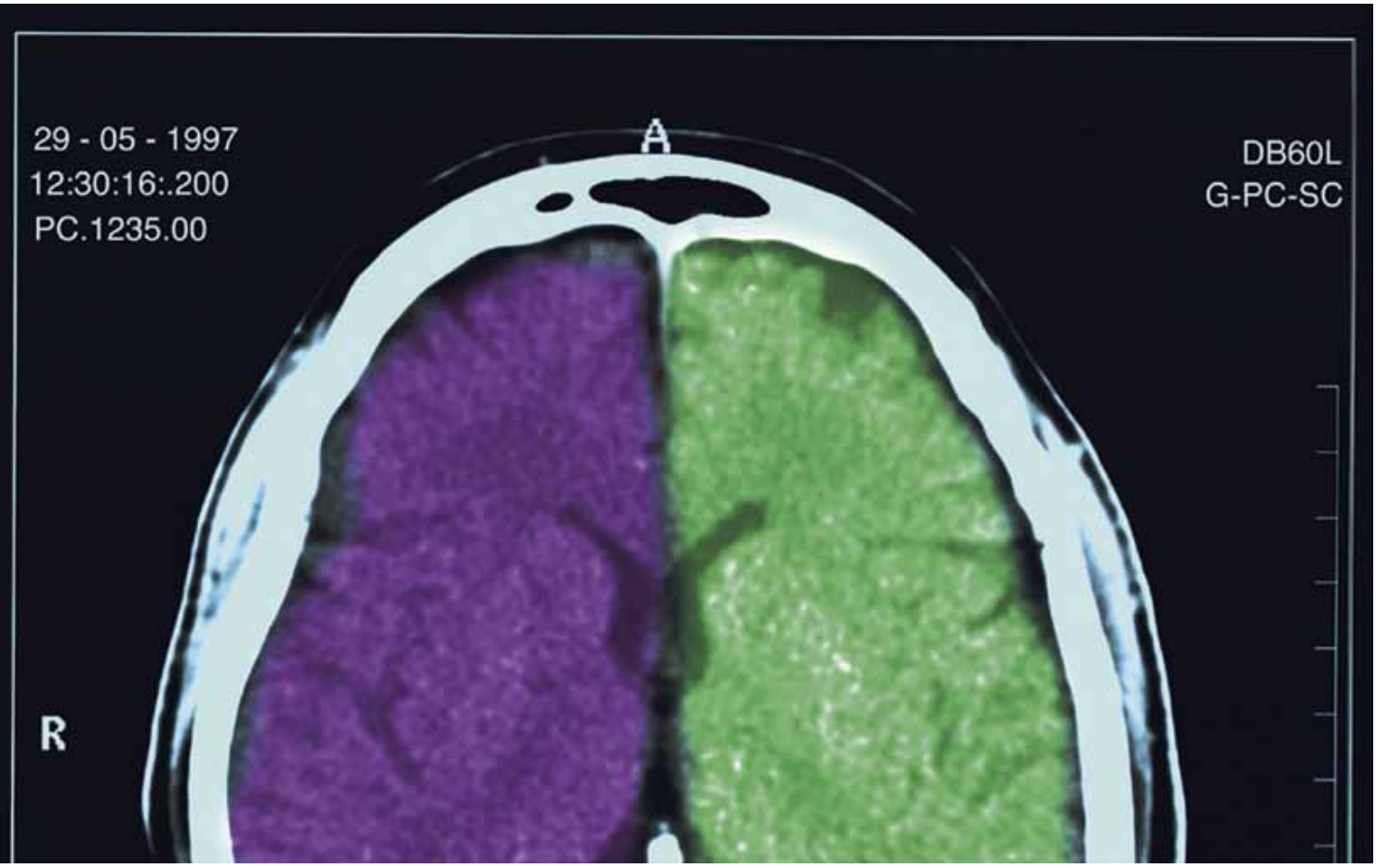
The information systems are applied in managing and administrating health centres and other services, as well as for clinical usage. These systems must acquire and handle huge amounts of data and provide channels to share this information. Examples of use are: supporting tools for medical decisions, information transfer and collaboration; e-prescribing; and medication management. Currently, patient record information systems are needed that allow information exchange between hospitals. The better availability of patient data can significantly improve workflows and business process efficiency.

The imaging systems are the basis for diagnosis and offer enhanced visualising, archiving and communication methods.

The analysis and simulation of medical treatments and research on diseases and drugs requires high-performance computing and extensive scalability to run computationally intensive applications. For instance, treatment planning systems are used to calculate the best dose that cancer patients should receive during a course of radiotherapy treatment.

On top of these basic areas, added services can be provided. These include telemedicine, 24/7 monitoring and diagnostic services in the field, and exchanging information between centres, researchers and others.

The health sector, in particular, should benefit from Grid. It requires rapid, high capacity data and computing within complex IT ecosystems. It must



adapt to changing needs, different applications and data confidentiality. Grid is already being used to create networks of medical centres and hospitals to share information for clinical analysis, run clinical simulations and research on cancer research, conduct drug discovery, etc.

BEINGRID BUSINESS EXPERIMENTS IN THIS SECTOR

BEinGRID includes one Business Experiment in this sector:

- **Enhanced IMRT Planning Using Grid Services on Demand with SLAs (BEinEIMRT)** provides new tools to hospitals for verifying and optimising radiotherapy treatments as a complement to existing local treatment planning systems, adding SLA and end-to-end security.

GRID IMPACT AND PERSPECTIVES

The barriers to the deployment of ICT solutions in the health sector are the costs, the high reliability requirements, data confidentiality and the lack of interoperability in existing solutions. Information needs to be protected from unauthorised access or use, and against loss or modification. Concerning interoperability, service providers use different manufacturers and technologies. Moreover, within Europe each country has different regulations and systems.

Health centres and government institutions must adopt more cost-effective procedures to cope with increasing demand for health services. This represents an opportunity for more flexible, effective and affordable solutions and business models, such as Grid-based offerings. Grid can have an important impact in this sector. A cost-effective solution, the higher capacity and faster performance of complex, computation-intensive tasks means that simulations and analyses are more reliable. Lastly, Grid already incorporates the required mechanisms to satisfy data confidentiality requirements.

ENHANCED IMRT PLANNING USING GRID SERVICES

"An e-IMRT platform will provide us with additional information that will allow us to improve radiotherapy treatment quality at an affordable cost."

