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EchoGRID

European and **Ch**inese C**o**operation on **Grid**

SSA Project

Information Society Technologies

D.2.1(2) – **Second Workshop Conclusions**

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Summary

The 2nd EchoGRID Workshop was held 29-30 October 2007 at CNIC, Beijing. The Workshop took place within the Grids@Work event, combining the objectives and outcomes of the Grid projects BRIDGE, GridCOMP, the 4th PlugTests Contest, and the ETSI Grid, bringing together over 100 Grid researchers and scientists. The 2nd project workshop focused on 4

topics, selected by a team of experts from China and Europe: New programming Paradigms, Trust & Security, Grid Workflow and Grid Middleware for Industrial Applications.

From the perspective of Grid techniques, there is a real and compelling need for suitable programming paradigms to improve the Grid techniques. Currently, there is still a lack of successful Grid application models in the commercial sector and a need to bridge the gap between the business and Grid communities. In order to improve the performance of Grid technologies, Grid software needs to provide a security solution to set up a trust environment and Grid workflows need to be further developed and enhanced so that users can organise their activities together.

The Workshop provided a platform for both Chinese and European Grid scientists to discuss and exchange ideas and experiences. The event was supported by the Chinese government and covered by the Chinese, European and global media organisations.

2nd EchoGRID Workshop, 29-30 October 2007

Table of Content

1. Session: New Programming Paradigms

1.1 Introduction

The first session, which was led by Zhiwei Xu (ICT), centered on the features and requirements associated new programming paradigms, with particular reference to perspectives from China.

1.2 Skeleton Programming

Marco Danelutto from Pisa University presented his work on skeleton programming, providing state-of-the-art Grid programming with an overview of the structured programming and an analysis of skeleton strategies. An explanation was given on the skeleton in Grid programming, skeleton implementation on the Grid, the behavioral skeleton and how to achieve automatic management.

1.3 A society-inspired Methodology

The talk by Bo Ding from NUDT was on a society-inspired methodology. The talk outlined the first steps towards developing next-generation distributed software, including the methodology and corresponding software infrastructure based on two key concepts: Autonomic Unit (AU - software abstraction of resources being able to actively adapt to the environment) and Commonwealth (a community that allows AUs to dynamically join and quit based on their own interests and the demands). The presentation proposed an abstract model to partially cope with challenges ahead, ideally integrated with maturing software engineering technology. Integration with maturing engineering technologies would lead to a reference software architecture based on component as well as a software infrastructure prototype supporting the applications of this architecture.

1.4 Architecture-Based Virtual Management

Minghui Zhou from Peking University focused on architecture-based virtual management, emphasising the need for virtualisation and automation on Grid. In her opinion, the management process is general but the essence is the same. Rules play an important role and architecture can make this efficient. Grid infrastructure can benefit from current technical solutions.

1.5 Discussion and summary

Several approaches were discussed and this led to some principles:

1. New programming paradigms for Grid infrastructures

There is no clear consensus on the best approaches in new programming paradigms for Grid infrastructures. Both EU and China have research activities on Grid programming.

2. Identification of Grid programming's unique & basic (minimal) requirements:
   - Form common vocabulary
   - Identify partitions (boundaries) between programmer, programming system, and Grid infrastructure
   - Metrics and benchmarks
   - Abstractions for transparency, reuse, mash-up (composition)
   - User interface
   - Mental model, programming model, and formalism
   - Implementation issues
   - Implementation complexity
   - "Nice" behaviour guarantee
   - Portability
   - What can/should be centralized, distributed, or decentralized
   - Implementation methods: still the traditional library, compiler,...

2. Session: Trust & Security

2.1 Introduction

The session on Trust and Security was led by Michael Wilson with speakers offering their solutions on security issues on the Grid. This session focused on research directions for Trust and Security with particular reference to web services using WS-Security, WS-Trust, WS-Federation. Key points raised include the conformance of Chinese Grid activities in CROWN and CNGrid of WS* standards for security.

