



Cyberinfrastructure

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Outline

- Management
- Resources
- Research

Management

CIWG Objectives

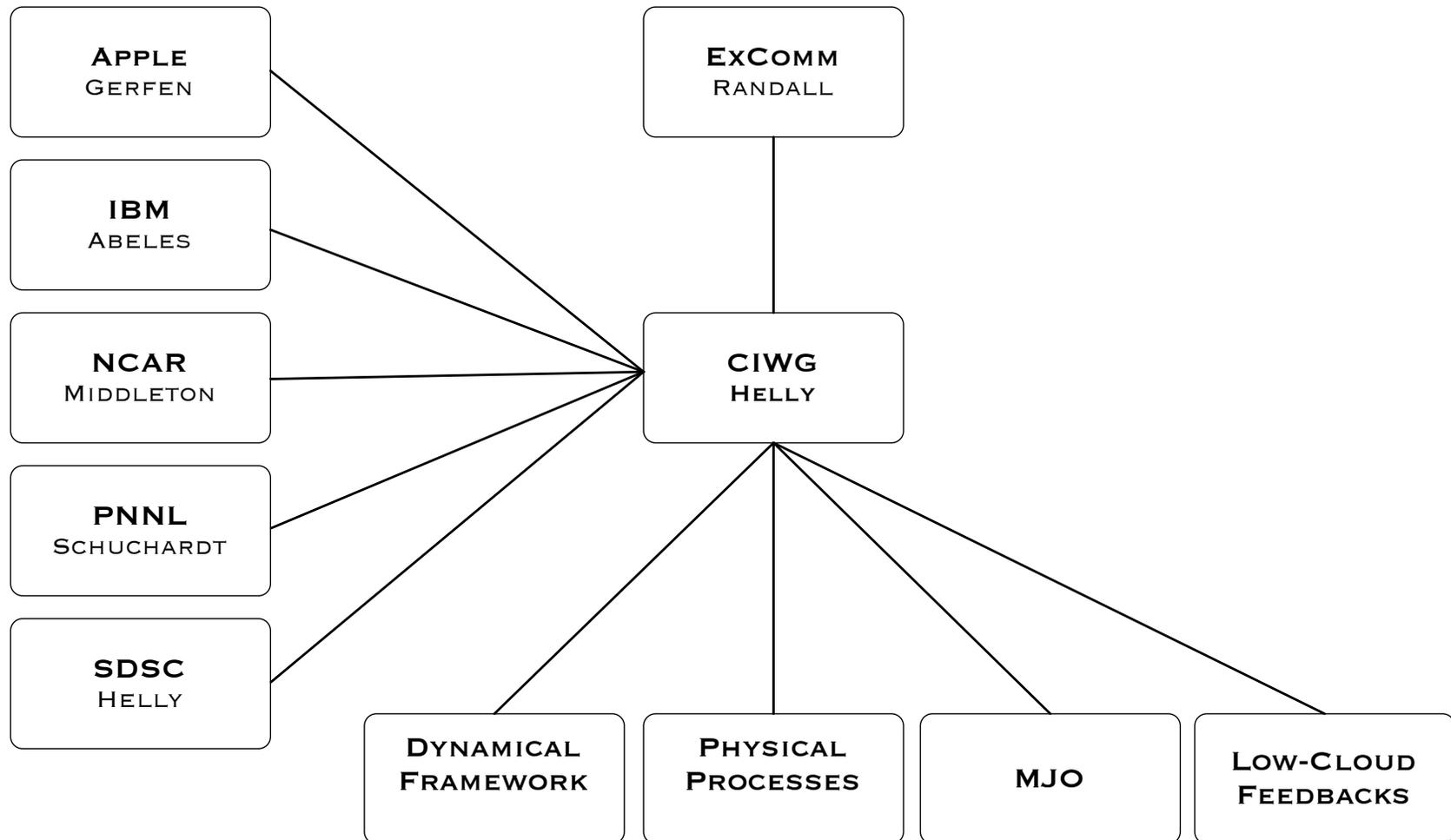
- Make efficient use of computing and data resources
 - acquire resources
 - coordinate resource utilization
 - collaborate to leverage joint efforts
- Validate goals and provide advice onto Executive Committee

CIWG Management Resources

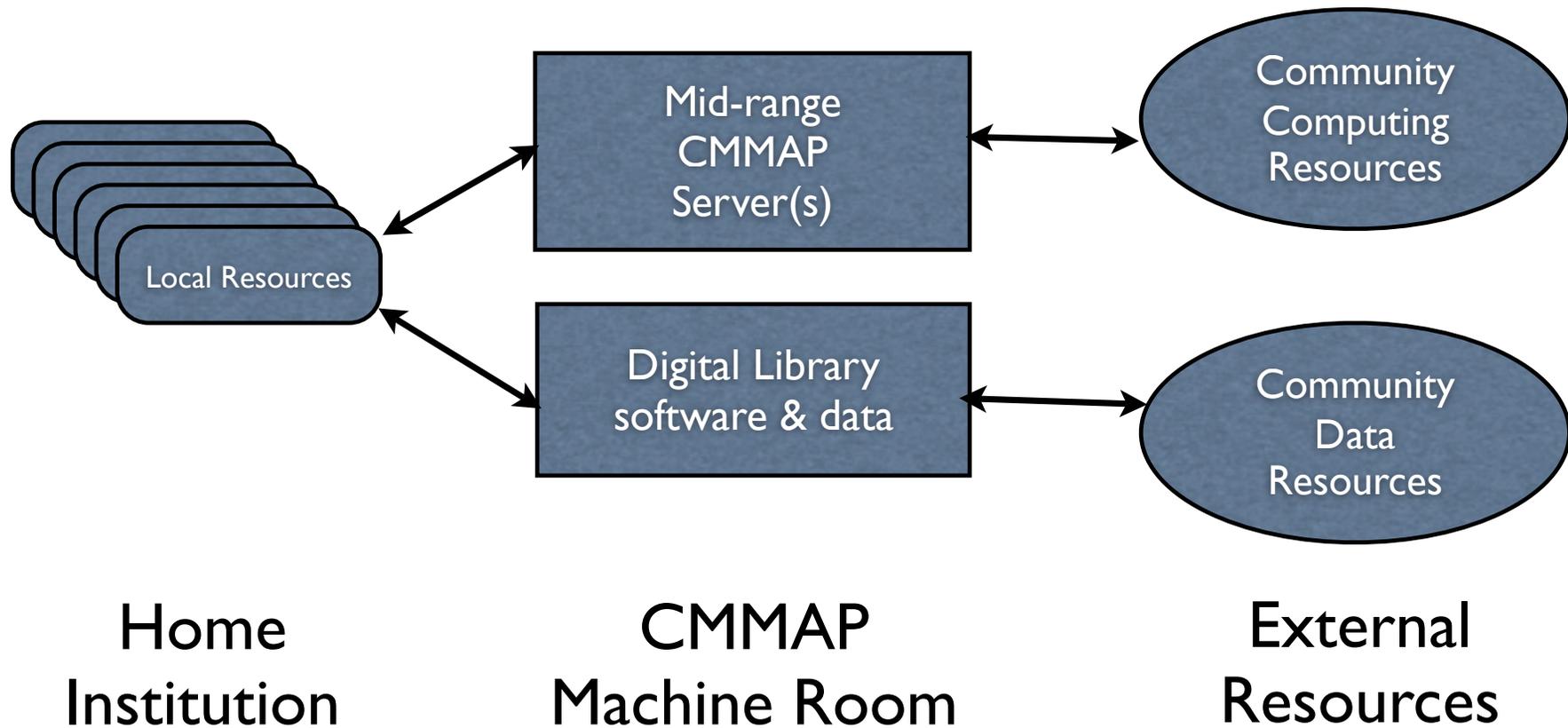
The screenshot shows a web browser window with the following elements:

- Browser Address Bar:** <http://magma.sdsc.edu:8080/?q=node/23>
- Page Title:** Cyberinfrastructure Working Group (CIWG) of the Center for Mesoscale Modeling of Atmospheric Processes (CMMAP) | Laboratory for Earth and Environmental Science
- Navigation Bar:** Wizz RSS 2.1.9, Feed Search, Help etc., Options etc., Watch List, Weather
- Header Image:** A photograph of a tall, dark, conical structure against a blue sky with clouds.
- Header Text:** Laboratory for Earth and Environmental Science / San Diego Supercomputer Center
The sun will burn out in 5 billion years
- Header Links:** Content | my account | Forums | Recent posts | General Purpose | News aggregator | Administer | log out
[edit primary links](#)
- Latest Articles:** [more](#)
- Section Title:** Cyberinfrastructure Working Group (CIWG) of the Center for Mesoscale Modeling of Atmospheric Processes (CMMAP)
- Buttons:** [view](#) [edit](#)
- Text:** This information is for managing and maintaining the CIWG activities and coordinating with collaborators.
- List of Resources:**
 - [Active Issues from 2007 Annual Meeting](#)
 - [Allocation Schedule](#)
 - [Computing Resource Matrix](#)
 - [Data Sources](#)
 - [Membership](#)
 - [Pending Proposals](#)
 - [Proposal Submission Process](#)
 - [Purpose](#)
 - [Reference Activities](#)
 - [Standards and Conventions](#)
 - [Top 500 Supercomputer Centers](#)
- Section Title:** Active Issues from 2007 Annual Meeting >
- Footer Links:** [add child page](#) | [printer-friendly version](#) | [add new comment](#)
- System Tray:** Done, Tor Disabled, and other icons.

Cyberinfrastructure Organization



Architectural Goals



Proposal Efforts

- 2006 MRI Not-selected by CSU
- 2007 NSF SDCI Modeler's Toolbox (not selected; reviewers said Teragrid is doing this)
- 2008 NSF MRI (could not match)
- 2008 NSF MSI Community Computing and Data Resource (not selected; do not have reviews yet)

Resources

Background

- CMMAP cyberinfrastructure is shared, not owned
 - Collaboration and leveraging are key to acquisition and efficient use of resources
 - CMMAP-owned computing and data resources will come from separate proposals
- Training the next generation of scientists in a state-of-the-art computing environment is essential
 - Want graduate student involvement in every aspect of computing activities

TeraGrid [User Support]

http://www.teragrid.org/userinfo/index.php

Getting Started Latest Headlines Surf Reports from ...

My Library TeraGrid [User Support]

TeraGrid About News Outreach Science Gateways User Support Search TeraGrid Search All TeraGrid Sites

User Support Resources Access Compute Data & Visualization Portal

User Support & Documentation

Home > User Support Resize This Text A A A

Accessing TeraGrid

First time user?

- Getting Started Diagram
- Getting Started Guide
- Access Overview
- Getting a start-up account

TeraGrid-wide Passwords!

- Learn about Single Sign-on
- Go to the TG User Portal

Monitor Your Usage

- From the command line
- From the TG User Portal

Need Help?

Help Desk page

- Phone Toll-free 1.866.907.2383
- Submit a Ticket (online form -- fastest)
- Submit a Ticket via email
- Get Advanced Support

Getting Started Guide

TeraGrid Knowledge Base

How do I ...

Form Finder

Latest User & System News

See all User & System News

View the Outage & Event Calendar

- Bigben Maintenance Wednesday 5/14/08
Posted: 2008-05-12 12:47:15 PM
- TACC Hosts 2nd Annual Summer Supercomputing Institute
Posted: 2008-05-12 10:54:20 AM
- Tungsten Disk Problems
Posted: 2008-05-11 09:28:43 PM
- Interruption to Access to TeraGrid User Portal
Posted: 2008-05-11 02:59:10 PM
- NCSA Tungsten is Down
Posted: 2008-05-09 07:28:50 PM

User Support Updates

- CTSS Upgrades Now Available
- Streamlined Single Sign-on from Desktop or Resource
- TeraGrid Knowledge Base Launched
- Batch Queue Prediction Service in User Portal
- Customized Searches in Resources Catalog

Computing

Computing & Running Jobs Overview

Programming Environment

- Compilers
- Managing environment variables with SoftEnv
- Environment variables common to all sites

Job Submission Technologies

- Condor-G
- Globus
- MyCluster
- MPICH-G2
- Multi-site VMI
- PBS

Reserve time for single- or cross-site runs

Data & Visualization

Data & Viz Overview

File Transfer

- Choosing the right data transfer method
- Where to initiate file transfers (GridFTP servers at each site)
- How to transfer files (GridFTP clients)

Data Storage and Management

- Data storage
- Policies at each site
- Archival storage
- Wide Area Network (WAN)

Hardware/Software/Storage

Hardware

- Resources Catalog
- Search the Catalog

Software

- Software Overview
- Supported applications
- Coordinated TeraGrid Software & Services
- Community Software Area

Storage

- Data storage
- Resources Catalog

TOP

The TeraGrid project is funded by the National Science Foundation and includes 11 partners: Indiana, LONI, NCAR, NCSA, NICS, ORNL, PSC, Purdue, SDSC, TACC and UCI/ANL. Please email help@teragrid.org with questions or comments. This site is XHTML 1.0 Transitional, CSS compliant.



NSF Teragrid Resources

High Performance Computing Systems

Name	Institution	System	CPUs	Peak TFlops	Memory TBytes	Disk TBytes	Load	Jobs*		
								R	Q	O
Ranger	TACC	Sun Constellation	62976	504.00	123.00	1730.00		1	291	67
Abe	NCSA	Dell Intel 64 Linux Cluster	9600	89.47	9.38	100.00		281	239	82
Lonestar	TACC	Dell PowerEdge Linux Cluster	5840	62.16	11.60	106.50		106	222	1
Queen Bee	LONI	Dell Intel 64 Linux Cluster	5440	50.70	5.31	100.00		52	1	0
Steele	Purdue	Dell Intel 64 Linux Cluster	6496	40.00	12.40	170.00		146	12	38
Big Red	IU	IBM e1350	3072	30.60	6.00	266.00		200	0	265
BigBen	PSC	Cray XT3	4136	21.50	4.04	100.00		0	0	0
Blue Gene	SDSC	IBM Blue Gene	6144	17.10	1.50	19.50		3	0	6
Tungsten	NCSA	Dell Xeon IA-32 Linux Cluster	2560	16.38	3.75	109.00		139	246	67
DataStar p655	SDSC	IBM Power4+ p655	2176	14.30	5.75	115.00		19	83	28
TeraGrid Cluster	NCSA	IBM Itanium2 Cluster	1744	10.23	4.47	60.00		100	34	0
Cobalt	NCSA	SGI Altix	1024	6.55	3.00	100.00		60	351	0
Frost	NCAR	IBM BlueGene/L	2048	5.73	0.51	6.00		11	5	0
TeraGrid Cluster	SDSC	IBM Itanium2 Cluster	524	3.10	1.02	48.80		12	22	2
DataStar p690	SDSC	IBM Power4+ p690	192	1.30	0.88	115.00		4	3	13
TeraGrid Cluster	UC/ANL	IBM Itanium2 Cluster	128	0.61	0.24	4.00		0	0	0
NSTG	ORNL	IBM IA-32 Cluster	56	0.34	0.07	2.14		0	0	0
Rachel	PSC	HP Alpha SMP	128	0.31	0.50	6.00		31	46	0
Total:			114284	874.38	193.42	3157.94		1165	1555	569

High Throughput Computing Systems

Name	Institution	Active/Available Nodes	Active/Available CPUs	Peak TFlops	Memory GBytes	Disk GBytes	Resource Details	Jobs
Condor Pool	Purdue	5212 / 6687	13318 / 17327	14	11588	230073		
Total:		5212 / 6687	13318 / 17327	14	11588	230073		

Advanced Visualization Systems

Name	Institution	System	CPUs	Peak TFlops	Memory TBytes	Disk TBytes	Graphics HW
TeraGrid Cluster	UC/ANL	Intel Xeon Cluster	192	0.61	0.38	4.00	nVIDIA GeForce 6600GT AGP graphics cards
Maverick	TACC	Sun E25K	128	0.27	0.50	0.56	16 nVIDIA QuadroFX 3000G graphics cards
Total:			320	0.88	0.88	4.56	

*Jobs Key: R - Number of Jobs Running, Q - Number of Jobs Queued, O - Number of Jobs in an Other State

ESG News

New Multifile Download Options: ESG now offers two ways of downloading multiple files at once to the user machine: [Data Mover Light](#) (see [DML instructions](#)) and the standard Unix command [wget](#) (see [wget instructions](#)). Both DML and wget are desktop clients that can be used to download large number of files from the ESG system without clicking on multiple hyperlinks.

New Browsing Options: now the ESG browsing interface allows to specify an optional string to match filenames, and to select many files with one single click.

Data Subsetting: OPeNDAP-G offers high-performance subsetting capabilities on a number of virtual aggregated datasets - see [list of available aggregations](#)

Registration is required to download some of the data: please [request](#) an account. Please [send us](#) comments or feedback.

New: [IPCC Working Group 1 data](#) available.

The [NCAR MSS](#) is scheduled for downtime each Sunday morning from 0000-0230 MST.

The [NERSC HPSS](#) is scheduled for maintenance downtime from 7-12 PST every Tuesday morning.

The [ORNL HPSS](#) is scheduled for downtime every other Wednesday morning from 8-12 EST.

ESG Current Status
 Updated: Fri May 9 11:49:55 MDT 2008 MDT

	LANL	LBNL	NCAR	ORNL
MSS/HPSS		☹	☹	☹
SRM	☹	☹	☹	☹
RLS	☹	☹	☹	☹
OpenDAPg			☹	
GridFTP server			☹	
HTTP server	☹		☹	

(Explanation of current status)

Data Search

Search Dataset metadata for:

Examples: c02, B06.77

- Browse Dataset Catalogs**
- 📁 [CCSM \(Community Climate System Model\)](#)
 - 📁 [CCSM POP \(modified version of Parallel Ocean Program\)](#)
 - 📁 [CSIM \(CCSM Sea Ice Model\)](#)
 - 📁 [CLM \(CCSM Community Land Model\)](#)
 - 📁 [NARCCAP \(North American Regional Climate Change Assessment Program\)](#)
 🔒 Restricted to registered NARCCAP users [[Register For Access](#)]
 - 📁 [PCM \(Parallel Climate Model\)](#)
 - 📁 [POP \(Parallel Ocean Program\)](#)
 - 📁 [Scientific Data Processing and Visualization Software](#)

Welcome to ESG

The Earth System Grid (ESG) integrates supercomputers with large-scale data and analysis servers located at numerous national labs and research centers to create a powerful environment for next generation climate research. This portal is the primary point of entry into the ESG.



- ESG Collaborators**
- Argonne National Laboratory
 - Lawrence Berkeley National Laboratory
 - Lawrence Livermore National Laboratory
 - Los Alamos National Laboratory
 - National Center for Atmospheric Research
 - Oak Ridge National Laboratory
 - University of Southern California/Information Sciences Institute

Funded by the U.S. Department of Energy

Shortcuts menu: - jump to -

DOE Earth System Grid Resources

Leveraging National & Partner Resources

	Organization	Resource	Amount
Data Allocations	San Diego Supercomputer Center (SDSC)	Disk	15 Terabytes
		BlueGene	30,000 SUs*
Computing Allocations	Teragrid (multi-institution)	SDSC DataStar (IBM SP4)	600,000 SUs
		Grid Roaming	600,000 SUs
	Lawrence Berkeley National Laboratory (LBNL)	National Energy Research Scientific Computing Center (NERSC)	700,000 SUs
	National Center for Atmospheric research (NCAR)	Bluelce IBM Power5	500,000 SUs
	IBM Watson Research Center	BGW - eServer Blue Gene Solution	TBD
	Stonybrook		TBD

Cyberinfrastructure Working Group (CIWG) of the Center for Mesoscale Modeling of Atmospheric Processes (CMMAP)

- Active Issues from 2007 Annual Meeting
- Allocation Schedule**
- Computing Resource Matrix
- Data Sources
- Membership
- Pending Proposals
- Proposal Submission Process
- Purpose
- Reference Activities
- Standards and Conventions
- Top 500 Supercomputer Centers

Events

May 2007

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Active forum topics

- General Invitation to Discussion

Allocation Schedule

view edit

Activities		Given Work	Flag	# Predec.	Planned Start	2005		2006			2007					
#	Info Title					F	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
0	Cyberinfrastructure Working Group		🚩		8/15/06				Cyberinfrastructure Working Group							
13	NAS@NASA Ames, Moffett Field				1/1/07				NAS@NASA Ames, Moffett Field							
14	Altix Requests	1d?			1/1/07				Altix Requests							
1	NCAR		🚩		8/15/06				NCAR							
2	Climate Simulation Lab (DOE)	1d?	🚩		8/15/06				Climate Simulation Lab (DOE)							
3	Scientific Computing Division (NSF)				4/2/07				Scientific Computing Division (NSF)							
5	April Submission	1d?			4/2/07				April Submission							
4	October Submission	1d?			10/1/07				October Submission							
6	NCCS@Oak Ridge National Laboratory		🚩		10/15/06				NCCS@Oak Ridge National Laboratory							
7	INCITE Proposal Submitted		🚩		10/15/06				INCITE Proposal Submitted							
15	NERSC@Brookhaven National Lab				10/18/07				NERSC@Brookhaven National Lab							
16	ERCAP Request	1d?			10/18/07				ERCAP Request							
8	San Diego Supercomputer Center		🚩		8/15/06				San Diego Supercomputer Center							
12	Data Allocation Requests	1d?	🚩		8/15/06				Data Allocation Requests							
9	Development Allocation		🚩		8/15/06				Development Allocation			1288.12 days				
11	LRAC: Large Resource Allocation	1d?			1/19/07				LRAC: Large Resource Allocation							
10	MRAC: Medium Resource Allocation	1d?	🚩		10/13/06				MRAC: Medium Resource Allocation							

< Active Issues from 2007 Annual Meeting up Computing Resource Matrix >

Attachment **Size**
[ScheduleGrab20061101.png](#) 129.73 KB

> [add child page](#) | [printer-friendly version](#) | [add new comment](#)



[Logout](#)
Welcome, John Helly

Home My TeraGrid Resources Documentation Training Consulting Allocations

Accounts and Usage Profile Registered DNS Change Portal Password GSI SSH [Beta] Add/Remove User Community Account Citation Info User Responsibilities

System Accounts

Resource	Username	Connect
IU		
login.bigred.iu.teragrid.org	tg-hellyj	Login
NCAR		
tg-login.frost.ncar.teragrid.org	no account	
NCSA		
login-co.ncsa.teragrid.org	jhelly	Login
login-cu.ncsa.teragrid.org	jhelly	Login
tg-login.ncsa.teragrid.org	jhelly	Login
login-w.ncsa.teragrid.org	jhelly	Login
login-abe.ncsa.teragrid.org	no account	
ORNL		
tg-login.ornl.teragrid.org	hellyj	Login
PSC		
tg-login.bigben.psc.teragrid.org	hellyj	Login
tg-login.rachel.psc.teragrid.org	hellyj	Login
Purdue		
tg-login.purdue.teragrid.org	hellyj	Login
SDSC		

Allocation Usage

Start Date (YYYY-MM-DD)	End Date (YYYY-MM-DD)	Resource	Project Allocation (SU) Remaining / Awarded	My Usage (SU)	Alloc. Type
Project Title: SDSC DAC: Climate Model Data Subsetting and Transformation on Bluegene Charge No.: TG-ATM070013N Grant No.: ATM070013N Project PI? Yes					
2007-03-15	2008-03-31	bluegene.sdsc.teragrid	26,841 / 30,000	150.0	new
Project Title: Modeling of Global Climate Variability with Super-Parameterization of Clouds Charge No.: TG-MCA07S011 Grant No.: MCA07S011 Project PI? No					
2007-04-01	2008-03-31	datastar-p655.sdsc.teragrid	369,356 / 400,000	0.0	new
Project Title: TeraGrid Roaming: Modeling of Global Climate Variability with Super-Parameterization of Clouds Charge No.: TG-MCA07T011 Grant No.: MCA07T011 Project PI? No					
2007-04-01	2008-03-31	teragrid_roaming	512,272 / 600,000	0.0	new

[\[User Responsibility Form\]](#)
[Need to cite TeraGrid?](#)
[Report Security Incident](#)

Petascale Computing

Emerging Track 1,2 Systems

August 8, 2007

- NSF's Track 1 petascale system is expected to be able to make arithmetic calculations at a sustained rate in excess of a sizzling 1,000-trillion operations per second (a petaflop per second)
- **Track 1: A Leadership-Class System**
 - **University of Illinois at Urbana-Champaign (UIUC) will receive \$208 million over 4.5 years to acquire and make available a petascale computer "Blue Waters"**
 - **500 times more powerful than today's typical supercomputers.**
 - **The system is expected to go online in 2011.**
- **Track 2: Mid-Range High-Performance Computing Towards the Petascale**
 - University of Tennessee at Knoxville Joint Institute for Computational Science (JICS).
 - \$65 million, 5-year project will include partners at Oak Ridge National Laboratory, the Texas Advanced Computing Center, and the National Center for Atmospheric Research.
 - **peak performance of just under one petaflop that is almost four times the capacity of the current NSF-supported TeraGrid.**
 - 2006 a 5-year, \$59 million Track 2 award to the Texas Advanced Computing Center at The University of Texas at Austin and Arizona State University and Cornell University (Ranger).
 - **Track 2 systems will be integrated into the TeraGrid.**

Leadership-Class System Acquisition - Creating a Petascale Computing Environment for Science and Engineering

PROGRAM SOLICITATION NSF 06-573



National Science Foundation

Office of Cyberinfrastructure

Track I Applications Managed Through Proposals

Preliminary Proposal Due Date(s) *(required)*:

September 08, 2006

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

February 02, 2007

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Leadership-Class System Acquisition - Creating a Petascale Computing Environment for Science and Engineering

Synopsis of Program:

NSF's goal for high performance computing (HPC) in the period 2006-2011 is to enable petascale science and engineering through the deployment and support of a world-class HPC environment comprising the most capable combination of HPC assets available to the academic community. The petascale HPC environment will enable investigations of computationally challenging problems that require computing systems capable of delivering sustained performance approaching 10^{15} floating point operations per second (petaflops) on real applications, that consume large amounts of memory, and/or that work with very large data sets. Among other things, researchers will be able to perform simulations that are intrinsically multi-scale or that involve the simultaneous interaction of multiple processes.

Research

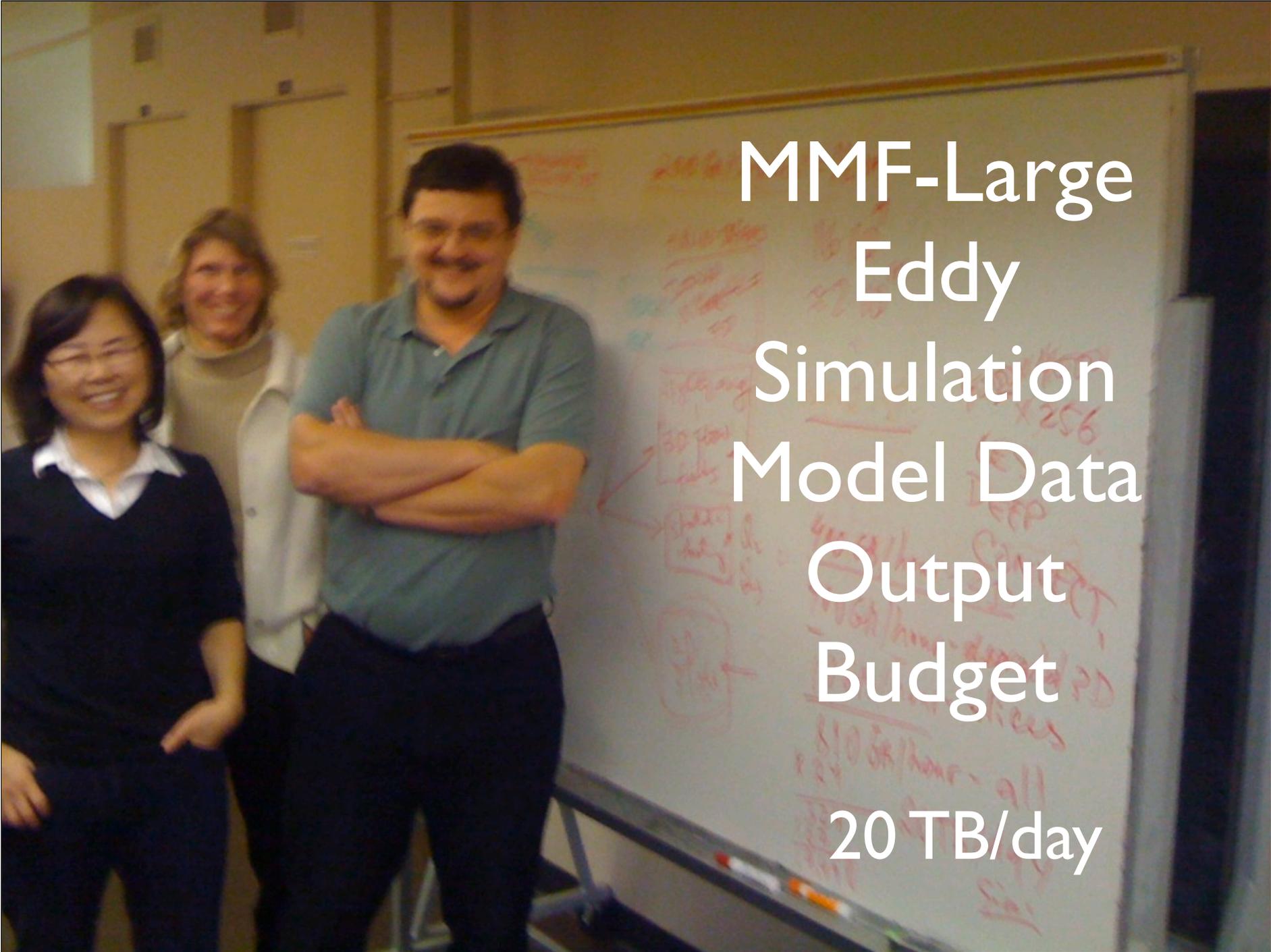
Collaborations

Participants	MMF Bluegene	Data Extraction & Subsetting	Data & Metadata Interoperability
IBM			
NCAR			
PNNL			
SDSC			
Stonybrook			



DATA

CMMAP

A photograph of three people standing in front of a whiteboard. On the left is a woman with dark hair and glasses, wearing a dark blue sweater over a white collared shirt. In the center is a man with glasses and a mustache, wearing a light blue polo shirt and dark pants, with his arms crossed. On the right is a woman with blonde hair, wearing a light-colored turtleneck and a white button-down shirt. The whiteboard behind them is covered in handwritten notes in red and blue ink, including diagrams and technical terms. The text 'MMF-Large Eddy Simulation Model Data Output Budget' is overlaid in large white font on the right side of the image, with '20 TB/day' at the bottom right.

MMF-Large
Eddy
Simulation
Model Data
Output
Budget
20 TB/day

The GCRM Tsunami

2 km, 100 levels, hourly data

- ~4 TB / simulated hour
- ~100 TB / simulated day
- ~35 PB / simulated year

4 km, 100 levels, hourly data

- ~1 TB / simulated hour
- ~24 TB / simulated day
- ~9 PB / simulated year

Other Data Tsunami

- 30 TB/night: Large Synoptic Survey (LSS) Telescope (2014)
- 15 PB/year: CERN's Large Hadron Collider (May 2008)
- 1 PB over 3 years: EOS (Earth Observing System) data (2001)

(from K. Schuchart presentation January, 2008)

Data Challenges of GCRM

- Extremely high volumes of data
 - 10 GB/ variable / step
 - 1-10 petabytes / simulated year
 - Can't just move data to local systems
 - Data will have to be on-offline
 - 4 byte offsets exceeded
 - Huge number of files per simulation
 - Model for running analysis on the entire data set needed

Data Challenges of the GCRM (cont)

- Geodesic Grid
 - Preliminary (but not sufficient) support in some analysis tools
 - Standards for complete description not defined
 - Hyperslab-ing on coordinate values not supported and very costly
 - Grid itself is large (~ 2GB)

Data Challenges of the GCRM (cont)

- Current scalar analysis tools break down
 - Insufficient memory
 - Assumptions made for smaller data sets no longer valid
 - Screen resolution exceeded

Strategic Planning

- CIWG is developing a strategy for handling model output with existing and projected resources
 - how much to write out?
 - how to subset and extract the right chunks of data for analysis?
 - how much can be stored for how long?
 - how much can be transported to what locations?

Dissemination and Interoperability

A tropical landscape at sunset. The sky is a deep blue with scattered white and yellow clouds. A vibrant rainbow arches across the center of the sky, starting from the bottom left and ending near the top right. The foreground is dark, showing the silhouettes of palm trees and a building. The overall mood is serene and beautiful.

CMMAP Digital Library



CMMAP Digital Library

www.cmmap.org

Home

About

- About CMMAP

hellyj

- Create content
- Login
- Search for Data
- My account
- Administer
- Log out

Search for Data

Search Parameters

filename:
subject:
keywords:
description:
type:

Navigation

North:
South:
East:
West:

Submit Query

Filename ▲	Metadata	Subject	Keywords	Description	Type
<input type="checkbox"/> spcam30_4km_32c.cam2.h0.1985-09.nc	metadata	AMIP Model Run	CMMAP_AMIP	MMF Output for the AMIP project	netCDF
<input type="checkbox"/> spcam30_4km_32c.cam2.h0.1985-10.nc	metadata	AMIP Model Run	CMMAP_AMIP	MMF Output for the AMIP project	netCDF
<input type="checkbox"/> spcam30_4km_32c.cam2.h0.1985-11.nc	metadata	AMIP Model Run	CMMAP_AMIP	MMF Output for the AMIP project	netCDF
<input type="checkbox"/> spcam30_4km_32c.cam2.h0.1985-12.nc	metadata	AMIP Model Run	CMMAP_AMIP	MMF Output for the AMIP project	netCDF
<input type="checkbox"/> spcam30_4km_32c.cam2.h0.1986-01.nc	metadata	AMIP Model Run	CMMAP_AMIP	MMF Output for the AMIP project	netCDF
<input type="checkbox"/> spcam30_4km_32c.cam2.h0.1986-02.nc	metadata	AMIP Model Run	CMMAP_AMIP	MMF Output for the AMIP project	netCDF
<input type="checkbox"/> spcam30_4km_32c.cam2.h0.1986-03.nc	metadata	AMIP Model Run	CMMAP_AMIP	MMF Output for the AMIP project	netCDF
<input type="checkbox"/> spcam30_4km_32c.cam2.h0.1986-04.nc	metadata	AMIP Model Run	CMMAP_AMIP	MMF Output for the AMIP project	netCDF

Standards and Conventions



Table 2. Tabulation of resources of interest identified by workshop participants.

Category	Common Name	Resource Description or Reference
Standards and Conventions	Climate and Forecast (CF) Standard Names	http://www.cgd.ucar.edu/cms/eaton/cf-metadata/CF-current.html#sname
	COARDS	ftp://ftp.unidata.ucar.edu/pub/netcdf/Conventions/COARDS
	Digital Object Identifier System	http://www.doi.org/
	Dublincore	http://dublincore.org/index.shtml
	EML	http://knb.ecoinformatics.org/software/eml/eml-2.0.1/index.html
	Fedora	http://www.fedora.info
	FGDC	http://www.fgdc.gov/
	Grib	http://www.wmo.ch/web/www/WDM/Guides/Guide-binary-2.html
	Geographic Markup Language	http://www.opengis.net/gml/
	Geoscience Markup Language	http://www.opengis.net/GeoSciML
	HDF	http://hdf.ncsa.uiuc.edu/
	ISO 19115	Defines the schema required for describing geographic information and services.
	ISO 19139	Geographic information -- Metadata -- XML schema implementation
	MMI	http://marinemetadata.org
	NetCDF	http://www.unidata.ucar.edu/software/netcdf/
	OAI	http://www.openarchives.org/
	Transport Protocol	OBIS
OpenGIS		http://www.opengeospatial.org/
SensorML		http://www.opengeospatial.org/projects/groups/sensorweb
STD-DOI		http://www.std-doi.de
GridFTP		http://www.globus.org/grid_software/data/gridftp.php
HTTP		http://www.w3.org/Protocols/
OPeNDAP		http://www.opendap.org/
REST	http://en.wikipedia.org/wiki/Representational_State_Transfer#References	
SOAP	http://www.w3.org/TR/soap/	

Adopting Community-based Standards and Conventions

Visualization

University of Melbourne has constructed a massive 96 million pixel "OptIPortal" visualization wall - known affectionately as the 'OziPortal' - constructed from twenty-four 30-inch LCD screens.

