Open Science Grid

at Condor Week

Ruth Pordes
Fermilab
April 25th 2006
Outline

- OSG goals and organization
- Drivers and use today
- Middleware
- Focus and roadmap
What, Who is Open Science Grid?

- **High Throughput Distributed Facility**
  - Shared opportunistic access to existing clusters, storage and networks.
  - Owner controlled resources and usage policies.
- **Supports Science**
  - Funded by NSF and DOE projects.
  - Common technologies & cyber-infrastructure.
- **Open & Inclusive**
  - Collaboration of users, developers, grid technologists & facility administrators.
  - Training & help for administrators and users
  - Partner with peer grid projects.
- **Heterogeneous**
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<tr>
<th>Role</th>
<th>Name</th>
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<tr>
<td>Executive Director:</td>
<td>Ruth Pordes</td>
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<td>Facility Coordinator:</td>
<td>Miron Livny</td>
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<td>Application Coordinators:</td>
<td>Torre Wenaus &amp; fkw</td>
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<td>Resource Managers:</td>
<td>P. Avery &amp; A. Lazzarini</td>
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<td>Education Coordinator:</td>
<td>Mike Wilde</td>
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<td>Engagement Coord.:</td>
<td>Alan Blatecky</td>
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<td>Middleware Coord.:</td>
<td>Alain Roy</td>
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<td>Ops Coordinator:</td>
<td>Leigh Grundhoefer</td>
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<td>Security Officer:</td>
<td>Don Petravick</td>
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<td>Liaison to EGEE:</td>
<td>John Huth</td>
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<td>Liaison to Teragrid:</td>
<td>Mark Green</td>
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<td>Council Chair:</td>
<td>Bill Kramer</td>
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& 5 year proposal submitted
OSG Drivers:

- Research groups transitioning from & extending (legacy) systems to Grids:
  - US LHC Collaborations
    - Contribute to & depend on milestones, functionality, capacity of OSG.
    - Commitment to general solutions, sharing resources & technologies;
  - Application Computer Scientists
    - Real life use of technology, integration, operation.
- Federations with Campus Grids
  - Bridge & interface Local & Wide Area Grids.
- Interoperation & partnerships with national/international infrastructures
  - Ensure transparent and ubiquitous access.
  - Work towards standards.

LIGO- gravitational wave physics;
STAR - nuclear physics, CDF, D0, - high energy physics,
SDSS - astrophysics
GADU - bioinformatics
Nanohub

NMI, Condor, Globus, SRM

GLOW, FermiGrid, GROW, Crimson, TIGRE

EGEE, TeraGrid, INFNGrid
LHC Physics drive schedule and performance envelope

- Beam starts in 2008:
  - Distributed System must serve 20PB of data in served across 30PB disk distributed across 100 sites worldwide to be analyzed by 100MSpecInt2000 of CPU.
  - Service Challenges give steps to full system

![Daily Averaged Throughput From 07/04 to 13/04](chart.jpg)
Priority to many other stakeholders

- New science enabled by opportunistic use of resources
  - *E.g. From OSG Proposal:* LIGO: With an annual science run of data collected at roughly a terabyte of raw data per day, this will be critical to the goal of transparently carrying out LIGO data analysis on the opportunistic cycles available on other VOs hardware.

- Opportunity to share use of “standing army” of resources
  - *E.g. From OSG news:* Genome Analysis and Database Update system, uses grid resources to analyse all publicly available genome sequence data used by over 2,400 researchers worldwide.

- Interface existing computing and storage facilities and Campus Grids to a common infrastructure.
  - *E.g. FermiGrid Strategy:* To allow opportunistic use of otherwise dedicated resources. To save effort by implementing shared services. To work coherently to move all of our applications and services to run on the Grid.
More than 18,000 batch slots registered.

... but only 15% of it used via grid interfaces that are monitored.

- Large fraction of local use rather than grid use.
- Not all registered slots are available to grid users.
- Not all available slots are available to every grid user.
- Not all slots used are monitored.
Use - Daily Monitoring
04/23/2006

Total Jobs per VO

“bridged” GLOW jobs
Genome analysis (GADU)

2000 running jobs

500 waiting jobs
Bridging Campus Grid Jobs - GLOW

- Dispatch jobs from local security, job, storage infrastructure and “uploading” to wide-area infrastructure.
- Fast ramp up in last week.
- Currently running the football pool problem which has application in data compression, coding theory, and statistical designs.
Genome Analysis and Database Update system

- Request: 1000 CPUs for 1-2 weeks. Once a month.
- 3 different applications: BLAST, Blocks, Chisel.
- Currently ramping up on OSG and receiving 600 CPUs and 17,000 jobs a week.
Common Middleware provided through Virtual Data Toolkit

Domain science requirements.

Globus, Condor, EGEE etc

OSG stakeholders and middleware developer (joint) projects.

Test on “VO specific grid”

Integrate into VDT Release.
Deploy on OSG integration grid

Include in OSG release & deploy to OSG production.
OSG allows you to

SURF

The Grid
Focus on a
Secure
Usable
Reliable
Flexible
Distributed Facility
Security - Management, Operational and Technical Controls

- **Management**: Risk assessment and security planning, Service auditing and checking.
- **Operational**: Incident response, Awareness and Training, Configuration management.
- **Technical**: Authentication and Revocation, Auditing and analysis. End to end *trust* in quality of code executed on remote CPU.
Usability - Throughput, Scaling, Fault Diagnosis

- Priority, quotas, write-authorization based on VO role rather than individual
- Minimize threshold of entry
- Address Errors through to the VO applications: e.g. CMS Analysis program dashboard:

![Graph showing destination stats from April 18, 2006 to April 24, 2006]
Automated validation of basic services and site configuration
Configuration of HeadNode and Storage to reduce errors:
- Remove dependence on Shared File System
- Condor-managed GRAM fork queue
- Scaling tests of WS-GRAM and GridFTP.
The Future?

- Enable existing and future users.
- Increase the effective throughput.

First Year View:

Total Jobs per VO

Future: