

April 22, 2014

XSEDE New User Tutorial

XSEDE

Extreme Science and Engineering
Discovery Environment

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National Center for
Supercomputing Applications

XSEDE Training Survey

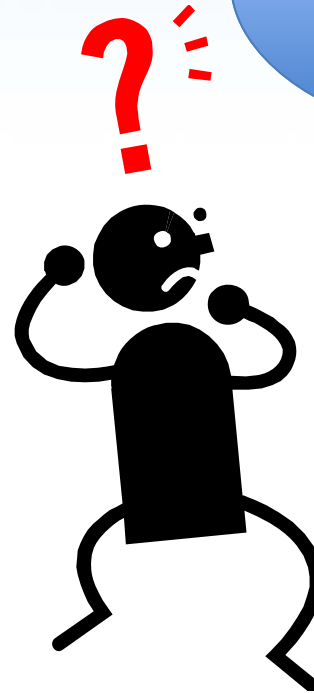
- **Make sure you sign the sign-in sheet!**
- At the end of the module, I will ask you to please complete a short on-line survey about this module. The survey can be found at <http://bit.ly/XSEDEATLANTA>
- I'll post this URL at the end of the course as well.



Yeah! I got an
XSEDE
allocation!



Now
what?



XSEDE

Learning Outcomes

After completing this tutorial, you will be able to:

- Use the XSEDE User Portal
- Access your XSEDE resources
- Manage files
- Run jobs
- Get help



XSEDE User Portal (XUP)

- URL: portal.xsede.org
- Single point-of-entry to information about XSEDE services and utilities for using them
- Anyone can create an XUP user account and access non-project features
- Only XSEDE allocation project members can access project features



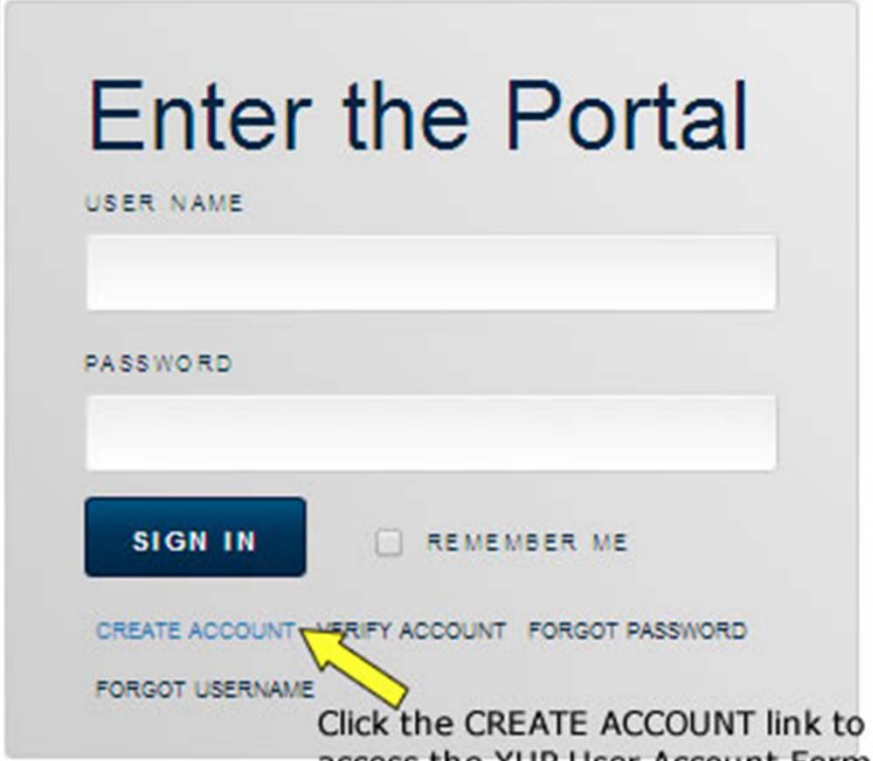
Using the XUP

- Create and login to your XUP Account
- Use XSEDE resources responsibly
- Get added to your XSEDE project
- Navigate your personal My XSEDE webpage
- Navigate the information in the XUP



