Enabling Grids for E-science in Europe

Industry Forum Newsletter

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Editorial

An important milestone for large-scale GRID infrastructure was recently passed when the High Energy Physics community successfully deployed close to ten thousand nodes in more than 80 sites in Europe, Asia and America to run in a sustained way up to 5000 simultaneous jobs in the common framework of the Large Hadron Collider Computing Grid (LCG) and of EGEE. This quite impressive achievement constitutes a very solid feasibility proof of the GRID concept and of the specific technologies used in EGEE. It forms a strong platform onto which various applications can be deployed, for the benefit of the academic and industrial sectors. During the next EGEE conference, to be held in Den Haag (the Netherlands) in November 2004, a new round of applications from both origins will be selected for that purpose. The details of this selection and the first results obtained by these early tests will be reported in a forthcoming issue of this Newsletter.

The Industry Forum has been created in order to promote and disseminate Grid concepts towards Industry and Services Companies, to raise awareness of the EGEE project amongst industry and to encourage businesses to participate in this project. Members of the EGEE Industry Forum are companies of all sizes: large international companies, SMEs or consortia of SMEs, services companies, IT companies or Grid Service Providers.

The keynote article in this newsletter is devoted to the very important issue of standardization bodies such as the Global Grid Forum (GGF). It is only through the successful definition and wide adoption of various standards in the Grid field that all the large potential benefits brought by the Grid technology and now demonstrated in some specific research domains will materialize on a large scale in the industrial world.

This quarterly newsletter will be the link between participants of EGEE, members of the Industry Forum and the various communities interested in GRID-concepts. With this electronic publication we hope to participate actively to the dissemination of such a challenging but promising technology .

Christian Saguez, CRSA / Guy Wormser, In2p3

Our newsletter key article
Working with Research on Grids : 5 years of enriching experience

Dr. Federico Rossi

Some thoughts presented at last GGF-12 in Brussels

The last Global Grid Forum in Brussels marked an important step for the revitalization of this organisation, bringing with it a new strength in the global standardisation arena. The first two days in particular, dedicated to the "enterprise grids", have shown several industrial planners, developers, users and managers of grids (or 'sort-of-grids') mostly from the US, presenting their experience and being somehow involved in the process.

The new chairman, Mark Linesch from Hewlett Packard, appeared very motivated in quickly bridging the gap between the Forum and big IT players (those represented in the Enterprise Grid Alliance, such as HP, Intel, NEC, Fujitsu, Oracle and Sun, and the others, such as IBM and Microsoft).

European participation was strong in the industrial panels (finance, aerospace, automotive, telecom), also following the recent launch of new Integrated Projects on Grids, and in the technical working groups. In the following article, a summary of a talk held in the panel is presented, dedicated to technology transfer from research to industry, chaired by Mr. Mario Campolargo from EC DG InfSo.

DATAMAT perceived GRID as one of the most promising novelties for the ICT market, representing a fundamental gap in how computing is intended. To acquire a specific knowledge of the technology, to understand its potential business return in terms of application and services deployment, also by applying technology transfer across our reference markets, we decided to participate in the first large GRID Project in Europe, DataGrid (http://www.eu-datagrid.org) in the year 2000 and in the following years to other EU outstanding initiatives:

- CrossGrid (http://www.crossgrid.org), EC FP5 project, aimed at extending Grid in Europe and exploring grid potential for interactive applications;
- EGEE (http://public.eu-egee.org), EC FP6 initiative, aimed at building on recent advances in Grid technology and developing a service grid infrastructure in Europe which is available to scientists 24 hours-a-day
- NextGrid (http://www.nextgrid.org), EC FP6 project, aimed at developing architectural components for the Next Generation Grid, thus paving the way to its broader adoption in the business and public domains
- AkoGriMo (http://www.mobilegrids.org), EC FP6 project, aimed at advancing the pervasiveness of Grid computing across Europe closely co-operating with evolving Mobile Internet infrastructures based on IPv6
- SpaceGrid (http://www.spacegrid.org), ESA study, aimed at assessing how Grid technology can serve requirements across several space disciplines, sketching the design of an ESA-wide GRID infrastructure
- The Voice (http://www.esa-thevoice.org), ESA study, aimed at understanding requirements and demonstrating innovative networked collaborative working modes in selected earth science communities.

