



GridSphere and the GridLab Project

Jason Novotny novotny@aei.mpg.de

Michael Russell russell@aei.mpg.de

Oliver Wehrens wehrens@aei.mpg.de

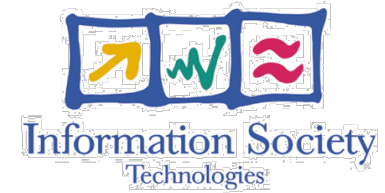
Albert Einstein Institute

The State of Grid Computing

- Access to Grid services and resources still difficult for end users
- Current API's and tools are still very primitive
- Grid middleware and tools are constantly evolving making it difficult to provide reliable, robust infrastructure
- Ultimately end users want to be hidden from technical or implementation specific details of Grids
- Growing infrastructure complexity means diminished usability
- Many projects focusing on a narrow range of services for a very specific set of users
- There is a real need for higher level tools and grid computing environments



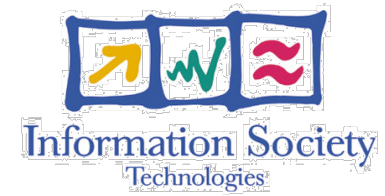
GridLab Project



- Funded by the EU (5+ M€), January 2002 – December 2004
- Application and Testbed oriented
 - Cactus Code, Triana Workflow, all the other applications that want to be Grid-enabled
- Main goal: to develop a Grid Application Toolkit (GAT) and set of grid services and tools....:
 - resource management (GRMS),
 - data management,
 - monitoring,
 - adaptive components,
 - mobile user support,
 - security services,
 - **A portal**
- ... and test them on a real testbed with real applications



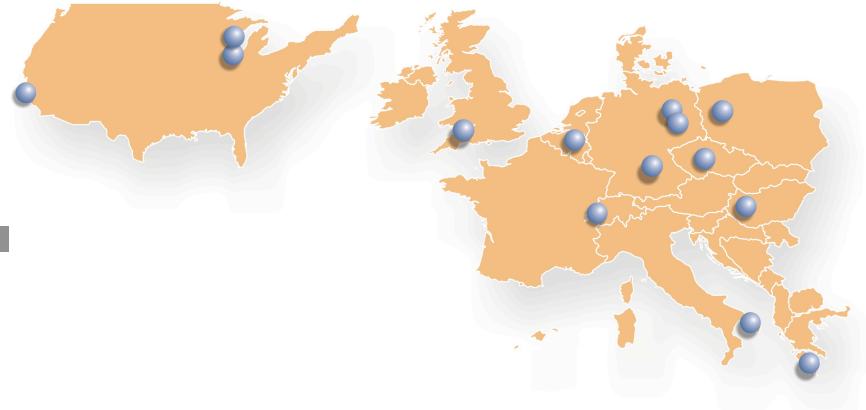
GridLab Services



- Resource Management Services
 - Resource Brokering
 - Job Submission
 - Usage Policy Management
- Data Management Services
 - Data Replication
 - Data Movement
 - Visualization Services
- Monitoring and Adaptive Services
 - Application Performance Monitoring
 - Resource Utilization
 - The ability to alter applications at runtime
- Information Services
 - GIS/GRIS Based
- Testbed Management Services
 - Form the basis of the GridLab Administrative Portlets
- Notification Services... and many more!



GridLab VO



- n PSNC (Poznan) - coordination
- n AEI (Potsdam)
- n ZIB (Berlin)
- n Univ. of Lecce
- n Cardiff University
- n Vrije Univ. (Amsterdam)
- n SZTAKI (Budapest)
- n Masaryk Univ. (Brno)
- n NTUA (Athens)
- Sun Microsystems
- Compaq (HP)
- n ANL (Chicago, I. Foster)
- n ISI (LA, C.Kesselman)
- n UoWisconsin (M. Livny)

Users!
EU Astrophysics Network,
DFN TiKSL/GriKSL
NSF ASC Project
other Grid projects
Globus, Condor,
GrADS,
PROGRESS,
GriPhyn/iVDGL,
CrossGrid and all the other European
Grid Projects (GRIDSTART)
other...

GridLab Goals

- Get Computational Scientists **using** the “Grid” and Grid services for **real, everyday, production** work (AEI Relativists, EU Network, Grav Wave Data Analysis, Cactus User Community), all the other potential grid apps
- Make it easier for applications to make flexible, efficient, robust, use of the resources available to their virtual organizations
- Dream up, prototype, and test new application scenarios which make adaptive, dynamic, wild, and futuristic uses of resources.

What Do Our Users Need?

- Application oriented environment
- Flexible, easy-to-use, simple interfaces
- Efficient and effective use of resources
- Robustness, fail-safety, adaptability
- The ability to work in distributed teams
- Support for mobile working environments

What Do Our Users Want?