Create and login to your XUP account

portal.xsede.org



Enter the Portal

USER NAME

PASSWORD

SIGN IN ☐ REMEMBER ME

[CREATE ACCOUNT](#) [VERIFY ACCOUNT](#) [FORGOT PASSWORD](#)
[FORGOT USERNAME](#)

Click the CREATE ACCOUNT link to access the XUP User Account Form

1. From the XUP homepage, click CREATE ACCOUNT
2. Complete the User Account Form
3. Verify your account request
4. Select your username and password
5. Login to the XUP



XSEDE Acceptable Use Policy

- Must accept the [User Responsibilities Form](#) after creating your XUP account and again at the beginning of each allocation you receive.
- Choose a strong password and protect it.
- Close SSH terminals and log out of the User Portal when you are finished with your session.
- Report Suspicious Activity : email help@xsede.org or call 1-866-907-2383 immediately, regardless of the time of day.

XSEDE Cybersecurity Tutorial

<http://www.citutor.org>



Get Added to Your XSEDE project

- PIs automatically have full access to their project's account.
- The PI is responsible for managing users on their account.
- Ask the PI, or their allocation manager, to add your XUP username to the project.



Your My XSEDE webpage

The screenshot shows the My XSEDE User Portal (XUP) interface. At the top is a navigation bar with links: MY XSEDE, RESOURCES, DOCUMENTATION, ALLOCATIONS, TRAINING, USER FORUMS, HELP, and ABOUT. Below this is a sub-navigation bar with links: Summary, Allocations/Usage, Accounts, Jobs, Profile, Publications, Tickets, Change Password, Add User, Community Accounts, and SSH Terminal.

The main content area is divided into three sections:

- WELCOME TO XUP (1)**: A welcome message for Sandra, stating that the XUP provides access to view and manage accounts and allocations, as well as find information about and access the XSEDE services and resources. It also includes a link to "Read the Getting Started Guide" and a "Find your Campus Champion" section.
- LATEST UPDATES (2)**: A section showing user statistics and updates. It includes a profile picture, a "Welcome, Sandra!" message, and links to "Update profile" and "Submit a ticket". It also displays "Last login: Mon 10/28/13 at 04:13:25 PM -0500", "Open tickets: None [Submit a ticket]", "Jobs: 0 running; 0 queued; 0 other", "Publications: New! Add publications to your Profile", and "Training: You are not registered for any upcoming classes. [Training Calendar]".
- MY ACTIVE ALLOCATIONS (3)**: A section showing active projects. It includes a table for "ACTIVE PROJECTS SUMMARY (See Full View)" with columns: RESOURCE, % LEFT, END DATE [DAYS LEFT], and BURN RATE. The table shows "Staff Resources" with 100% left (300,000 SUS remaining) and an end date of 2014-09-20 [326d]. A "Burn Rate" gauge is also displayed.

(1)

WELCOME TO XUP

- Quick access to commonly used features.

(2)

LATEST UPDATES

- Latest information specific to your user account.

(3)

MY ACTIVE ALLOCATIONS

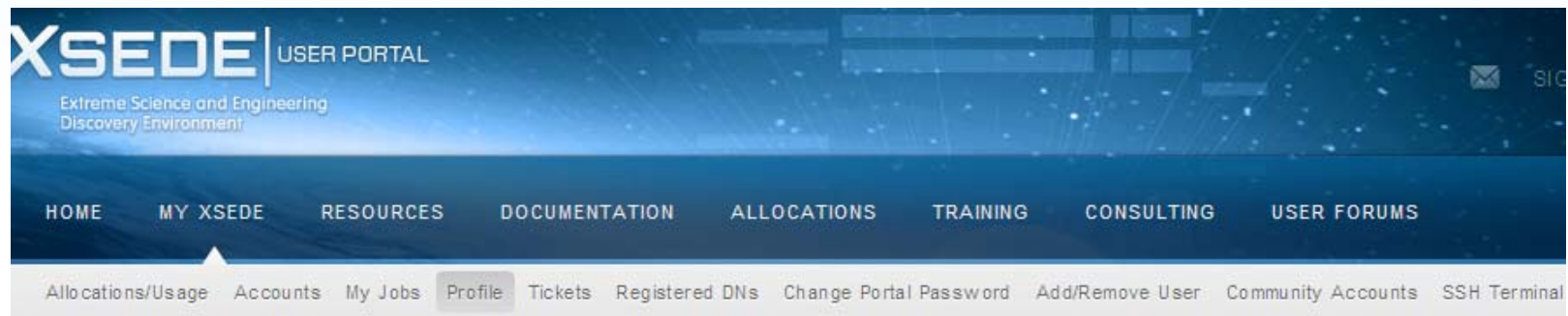
- Summary of the active projects for which you are either a PI or member.