From the collaboration with the excellence of European Grid research institutions within these projects, a preliminary assessment can be performed: the result of such collaboration, in particular with the computer scientists within the High Energy Physics community (INFN, CERN,etc.) has been extremely profitable.
The cross-fertilization resulting from mixing different backgrounds allowed our teams to improve in terms of flexibility, teamwork, and openness to innovative ideas, while being able to transfer our traditional development culture in terms of structured approach, consolidated methodologies for analysis and design and tight project management (resource allocation, planning, etc.).

On the basis of its experience to date, DATAMATis expecting a significant exploitation potential in the B2B market (GASP, GSP) for:

- distributed supercomputing applications mainly in the research field (public and private)
- collaborative applications dealing with distributed instruments and resources for the human community in fields such as

medical, environmental, media, transport, industrial design (e.g. aerospace)
- on-demand applications mainly targeted at meet peak needs in terms of computational resources (e.g. in the financial sector)

We believe that these objectives can be achieved if suitable initiatives bridging research and commercial exploitation are undertaken and secured at all levels (National, European, Global) in terms of:

- A pan-European Grid infrastructure deployment

The relationship with public sector research is fundamental to deploy and operate a wide and reliable Grid Infrastructure that can also be available, at least initially, to Industry. This will enhance confidence in Grid from those end-user industries that have problems suitable to be solved with the help of Grid, but that still do not have enough evidence that such technology could give benefits on a large scale in an industrial arena. We consider the EC FP6 initiative EGEE to be a first important step in this direction, aiming at setting up a production-quality infrastructure for research: such an effort should not stop at the end of the project, but should also be supported as a long-lasting initiative.

- A technological convergence of middleware on Grid for business

From an industrial viewpoint, it is mandatory that middleware converges on solid business models and shared architectures to be exploited on Grid Infrastructures. This means supporting the efforts required to enhance and standardise all technological aspects relevant to business, such as Security, Quality of Service, Service Level Agreement, reliability of the Grid, Accounting policies, Certification (as a result of an industrial level engineering process). In a few words, supporting a next generation of Grid technology to move the focus *from Science to Business*.

- A wide OMII-like action on middleware. To ease sharing of developed solutions and technology take-up (in particular for SME's), and to start building value-added services, it makes sense that public and private research commit themselves to setting up Open Middleware Initiative Institutes aiming at:

-Integration, validation and packaging of platforms and solutions,
-Repository of certified component / solutions
-Education, Training, "after-sales" support

This would allow to complement ongoing initiatives, such as gLite development in EGEE, or next generation Grid architecture definition in NextGRID, with long-lasting foundations, not just bound to a single (or a series of) project(s). It is reasonable to ensure this at the global level, taking into account, harmonising, and federating on-going efforts at continental and national levels (e.g. US NMI, UK OMII, IT OMG, etc.).

- A new generation of Grid-enabled applications

The initiatives on the application front shall ease the diffusion of a Grid culture, at most through a generalised test-bed policy aimed at demonstrating in concrete terms the advantages of using it, in strong synergy with research; Grid enable classes of applications by developing suitable tool kits and/or porting existing problem-solving environment in Grid contexts; standardise as much as possible the access to Grid services and resources, to strongly reduce the dependency on specific middleware implementation and /or specific infrastructure; and search for new applications by exploring new working environments (e.g. mobile).

In conclusion, we believe that the initial expectations of Grid are going to be fulfilled, as it is shown by the growing interest from industrial customers and increasing investments from ICT solution providers: therefore DATAMAT's bet is becoming rewarding. The initial enthusiasm, in fact, is now being replaced by consciousness of the actual potential, in terms of business.

From an industrial viewpoint, to make profit out of technology, it is fundamental to achieve the needed stability and continuity, focusing new initiatives on bridging research and industry for a possible commercial exploitation of the Grid.

DATAMAT, while confirming its commitment in ongoing and future innovation activities, believes that the Grid community should push stakeholders to:

- Put in action a long-living global Grid infrastructures deployment plan
- Promote the set-up and federation of national / continental Open Middleware Initiative Institutes

- Ensure the support to the technological convergence of middleware on Grid for business
- Widen Grid culture diffusion to favour technology uptake and improve its integration capability for a new generation of Grid enabled applications.