Miguel Pombar Cameán, Medical Physics Dept. Manager, Santiago de Compostela University Hospital Complex

SITUATION

Cancer is Europe's second largest killer. One of the most common and effective treatments is external radiotherapy, where a linear accelerator (Linac) is used to attack the cancerous tissue with radiation delivered from several different directions. The treatment plan – the direction, size and length of dosages – has to be carefully calculated to avoid damaging healthy tissue. These calculations can take a long time – speeding up this process would allow more patients to be treated, and earlier.

Based on Grid technology and services, this Business Experiment has developed a solution that helps hospitals plan the best possible treatment for each patient. It has two core functions: plan verification using accurate but computationally-expensive techniques, and searching for optimal treatments. These tools improve the efficiency and effectiveness of planned treatments as well as reducing the overall cost of treatment planning.

CHALLENGES

External beam radiotherapy treatment must be determined uniquely for each patient. This requires complicated and lengthy calculations and, in some cases, experimental validation before delivery. Currently, such calculations are run locally using proprietary software. Reducing the length of time required to perform the calculation or improving its accuracy will increase quality, efficiency and satisfaction with the treatment procedure.

To help plan treatments, medical physicists demand algorithms based on Monte Carlo simulation, which are accurate though computationally costly, and other cutting-edge tools. However, hospitals have limited computing capacity (it is not related to the hospital's main business) and radiophysicists are scarce. As in other health areas, the fast translation of powerful new techniques into hospital procedures is challenging and demands disruptive information technology solutions.

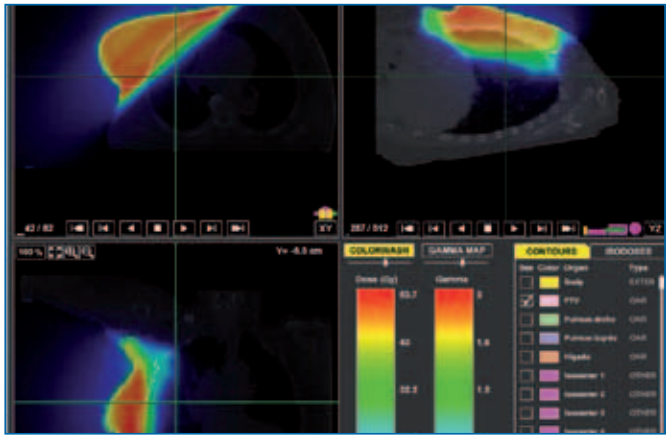
SOLUTIONS

The new solution for helping physicists plan radiotherapy treatments, e-IMRT, is based on massive remote computational capacity using Grid. It has two core services:

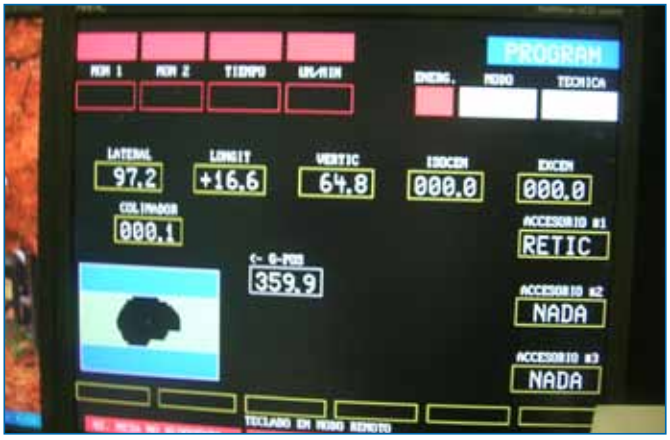
- Verification of treatments. Using Monte Carlo simulation, the treatment is re-calculated and compared with the treatment planning system result. This allows detection of hot areas (which can be dangerous for the patient) and low-dose areas (which may not be enough to cure the cancer).
- Search for treatments using optimisation. Based on the computed tomography scan of the patient, the treatment prescriptions, and other constraints, the solution will produce several alternative treatment plans (Linac positions and dosages) which can be analysed and downloaded.

Both services work in unattended mode: the medical physicist defines the problem, submits it, and disconnects. The service performs the computation, managing all the distributed calculations. When the solution is ready, an email is sent. However, the current status of the computation can be checked at any time.

e-IMRT gets new resources dynamically to attain quality of service using WS-Agreement protocol. It also uses security service-oriented components to assure confidentiality.



Verification dose map for breast cancer generated by Monte Carlo



Accelerator control panel

ON DEMAND WITH SLAs (BEinEIMRT)

BUSINESS IMPACT

Outsourcing processing to a Grid resource provider has multiple advantages:

- Flexibility. The proprietary or service contract model is replaced with a pay-per-use model. The hospital only pays for the really needed service, and can adapt usage to both budget and demand by scaling up or down computing resources as necessary.
- Fast deployment. The service provider can implement and deploy new developments coming from the most advanced research, providing all hospitals with access within a short timeframe. This will speed up the adoption of new radiotherapy techniques.
- Improved treatment quality and effectiveness. The solution allows the execution of algorithms with a greater degree of accuracy, which improves the quality and effectiveness of the cancer treatment plans.

PERSPECTIVES

The solution has demonstrated the proof-of-concept of using on-demand, remote computing capacity through the Internet to bring innovative services to hospitals with radiotherapy facilities, while maintaining a high level of safety, reliability, security and trustworthiness, all crucial for any health solution.

The future of radiotherapy treatment planning must be based on open solutions provided through the Internet and requiring high computing capacity. Both services and computing could be provided on-demand with quality of service and improved security.

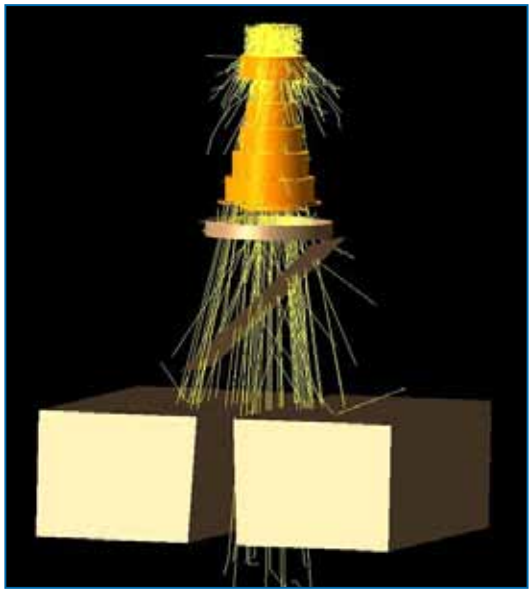
The concept should be applied to other radiotherapy classical techniques, such as brachiterapy or the recently developed image-guided radiotherapy (IGRT) and hadrontherapy.