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Update your XUP User Profile

MY XSEDE→Profile

- View and or change your user information (organization, address).
- Make sure your email address is correct. XSEDE staff will use it to communicate with you regarding your allocation.



Name	
Email	
NSF Status	
Organization	Pittsburgh Supercomputing Center
Address	



Navigating the XUP



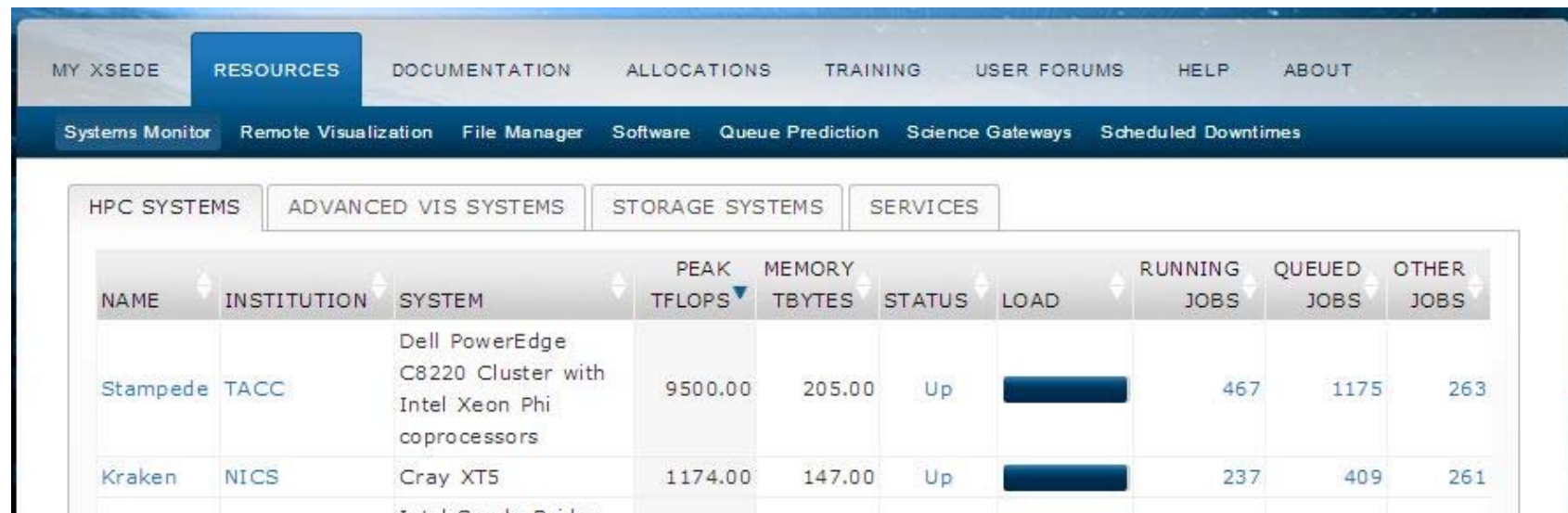
- My XSEDE
- Resources
- Documentation
- Allocations
- Training
- User Forums
- Help
- About



View the XSEDE Systems Monitor

- **Resources -> Systems Monitor**

- Provides technical and status information for all of XSEDE's resources.
- The STATUS column indicates whether the system is up or down. If down, can click on status to find when the machine is expected to come back up.