2.2 A Security on XtreemOS

Dr Erica Y. Yang (STFC) reported a security approach on XtreemOS, a Next Generation Grid Operating System. The EC-funded project, XtreemOS, aims to design, implement, evaluate and distribute an open source Grid operating system supporting Grid applications and capable of running on a wide range of underlying platforms, from PCs, clusters to mobiles. The goal is to provide an abstract interface to its underlying local physical resources as a traditional OS does for a single computer.
Yang described the security work undertaken by the XtreemOS project which has been focusing on developing and understanding requirements and performing initial security architecture design. The initial implementation of XtreemOS is being tested and will soon undergo the integration phase. This will then be tested on a variety of use cases and further refined. In XtreemOS, VO management is tightly coupled with major security issues, such as identity, attribute, credential, and policy management.

2.3 CROWN Security Architecture &Security Policy

Jianxin Li (BUAA) described the CROWN Security Architecture &Security Policy-Enabled Virtual Organization Management. CROWN aims to provide a fine-grained and extensible security framework, supporting trust federation and trust negotiation for resource sharing and

collaboration in an open Grid environment. The CROWN team has proposed a novel secure policy-enabled collaboration framework, in which a fully distributed policy evaluation algorithm is devised to improve evaluation efficiency without disclosing the full domain security policy.

2.4 TrustCoM

TrustCoM has developed a framework for trust, security and contract management in dynamically evolving virtual organisations, whici will meet the needs of this situation and provide the basis of products and services. The presenter introduced theTrustCoM vision and described theTrustCoM simplified Architecture, citing a real example using the TrustCoM Architecture. Within the implementation of this test bed, providers have a fully functional platform. Without implementing major changes to their respective previous legacy systems, TrustCoM framework enables a correct, secure, and reliable transmission of the courses through the internet.

2.5 GridTrust

Philippe Massonet from CETIC, Belgium gave a talk about Trust and Security for Next Generation Grids, describing the GridTrust framework. On the VO level, the system has secure resource broker, service usage control, reputation management service etc. The framework uses policy refinement tools to define the control policy. The talk underscored innovative features, such as UCON for Grids, combining security with reputation, VO management integrated with GridTrust services, among others.

2.6 Discussion and Summary

1. The approach taken to security in the European TrustCoM project and the Chinese CROWN grid are very similar, and should be interoperable: Web Services using WS-Security, WS-Trust, WS-Federation
2. The approach taken in the European GridTrust project is consistent with these, although its focus is more on authorization for access control with the innovation of usage control for Grids, but the delivered application could use WS.
3. The requirements to be met by XtreemOS are consistent with these approaches, although the implementation will be based on changes to the Linux OS rather than on Web Services.
4. The Web Services approach to security has been implemented in the CROWN Grid in China, although it is hard to predict if it will be adopted in the larger production academic research Grids of CNGrid and ChinaGrid, which are funded by different ministries.
5. No view was stated on the possible commercial approach to be taken in China.
6. In Europe the Web Services approach to security is available in commercial offerings from BEA Systems (maybe soon to be Oracle), Microsoft, IBM and SAP.
7. In Europe it is unclear if the academic research Grids will adopt the Web Services approach to security. The UK NGS is adopting it after Globus V4 is installed in 2008, but there are no plans for gLite to move to any more complex security model.
8. The GridTrust implementation in Globus on Linux in Java could be adopted by gLite.
9. In conclusion, the requirements understood in China and Europe are very similar with multiple levels of enforcement of control, and the Web Services approach has been consistently adopted by the more mature research projects.

3. Session: Grid Workflows

3.1 Introduction

This session was chaired by Thierry Priol from INRIA. Grid workflow concerns the automation of distributed processes in the area of scientific and business computing. It describes a pattern of interaction between services. The objective of this session was to review the latest scientific advances in the area of Grid workflow.

3.2 Advanced Services for Scientific Workflows

This topic was presented by Professor Thomas Fahringer, University of Innsbruck. Simulations of flooding of the Danube River with Grid Applications are complex and dynamically constructed from different organization services. Co-operation is needed to predict flooding behaviour of the Danube by using Grid sensors, computing and data storage services resources, as well as modelling and simulation services, which has led to the development of a workflow system called Askalon by Fahringer's team. Askalon is an application development and runtime environment for the Grid. The characters include: a GUI based on UML that generates an AGWL; data distribution between activities HPF; deployment of activities on demand in an automatic way; and scalability experiments. This system has been implemented in a Grid environment for Interactive Gaming through the EC-funded Edutain@grid project and can provide a dynamic workflow schedule.

3.3 VINCA workflow

Zhan Liyong, ICT, described the VINCA workflow, explaining briefly the workflow in CNGrid as an end-user oriented service composing system and a service-oriented application. Liyong analyzed the differences between BPEL and JSDL in CNGRID. Currently, CNGrid lacks a meta-workflow system which can aggregate and incorporate heterogeneous workflow systems, which has led to the design of a 4-layer framework:

- workflow resource layer
- workflow capability description layer
- workflow capability abstraction layer
- abstract workflow definition layer.

Specifically, VINCA has separated into workflow module, meta-workflow console, portal, executing environment. This talk reported on several cases in scientific computing of virtual labs.

3.4 Decision Services in the frame of Quality of Service

This topic was presented by Dimosthenis Kyriazis from NTUA. Workflows can be abstract or concrete. Since each workflow contains processes (also called service types) that can be executed from a set of service instances (candidates), which are annotated with QoS information. Decision services are needed to estimate the selection of the available service types and instances and map workflow processes to Grid service instances with regard to the

provided QoS metrics. Kyriazis described the workflow mapping mechanism which covers input and output matching, the SLA checking.
The talk underscored the fundamental role of quality provision for enabling Grid applications to become QoS compliant, outlining an approach for service selection using QoS criteria. This approach comprises a suite of components including a workflow mapping mechanism, a Service Level Agreement (SLA) mapping, usage and terms checking service and a decision support component, allowing the different mapping of application workflow processes to Grid services that not only meet user goals and requirements but also maximize benefits in terms of the QoS level offered. Key benefits comprise: service selection based on QoS and QoE criteria, improvements in reliability, efficient SLA usage, maintaining service providers' reputation.

3.5 AVLAB in scientific network environment

Yongzhen Ma, CNIC, described recent improvements on the AVLAB in a scientific network environment. AVLAB is a co-operation project combined with CNIC and 3 Astronomical observatories. The purpose of this project is to enable remote access to astronomical resources distributed over China. Now a portal has been set-up to apply and access telescope remotely and there are about 100 users of AVLAB. The most exciting feature of AVLAB is that it can provide collaborative observation (co-scheduling).

3.6 Discussion and summary

Discussions focused on evaluating and reviewing the current state of workflows. There is a general consensus that workflows are important for the Grid environment as activities can be integrated through the events within it. However, there are many Grid workflow systems with each one working in its own way, and own description language. Existing workflow systems need further evaluating and qualifying, in order to establish whether they are required and whether they could be reduced. A graphic user interface is highly desirable. Dynamic schedule supported workflows are more suitable for the Grid environment.

4. Session: Grid Middleware for Industrial Applications

4.1 Introduction

This session was chaired by Thomas Farhinger from Innsbruck University. Several Grid middleware systems have been designed and implemented such as Globus, Unicore, gLite, CNGrid, and CROWN. The objective of this session was to show the latest user experiences using them with industrial applications.

4.2 Information Grid with New Intelligent Engine

Li Rubao from ICT described new advances in the information Grid with new intelligent engine. Information Grid is important in Grid research. However the distributed environment

of Grid blocks fluent implementation. Intelligent method has been incorporated into the information Grid. The new engine enabled the information node to exchange their message.

4.3 EGEE and Industry Uptake

Gabriel Zaquine (CERN & BT France) represented the EGEE project, which aims to operate a large-scale, production quality Grid infrastructure for e-Science and attract new resources and users from both the scientific and business communities. The EGEE infrastructure currently includes ~240 sites across 45 countries and supports >200 Virtual Organizations from diverse research disciplines. The talk presented the EGEE-II roadmap for industrial uptake and increased emphasis on outreach to the business community. The aim has been to formulate strategies to improve the uptake of EGEE's Grid middleware by industry and attract new and support current Business Applications using gLite (early adopters).
The talk evaluated the adoption of gLite in the commercial sector and made reference to the barriers to adoption that need overcoming. Use studies were presented in support of this analysis, for example, an SME project, which is a Grid on-demand & collaborative Grid for the plastic industry, was showcased with particular reference to meeting the requirements of industry with gLite Grid middleware.

4.4 Virtual Laboratory: Exploring e-Science at CAS

JianJun Yu from CNIC described the CAS e-Science programme, outlining the e-Science motivation of CAS, in order to satisfy key requirements of e-Science. The talk described current e-Science activities and related applications. A virtual lab infrastructure has been set up to implement e-Science activities and provide solutions. The achievements of the VLAB were showcased through a set of examples.

4.5 Aviation Grid Application and Drug Discovery Application

The talk given by Yongjian Wang, BUAA, centred on Aviation Grid Application and Drug Discovery Applications, which are two key applications supported by CNGrid. The Aviation Grid Application plans to use computing and storage resources across the Internet to accelerate the design of airplanes. Drug Discovery Grid plans to use computing and storage resources across the Internet to accelerate the drug discovery process. The patterns of Condor MW, Google MapReduce and CommonJ were described. The talk explained the need to provide a new Master/Worker Pattern implementation. The framework for the implementation was outlined. The conclusions summarized the lessons learned from the project. The results show that Master/Worker pattern is especially suitable for data-central Application Scenario, Communication between the master node and worker nodes are flexible with many different ways for implementation.

4.6 Grid and Finance

Giulio Galiero, ENG, presented a project focusing on Grid and Finance. Grid technologies are emerging and becoming mature for new application fields, moving beyond pure research communities. Finance is showing an increasing interest in Grid because of benefits Grid brings. On one hand, Grid Computing provides access to several resources (e.g. storage and computing power) spread over the net. On the other hand, users in the financial sector have a

high demand for accomplishing time-critical tasks (e.g. portfolio management, risk analysis, derivative prices, etc.) through compute-intensive algorithms, such as Montecarlo simulations. The presentation aimed to evaluate whether Grid features can match finance requirements, taking into account security issues. A case study was presented.
GriFin (Grid for Finance) is an ongoing Italian project started in 2007, partially supported by the Italian Ministry of Research where Engineering Ingegneria Informatica S.p.A. collaborate with University of Lecce and the SPACI Consortium (Southern Partnership for Advanced Computational Infrastructures)[1]. It aims at creating a Problem Solving Environment (PSE) for the financial market based on Grid infrastructures (mainly globus and gLite). The initial findings have been presented along with the solutions proposed both for security and middleware architecture.

[1] For further info: http://www.spaci.it

4.7 Discussion and Summary

Grid technology is currently being used in industrial contexts, both in Europe and in China. Grid middleware that has been tested outside the research communities in EU and China include gLite, Globus, Unicore, CROWN, and GRIA. These initiatives are led by enterprises and are initial attempts to solve current customer requirements using Grid technology. Although they are driven by industrial requirements, there are several unresolved problems regarding Gird technology that require further clarification. Grid experts need to work closely with the commercial customers and engage with enterprises, especially computing companies, to support Grid research initiatives and projects.

5 Dissemination & Outreach

Consortium outreach activities in both Europe and China comprised producing an event announcement, a press release and latest news item for circulation to pertinent contacts, including European Grid projects. A post-event article in English was also prepared and circulated. The main outcomes of dissemination activities in addition to a Grids@Work announcement published by GridToday, are summarized in the sections below. The Annexes provide screenshots of articles and announcements.

Event Announcements & Latest News Items
The 2nd Workshop was announced through the following channels.