REFERENCES

- A. Gómez, et. al. "Monte Carlo Verification of IMRT treatment plans on Grid" , in From Genes to Personalised HealthCare: Grid Solutions for the Life Sciences, Proceedings of HealthGrid 2007, Nicolas Jacq and others, eds., IOS Press, 2007
- J. Pena, et. al. "eIMRT: a web platform for the verification and optimisation of radiation treatment plans", Journal of Applied Clinical Medical Physics, Vol 10, No 4 (2009).

BENEFITS

- Hospitals that exploit these services will benefit from a number of advantages.
- Algorithms can be executed much faster.
- Algorithms can reach a greater degree of accuracy.
- A pay-per-use model can be used for proven radiotherapy treatment plan services.
- Virtual verification of treatment plans with Monte Carlo simulation can be performed in a few hours.
- Treatment plans can be sought in several modalities (IMRT, CRT and a few levels) simultaneously.



Simulation of the accelerator head by Monte Carlo

www.beingrid.eu/be25.html

PARTNERS

CESGA is developing SLA-GridWay integration, provides infrastructure, and leads the consortium. **USC/GIR** develops solutions for radiotherapy. **UVI/GTI** provides user interface technology. **UCM/DSA** contributes with the GridWay. **IDCHUS** acts as final user and validates the solution.

CONTACT

Andrés Gómez Tato | CESGA
Avda. de Vigo S/N
15705 Santiago de Compostela, Spain
Phone +34 981569810 | Fax +34 981594616
eimrt@cesga.es

SEVEN CAPABILITIES FOR SERVICE-ORIENTED

Technologies such as Web services based on service-oriented architecture (SOA), Grid computing and more recently Cloud computing, which we classify under the general term service-oriented infrastructure (SOI), form the basis of the technology tool-box utilised in modern enterprises. As Cloud computing matures we expect these strategies to increasingly involve outsourcing models that integrate in-house and in-cloud services or that integrate services hosted in different Cloud computing platforms.

However, there are still disparities between the research and technological advancements of the last decade in SOI and its uptake by the market to the extent that technological innovation is applied to bring real improvements in everyday business. BEinGRID tackled this gap by understanding the commercial requirements for SOI use and applying these technologies in a commercial environment involving software vendors, IT integrators, service providers and end users. The 25 Business Experiments in diverse economic situations helped us to understand and extract common requirements and validate the designed and developed solutions.

Technological innovation in BEinGRID focused on areas where either we witnessed significant challenges that inhibit widespread commercialisation or where the anticipated impact of the innovation ("innovation dividend") is particularly high. Common capabilities (i.e. services capturing reusable functionality of IT solutions) have been applied to tackle challenging business problems and were validated in real-life business trials covering most European market sectors. For more information on these solutions please refer to the book "Service Oriented Infrastructures and Cloud Service Platforms for the Enterprise" by Theo Dimitrakos, Josep Martrat and Stefan Wesner, published by Springer in late 2009.

1. MANAGING THE LIFECYCLE OF B2B COLLABORATIONS

Identifying and selecting business partners (based on reputation and suitability of services) from an available pool of service providers or consumers, and creating and managing a circle of trust among the partners are often identified as the most significant recurring expectations of future technological support for managing business-to-business (B2B) collaborations.

Developed by CRMPA and BT Innovate & Design for the BEinGRID project, the "Virtual Organisation Set-up" common capability offers a standards-based foundation for business solutions to these problems. This capability facilitates the identification and selection of business partners engaging in B2B collaborations; the creation of a distinct context for each of these collaborations; the creation and lifecycle management of a distinct circle of trust amongst the business partners involved in each collaboration; and the binding of each collaboration context with the corresponding circle of trust.

A difference from alternative solutions is that trust between partners can be aligned with consumer/provider relationships, therefore supporting the evolution of a circle of trust towards a trust network that reflects supply network relationships.

This capability has been trialled in pilot projects including one on a virtual hosting environment for distributed online gaming, and one on supply chains in agriculture.

2. FEDERATED IDENTITY AND ACCESS MANAGEMENT

According to a market analysis report by Gartner in 2009, the need for security for agile business operations is so strong that, despite the worldwide economic crisis – or possibly because of it – security aspects such as identity and access management (IAM) remain a critical investment for enterprises of all sizes and market sectors. Through increasing business-level visibility led by data-breach headlines, security spend continues to rise and take a growing share of overall IT spending.

- A team of security experts in the BEinGRID project developed an innovative solution for identity brokerage and access management in multi-administrative environments that span multiple trust domains. The solution combines several primary security capabilities including the following:
- An identity broker that helps to establish trust and federate identities between trust domains, and can adapt the authentication scheme used to the context of each collaboration.
- A distributed access control and authorisation service allowing groups of service-level access policies to be enforced in a multi-administrative environment, while ensuring regulatory compliance, accountability and auditing.
- A policy-based security gateway that enables the secure exposure of services, the integration of other security capabilities, and the enforcement of security policies, and that facilitates the governance of service-level security and usage policy.

A prototype of this solution was developed for the BEinGRID project by BT Innovate & Design, on top of commercial security capabilities by Axiomatics, Microsoft and Vordel. It was a finalist in the "Innovative Research and Development Project of the Year" category of the BCS Industry Awards in 2009.

These security capabilities have also been validated in two Business Experiments: one in Virtual Hosting Environment for Distributed Online Gaming, and another in eHealth demonstrating the secure integration of an in-cloud HPC capability into a regional network of hospitals in Spain providing the processing of radiotherapy analysis results.

3. MANAGING LICENSES IN VIRTUALISED ENVIRONMENTS

Technological innovation in how software licenses are provided and managed throughout the service lifecycle is necessary for enabling commercial applications from independent software vendors (ISVs) on SOI and Cloud computing environments. SMEs, especially from the engineering community, stand to profit from this.