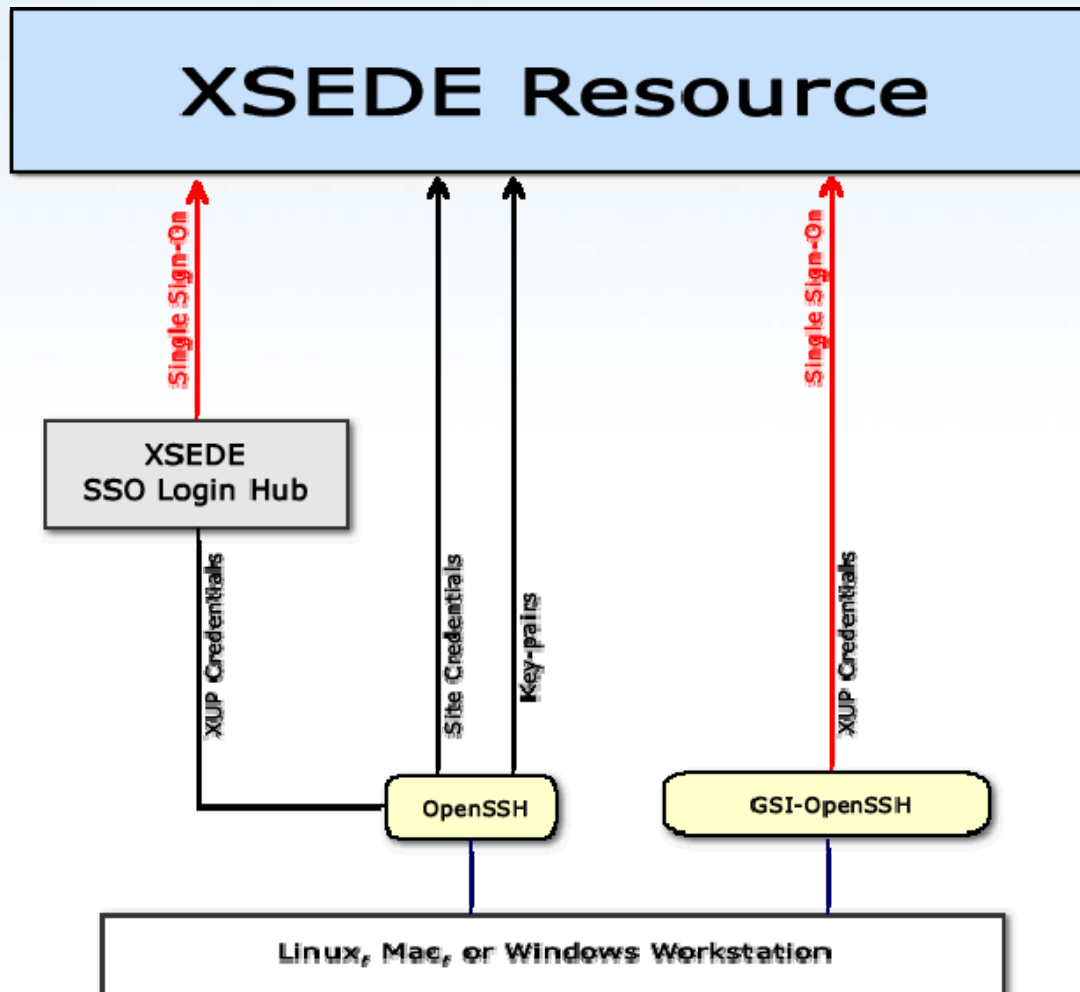
The screenshot shows the XSEDE Systems Monitor interface. At the top is a navigation bar with links: MY XSEDE, RESOURCES (selected), DOCUMENTATION, ALLOCATIONS, TRAINING, USER FORUMS, HELP, and ABOUT. Below this is a sub-navigation bar with links: Systems Monitor (selected), Remote Visualization, File Manager, Software, Queue Prediction, Science Gateways, and Scheduled Downtimes. The main content area has tabs for HPC SYSTEMS, ADVANCED VIS SYSTEMS, STORAGE SYSTEMS, and SERVICES. The HPC SYSTEMS tab is active, displaying a table of systems.

