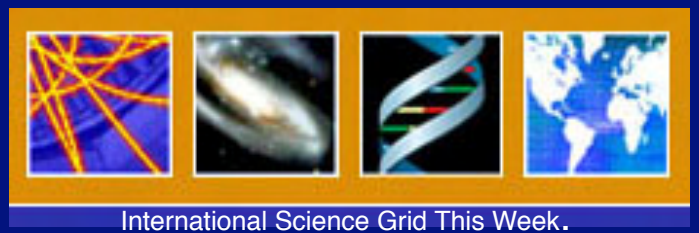
What Can the Open Science Grid Do for You?

Ruth Pordes

Associate Head, Fermilab Computing Division

Executive Director, Open Science Grid

US CMS Grid Services and Interfaces Coordinator

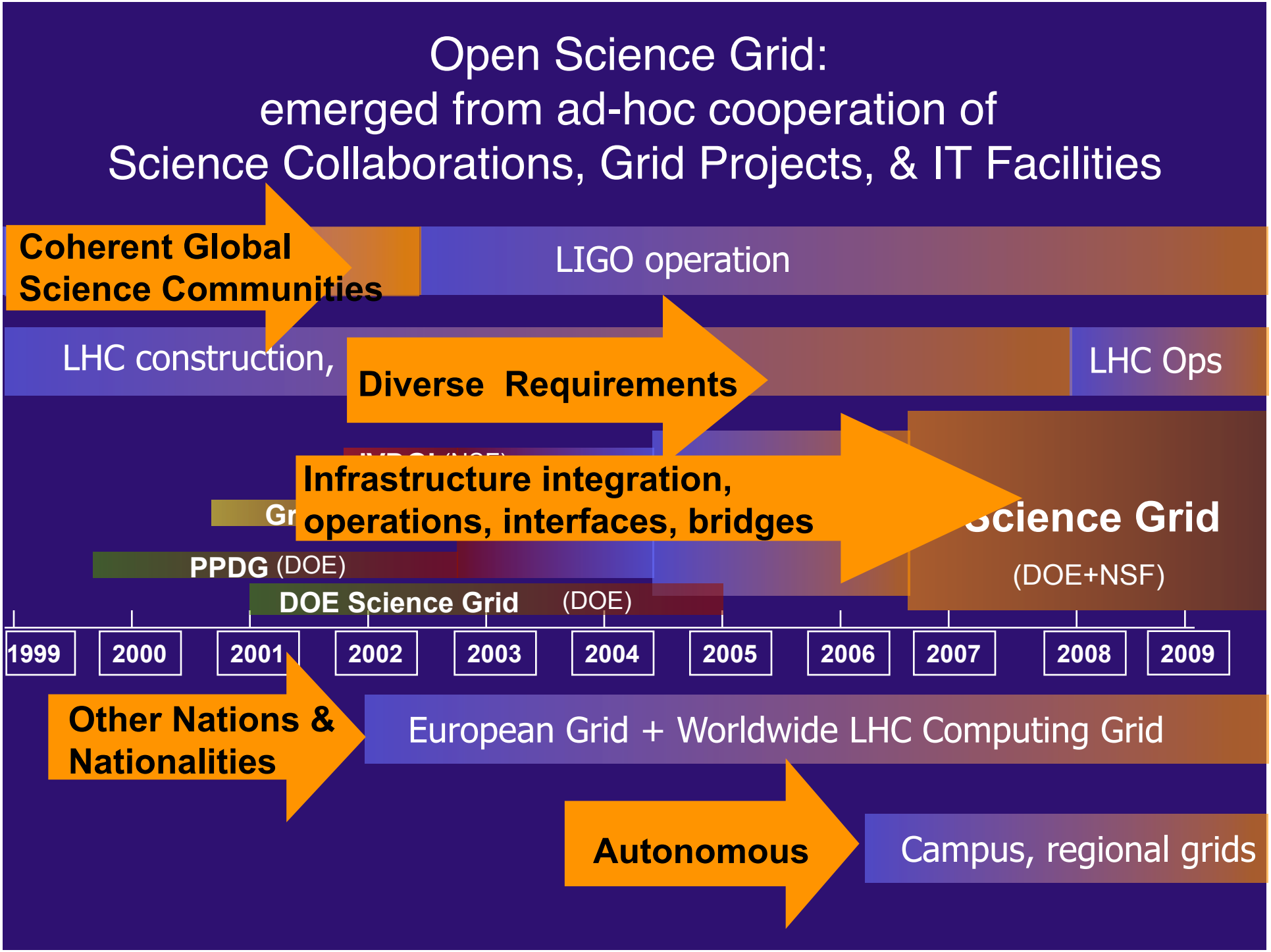


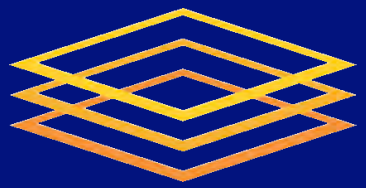
Since 1980s…Fermilab Science Mission supports Science with Large Data and Collaboration Needs

Data stored in 2007 for the 2 Tevatron Experiments (CDF, DZero)
if on DVDs 4 GB, 1.2 mm high

Early adopters of networks for data distribution, web information access, & distributed computing.

DZero Collaboration


Open Science Grid:
emerged from ad-hoc cooperation of
Science Collaborations, Grid Projects, & IT Facilities
Coherent Global Science Communities
LIGO operation
LHC construction,
Diverse Requirements
LHC Ops
Infrastructure integration, operations, interfaces, bridges
Science Grid
(DOE+NSF)
PPDG (DOE)
DOE Science Grid (DOE)
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Other Nations & Nationalities
European Grid + Worldwide LHC Computing Grid
Autonomous
Campus, regional grids



