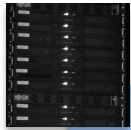


Computational Resources

Managed by the Department of
Scientific Computing

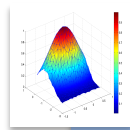


“Pillars” of DSC Computing Resources



FSU's Shared HTC

- Condor Scheduler
- Opportunistic
- Serial jobs only
- x86
- x86_64
- PPC
- Clusters
- Desktops
- Mixed Storage
- www.sc.fsu.edu/computing/general-access/batch



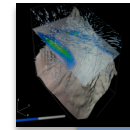
Interactive Cluster

- SGE Scheduler
- (will be MOAB)
- Interactive
- Short Serial jobs
- Some support for GPUs to support high-end vis
- Some support for GPUs to support CUDA/OpenCL
- Lustre Storage
- www.sc.fsu.edu/computing/general-access/interactive



FSU's Shared HPC

- MOAB/Torque
- Parallel environment
- Infiniband for MPI
- 3000+ cores
- 3Leaf Shared memory machine (132 cores, .5 TB mem)
- Smaller Shared memory Machines
- Panasas Storage
- www.hpc.fsu.edu



Scientific Visualization

- 3D stereo VisWall
- 3D stereo workstations
- Vis software
- DSC Panasas Storage
- www.sc.fsu.edu/computing/general-access/visualization

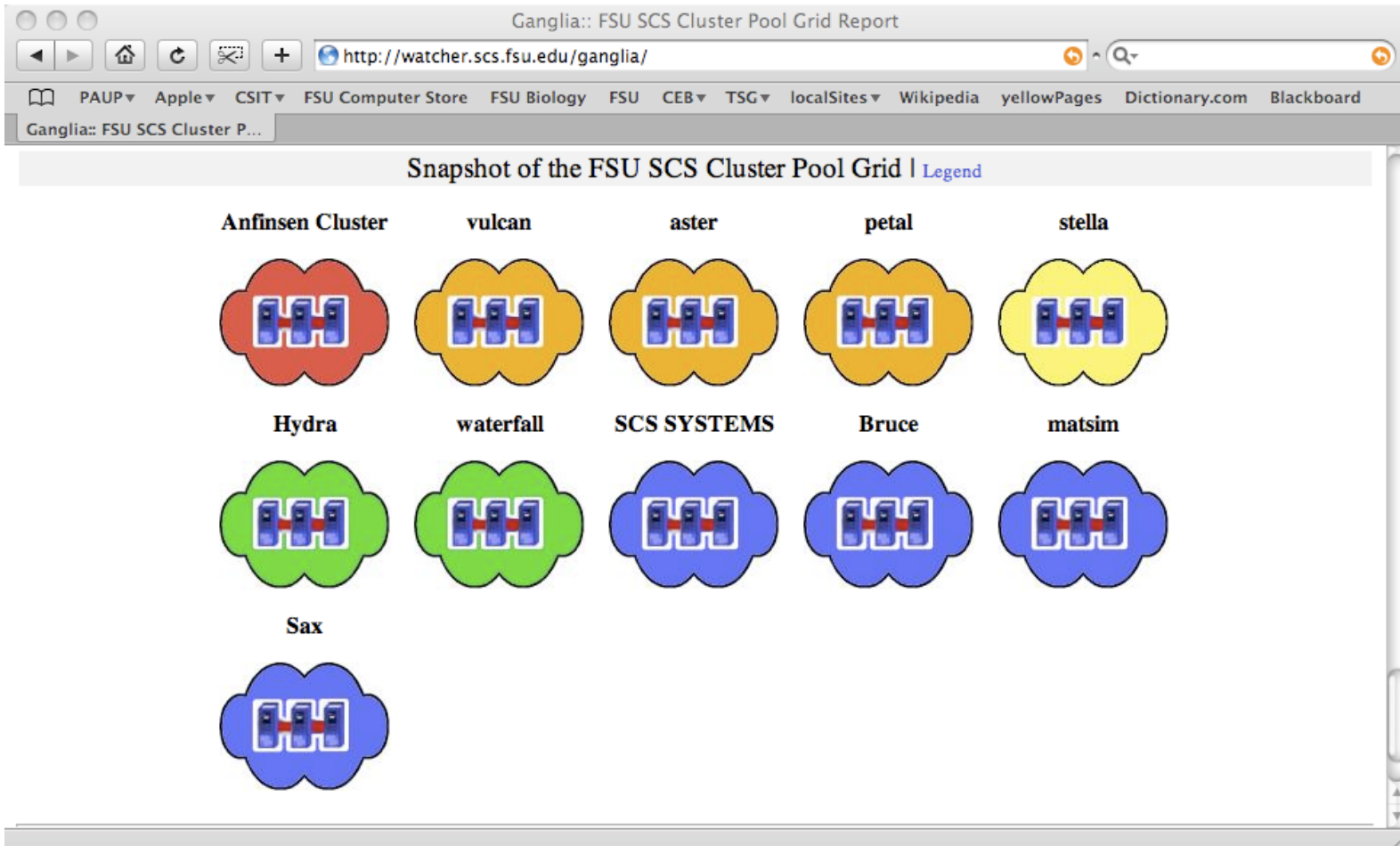
High Throughput Computing (HTC)

What is it?



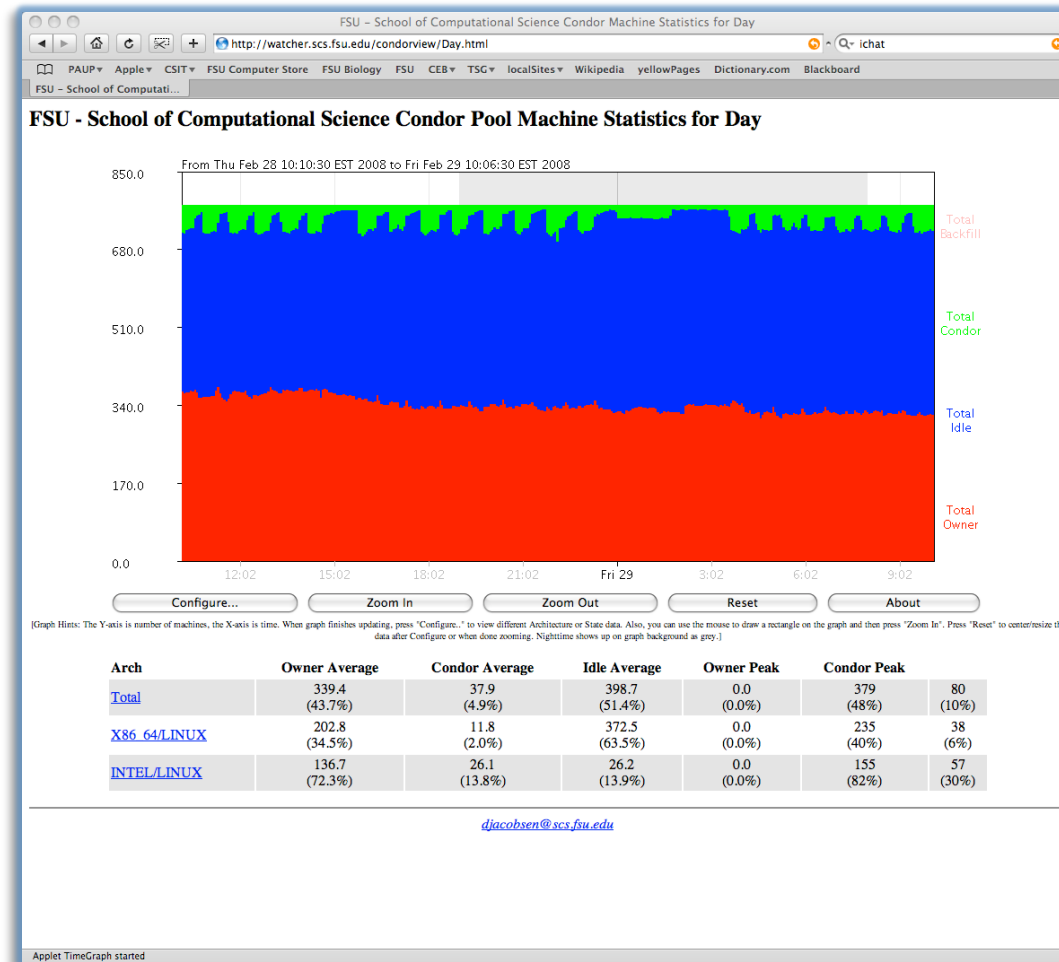
High Throughput Computing (HTC)

What is it?



High Throughput Computing (HTC)

What is it?



High Throughput Computing (HTC)

What is it?

- Up to 1000 Total CPUs in the “Flock”
 - 684: X86 64-bit Linux
 - 218: X86 32-bit Linux
 - 128: PPC Linux
 - Aggregate throughput of over 1 TF
- Submit from HPC Login nodes
 - SC users can use submit.sc.fsu.edu
- Two runtime environments supported
 - Vanilla Universe
 - Highly portable
 - No checkpointing
 - Standard Universe (SC users only)
 - Will checkpoint and migrate to like architectures
 - Very robust
 - Must link your code to condor libs (need at least object files)

High Throughput Computing (HTC)

What should I use it for?

- Long or short running serial process jobs
- Big (1000 plus) job arrays are supported
- Will not run parallel jobs (use HPC)
- Will not run interactive jobs (use general purpose clusters)

High Throughput Computing (HTC)

Demonstration

A very simple condor submit file

```
Executable = foo  
Log = foo.log  
Queue
```

High Throughput Computing (HTC)

Demonstration

- Live Demonstration
- For a Screen cast demonstrating the use of condor on DSC systems go to:
 - <http://www.sc.fsu.edu/computing/general-access/batch>

High Throughput Computing (HTC)

Getting Help

- General Documentation (For DSC) including screen cast
 - <http://www.sc.fsu.edu/computing/general-access/batch>
- Condor project pages
 - <http://www.cs.wisc.edu/condor/>

Interactive Cluster

What is it?



Interactive Cluster

What is it?

- Interactive: gp000 to gp003
 - 4 Single-core Quad socket Intel(R) Xeon 2.8 GHz, 1 GB RAM
- Interactive: gp004
 - 1 Dual-core Dual socket AMD Opteron 2.0 GHz, 2 GB RAM
- Batch: gp005-gp020
 - 16 Single-core Dual socket AMD Opterons 2.0 GHz, 1 GB RAM

Interactive Cluster

What should I use it for?

- Matlab
- GNUPlot
- Software compilation with GNU compilers
- Tecplot
- Maple
- COMSOL
- ...

Interactive Cluster

Demonstration

A very simple SGE submit script:

```
#!/bin/bash
# Execute from the current working directory
#$ -cwd
# join std error and std out
#$ -j y
# commands you want executed
ls -l /etc/
```

Interactive Cluster

Demonstration

FSU's Shared HPC

What is it?



FSU's Shared HPC

What is it?

- Opened in 2007
- Hardware overview
 - Storage:
 - 156 TB of Panasas Storage
 - 120 plus TB of Infiniband connected Storage
 - Cores
 - 3972 plus
- IB cluster is in 3 Parts
 - DDR IB
 - 2176 Quad Core AMD opterons
 - 2 GB per core
 - QDR IB Y1
 - 512 Dual Core AMD opterons
 - 2GB per core
 - QDR IB Y4
 - 1152 12-core AMD opterons
 - 2.6 GB per core
- 3Leaf Virtual Shared Memory Machine
 - 12 nodes
 - Total of 132 cores usable
 - Total of 528 GB memory usable

FSU's Shared HPC

What is it?

- DSC Ownership Share in HPC
 - 220 Cores
 - 23 TeraBytes of Storage
 - One log in node: scs.hpc.fsu.edu
- Job Policy For DSC
 - Max Jobs = 10
 - Max procs = 128
 - Queue name: "scs_q"
- General queue access policy
 - Max Jobs = 8
 - Max procs = 512
 - Queue name: "genacc_q"
- Backfill queue access policy
 - Max jobs = 100
 - Max procs = 512
 - Queue name: "backfill"

FSU's Shared HPC

What should I use it for?

- Large and small parallel jobs
- Short (e.g., < 4 hours) parallel or serial jobs
- Jobs that require very low communication latency
- Application areas currently served
 - Biology: Evolutionary, population, structural Biology
 - Engineering
 - Physics
 - Meteorology
 - Math
 - Chemistry
 - Economics
 - ...

FSU's Shared HPC

Demonstration

A very simple MOAB submit script:

```
#!/bin/bash

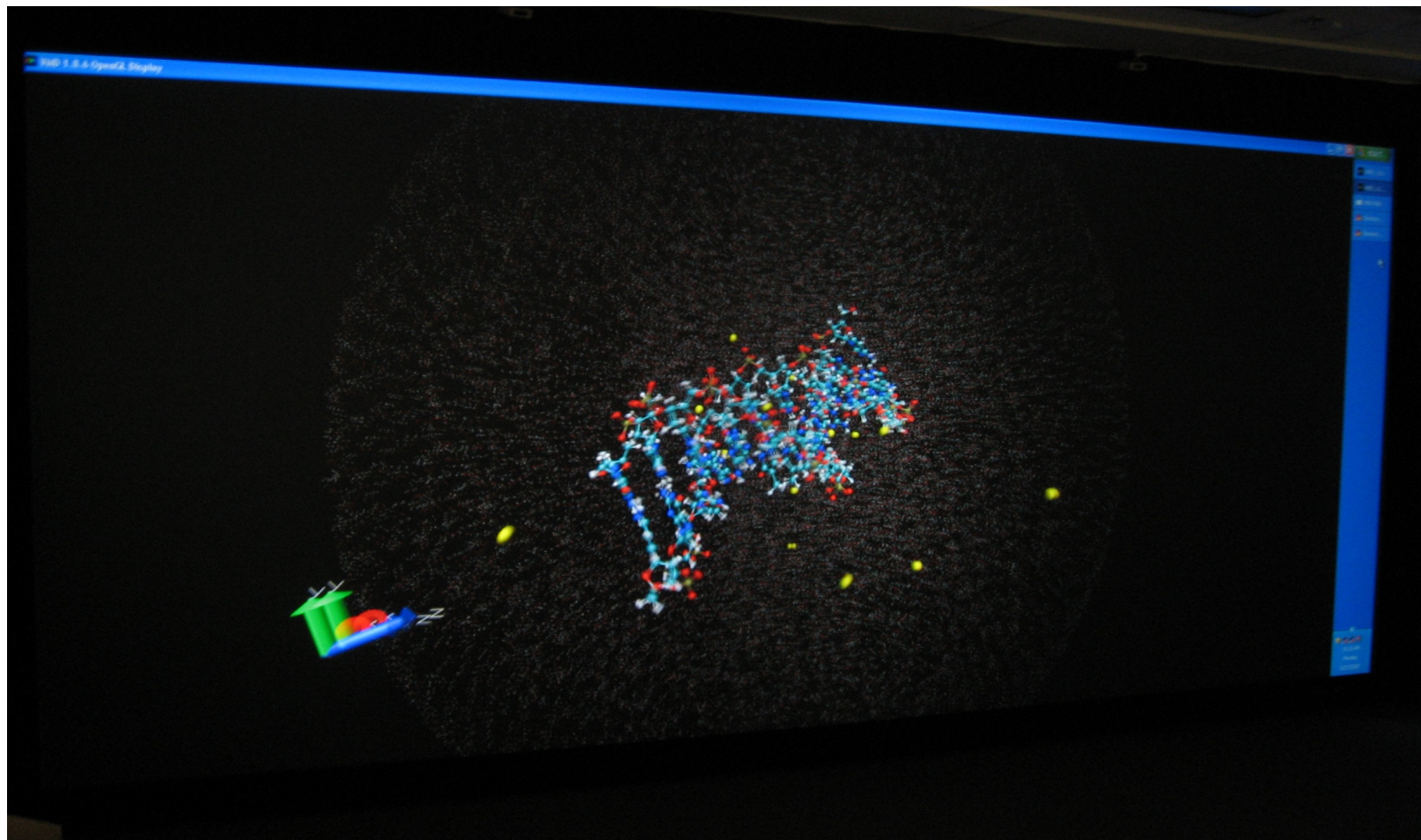
#MOAB -l nodes=16          <- request these resources
#MOAB -j oe                <- combine output and error
#MOAB -l walltime=120:00   <- specify runtime
#MOAB -N TRAP-OPENMPI      <- name for this job

source /usr/local/profile.d/openmpi-gnu.sh

cd $PBS_O_WORKDIR
mpirun ./trap-openmpi option1 option2
```

DSC Vislab

What is it?

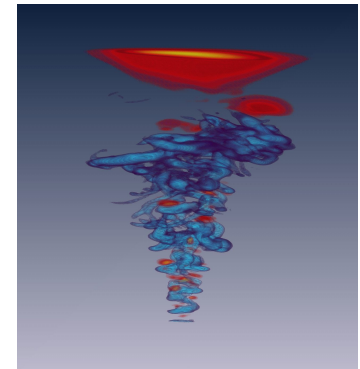


DSC Vislab

What is it?



- 499 DSL (Seminar Room)
 - 3D (Stereoscopic) Display Wall (8'x18')
 - MRI: Acquisition of a Stereographic Projection System to Support Multidisciplinary Scientific Visualization
 - Access Grid (multi-institutional A/V conferencing)
- 428 DSL (Public Lab)
 - Stereoscopic prototyping workstation
 - 6 Graphics rendering workstations
 - 9 TB data storage
 - CUDA (NVIDIA) enabled graphics cards

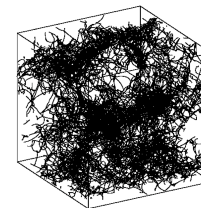
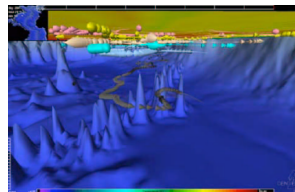
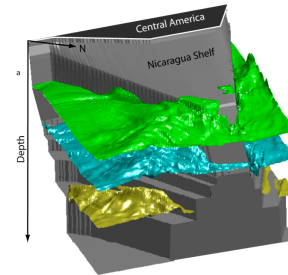
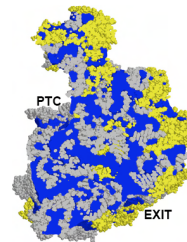
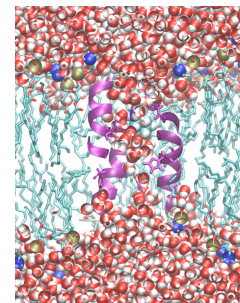
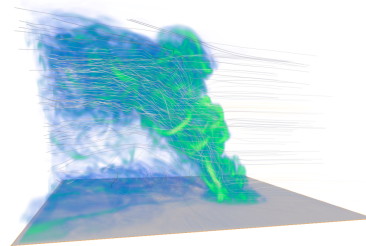




DSC VisLab

What should I use it for?

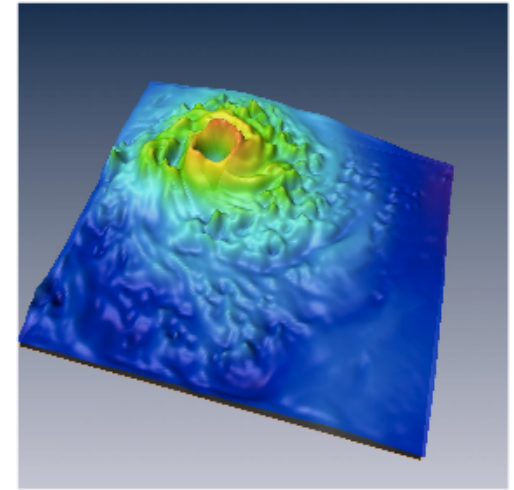
"offers a way to see the unseen"



DSC Vislab

What should I use it for?

- Chekhov (OSX)
 - Video editing (Final Cut Studio)
 - Graphic Design (Omnigraffle)
- Borg (Windows)
 - Stereo Visualization/Prototyping
 - Movie Rendering
- Kirk, Spock, Uhura, Bones, Worf (Linux)
 - Data Interrogation (Avizo, ParaView, VisIt, VMD, ...)
 - GPU Computing



DSC Vislab

Getting Help

- General Information
 - <http://www.scs.fsu.edu/twiki/bin/view/Computing/VisCluster>
- Stereoscopic Visualization/Movies
 - <http://www.scs.fsu.edu/twiki/bin/view/Computing/VislabPowerWall>
 - <http://www.scs.fsu.edu/twiki/bin/view/Computing/VislabStereoWorkstations>
- Lab Access
 - For user account see TSG's User Management page
 - For key card access see Anne Johnson

Summary of DSC Computing Resources

	HTC	Interactive	HPC	Scientific Vis
Total CPUs	Variable as much as 1000	20(interactive)/32(batch)	3000 plus	4 + workstations
Max CPUs	400	4 jobs	640 (w/ GA)	N/A
Max runtime	No limit	8 hours/process	90 days	N/A
Scheduler	Condor	SGE	MOAB/Torque	N/A
Environ.	Serial	Serial+Threads	Parallel	Serial+Threads
Login node	HPC login nodes submit.sc.fsu.edu	pamd, dsk...	scs.hpc.fsu.edu	N/A
Password	HPC and FSU	FSU	HPC	DSC
Example use	Large serial job array	Matlab, Maple, TechPlot	Large parallel job using MPI	Visualization of 3D data, graphic rendering



Systems Support

The key to everything

- Technical Support Group
- HPC group
- Graduate Assistants



Systems Support in General

Getting Help

- HPC Resources:
 - support@hpc.fsu.edu
- DSC Resources:
 - ops@sc.fsu.edu
- Your contact information
 - username
 - Email
 - telephone
- Full description of problem
 - Where did it happen (hostname)
 - When did it happen
 - What happened
 - Error messages given?
 - Can you repeat the problem?