NAME	INSTITUTION	SYSTEM	PEAK TFLOPS	MEMORY TBYTES	STATUS	LOAD	RUNNING JOBS	QUEUED JOBS	OTHER JOBS
Stampede	TACC	Dell PowerEdge C8220 Cluster with Intel Xeon Phi coprocessors	9500.00	205.00	Up	<div></div>	467	1175	263
Kraken	NICS	Cray XT5	1174.00	147.00	Up	<div></div>	237	409	261



XSEDE

Accessing XSEDE Resources



Authentication Methods

1. Password
 - XUP credentials
 - Site-password
 - One-time password
2. Key-based

Single Sign-On

- Enables logging in once to access all of your allocated resources

Connection Methods

1. GSI-OpenSSH
2. OpenSSH

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XSEDE SSO Login Hub

An SSO enabled connection point to XSEDE resources



➤ Move among resources using **gsissh** command

➤ SSH to **login.xsede.org** using your XUP credentials

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Following along with today's tutorial:

- Verify that everyone has an ssh client on their laptop!
- For ssh to XSEDE SSO login hub (**today!**)
 - ***ssh -l username login.xsede.org***
 - ***Username*** on handout
- And from there go to your XSEDE resource, for example:
 - ***gsissh trestles.sdsc.edu***



Managing your XSEDE files

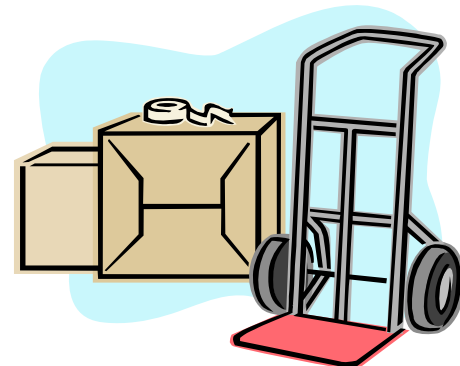
1. Where to store files

- Home directory
- Scratch directory
- Archival storage



2. How to move files

- Command line using globus-url-copy, uberftp, scp, or sftp
- **Globus Online**



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XSEDE File Systems

- **Home directory**

- Location specified in the environment variable `$HOME`.
- Use to store project files you want to keep long term such as source code, scripts, and input data sets.
- Not backed up regularly and not purged.
- Quotas typically set to limit amount of disk space available.

- **Scratch directory**

- Location specified in environment variable varies among resources but will include the term `SCRATCH`, e.g. `$SCRATCH_DIR`.
- Use to temporarily store files produced during application runs.
- Not backed up and routinely purged.
- No quotas. Available space depends on cumulative use by all users.

- **Archival storage**

- Must request through allocation process



Your XSEDE Compute Environment

- Your default XSEDE compute environment provides access to the compilers, directories, and software you will need to efficiently use your XSEDE resources.
- Customize it using **Modules**



Modules Package

- A command line interface used to configure the shell for an application. Two components:
 1. Modulefiles - contain configuration information
 2. Module command - interprets modulefiles
- Pre-written modulefiles available for compilers, mpi implementations
- Pre-written modulefiles available for common software, e.g. NAMD, GAMESS



Module Commands

Module command	Description
module avail [path...]	List all modulefiles available on the system.
module list	List the modulefiles currently loaded in the shell environment.
module help modulefile	Print help information for the modulefile specified in the argument.
module display modulefile	Display the changes made to the environment when the specified modulefile is loaded.
module load modulefile	Interpret the commands contained within the specified modulefile.
module switch modulefile1 modulefile2	Remove the environment changes made by modulefile1 and make the changes specified in modulefile2 .
module unload modulefile	Remove the environment changes made by modulefile .