The absence of a means offering controlled access to a local or remote licence server that is suitable for HPC utility and in-cloud hosting limits the use of commercial ISV applications in these environments. The licence management architecture (LAM) capability developed in BEinGRID by T-Systems and Fraunhofer SCAI is the first complete solution for HPC utility or Cloud platforms that solves this problem. LMA is architected as a bundle of capabilities, which combined enable the management of software licences for shared resource use.

LMA is generic, independent of specific middleware choice, and features cost-unit based accounting. In combination with secure access to the licence server, LMA facilitates the non-interruptive business transition to pay-per-use models while supporting the current legacy technology used to manage software licences.

Aspects of LMA have been validated in various HPC utility contexts. One is a pilot project demonstrating the use of a large-scale multidisciplinary compute Grid to generate cost-effective and optimised solutions for water management. Another is a pilot project that demonstrates a solution to reduce the technical and economical risks implicit in large and complex shipbuilding projects.

4. MANAGING SERVICE LEVEL AGREEMENTS

Quality of service (QoS) is in essence about a set of quality metrics that have to be achieved during the service provision. These metrics must be measurable and constitute (part of) a description of what a service can offer. The QoS of IT services is often expressed in terms of capacity, latency, bandwidth, number of served requests, number of incidences, etc. The QoS of services offered to the customer is sometimes expressed as a package (for example bronze, silver, gold) and in relation to key performance indicators (KPIs). In this case, a match between the elements of the scale and measurable metrics relative to the service is provided. A service level agreement (SLA) defines the QoS of the services offered.

BEinGRID has developed a bundle of capabilities for managing SLAs that can enhance common Grid computing platforms with a comprehensive environment covering the full lifecycle of SLAs for the use of ICT resources and services. One such example includes the first implementation of a comprehensive SLA framework on top of the Globus Toolkit – an open source Grid computing middleware commonly used in large-scale science projects and some commercial applications. This capability was developed by a team of experts led by Atos Origin Research & Innovation.

Such a comprehensive environment for SLA management over Grid middleware provides a number of business benefits. These include optimising resource allocation and use in response to market requirements; reducing total cost of ownership by improving the efficiency of resource utilisation and by faster and better-targeted response to failures; increasing customer confidence through transparent operation (subject to the SLA); and enabling customisable billing by providing finer granularity of accounting and reporting. These results have been validated in various Business Experiments in different vertical market sectors, including pilot projects in the area of Virtual Hosting for Online Collaborative Gaming and eHealth (in-cloud radiotherapy analysis processing).

5. MANAGING DISTRIBUTED AND HETEROGENEOUS DATA

Companies in most vertical market sectors that are considering the use of Cloud computing or data Grids for federating data share common concerns about storage, access, translation and integration.

OGSA-DAI is a standards-based open source data integration platform contributed by the Open Grid Services Architecture - Data Access and Integration (OGSA-DAI) project, a part of the Open Middleware Infrastructure Institute of the UK (OMII-UK).

BEinGRID has been developing a selection of capabilities that enhance the business relevance and wider applicability of OGSA-DAI for the management of distributed and heterogeneous data. These include the following:

- Data Source Publisher enhances the set-up of existing grid middleware by allowing a source of data to be published over web services. It also increases the ease of use of OGSA-DAI, hence lowering the overall entry cost.
- OGSA-DAI Trigger enhances OGSA-DAI with new data integration features and allows for automated data integration. Underpinning this capability is innovation that allows executing event-driven OGSA-DAI workflows when the database state changes.
- JDBC Driver offers a new interface for OGSA-DAI that allows enhanced data integration in existing applications and makes integrated data resources appear as a simple database.
- OGSA-DAI SQL views allows adapting an existing data source for use in a data Grid; it enables a view that is independent of the data source and appropriate for use in a data Grid without affecting the original data source.

Some of these results have been validated in a Business Experiment demonstrating the use of data Grid technologies for affordable data synchronisation and SME integration within B2B networks. Complementary aspects were validated in a Business Experiment demonstrating improvements to competitiveness within the textile industry, gained by implementing a SOI between textile firms and technology provider that focused on offering high-end services such as production scheduling.

6. GRID PORTAL DEVELOPMENT & COMPOSITION ENVIRONMENTS

Portals are commonly used as a means of obtaining a unifying view of SOI and Cloud platforms and of introducing transparencies that hide the complexity of the underlying IT infrastructure. They include portals for managing user communities, portals for accessing distributed data sources and portals for managing the lifecycle of computational tasks (i.e. submitting, monitoring in real-time and controlling a job). Many businesses considering investing in Grid or Cloud computing have business needs relating to the use of such portals. These become even more critical in the case of cross-organisational portals – i.e. portals shared among a community of business partners (virtual organisation), portals that offer access to shared resources, or portals that offer access to federated services or resources offered by a virtual organisation. Unfortunately, this is where most current solutions appear to be weaker.

Capabilities in this area developed by BEinGRID constitute a plug & play portals development framework built by PSNC and NTUA on top of the Open Source Vine toolkit. The key innovations underpinning this result are a configurable abstraction layer that uses Web 2.0 mash-up technology to hide the complexity of Grid computing tasks, and an innovative user and account provisioning mechanism. This framework helps reduce integration costs and preserve existing investment by facilitating integration with existing solutions through a flexible plug-in adaptor mechanism. Ease of integration with existing content management tools and legacy applications also results in reducing the cycle time of Grid portal development projects. Finally, the user provisioning and administration mechanisms help reduce human error, coordinate application-specific accounts and authentication mechanisms, and results in an easier-to-manage uniform administration layer.

Different aspects of this capability have been validated in various vertical market sectors, including a Business Experiment focusing on production scheduling and virtual retailing in the textile industry, and a Business Experiment demonstrating the enactment of Web 2.0 workflows for service-oriented infrastructures in complex enterprises.

7. APPLICATION VIRTUALISATION AND VIRTUAL SERVICE HOSTING

The European IT infrastructure management services market was worth almost €50 billion in 2006, according to a report from technology researcher IDC, and increased by almost 10% a year until 2009. It appears that a similar trend is now emerging in the Cloud computing area. Merrill Lynch derives the spending on Cloud computing from total software spending. For 2011, it is expected that 20% of spending on enterprise applications and infrastructure software and 8% of spending on custom software will be spent on Cloud computing. The worldwide Cloud computing market is expected to reach $95 billion by 2011. This represents 12% of the total worldwide software market.