Transform processing and **data** intensive **science** through a

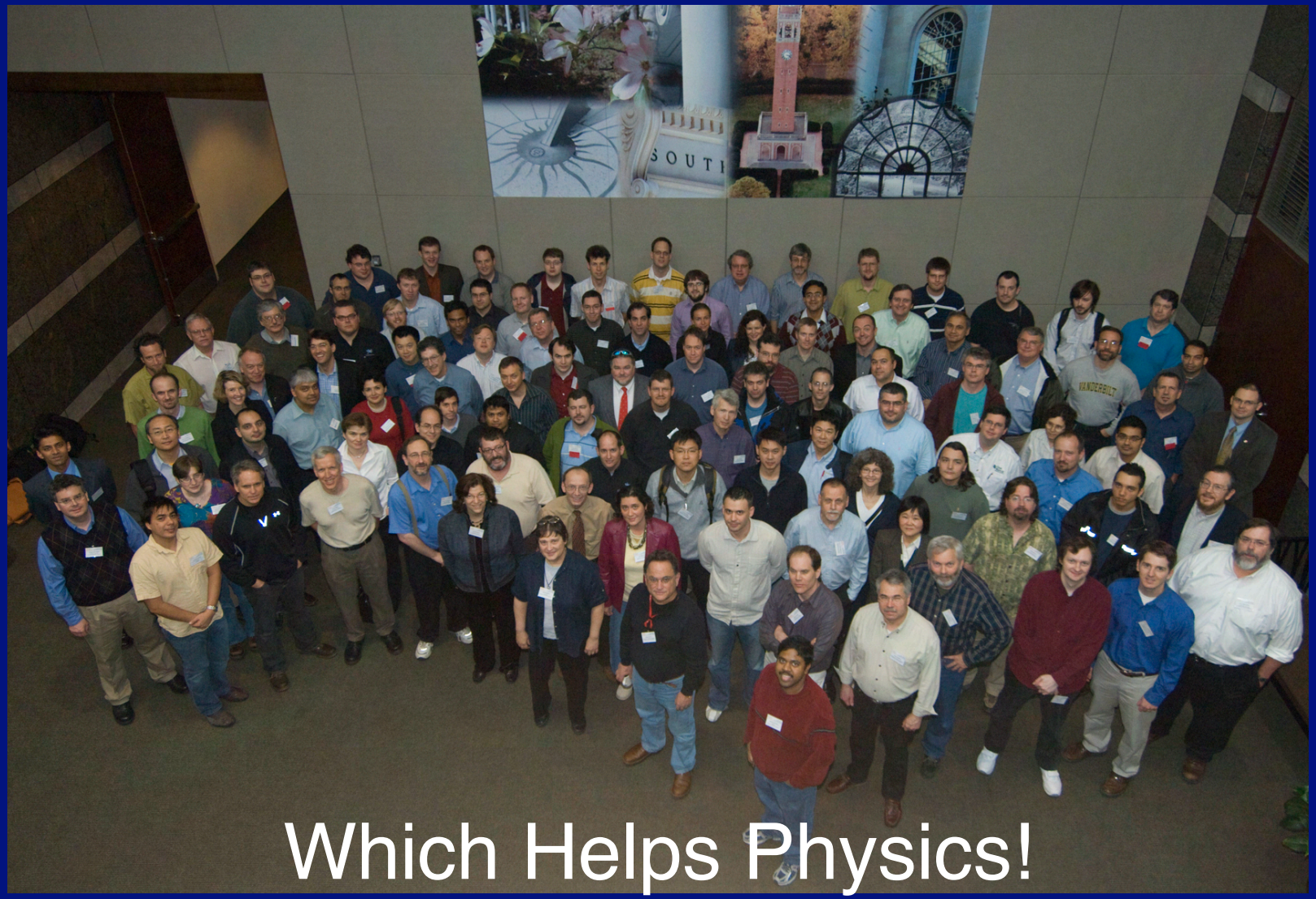
cross-domain **shared national distributed cyber-infrastructure** that

brings together **campus and community** infrastructure and facilitates the needs of

Virtual Organizations (VO) at all scales

Through Practical Steps

Physics Helping Non-Physics



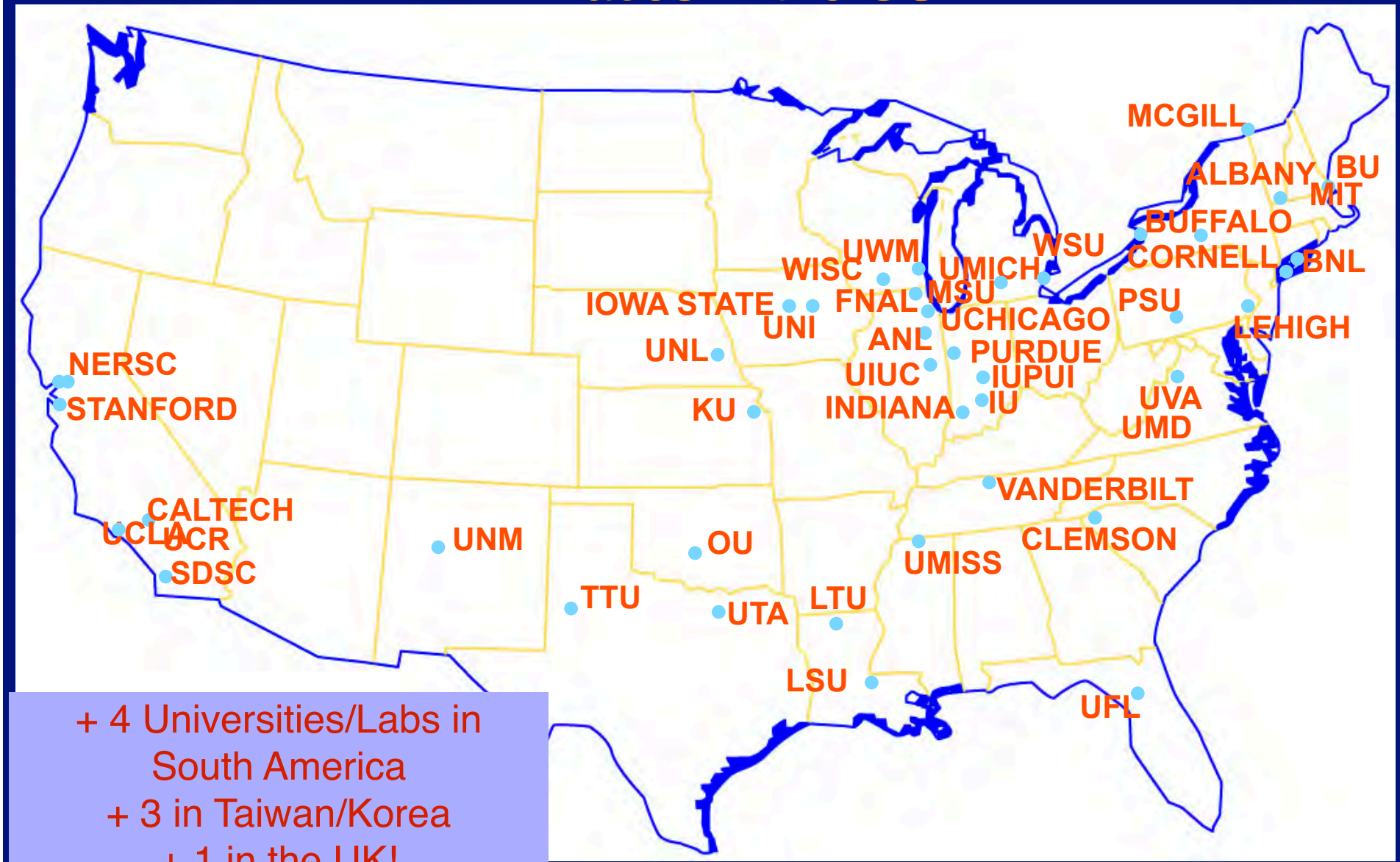
Which Helps Physics!

Project supported by the
Department of Energy Office
of Science SciDAC-2 program
High Energy Physics,
Nuclear Physics and
Advanced Software and
Computing Research
programs,

and the

National Science Foundation
Math and Physical Sciences,
Office of Cyber Infrastructure
and Office of International
Science and Engineering

Computers and Disks Accessible at Many Places in the US



+ 4 Universities/Labs in South America
+ 3 in Taiwan/Korea
+ 1 in the UK!