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The next generation middleware for grid computing

gLite (pronounced "gee-lite") is the next generation middleware for Grid computing being assembled by the EGEE Project.
Born from the collaborative efforts of more than 80 people in academic and industrial research centres as part of the EGEE Project (funded by the European Union), gLite provides a cutting-edge, best-of-breed framework for building Grid applications, tapping into the power of distributed computing and storage resources across the Internet.

gLite re-uses software from a number of previous and current Grid projects. This re-engineered software will be simpler to install, deploy and use than ever before, while being more secure and robust.

The following academic and industrial research centres are collaborating towards the development of the gLite software: CERN (CH), INFN (IT), DATAMAT (IT), CESNET (CZ), and CCLRC (UK). Grid services covering data management, workload management, monitoring, accounting, computing element, storage element, logging and bookkeeping are being devised by them. Other EGEE activities support the gLite effort, in particular providing security solutions which are pervasive in the middleware and providing network monitoring and provisioning.

It is a major accomplishment that the architecture and interface design of the gLite Grid services has been finalised. According to this design and to the release plan, the first gLite services have been released to integration and testing and made available to early adopters. These services include (ordered according to the release plan): the information services (R-GMA), the accounting system, the logging & bookkeeping service (L&B), the Computing Element (CE), including the notification service, the Workload Management Service (WMS) , the gLite-I/O system, the metadata interface, the file transfer service, the file and replica catalogs, the Grid access service and the package manager. These services are continuously being improved based on user feedback and augmented with further gLite services. The first services for delivery to the pre-production service have been identified (CE, WMS, L&B, and gLite-I/O) and hence prioritized in the integration and testing activities. Work is progressing to build gLite on the Windows platform.

The first release candidate is scheduled for the end of 2004. The first release of gLite is expected in March 2005.

The definition of the security architecture progressed well and is of great interest to other Grid projects. The security software modules that will be integrated with gLite have been included in the release plan so that their progress can be better monitored. The integration and testing teams are now functional and have set up a complete source code management system and basic testsuite that is integrated with the build system and executed daily.

The already established links to related projects like OGSA-DAI, Unicore, and GEMSS have been intensified. New contacts have been made with DILIGENT, Platform Computing, GridLab, and PPDG. Various activity members contribute to ongoing standardization efforts, in particular through GGF research and working groups (OGSA-WG, OGSA-DATA design team, OREP-WG, GSM-WG, INFOD-WG).

A web-site dedicated to the gLite middleware has been created (http://www.glite.org) and is being populated with details of the software.

Robert Jones, CERN (Robert.Jones @cern.ch)
and Frederic Hemmer, CERN
(Frederic.Hemmer@cern.ch)

The CrossGrid Project on the Home Stretch

The CrossGrid project, an ambitious undertaking to extend the functionality of Grid

computing networks to a new category of applications – one of these, which includes a human in a processing loop, is nearing the finish line. As a three-year project, it is expected to conclude in early 2005, having delivered a package of new Grid services and tools, as well as Grid-ready applications, and having created a major European testbed for Grid computing, which, among others, involves key supercomputing centers in new EU member states - Poland and Slovakia - in European computing and research.

The aim of the CrossGrid project has been to create a coherent computing platform, which would enable interactive processing in a Grid environment, and to apply that platform to solving society-important problems within the CrossGrid consortium's areas of expertise. As such, the Project consists of the development of Grid-enabled applications, a set of new Grid tools designed to aid Grid application developers, a collection of Grid services which extend the basic functionality of Grid middleware to provide further optimisation and monitoring capabilities for system administrators, and – finally – a European testbed which will utilise the computing resources of various European partners (both academic and commercial) in testing CrossGrid solutions and applying them to real-life cases.

Project achievements can thus be divided into four separate areas:

1. Work Package 1: Applications

The applications which have been selected for development within CrossGrid are at the same time compute- and data-intensive. Each of these applications can be put to practical use once the project concludes and additional applications may be developed for deployment on the CrossGrid testbed (see below).

- Interactive simulation and visualisation in a biomedical system

This application computes and visualises the blood flow in vascular systems for pre-treatment and planning in vascular interventional procedures. This uses CrossGrid for its computational and data management needs.

- Flooding crisis team support system

This is a decision support system designed for predicting and visualising potential flood hazards based on weather forecasts and observed rainfall in selected river basins. Advanced meteorological, hydrological and hydraulic models are ported to the Grid environment and human controllers can decide upon further investigation of selected flooding scenarios, when initial simulations indicate high likelihood of a flood.