- Larger computational resources
 - Memory/CPU
- Faster throughput
 - Cleverer scheduling, configurable scheduling, co-scheduling, exploitation of unused cycles
- Easier use of resources
 - Portals, grid application frameworks, information services, mobile devices
- Remote interaction with simulations and data
 - Notification, steering, visualization, data management
- Collaborative tools
 - Notification, visualization, video conferencing, portals
- Dynamic applications, New scenarios
 - Grid application frameworks connecting to services

Many Application Scenarios!

- **Dynamic Staging**
 - move to faster/cheaper/bigger machine
- **Multiple Universe**
 - create clone to investigate steered parameter
- **Automatic Convergence Testing**
 - from initial data or initiated during simulation
- **Look Ahead**
 - spawn off and run coarser resolution to predict likely future
- **Spawn Independent/Asynchronous Tasks**
 - send to cheaper machine, main simulation carries on
- **Application Profiling**
 - best machine/queue
 - choose resolution parameters based on queue

Dynamic Load Balancing

inhomogeneous loads

multiple grids

Portal

User/virtual organisation interface to the grid.

Intelligent Parameter Surveys

farm out to different machines

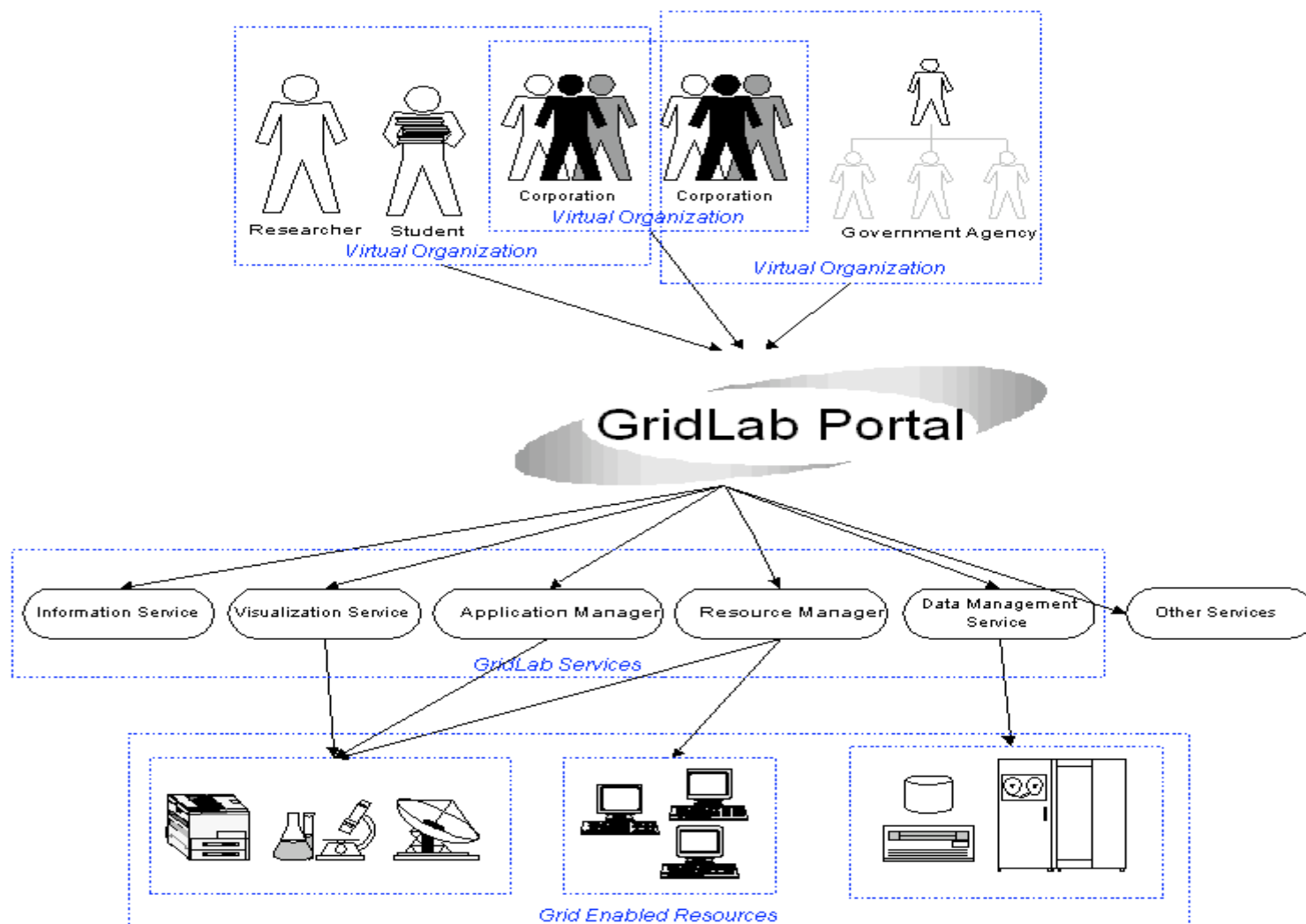
Make use of

Running with management tools such as Condor, Entropia, etc.