Academia Sinica	Kyungpook National University	University of Arkansas
Argonne National Laboratory (ANL)	Laser Interferometer Gravitational Wave Observatory (LIGO)	Universidade de São Paulo
Boston University	Lawrence Berkeley National Laboratory (LBL)	Universideade do Estado do Rio de Janerio
Brookhaven National Laboratory (BNL)	Lehigh University	University of Birmingham
California Institute of Technology	Massachusetts Institute of Technology	University of California, Davis
Center for Advanced Computing Research	National Energy Research Scientific Computing Center (NERSC)	University of California, Riverside
Center for Computation & Technology at Louisiana	National Taiwan University	University of California, San Diego
The State University of New York at Buffalo	New York University	University of Chicago
Center for High Performance Computing at the University of New Mexico	Notre Dame University	University of Connecticut Health Center
Clemson University	Oak Ridge National Laboratory	University of Florida
Collider Detector at Fermilab (CDF)	OSG Grid Operations Center (GOC)	University of Illinois at Chicago
Columbia University	Pennsylvania State University	University of Michigan
Condor Project	Purdue University	University of Nebraska - Lincoln
Cornell University	Renaissance Computing Institute	University of New Mexico
DZero Collaboration	Rice University	University of North Carolina
Fermi National Accelerator Laboratory (FNAL)	Rochester Institute of Technology	University of Northern Iowa
Florida International University	São Paulo Regional Analysis Center (SPRACE)	University of Oklahoma
Georgetown University	Sloan Digital Sky Survey (SDSS)	University of Rochester
The Globus Alliance	Solenoidal Tracker at RHIC (STAR)	University of South Florida
Hampton University	Southern Methodist University	University of Texas at Arlington
Harvard University	Stanford Linear Accelerator Center (SLAC)	University of Virginia
Indiana University	State University of New York at Buffalo	University of Wisconsin-Madison
Indiana University-Purdue University,	Syracuse University	University of Wisconsin-Milwaukee Center for Gravitation and Cosmology
Wayne State University	Texas Tech University	US ATLAS
	Thomas Jefferson National Accelerator Facility	US CMS
		Vanderbilt University

~43,000 cores

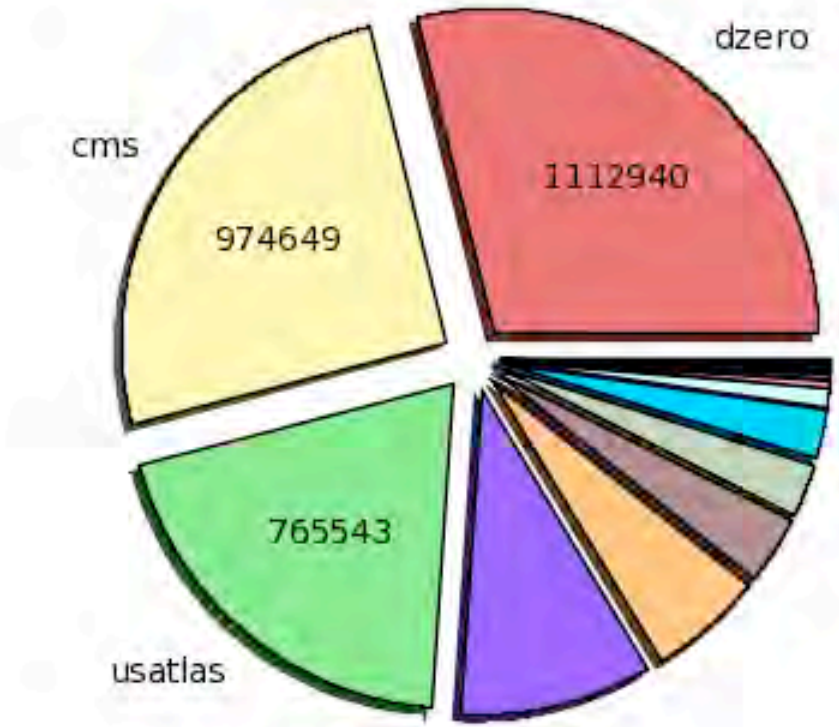
~6 Petabytes shared Disk

Tape storage

Sharing of the Facility among all LHC experiments and Run II, RHIC, Theorists, Biologists, Chemists, Climate…

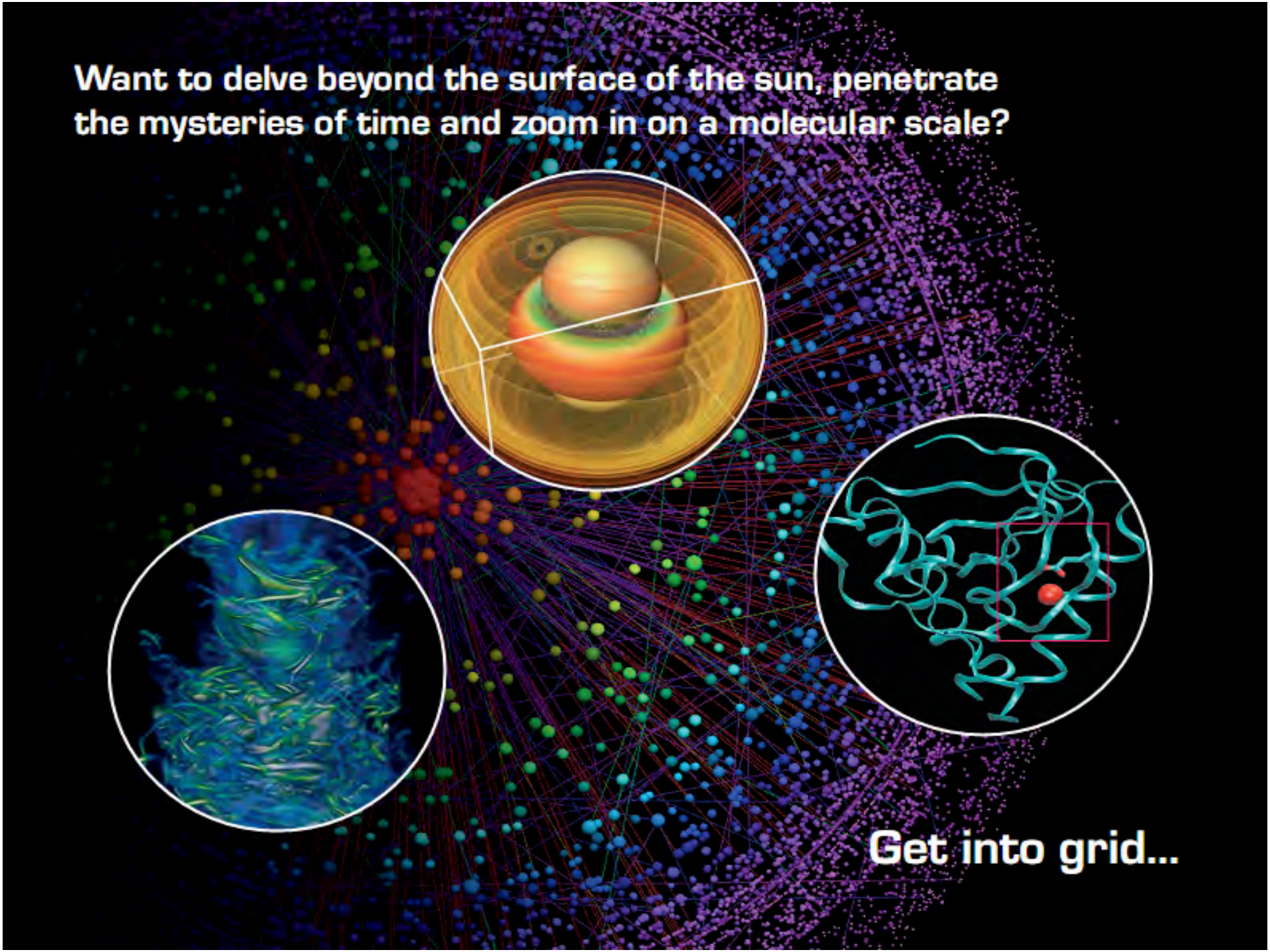
Common software developed between Computer Science projects and HENP.