WEBSITE	URL
BELIEF project	http://www.beliefproject.org/
EGEE-II (Related events section)	http://www.eu-egee.org/egee_events/events/2nd%20EchoGRID%20Strategic%20Workshop/
EGEE-II (Latest News section)	http://www.eu-egee.org/news/2nd-echogrid-strategic-workshop-29-30-october-2007-beijing-china/
EC-Gin (Event Announcement)	http://www.ec-gin.eu/corpsite/display/dsp_Entity.asp?EN_ID=515

EC-Gin (link to Press Release)	http://www.ec-gin.eu/corpsite/manage/assets/echogrid_beijing%20october%20workshop_v2.0.pdf
XtreemOS	http://www.xtreemos.eu/events/forthcoming-events

Post-Event Articles

Articles on the 2nd EchoGRID Workshop were published by several Chinese newspapers, such as Beijing *Sci-Tech Report*; *Science and Technology Daily*; and *Science Times*, as illustrated in Annex 2. These reports highlighted how Grid computing has emerged as an important paradigm for distributed computing, in order to connect the heterogeneous, distributed resources together and facilitate businesses, scientific research or even daily life. Grid is enabling resource sharing and has now become one of the hot research fields in the world. Additionally, the articles made reference to the various workshops, main objectives and participation of Grid research scientists from both China and Europe.

An article was published in GridToday on 3 December 2007. This article, entitled 'EchoGRID Workshop Strengthens Links between China & Europe', provides a snapshot of the four Workshop sessions, the main outcomes of each one, and some of the wider implications of EchoGRID Workshops with reference to the Roadmap. This article was classified in the top 5 articles of the weekly issues.

6 Overall Conclusions

The 2nd EchoGRID Workshop brought together representatives from EC-funded projects: EGEE-II, GridTrust, Edutain@Grid, and XtreemOS; EU national projects: GriFin; and Chinese initiatives: CNGrid, ChinaGrid, and CROWN, as well as experts within the project. Possible future collaborations between partners from both regions were reported by Michael Wilson.

Additionally, the Workshop highlighted how the commercial approach adopted in China includes the exploitation of technologies developed by academic institutions by SMEs, the aerospace sector and other companies, using the web approach. The development of Grid in Europe for enterprise and SMEs was also presented. Examples from both could be showcased at the 2nd EchoGRID Conference, 24-26 October 2008 in Shenzhen, in addition to the presentation of the final Roadmap.

The main conclusions from the Workshop are summarised below:

1. New Programming Paradigms: While there is no clear consensus on the best approaches to new programming paradigms, several principles on the unique features and basic requirements have been established.

2. Trust and Security: Requirements evaluated in China and Europe are very similar with multiple levels of enforcement of control. The Web Services approach has been consistently adopted by several mature research projects. The GridTrust implementation in

Globus on Linux in Java could be adopted by gLite. Security approaches in TrustCOM and CROWN should be interoperable.

3. Grid Workflows: these are important in Grid environments allowing the integration of activities. However, there are many different workflow systems, each working in its own way and with its own description language. Existing systems need to qualified and the advantages of reducing the number of workshop systems and tools should be further investigated.

4. Grid middleware for industrial applications: Grid is being adopted by enterprises in both Europe and China with the use of gLite, Globus, Unicore, CROWN, and GRIA. However, a number of technological issues need addressing and require the involvement of Grid experts from both industry and research. User studies form both regions would help foster further adoption.

ANNEX 1 – Workshop Announcements and Articles

Articles published in Chinese Journals, *Sci-Tech Report*; *Science and Technology Daily*; and *Science Times*

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如何有效开发利用地球表面 71%海洋

全球专家青岛聚焦 2007 年

■ 信息快递

网格联合研讨会在京召开

本报讯 （周维）由中科院计算机网络信息中心承办的 Grid@Work 联合研讨会于10月29日至11月1日在北京举行。

网格计算成为近年来计算机领域中一个研究热点。网格计算的目标是把整个互联网上的信息整合起来，实现计算资源、存储资源、数据资源、信息资源、知识资源的全面共享，从而通过网格技术能够实现分布式、动态的、虚拟组织的协同工作，促进信息社会的发展。

这次联合研讨会涉及 5 个项目，分别是：3 个欧盟第六框架的网格项目(EchoGRID、BRIDGE 和 GridCOMP)，第 4th 国际网格竞赛(PLUGTESTS)和欧洲电信标准协会 ETSI TC 网格项目。会议的宗旨是为中欧双方网格研究专家提供一个交流探讨的平台，共同促进网格计算等问题的深入研究，促进中国和欧盟在网格科研上的合作。