One of the recurrent challenges for businesses in this area is how to manage the deployment, distribution and configuration of the capabilities and resources required for offering a service that is distributed over multiple hosts that may not be under the control of the same enterprise. According to analysis by Theo Dimitrakos et al. (2009), the top four concerns in this area have to do with:

- How to define and enforce security policy
- How to measure and optimise resource usage
- How to monitor and evaluate the quality of service offered against an SLA
- How to manage configuration over a federation of hosting platforms

In response to this challenge, a team of experts from BT Innovate & Design and CRMPA showed that many of the BEinGRID capabilities mentioned above can enable management of the deployment, distribution, coordination and configuration of the capabilities and resources required for offering applications as a service distributed over a group of network hosts. The latter can be nodes of a Grid or an aggregation of Cloud platforms offered by one or multiple platform providers.

This integration of BEinGRID capabilities has been called "(Enhanced) Application Virtualisation". This capability can add an instrumentation layer configuring and coordinating different service execution environments for enabling the secure and manageable exposure to consumers of remotely hosted (and potentially distributed) applications. Even if, in the short term, an enterprise is not considering managing services that are distributed among different Cloud environments, this collection of capabilities offers a means for providing a unifying layer for managing security (i.e. identity, access management, secure service integration, etc.), SLA fulfilment and performance monitoring across multiple service delivery platforms.

TEN TIPS TOWARDS SUCCESSFUL GRID-BASED BUSINESS

A team of business consultants and researchers from BEinGRID project partners (Atos Origin, Athens University of Economics and Business, BT Group, T-Systems, CETIC, ICRI-Katholieke Universiteit Leuven, Logica, Telefonica, St. Gallen University, Gridsystems) has assisted Business Experiments to develop their business models and business plans. As expected, developing new businesses based on new technology is not an easy task, and BEs faced many challenges in matching the technical solutions to the business contexts and requirements. "Ten Tips Towards Successful Grid-Based Business" is based on the lessons learnt with the 25 BEs, and it provides advice and hand-outs for organisations interested in developing and providing solutions based on Grid and/or related technologies. The project's business team has also published the book *"Grid and Cloud Computing: A Business Perspective on Technology and Applications"* that reflects additional context on these lessons. More content and book information are available on www.it-tude.com (see page 88 for more info)

"GRID TECHNOLOGY ADOPTION IS A STRATEGIC MATTER."

1. Think broadly – Grid as an underlying technology facilitates many other technologies, and provides multiple ways to provide value.

Often Grid is linked to concepts like cluster computing, resource sharing, and virtualisation. However, it covers a much wider scope. Grid facilitates a lot of SOA and Cloud computing characteristics, such as the use of middleware, open standardised protocols, scalability and elasticity, flexibility, etc. Grid can therefore be incorporated into these frameworks. Moreover, it is suitable technology to deliver, for example, IaaS- and SaaS-based solutions.

2. Build product, pricing and licensing strategies that guarantee revenue flow and satisfy customer needs.

Technology providers transforming their offerings into Grid-enabled applications (especially SaaS-based offerings) have to carefully change licensing models from per-user or per-CPU models to pay-per-use pricing models. A cautious strategy is necessary in order to keep existing customers that do not want or cannot use the Grid-enabled application and to meet the requirements of new customers. It is a challenge to set the prices and to diminish cannibalisation of the same application that is not Grid-enabled. Thus, multiple schemes are necessary, targeted to the customer profile, product pricing, versioning and packaging.

3. Construct a sound value chain to deliver your solution.

Technology providers offering only one part of the solution should position-in and build-up the whole value chain in order to complete the product and distribute it. The value network for Grid-based services is different from traditional service provision and very complex in terms of contractual agreements, licensing models, SLA definition, accounting and billing. Careful planning and clear distribution strategy are keys to success.

4. Be cautious with the general assumptions.

There are many technical and business principles associated with distributed computing that are normally assumed to be true. These assumptions refer to network and data transport aspects: network is reliable, latency is zero, bandwidth is infinite, network is secure, the topology doesn't change, network is homogeneous, transport cost is zero, etc. These assumptions are not always true, and must be analysed properly case by case to make sure that none of these well-known fallacies can and/or will undermine a Grid-based project. Reduction of costs in one area can sometimes increase costs in another, and may compromise ROI.

"CUSTOMERS DON'T BUY A TECHNOLOGY – THEY BUY A SOLUTION."

5. Base the value proposition on the target customer's needs and benefits. Sell a solution to solve a business problem.

Grid-enabled solutions won't be bought just because they are based on Grid technology. Most customers, especially in business sectors, don't buy technology as such, and most of the decision makers don't understand it. They search for solutions that help them solve problems or gain an

advantage over their competitors. Providers should take the customer's point of view and describe how their offering solves a problem, satisfies needs or improves business aspects – that is, in terms of customer benefits.

6. Build user-friendly interfaces and reduce complexity.

End users are very sensitive to how an application is accessible, and most of the time the Grid is at its best when hidden from the end users. Very often the Grid has to be hidden behind a web portal, or an existing user interface reengineered to access the Grid infrastructure. When an application is reengineered to use the Grid, a well-implemented portal can help sell the solution.

7. Be sensitive to customer's concerns regarding security and privacy.

Grid technology-based solutions almost always imply that the customer has to release information out of its administrative domains. This often raises questions about security and data privacy (e.g. credibility of data anonymity, authentication, and user authorisation) and has a direct relationship to customers' willingness to adapt these solutions. The provider should have a sound strategy in place to convince a customer that its sensitive data is safe from competitors and that regulations will be respected.

"LEGAL ISSUES DO MATTER."

8. Contractual issues have to be carefully tackled.

Legal restrictions can be crucial barriers for Grid-based solutions and services. In addition to business aspects, major legal issues must be addressed. More specifically, as starting point it is pivotal to address what is, in legal terms, the agreement encompassing the provision of SaaS and other services delivered using the Grid paradigm. This, of course, depends on the applicable national legal framework, but in general it means setting up an ASP contract. The parties involved in the Grid business should construct a "contractual architecture" that locates risks and liabilities and motivates users to buy Grid services (e.g. if all risks are shifted to the customer, he is not likely to be motivated to trust technology and service providers). Furthermore, parties should use their contractual freedom in order to make contracts that are as complete as possible. An incomplete contract will give rise to problems and potentially litigation, thus loss of time and money. This is especially true in the field of Grid computing, as in many circumstances the adoption of dispersed computing resources makes legal provisions impossible to implement. Such gaps therefore should be filled by the parties in their contracts.