400,000 CPU days/day
200,000 jobs/day



dzero (1112941)
engage (131131)
dosar (8768)
Other (2937)
cms (974649)
fermilab (103352)
ilc (6207)
lhcb (2575)
usatlas (765543)
ligo (94711)
osg (4340)
geant4 (2091)
cdf (371072)
star (34383)
nanohub (3604)
miniboone (1463)
unknown (219324)
nysgrid (14572)
other (3188)
hypercp (1287)

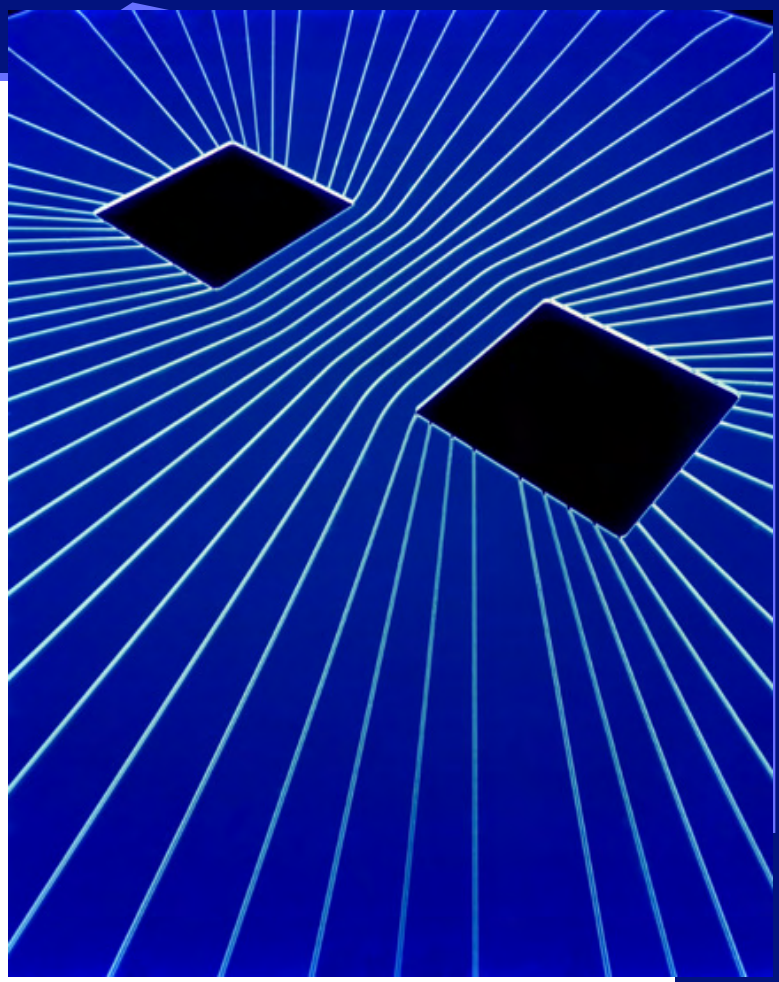
OSG is part of the Worldwide LHC Computing Grid Collaboration (together with EGEE & the Experiments)


Want to delve beyond the surface of the sun, penetrate the mysteries of time and zoom in on a molecular scale?
Get into grid...

Britta Daudert

California Institute of Technology

Britta is an OSG user with the Laser Interferometer Gravitational Wave Observatory (LIGO) experiment; gravity wave research is one of OSG's principle science drivers.



Alain Roy

University of Wisconsin-Madison

Alain is the software coordinator for OSG. He is a computer scientist in the Condor Project.

(He is a master bread maker)

Building a **symmetric "eco-system"**
Sites, VOs, Users all participate.

"Providing the security framework that promotes autonomous and open science collaboration…"

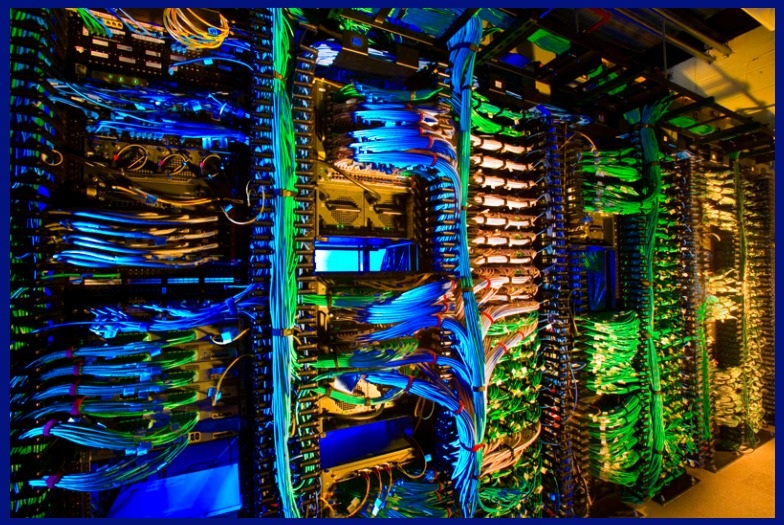
Balancing openness needed for the science with the **security** needed for OSG members

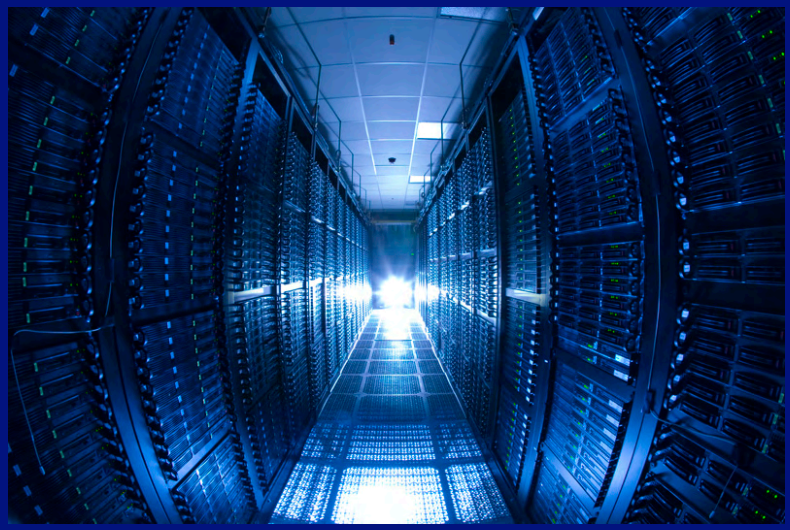
- Ensuring security is not compromised because of Open Science
- Ensuring science is not burdened because of security

Mine Altunay, Fermilab

The OSG Security Officer.

Acknowledg
http://www.la





Sites

Virtual Organizations

Autonomous and self-organized collaborative community of people and things they share.

Delegate physical identity management to the participating “Real” Organizations:

from “heavy-weight” long-lived, with strong governance and policies e.g. the LHC experiments,

to “ad-hoc” self-organizing, groups of individuals who dynamically build on a few common ideas in much the same way as internet -based social networks e.g. students in a Grid school class.