在近一个星期的活动中，来自中欧双方网格研究领域的专家学者将共同对网格研究领域一些热点问题，交换意见，并共同研讨网格计算的发展战略。其间，专家们将围绕网格中间件，新编程模式，信任与安全，网格工作流，网格市场应用等多个主题展开讨论。

全国中小企业节将“呱呱坠地”

■ 研发领域

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综合信息

网格研究研讨会上
中外专家探讨计算机研究热点

本报讯 网格计算成为近年来计算机领域中一个研究热点。网格计算的目标是把整个互联网上的信息整合起来，实现计算资源、存储资源、数据资源、信息资源、知识资源的全面共享，从而通过网格技术能够实现分布式、动态的、虚拟组织的协同工作，促进信息社会的发展。

由中科院计算机网络信息中心近日承办的中外联合研讨会，其宗旨是为中欧双方网格研究专家提供一个交流探讨的平台，共同促进网格计算等问题的深入研究，促进中国和欧盟在网格科研上的合作。

另外，在中科院计算机信息中心举办的全球网格竞赛结果，也在会上发布，在第二部分的 N 皇后竞赛中，由北京航空航天大学组成的队伍取得了第二名的好成绩。来自北京邮电大学和清华大学的队伍并列第三。

Post-event article, GridToday, 3 December 2007

EchoGRID Workshop Strengthens Links between China, Europe - Mozilla Firefox

http://www.gridtoday.com/grid/1917898.html

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December 3, 2007

Home Page

Scientific Applications:

EchoGRID Workshop Strengthens Links between China, Europe

EchoGRID Thematic Workshops focus on key grid topics defined by a team of European and Chinese experts with the aim of defining the perspectives for R&D and enterprise developments in the two regions for the future. The second EchoGRID Strategic Workshop, which took place last October, brought together high-profile players from business and research to engage in a mutually beneficial dialogue on grid developments.

Hosted by the Chinese Academy of Science (CAS) in Beijing, the Workshop explored new programming paradigms for grid infrastructures, key mechanisms that should be embedded within grid middleware, the latest scientific advances in the area of grid workflows, and the most recent user experiences in adopting several grid middleware systems, including Globus, gLite, CNGrid, CROWN and Unicore. Participants shared valuable knowledge on the work, resources and skills needed to facilitate grid development for both business and science. EchoGRID is evaluating these developments in terms of their technological validity, and industrial and societal impact, with the aim of analysing the potential and risks involved.

Experts from China brought beneficial knowledge on several fundamental changes in the programming paradigm. Bo Ding, National University of Defense (China), explained how new technologies will ease the shift towards emerging pervasive computing applications and Internet-based large-scale computing systems. Yann Radenac, an EchoGRID fellow at the Chinese

Completato

Event Announcement: EGEE-II Website

2nd EchoGRID Strategic Workshop — Enabling Grids for E-sciencE - Mozilla Firefox

http://www.eu-egee.org/egee_events/events/2nd%20EchoGRID%20Strategic%20Workshop/

Home > EGEE EVENTS > Related Grid Events > 2nd EchoGRID Strategic Workshop

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GRID INITIATIVES
NEWSROOM

iSGTW INTERNATIONAL SCIENCE GRID THIS WEEK

2nd EchoGRID Strategic Workshop

The event features New Programming Paradigms; Trust & Security; New Forms of Plugtest; Grid Workflows; and Grid Middleware for Industrial Applications. EchoGRID Thematic Workshops focus on key Grid topics defined by a team of experts with the aim of defining the perspectives for R&D developments in both China and Europe in the years ahead.

What	Workshop
When	29/10/2007 to 30/10/2007
Where	Beijing, China
Contact Name	Mrs Florence Pesce
Contact Email	florence.pesce@ercim.org
Add event to calendar	vCal (Windows, Linux) iCal (Mac OS X)

The Workshop sessions put the spotlight on:

· alternative programming paradigms for Grid infrastructures
· key mechanisms that should be embedded within Grid middleware
· the latest scientific advances in the area of Grid workflows
· the most recent user experiences in adopting several Grid middleware systems, including Globus, Unicore, gLite, CNGrid and CROWN.

Workshop participants are high-profile experts with the skills and resources needed to carry out Grid research projects, and plans to collaborate with other research teams world-wide.

This event will generate direct feedback from business and research communities and establish a dialogue and exchange between diverse stakeholders from both Europe and China., strengthening links between the two regions and helping to define a collaboration roadmap that sets a clear co-operation agenda for the short-, medium-, and long-term.

The Workshop is organised with 2 EC-funded projects, GridCOMP (http://gridcomp.ercim.org/) and BRIDGE (http://www.bridge-grid.eu/), in parallel with the 4th Grid Plugtest (http://www.etsi.org/plugtests/grid/grid.htm) jointly organised by ETSI, INRIA and ERCIM.

Workshop Hosts: CNIC, Chinese Academy of Science, Beijing, China.

Latest News

2nd EchoGRID Strategic Workshop, 29-30 October 2007, Beijing, China: Towards a Shared EU & Chinese Vision for Grid Research Perspectives

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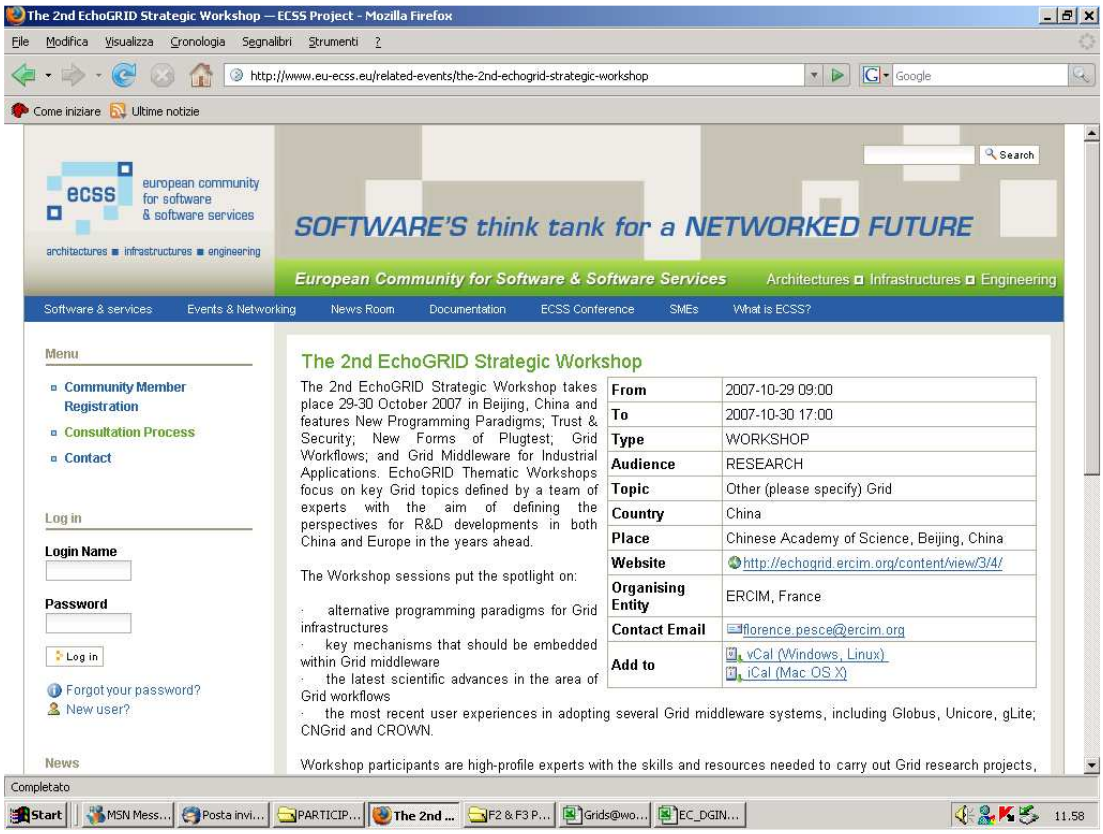
Event Announcement on 3S website (ECSS – European Community for Software and Software Services)



Grids@Work Announcement