9. Data security issues and reliability are crucial for Grid-based service providers.

Confidentiality is very important and technology and service providers should address it within a comprehensive security policy. Confidentiality, in particular, should be protected through effective and clear contractual clauses.

The parties involved in the Grid business should implement an efficient and clear privacy policy where they state who the data controller and the data processor are. Furthermore, it is advisable to minimise the amount of personal customer data collected in order to avoid potential litigation with and sanctions from privacy authorities. As regards confidentiality, it is necessary to protect the information of customers and technology/service providers. A set of non-disclosure agreements must be entered into by all parties involved, stating clearly what is allowed and what is forbidden (e.g. what is confidential information, if the confidential information can be transmitted to subsidiaries or related parties, etc).

10. Technology providers should be aware of the tax issues linked to their service provision.

Tax issues are pivotal. Technology and service providers should explore where it is more convenient for them to locate their headquarters and Grid components.

As regards value added tax (VAT), they have to verify whether any VAT is due and, if so, where. In B2B transactions the principle for European providers is that no VAT is due if the service is effectively directed to a customer established outside the European Union. If the client is located in a Member State, the VAT rate of the customer's country will be levied. Regarding income tax, every server, node and cluster (that is, Grid component) of a Grid infrastructure is considered as a permanent establishment of the company and therefore the profits generated from it will be taxed. However, although accepted in many countries in the world, this principle is not followed by the tax authorities in several jurisdictions, including, for instance, the UK.

MULTIMEDIA DEMONSTRATIONS OF APPLIED GRID

The demonstrators are a major outcome of the BEinGRID project. Each provides a compelling and dynamic showcase that highlights the competitive advantages that the use of Grid and Cloud technology can deliver to industry.

Via modular multimedia presentations, each demonstrator describes a real business solution developed using Grid and Cloud technologies. EPCC, a UK supercomputing centre, worked closely with selected pilots to create something more than just a project demo presentation: these are specially-designed dynamic dissemination tools that can be easily adapted to suit a wide range of venues and audiences. This dynamic range advances our goal for massive transfer-to-market uptake, spearheaded by industry-ready pilots.

Each demonstrator clearly highlights the business advantages the solutions will deliver and provides persuasive arguments for adoption of the technologies across market sections. The demonstrators consist of a collection of videos, each around five minutes long. The videos are structured as follows:

- Executive Summary: a short overview of all aspects of the solution
- Background: information on the company and the business sector the solution was developed for
- Technical Overview: technical details on the Grid and Cloud aspects of the solution
- Business Case: financial benefits and revenue forecasts arising from the use of the solution in the future
- Live Demo: a demonstration of the solution in action

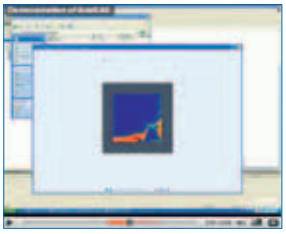
An additional, comprehensive document, the "key story", provides a complete overview of the demonstrator.

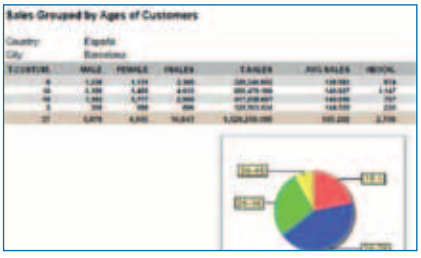
By providing these videos in an adaptable and modular format, audiences can be exposed to the demonstrator at a level which most directly matches their background, interests and experience. These videos can be found on IT-Tude *(www.it-tude.com)* and YouTube *(www.youtube.com/user/beingrida6)*.

The following demonstrators are available:

- **GridCAE:** How Grid technology can enable the execution of computer aided engineering simulations in hours rather than weeks, whilst reducing costs and increasing flexibility.

See *www.it-tude.com/gridcaedemo.html*





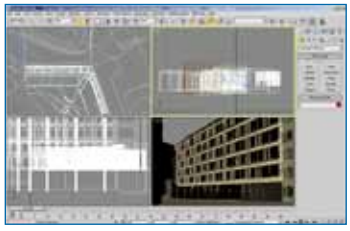
- **TravelCRMGrid:** How Grid technology can be used to provide small travel agencies with access to powerful business intelligence reports that were previously only attainable by much larger companies.

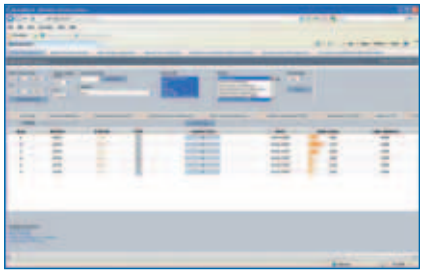
See *www.it-tude.com/tcrm-case-study.html*

SOLUTIONS

- **Grid for Architects:** How architects can use Grid and Cloud resources to render images within tight deadlines. Architects commonly compete in calls to tender where they must submit proposals that include 3D rendered images. Rendering these images requires large amounts of computer resources, which are too expensive for many architects to afford. By using Grid for Architects, architects have on-demand access to Grid and Cloud computing resources, providing as much computing power as they need, when they need it.

See *www.it-tude.com/gridforarchitects.html*



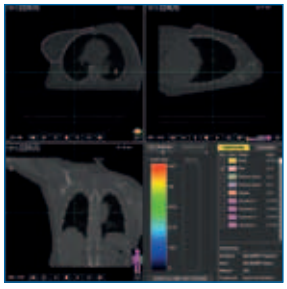


- **AMONG:** How Grid technology can be used to provide banks with collaborative tools in the fight against money laundering. AMONG focuses on providing inter-bank information on suspicious transactions, whereas existing solutions for detecting money laundering focus on the transactions of a single bank. Grid technology allows banks to share relevant information in a secure and mutually trusted environment.

See *www.it-tude.com/among-case-study.html*

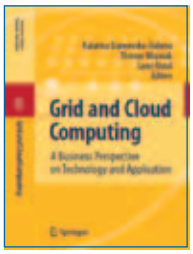
- **RadiotherapyGrid:** How Grid technology can provide hospitals with services for verifying and optimising radiotherapy treatments for cancer patients. By using Grid resources, RadiotherapyGrid is able to quickly provide hospitals with useful data that would otherwise take days to process.

See *www.it-tude.com/rg-case-study.html*



The demonstrators are also available as presentations. The technical demonstrations in this instance can be given using the videos or complementary demonstrator software, available for download from *www.beingrid.eu/demos.html.*

BEINGRID PUBLICATIONS AND MOVIES



- *Grid and Cloud Computing: A Business Perspective on Technology and Applications.* Editors: Stanoevska-Slabeva, Katarina; Wozniak, Thomas; Ristol, Santi. Springer. ISBN: 978-3-642-05192-0

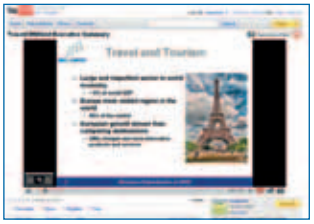
- *Service Oriented Infrastructures and Cloud Service Platforms for the Enterprise: A Selection of Common Capabilities Validated in Real-life Business Trials by the BEinGRID Consortium.* Editors: Dimitrakos, Theo; Martrat, Josep; Wesner, Stefan. Springer. ISBN: 978-3-642-04085-6

Find these books through www.it-tude.com/beingridbooks.html

The BEinGRID Movies are concise, clear films that describe the Grid as a simple, effective means for businesses to add value to their offering and reduce their costs. Also produced by eUconnect Ltd, the movies complement and enhance the original Grid Stories, which were devised by the NextGRID project to increase awareness on what was then a new technology.

The BEinGRID movies are designed to highlight the benefits of the Grid to the boardroom and pave the way to adoption of the Grid by businesses. "Crystal Clear" looks 20 years to the future and shows how businesses and day-to-day life have been transformed through the deployment of Grid today. It shows in a graphic manner the breadth and impact of Grid solutions and potential applications. "Building Grids" uses the analogy of building a house to explain further technical details on Grid in a memorable way. Two further movies concentrate on common questions about Grid and concisely expose the multiple technical and economic benefits of Grid for business.

The BEinGRID movies are available from *www.beingrid.eu/media.html*



CONCLUSION AND PERSPECTIVES

The twenty-five successful case studies from BEinGRID provide an impressive overview of the benefits of distributed computing for current and future business. Through a diversity of industries and profiles, nearly 100 organizations were able to fulfill cross-sector common goals in reducing time to market, offering new services, lowering costs, improving quality, and increasing flexibility.

The pilots described in this book show that the transition of Grid technology from research and academics to enterprise is already in progress. In order to push the transition forward, it will be necessary to continue communicating the benefits, in particular to small and medium enterprises. The high uptake of Cloud Computing shows us that business adoption of IT solutions is even more accelerated as computing research also centralizes on concrete business needs as it once did exclusively to science and academia.

Implementations of real business scenarios, best practices and practical software solutions will help companies to cross the chasm between innovators and visionaries on the one side and mainstream markets on the other. It is an opportunity for enterprises to build on the success of the early adopters.

The companies which are quick to seize the chances of Grid technologies gain the first mover advantage. They will be able to distinguish their offerings from competitors and will be first on the market with new products and services. In the Information and Communication Technology industry there are numerous niches to fill with innovative ideas, but the actual adoption of innovation can only be done with a compelling and worthy case.

BEinGRID has been a project dedicated to this market-focused practicality. In an economy that often insists on proven business cases to support needed change, the project has produced just that: concrete examples of how and why distributed computing can benefit an array of industrial sectors. For a small-to-medium enterprise to take notice, they must see it applied in quantitative terms, not qualitative hype alone. IT-Tude.com, built by BEinGRID, exists as a platform for this wide-spread adoption and will continue to serve as the link to Grids, Clouds, Virtualization, SaaS, IaaS, and other services and technologies to the parallel markets they can most impact.

The case study for an IT service solution is a staple to industry adoption. With this tangible example to build upon, innovation can become a business reality. The services and technologies will continue to develop, building from the roots of previous innovation, but the existence of a compelling and clear case for uptake will always remain the key driver of adoption.

THE BEINGRID CONSORTIUM

CORE TEAM PARTNERS

- Atos Origin sae
- Athens University of Economics and Business
- British Telecom
- Centrale Recherche SA
- Centre d'Excellence en Technologies et de la Communication
- Centro di Ricerca in Matematica Pura ed Applicata
- Ente per le Nuove Tecnologie, l'Energia e l'Ambiente
- EPCC, The University of Edinbourgh
- Fraunhofer SCAI
- K.U.Leuven – ICRI
- LOGICA CMG
- National Technical University of Athens
- Telefónica I+D
- T-Systems
- University of St.Gallen
- University of Stuttgart – HLRS

For more information, visit our website at *www.beingrid.eu*

You can contact the BEinGRID project partners via e-mail: *beingrid@cetic.be* and *connect@it-tude.com*

Contract number: 034702

Type of project: Integrated Project

Project coordinator: Atos Origin

Contact person: Mr. Santi Ristol | Atos Origin
Avda. Diagonal 200 | 08018 Barcelona, Spain
santi.ristol@atosorigin.com