Module Commands Example

```
% module list
```

```
Currently Loaded Modulefiles:
```

```
1) torque/2.3.13_psc    4) icc/14.0.0          7) globus/5.2.2
2) mpt/2.04             5) imkl/10.3.3         8) xdusage/1.0-r7
3) ifort/14.0.0         6) psc_path/1.0
```

```
% module avail gcc
```

```
----- /usr/local/opt/modulefiles -----
gcc/4.3.5 gcc/4.4.6 gcc/4.5.3 gcc/4.6.0 gcc/4.7.2 gcc/4.8.0 gcc/4.8.1
```

```
% module load gcc/4.8.1
```

```
% module list
```

```
Currently Loaded Modulefiles:
```

```
1) torque/2.3.13_psc    5) imkl/10.3.3         9) mpfr/3.1.0
2) mpt/2.04             6) psc_path/1.0        10) gmp/5.0.5
3) ifort/14.0.0         7) globus/5.2.2       11) mpc/0.8.2
4) icc/14.0.0           8) xdusage/1.0-r7     12) gcc/4.8.1
```

```
% module unload gcc
```

```
% module list
```

```
Currently Loaded Modulefiles:
```

```
1) torque/2.3.13_psc    4) icc/14.0.0          7) globus/5.2.2
2) mpt/2.04             5) imkl/10.3.3         8) xdusage/1.0-r7
3) ifort/14.0.0         6) psc_path/1.0
```

The XSEDE logo is displayed in a large, white, sans-serif font against a dark blue background. The background features a stylized representation of a globe with grid lines and a bright light source on the right side, creating a sense of depth and technology.

Moving Files - **Globus Online**

- A fast, reliable, and secure file transfer service geared to the big data needs of the research community.
- Moves terabytes of data in thousands of files
- Automatic fault recovery
- Easy to use
- No client software installation
- Consolidated support and troubleshooting
- Supports file transfer to any machine
- Accounts are free - www.globusonline.org



Globus Online Dashboard



The screenshot shows the Globus Online Dashboard in a Firefox browser window. The browser's address bar displays "https://www.globus.org". The page features the Globus logo and navigation links for Products, News, About, and Support. There are buttons for "Log In" and "Sign Up". The main content area has a blue background with a graphic of three orange arrows labeled "share", "move", and "sync" forming a circle around the text "BIG DATA". To the right of this graphic, the text reads "Your research data where you need it." Below the graphic, a large number "41,023,758,737 MB" is displayed, with "TRANSFERRED" written in smaller text below it. The page is divided into three columns: "Researchers", "Resource Providers", and "How It Works". Each column contains a brief description of the service, a "LEARN MORE" link with a right arrow, and a "GET GLOBUS PLUS" link with a right arrow. Below each link is a small portrait of a person. The "Researchers" section mentions focusing on research and making it easy to move, manage, and share big data. The "Resource Providers" section mentions giving more control over data infrastructure and providing excellent ease-of-use. The "How It Works" section mentions helping connect people and HPC resources so that no researcher is an island.

Firefox

Home | globus

https://www.globus.org

Google

globus

Products News About Support Log In Sign Up

share move sync

BIG DATA

Your research data where you need it.

41,023,758,737 MB
TRANSFERRED

Researchers

Focus on your research, not IT problems. We make it easy to move, manage, and share big data.

[LEARN MORE](#)

[GET GLOBUS PLUS](#)



Resource Providers

Globus gives you more control over your data infrastructure, while providing excellent ease-of-use for your researchers.

[LEARN MORE](#)

[GLOBUS PROVIDER PLANS](#)



How It Works


Globus' tools and services help connect people and HPC resources, so that no researcher is an island.

[LEARN MORE](#)



XSEDE

Globus Online File Transfer

 globus

Manage Transfers Groups Support skappes

start transfer | view activity | manage endpoints | dashboard

Get Globus Connect
Turn your computer into an endpoint.