Scripting thorns (management, launching new jobs, etc)

Dynamic use of eg MDS for finding available resources

Portal Bridges Users and Services



Virtual Organizations

- A *Virtual Organization (VO)* consists of resources, services, and people collaborating across institutional, geographical, and political boundaries.
- Grid Portals provide a gateway for linking all of these elements together
- Grid Portals hide the complexity of the underlying Grid infrastructure that make VOs possible.
- Furthermore, Grid Portals can provide *value-added* services with Web interfaces tailored to the specific applications that are most important to particular VO.

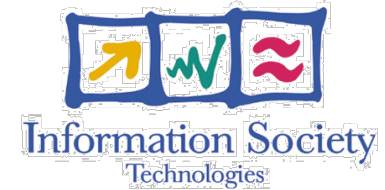
Grid Portals in the past...

- A Portal is only as good as the underlying deployed infrastructure
- Portlet development often involves debugging underlying middleware
- Often difficult and hard to maintain glue code must be written connecting the portal to Grid services, due to lack of/evolving standards.
- Most portals are stovepipe solutions that provide a complete solution with very little customization capabilities.
 - Separation of presentation and login
 - Generally hard coding of underlying Grid infrastructure details and the codebase
- Lack of real usability has made it difficult to test and evaluate user interfaces.
- Web application development still remains a tedious task with little in the way of reusable components, forcing developers to constantly “re-invent” the wheel.

- JSR 168 Portlet API ratified August 2003
 - Similar to Servlet API in providing reusable web applications
 - Ratified by vendors including BEA, Sun, IBM, Oracle, Plumtree and others...
- WSRP (Web Services for Remote Portlets) ratified by OASIS committee
 - Specifies how web services can be consumed by standards compliant portals
- Java Server Faces ratified
 - Specifies an event based user interface for web presentation development



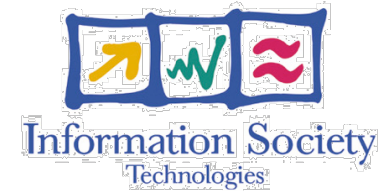
GridSphere Portal Framework



- GridLab Portal is developed using the GridSphere Portal Framework
- GridSphere provides a generic JSR 168 compliant portlet container
- The GridSphere portal framework provides an architecture for deploying “pluggable” web applications using the Portlet model.
- Provides a development environment for easily creating new portlet applications
- Offers a core set of portlets for the management of portlets, users, groups and layouts.
- A successful open source development model:
 - Active and responsive mail list
 - CVS access
 - Bugtracker
- <http://www.gridsphere.org>



GridLab Portlets

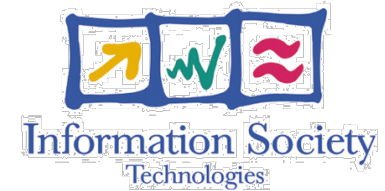


- The GridLab portal is an instance of GridSphere customized for the users and requirements of the GridLab project
- GridLab portlets can easily “plug” into GridSphere portlet container-- and hopefully any other portlet container.
- GridLab portlets provide access to GridLab services and can be modified/reused by other Grid projects.
- Core aspects of grid portlets include security, job execution, file management/data transfer and providing resource information

- Currently developed portlets to support GridLab:
 - General job submission portlet
 - Supports GRMS Job Broker service developed by Work Package 9
 - Supports Globus job submission
 - Soon to come is GSI-SSH and Condor submission
 - General credential management portlet
 - Uses Myproxy for the secure storage and management of users credentials.
 - Allows users to selectively retrieve and use credentials for performing Grid operations.
 - Monitoring portlet demonstrates monitoring service developed by Work package 11



External Collaborations



- Working to support GridSphere for the general Grid portal community:
- Albert-Einstein-institute in Berlin & LSU to develop portlets for studying numerical relativity.
- Geon earth sciences, microscopy portal and others at SDSC
- Canadian National research Council (NRC) to develop grid data transfer portlets using GridFTP
- SZTAKI research center in Budapest to use GridSphere to support users of SuperGrid and ClusterGrid projects
- Virtual Observatory project in Australia
- PSNC in Poland to support ClusterIX project
- Many more:
 - <http://www.gridsphere.org/gridsphere/gridsphere?cid=collaborations>
- Interested in promoting GridSphere, grid computing and portlets to more communities! Please e-mail us if interested!