- Distributed data analysis in High Energy Physics

This application provides a computing interface which uses large distributed databases for storage and manipulation of data generated by the new Large Hadron Collider (LHC), currently under construction at CERN.

- Weather forecasting and air pollution modelling

This task has developed a representative collection of Grid applications for use by the atmospheric/oceanographic community, focusing on long- and medium-range weather forecasts for the Baltic Sea basin, as well as comprehensive air pollution modelling for selected sites.

2. Grid Application Programming Environment

This area includes software which facilitates the development and tuning of parallel, distributed high-performance and high-throughput computing applications within the Grid infrastructure:

- MARMOT

The MARMOT MPI verification tool has been developed to test the inherent correctness of MPI applications submitted for processing on the Grid (detecting deadlocks, race conditions and other types inefficiencies).

- PPC

The PPC (Performance Prediction Components) analyzes the behaviour of application kernels (the most compute-intensive parts of selected applications) under various simulated (even hypothetical) conditions of the Grid testbed, enabling developers to assess whether the actual applications will perform on the real Grid in a satisfactory manner.

3. New Grid Services and Tools

This area deals with new Grid functionality as required by the interactive applications being considered by the CrossGrid project. Two distinct categories of services can be discerned:

- Application-Specific Services

This category includes services tailored to the needs of individual applications, such as the

Grid Visualization Kernel (GVK) for image manipulation within the biomedical application or the User Interaction Services which translate requests submitted by users of each application into generic jobs which can be handled by Grid scheduling agents.

- Generic Services

A layer of basic services which extend the backbone of the Grid. These typically augment the capabilities of standard Grid middleware (most notably the Globus and DataGrid toolkits, which are at the heart of most European Grid infrastructures; notably the EGEE infrastructure, with which CrossGrid is closely aligned) to provide advanced functionality and better optimisation specifically within CrossGrid. A set of Web-based portals and a so-called Migrating Desktop have also been developed, to ensure user-friendly access to the Grid environment for all authorised users, from any entry point, with the sole requirement being a Java-enabled Web browser. The CrossGrid Portal and Migrating Desktop enable users to set up their personalized workspace (which is stored on a separate Roaming Access Server), submit jobs and handle all file transfer operations (using a specially-prepared Grid Commander tool). Moreover, CrossGrid has also produced a performance measurement suite, intended to benchmark and monitor the behaviour of the Grid infrastructure as well as the applications running on it.

4. International Testbed Organization

One of the principal aims of CrossGrid has been to create a pan-European testbed for developers of Grid applications, paving the way for further deployment and cooperation in a Grid environment, even after the Project concludes. These objectives have now been achieved - the Project testbed includes 16 separate sites in 9 countries, with over 200 CPUs and 4 TB of storage space dedicated to the Project. The CrossGrid testbed, having recently installed the LHC-2 middleware distribution, is fully compliant with the infrastructure of the EGEE project (representing the next generation of European Grid computing), and will be further supported in the framework of this project.

From the very beginning of the Project's development cycle, cooperation has been maintained between CrossGrid and other European and international Grid projects, such as Globus, DataGrid, GridLab and GridStart. Particularly close contacts have been maintained with the DataGrid project. As a result of the joint effort of both projects, a common European Grids Industry and Research Forum was formed, starting with the First European AcrossGrids Conference organised by the CrossGrid project in Santiago de Compostela in February 2003. The next conference is scheduled for March 2005, in Amsterdam. Another important event spawned by the CrossGrid project is the Cracow Grid Workshop - an international conference devoted to emerging trends in Grid computing, hosted annually by the Institute of Nuclear Physics and ACC Cyfronet in Cracow, Poland (the next edition being scheduled for December 2004, with details at http://www.cyfronet.krakow.pl/cgw04).

In view of the Project nearing its conclusion, the CrossGrid dissemination team has been working on a new website of the Project, focusing on exploitation of its results. The new site is expected to be launched in November; for now, all Project-related information and contact persons can be found at http://www.eu-crossgrid.org.

Piotr Nowakowski, Cyfronet, October 2004
(ymnowako@cyf-kr.edu.pl)

CGG and the Grid: point of view of an EGEE member

The main objectives for CGG are to port the generic seismic processing platform to the EGEE infrastructure and demonstrate the capability to process seismic data on the Grid.
Others goals to attain are the access to more computing and storage resources to solve complex problems, the optimizsation of IT infrastructure or share and acquire knowledge.

CGG RC centre (1 MON, 1 UI, 1 CE with 24 WNs - up to 64 WNs by the end of the year - and 1 SE with 50 GB) is already available and supports most of the VOs. We now have all the knowledge needed to be able to help and support the installation and deployment in new RC centres.
The main difficulties encountered during the installation were on the network architecture (for security purposes and to limit the number

of IP address accessible through Internet, we chose to have a private network for the WNs) and to learn how to install and use Globus/lcg (finding the correct information in the whole documentation) or PBS.

The next challenges will be to share resources between CGG (for internal purposes) and EGEE, to build an intra-Grid with several CGG centres and to use our own job manager.

A simplified version of the software platform Geocluster adapted to the Grid is available and was tested on both Genius/Gilda and directly on EGEE nodes.

In addition to the installation of a Grid node in our R&D Department, we have launched EGEODE, an initiative to create a Virtual Organization dedicated to research in Geosciences for both industrial R&D (public and private) and Academic research centres. EGEODE, which stands for "Expanding Geosciences On Demand", has already raised interest across Europe and Russia and will deliver a framework for collaboration Industry and Research.

Gaël Youinou, CGG (gyouinou@cgg.com)

Next Industry Forum Meeting and second EGEE Conference to come in The Hague

Second EGEE Conference

The Second EGEE Conference will be held at the NCC in The Hague, The Netherlands, between Monday 22 and Friday 26 November.
The second EGEE conference is one of the events taking place in the Netherlands under the banner "European Leadership in e-Science and Grids" during the six months of the Dutch European presidency.
Other European Commission Research Infrastructure Grid projects - DEISA, SEEGRID and DILIGENT will participate in this large event where project partners will gather to work together and discuss Grid issues.
The EGEE programme includes guest speakers Professor Tetsuya Sato, from the Earth Simulator Centre in Japan, Dr. Irving Wladawsky Berger, from IBM and Mark Linesch, from the Global Grid Forum.
EGEE, DEISA, SEEGRID, DILIGENT and GEANT2 will host the first Concertation Meeting on eInfrastructures on the Monday and Tuesday of the week.
Registration is now open. Visit http://public.eu-egee.org/conferences/2nd/ to register, view the programme and find out more about The Hague.

Second Industry Forum Meeting

The next Industry Forum meeting will take place during the EGEE Conference, on November 23rd, from 9:00 until 11:00.
A round table is planned, during which some industrials will share with us their own experience and their expectations about Grid. The content of the meeting will be accessible on the following webpage: http://agenda.cern.ch/fullAgenda.php?ida=a044722.
For more information, contact brun@mas.ecp.fr

News from members

IBM : Six Strategies for Grid Application Enablement

IBM has identified six different strategies for Grid application enablement. An application is said to be Grid-enabled when it can simply run in a Grid. Fully exploiting the Grid, however, means taking advantage of the virtualised Grid infrastructure to accelerate processing time or to increase collaboration. As Grid standards such as OGSA mature, Grid-enablement will mean that the application can run as a Web service in a Grid environment, while optionally taking advantage of the various services provided by the Grid infrastructure. For example, a Java 2 Platform, Enterprise Edition (J2EE) or C application run as a Web service on top of Grid-enabled middleware, such as the upcoming version of WebSphere® Application Server, while optionally taking advantage of the services provided by the middleware and the Grid infrastructure.

Over time, there will be an unavoidable requirement for Grid enablement: your application must be accessible as a Web service. For example, your application must have its Session Enterprise JavaBeans (EJBs) components exposed as Web services, or it must have a Web services artifact (wrapper, interface, facade, veneer, etc.) that can invoke the existing code. As Grid standards are built

into the appropriate Web services specification, Web service enablement becomes increasingly important. Service-oriented architectures and Web services are becoming the substrate on which strategic Grid environments are based.

The Grid enablement strategies described in this article are linked, but they do have differing benefits, and differing efforts are required to achieve the benefits. Even though there is value with every strategy, not every application needs to implement the highest strategy nor do the strategies need to be implemented in order.