OSG acts as an Agency

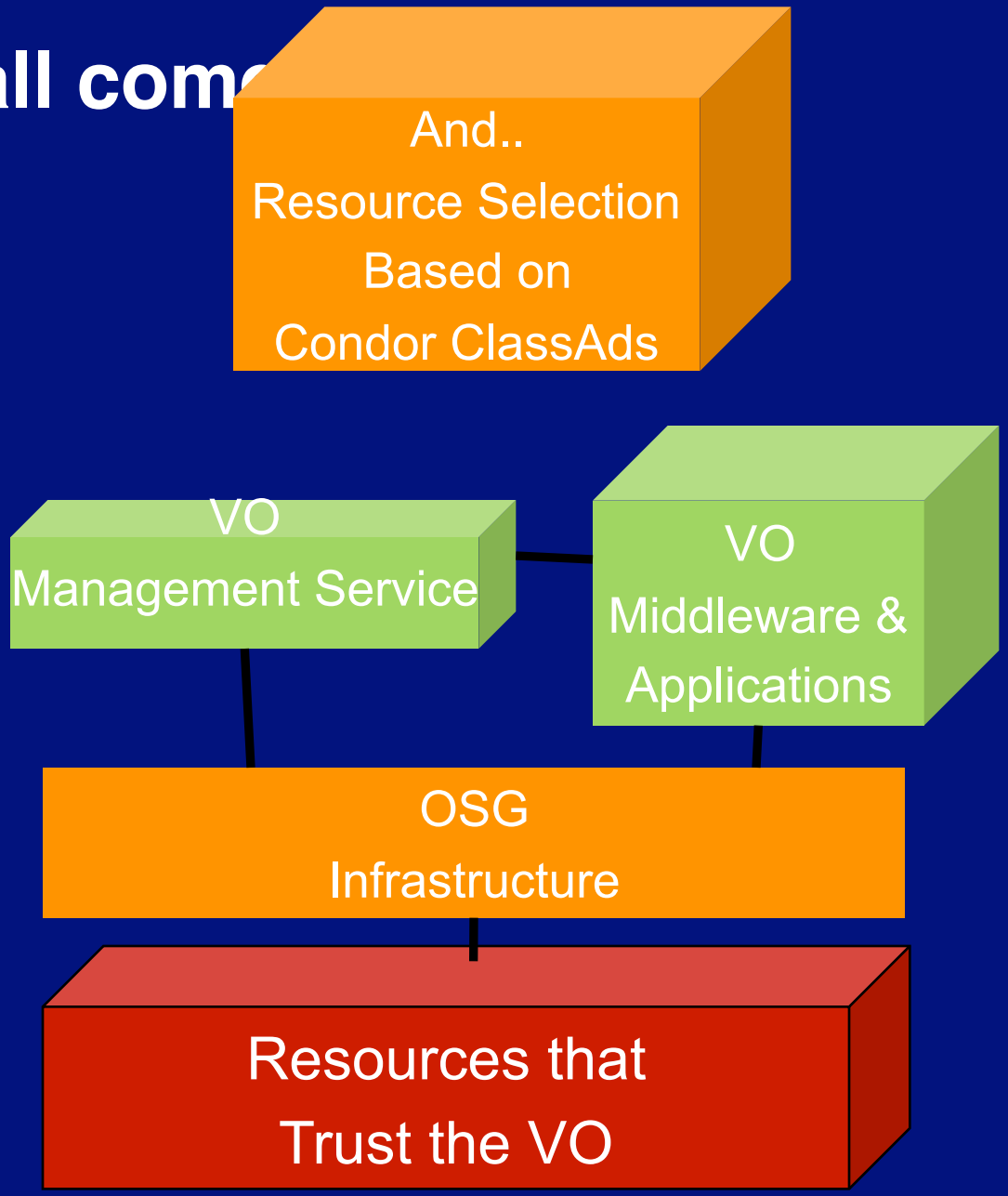
..brokers & supports relationships/expectations between VOs & resource, facility, service, software providers.

How it all com

Virtual Organization Management services (VOMS) allow registration, administration and control of members of the group.

Resources trust and authorize VOs not individual users

OSG infrastructure provides the fabric for job submission and scheduling, resource discovery, security, monitoring, …



Common Reusable Software

The Virtual Data Toolkit includes Condor, Globus, VO/group management security modules, accounting, monitoring, resource selection

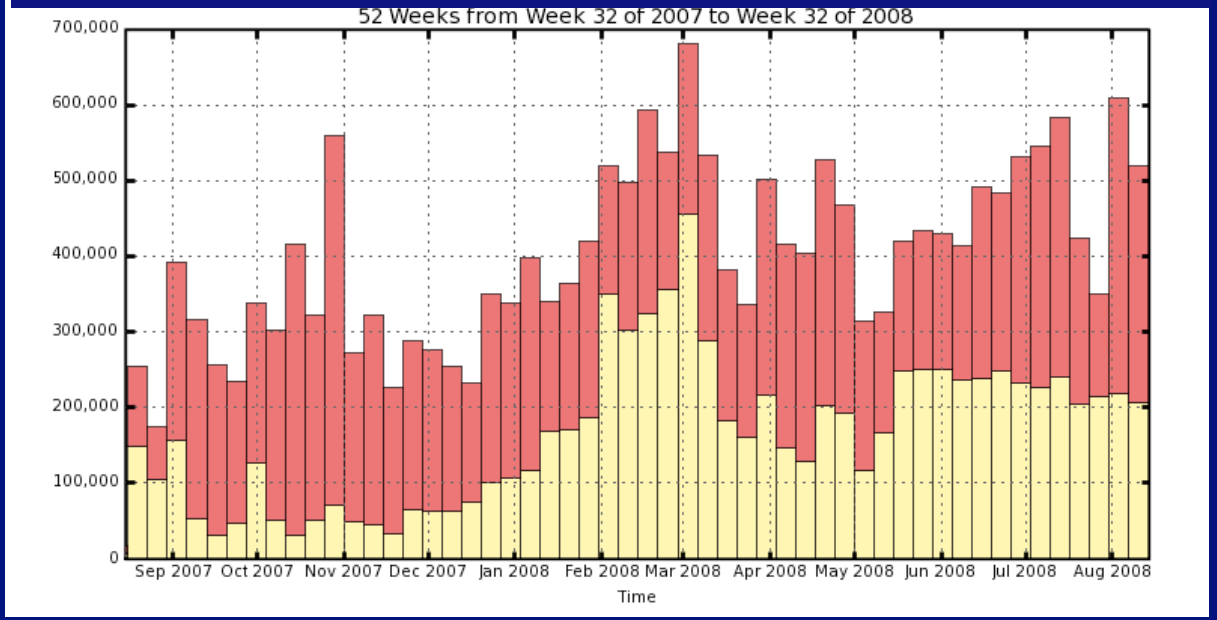
All software is open source.

The VDT is also supported for TeraGrid, Enabling Grids for EsciencE in Europe, National UK Grid and is in test for the Earth System Grid.

Opportunistic Use and Sharing:

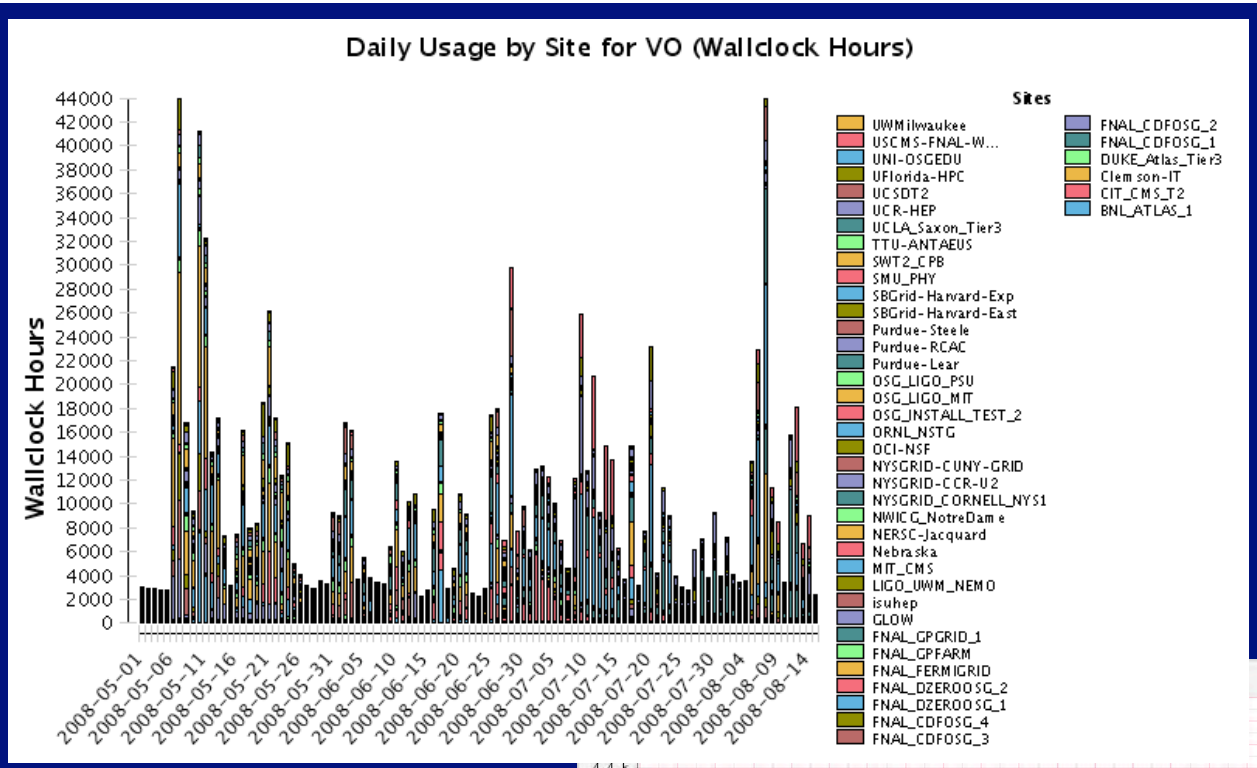
Helping Other HEP Collaborations

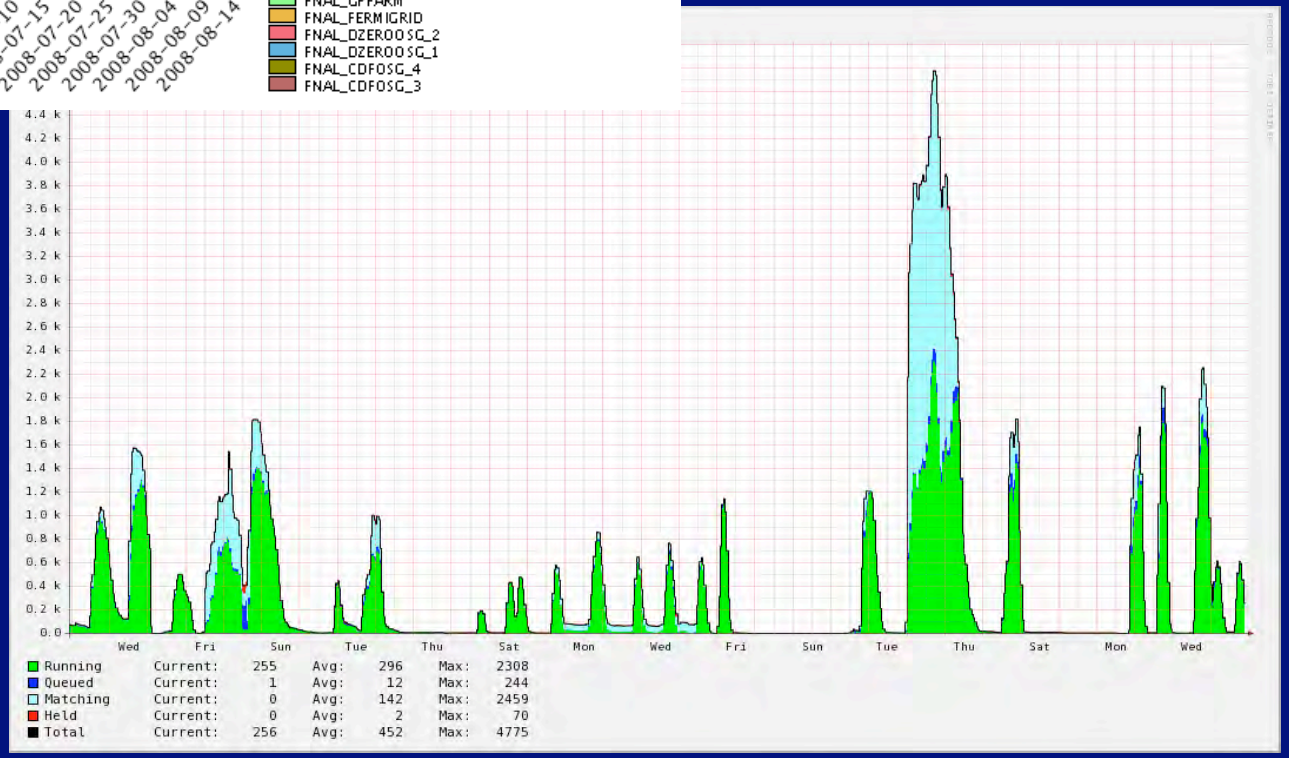
D0 use of Owned & Non-Owned CPUs



Engage

Helping the non-Physics Sciences



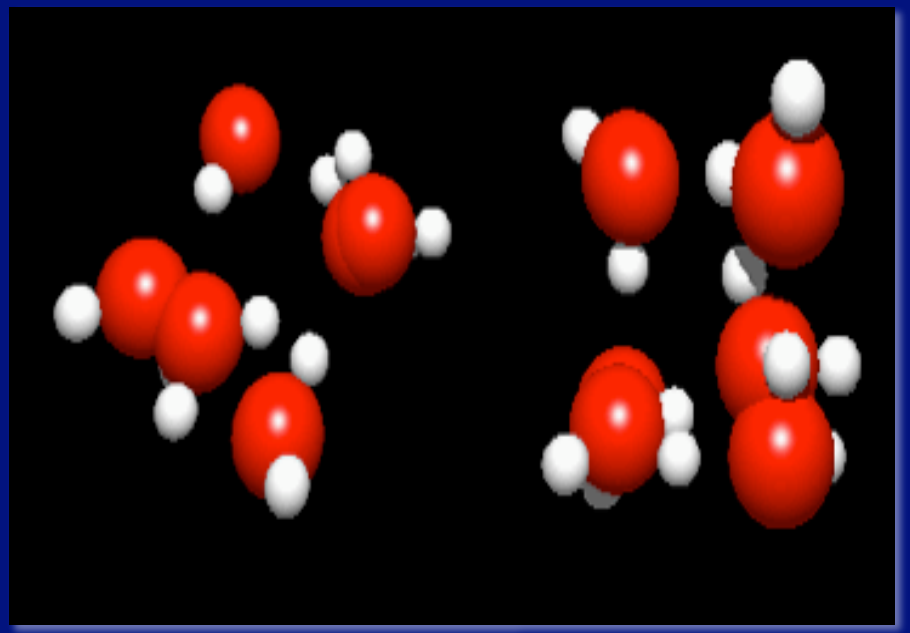


Chemistry - Andrew Shultz, University of Buffalo.

Application to model virial coefficients of water.

Anticipate research highlight/publication this summer.

78,000 jobs consuming average of about 100 CPU days/day over 6 months.

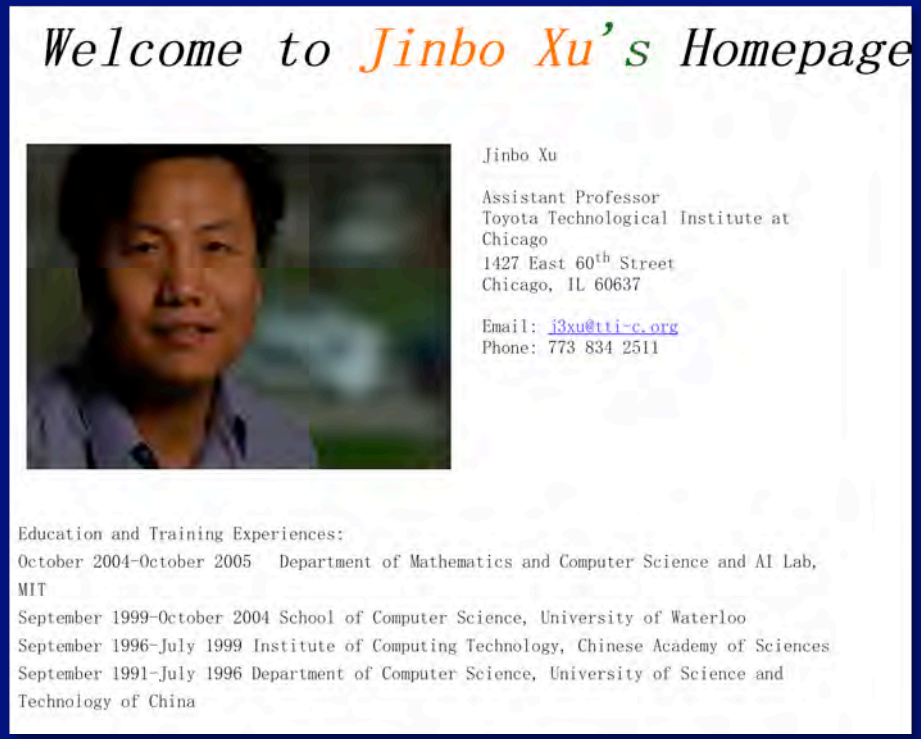


Computational Biology: Protein Folding/Structure

Assistant professor and 2 students running fairly steadily.

~620,000 CPU wallclock hours in 2008 (average 120 cpudays/day for ~210 days).

Expect research highlight in the next few months.


Welcome to Jinbo Xu's Homepage

Jinbo Xu

Assistant Professor
Toyota Technological Institute at Chicago
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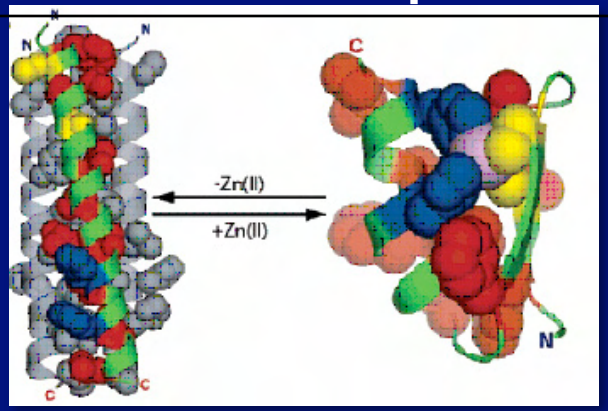
Chicago, IL 60637

Email: j3xu@tti-c.org
Phone: 773 834 2511

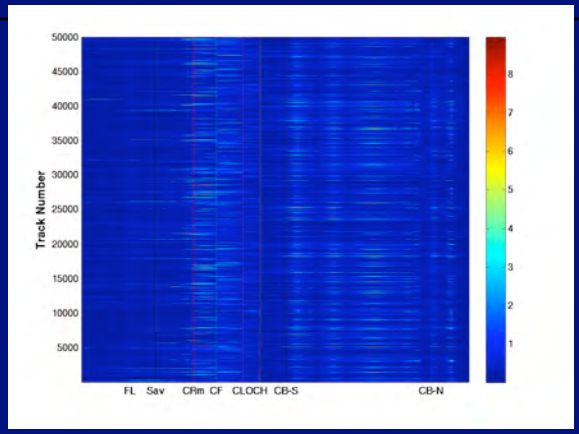
Education and Training Experiences:
October 2004-October 2005 Department of Mathematics and Computer Science and AI Lab, MIT
September 1999-October 2004 School of Computer Science, University of Waterloo
September 1996-July 1999 Institute of Computing Technology, Chinese Academy of Sciences
September 1991-July 1996 Department of Computer Science, University of Science and Technology of China

When does a set of individuals become a community/VO?

Kuhlman: Rosetta protein modelling

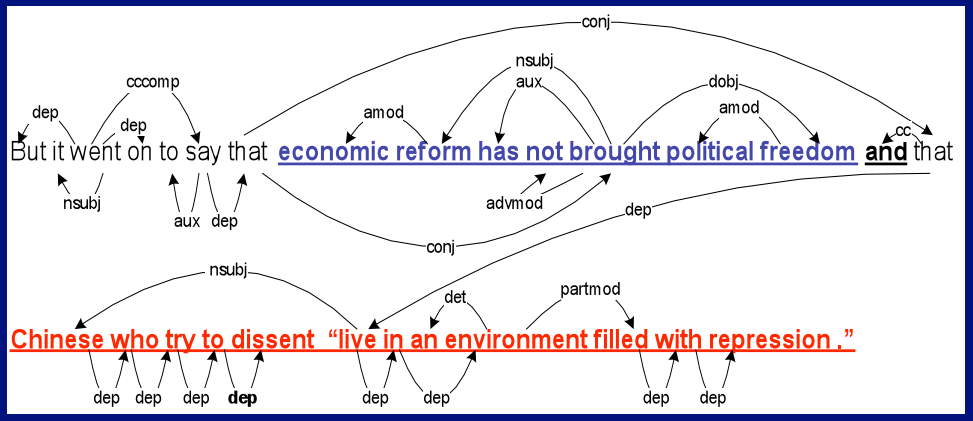


Luettich: Coastal Modeling



Protein Analysis; JHU

Deep language processing: UNC

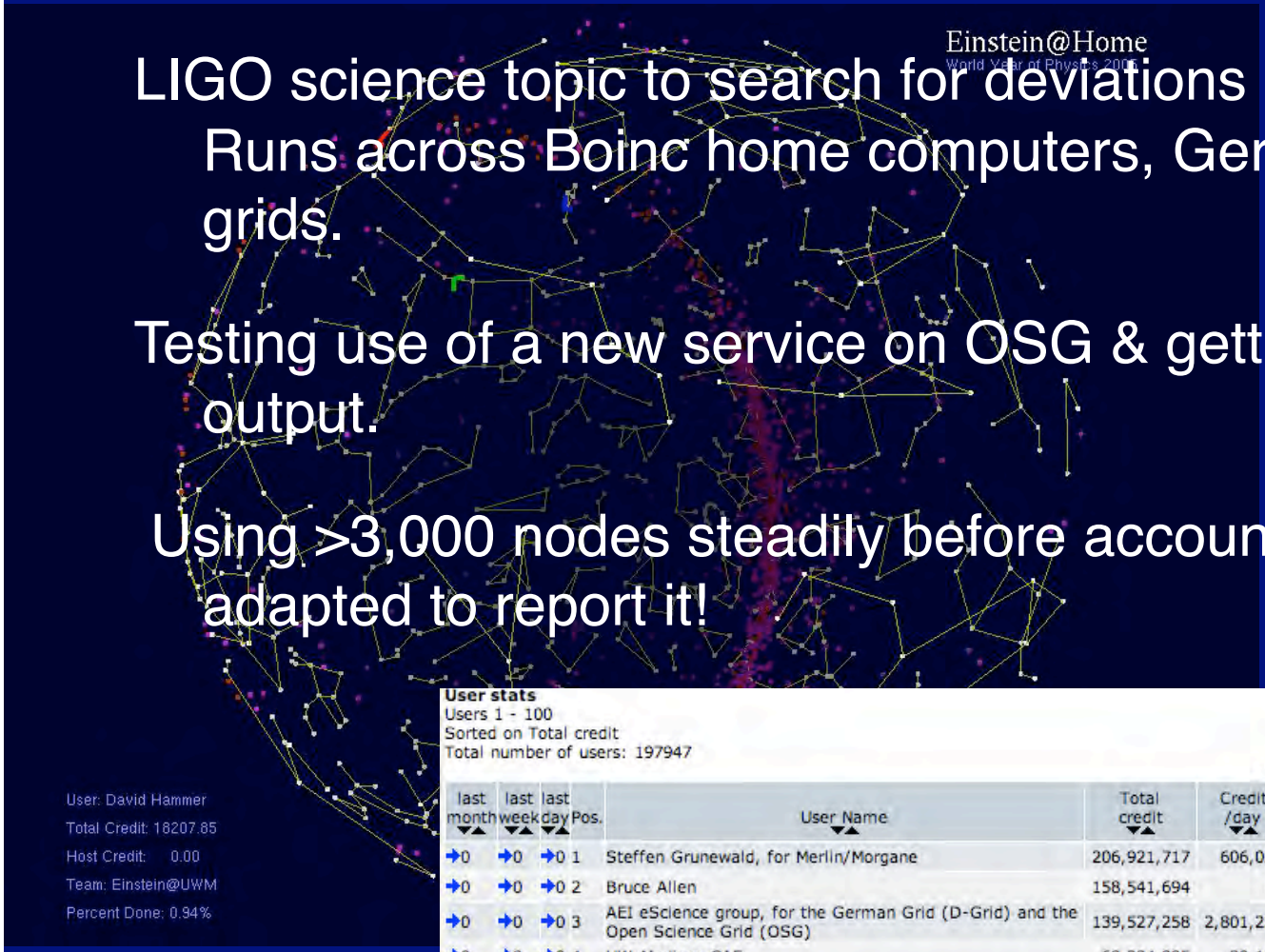


Einstein@home

LIGO science topic to search for deviations in pulsar signals. Runs across Boinc home computers, German and US grids.

Testing use of a new service on OSG & getting science output.

Using >3,000 nodes steadily before accounting system adapted to report it!



User stats
Users 1 - 100
Sorted on Total credit
Total number of users: 197947

Einstein@Home

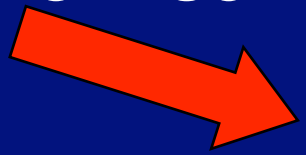
▸▸ 100 ▸▸ 500 ▸▸ 1000 ▸▸ 10000

last month	last week	last day	Pos.	User Name	Total credit	Credit /day	Credit /week	Credit /month	Average credit	Over take	Options Compare
→0	→0	→0	1	Steffen Grunewald, for Merlin/Morgane	206,921,717	606,039	4,571,176	24,452,071	726,257	-	
→0	→0	→0	2	Bruce Allen	158,541,694	0	0	0	1	-	
→0	→0	→0	3	AEI eScience group, for the German Grid (D-Grid) and the Open Science Grid (OSG)	139,527,258	2,801,237	21,153,060	55,293,054	2,425,140	8	
→0	→0	→0	4	UW-Madison CAE	68,334,005	30,108	259,335	1,396,695	38,629	-	
→0	→0	→0	5	L&S IT Office	62,610,351	131,061	1,005,620	4,097,124	138,993	59	
→0	→0	→0	6	Erik A. Espinoza	48,553,082	23,000	282,851	2,231,881	50,335	-	
→0	→0	→0	7	LIGO Livingston LDAS	45,309,169	948	8,538	225,044	7,080	-	
→0	→0	→0	8	UTSC Computing Labs	42,474,911	3,790	19,898	81,018	2,741	-	
→0	→0	→0	9	UITS Computer Labs	42,065,464	33,886	250,956	1,093,532	36,025	13	

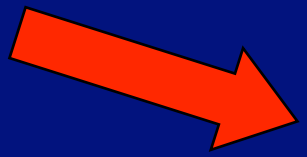
Becoming a Full OSG Citizen

Join the OSGEDU VO:

Run small applications after learning how to use OSG from schools



Be part of the Engagement program and Engage VO:



Be a standalone VO and a Member of the Consortium:

Ongoing use of OSG & participate in one or more activity groups.

iSGTW INTERNATIONAL SCIENCE GRID THIS WEEK

Home > iSGTW 13 August 2008 > iSGTW Feature - Youngest-ever attendee at grid summer school

Feature - Youngest-ever at grid summer school?

This summer, OGF (Open Grid Forum) welcomed someone who was possibly the youngest delegate in their history at OGF23, a grid standards conference held in June in Barcelona, Spain. We caught up with 15-year-old Iris Schott to hear how she got interested in grids and what else she has been doing with her summer. Here is the result of our question-and-answer session:

Iris Schott (center), possibly the youngest-ever OGF delegate, produced a report on OGF23, highlighting issues such as cloud computing, the BEinGRID Industry Days and OGF-Europe's Seminar on Digital Repositories. *Image courtesy of OGF*

iSGTW: What did you think of the conference?

IS: "To be honest, I didn't understand much the first two days! At the end of the second day, some friends sat down with me, I asked them questions, and they explained a lot about how grid computing works. After that I found it much more exciting."

iSGTW: What do you think is exciting about grids?

IS: "You can do really interesting things with them. For example, it is possible to predict the development of a company's shares, an investment, or the economy by performing simulations on the grid. This can help you make good business choices. Companies can also use grids for technical calculations, I learned of car producers who are using it in crash simulations."

iSGTW: Do grids fit into your future career plans?

IS: "Yes! This summer at OGF23 was very important for me in fact. It gave me the final trigger to choose my topic for study at university. I'll next year, in the fall of 2009, studying mathematical finance and computing."

"When I haven't been learning about Service Level Agreements I've been building forts, swimming and cooking with kids." *Image courtesy of Wolfgang Pohl, Abenteuergelände*

Origins

iSGTW: How did you originally get interested in this?

IS: "It began in 2005—I was 13—when my father brought home a Desktop Grid (Platform LSF Desktop) to test. He connected all the PCs in house, including mine. This really fascinated me. I charged him for CPU hours used and saw for the first time that grid computing could be used to make money."

iSGTW: What else have you been doing with your summer?

IS: "I attended the Core Grid Summer School held in early July in Dortmund, Germany. And I also interned as a team leader at a scout camp in Germany. So, this summer, when I haven't been learning about Service Level Agreements I've been building forts, swimming and cooking with kids."

iSGTW: You were the youngest participant at OGF this summer; Were you one of the few females as well?

Search *iSGTW*

Search by keyword

enter query...

Browse by subject

iSGTW 13 August 2008

Feature - Almost starting-up the LHC

Feature - STAR of the show

Feature - Youngest-ever attendee at grid summer school

Link - LHC at home

Image - Go ask ALICE

Announcement

Job opening: UNL-CMS Tier-3 systems administrator

Submissions open, AGU Meeting, San Francisco, 10 Sept

Jobs in grid - Nikhef

Call for Exhibitors, eChallenges, Stockholm, 15 August

Mark your calendar

August 2008

10-16 Aug, SC Education Workshop 2008, OK, US

19-22, Concurrency Theory, Toronto, Canada

20-22, ChinaGrid 2008, Dunhuang, China

25-27, ISD 2008, Paphos, Cyprus

25-28, CoreGRID Symposium, Canary Island, Spain

Education & Communication

New Technologies,
Clouds, Companies

How To:

Have usable global file systems.

Have really transparent use of the global computer.

Make effective use of multi-core.

Integrate High Performance and High Throughput computing.

Use specialized hardware & new operating systems.

What can You Do for the Open Science Grid ?