Project websites: www.beingrid.eu | www.it-tude.com

Budget: 24.8 M euros

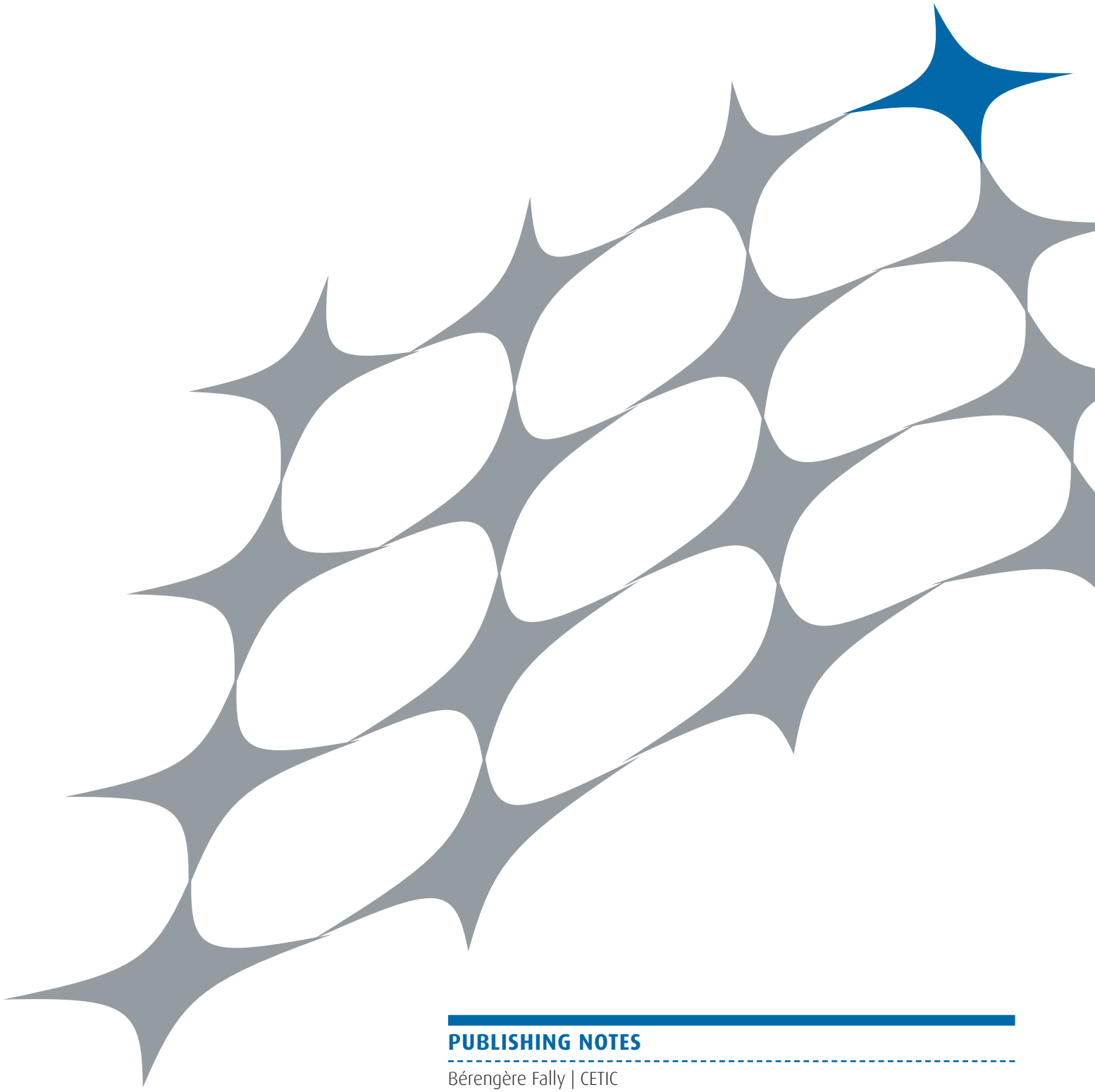
Maximum community contribution: 15.7 M euros

Project start date: 1st June 2006

Duration: 42 months

BUSINESS EXPERIMENT PARTNERS

- Andago SL
- Art & Build
- Assurances AXA
- Avantours
- Banca Finnat Euramerica SpA
- Barcelona Supercomputing Center
- Beijing Water Authority – BHRI
- Bentivogli S.n.c. di Bentivogli Paolo, Ugo E C
- Business Exchanges SA
- Center for Maritime Technologies e.V.
- CGG Service
- CNR – Istituto di Scienze dell'Atmosfera e del Clima
- Compagnie Generale de Geophysique
- Concurrent Computing GmbH
- Consorzio Interuniversitario per il Calcolo Automatico dell'Italia Nord Orientale
- Deutsches Zentrum für Luft- und Raumfahrt
- Domina SRI
- DOMINIO
- Ducati Motor Holding S.p.A
- Eden Viaggi Srl
- Engineering Ingegneria Informatica
- Erasmus University
- European Aeronautic Defence and Space Company – EADS France
- European Space Agency – ESRIN
- Exodus
- Faculty Politechnic of Mons
- Famar A.V.E.
- FedStage Systems Russell i Wspolnicy Spolka jawna
- FinInfo
- Fischer & Kaufmann GmbH & Co. KG
- Flensburger Schiffbau Gessellschaft
- Fornara e Maulini
- Fundación Centro Tecnológico de Supercomputación de Galicia
- Fundación para la Investigación, Desarrollo e Innovación del Centro Hospitalario de la Universidad de Santiago
- GMV SA
- Grande Service Srl
- GridSystems
- Icon Computer Graphics
- Innova SpA
- JDC Ltd
- Joinet S.n.c
- Lanificio Luigi Colombo SpA
- Leibniz Institute for Catalysis
- Linksniederrheinische Entwässerungs-genossenschaft
- Marchi & Fildi SpA.
- Mental Image
- MPS Capital Services Banca per le imprese SpA
- MPS Finance Banca Mobiliare SpA
- Netherlands Organisation for Applied Scientific Research
- NICE Srl
- OpenCFD Ltd
- Pastificio Felicetti
- PetroSoft spol s.r.o.
- Pireus Bank
- Pizza New SpA
- P.M. S.p.A
- Poznan Supercomputing and Networking Center
- Process & Information Systems Engineering
- Rabobank
- Sogea Srl
- Southern Partnership for Advanced Computational Infrastructures
- Stichting AlmereGrid
- Tecnocassa Srl
- TERRADUE
- The Hat Factory Ltd
- TraceTracker AG
- Universidad Complutense de Madrid
- Universidad de Santiago de Compostela
- Universidad de Vigo
- Universidad Rey Juan Carlos
- Università della Calabria
- Univerisität Hohenheim, Center for Research on Innovation and Services
- Universität Zurich
- University of Bologna
- University of Pisa
- University of Siegen
- University of Southampton. IT. Innovation
- Valadis System
- Versys Travel
- Vodafone
- WASY GmbH
- Wyeth Hellas SA



PUBLISHING NOTES

Bérengère Fally | CETIC
James Ahtes | Atos Origin
Till Martensmeier | Fraunhofer SCAI

www.it-tude.com

www.beingrid.eu