Strategy 1: Batch Anywhere
Strategy 2: Independent Concurrent Batch
Strategy 3: Parallel Batch
Strategy 4: Service
Strategy 5: Parallel Service
Strategy 6: Tightly Coupled Parallel Programs

For more information about IBM's Grid computing business, visit www.ibm.com/grid

David Kra, Executive I/T Architect - IBM Grid Computing (dakra@us.ibm.com)

Forthcoming events about GRID

Supercomputing 2004

Date: 6-12 Nov 2004
Location: Pittsburgh, United States
The Supercomputing 2004 conference will bring representatives from many technical communities together to exchange ideas, celebrate past successes and plan for the future. To reflect this important function, the conference theme is Bridging Communities, which represents not only the technical communities participating in the conference but the architecture of the city too.
For more information please visit:
http://www.sc-conference.org/sc2004/

5th IEEE / ACM International Workshop on Grid Computing (in conjunction with Supercomputing 2004)

Date : 8 Nov 2004
Location : Pittsburgh, United States
Grid 2004 will include service-oriented Grid and utility computing technologies, with emphasis on e-Science and e-Business applications.
For more information please visit:
http://www.gridbus.org/grid2004/

IST2004

Date : 15-17 Nov 2004
Location : The Hague, The Netherlands
IST 2004 is the European Commission's most important Information Society Technologies event. IST 2004 will include a conference, an exhibition of research results and networking facilities for the participants. The overall themes are "People" and "Economy". This year the event will bring together not only researchers and companies, but also politicians and interested citizens of Europe.
For more information please visit:
http://europa.eu.int/information_society/istevent/2004/conference/conference_programme/index_en.htm

E-Infrastructures Events

Date : 18-19 Nov 2004
Location : The Hague, The Netherlands

The Second EGEE Conference and Industry Forum Meeting

Date : 22-26 Nov 2004
Location : The Hague, The Netherlands
See our previous article.

CANS2004 Conference

Date : 30 Nov - 2 Dec 2004
Location : Miami, United States
The CANS2004 (Chinese-American Networking Symposium) conference includes presentations by networking experts from both China and the US, by researchers currently using advanced network technologies to collaborate between China and the US and will include panel discussions about future collaborative areas in next generation networking. This annual conference, alternately held in the US and China, will be hosted by Florida International University.
For more information please visit:
http://www.canscouncil.org/cans/2004/index.html

Research Networks, Advanced Networks and Broadband Solutions

Date : 9-10 Dec 2004
Location : Shanghai, China
The EC-Bridge conference on Research Networks, Advanced Networks and Broadband Solutions, funded by the European Commission, is the first of two international cooperation events addressing the European and Chinese visions of Research Networks and

Broadband solutions, and on eWork and eLogistics for the Mobile User.
The free EC-Bridge Shanghai conference programme will provide a stimulating mix of plenary presentations and parallel workshops as well as a first rate exhibition area.
For more information please visit:
http://public.eu-egee.orgwww.ec-bridge.com

GlobusWORLD 2005

Date : 7-11 Feb 2005
Location : Boston, United States
GlobusWORLD 2005 will build on the success of the previous conferences.
For more information please visit:
http://www.globusworld.org/

European Grid Conference (EGC2005)

Date : 14-16 Feb 2005
Location : Amsterdam, The Netherlands
EGC2005 will focus on all aspects of Grid computing in Europe and bring together participants from research and industry.
EGC2005 will have three tracks: a scientific paper track, an industrial track and a special event track.
For more information please visit:
http://genias.biz/egc2005/

5th Annual Access Grid Retreat

Date : 25-29 Apr 2005
Location : Berkeley, United States
The AG Retreats provide an interactive forum for the Access Grid community, including developers, node operators, and users to share recent experiences and research findings, to present ideas for future AG technical directions and to train and educate AG newcomers.
For more information please visit:
http://www-unix.mcs.anl.gov/fl/flevents/ag/agr05/

CCGrid 2005 - May 2005

Date : 1 May 2005
Location : Cardiff, Wales, United Kingdom
CCGrid 2005 is designed to bring together international leaders who are pioneering researchers, developers and users of clusters, networks and Grid architectures and applications. The symposium will also serve as a forum to present the latest work, and highlight related activities from around the world.
For more information please visit:
http://www.cs.cf.ac.uk/ccgrid2005/

Call for proposals

Anyone interested in joining the EGEE Industry Forum should contact either Christian Saguez (christian.saguez@ecp.fr) or Guy Wormser (wormser@lal.in2p3.fr).

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