Transfer Files

Endpoint Go

Path Go

select all | none up one folder refresh list

Process Colors - Copy.c 2.77 kB

Process Colors.c 2.77 kB

Endpoint Go

Path Go

select all | none up one folder refresh list

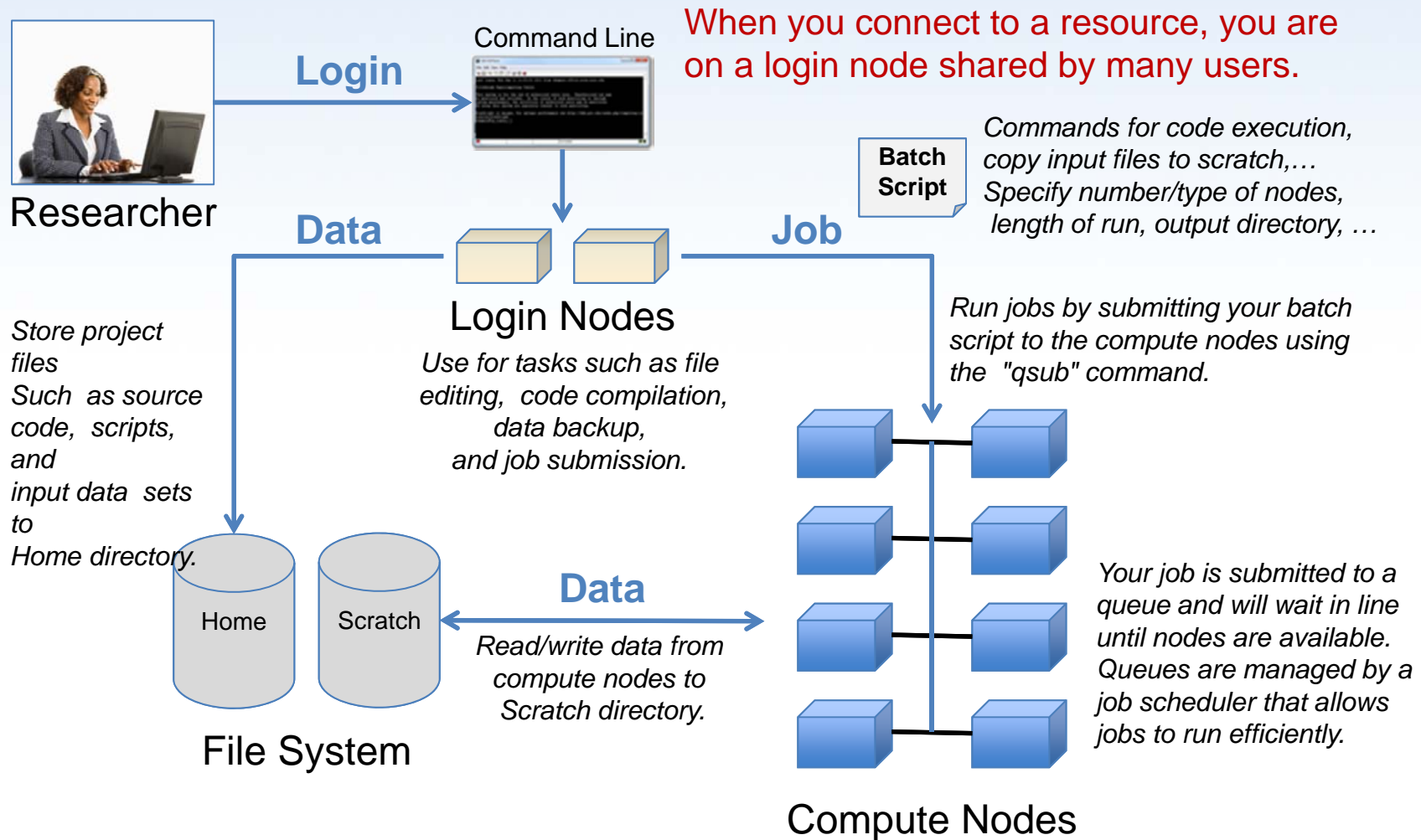
project-files Folder

[more options](#)

Label This Transfer

This will be displayed in your transfer activity.

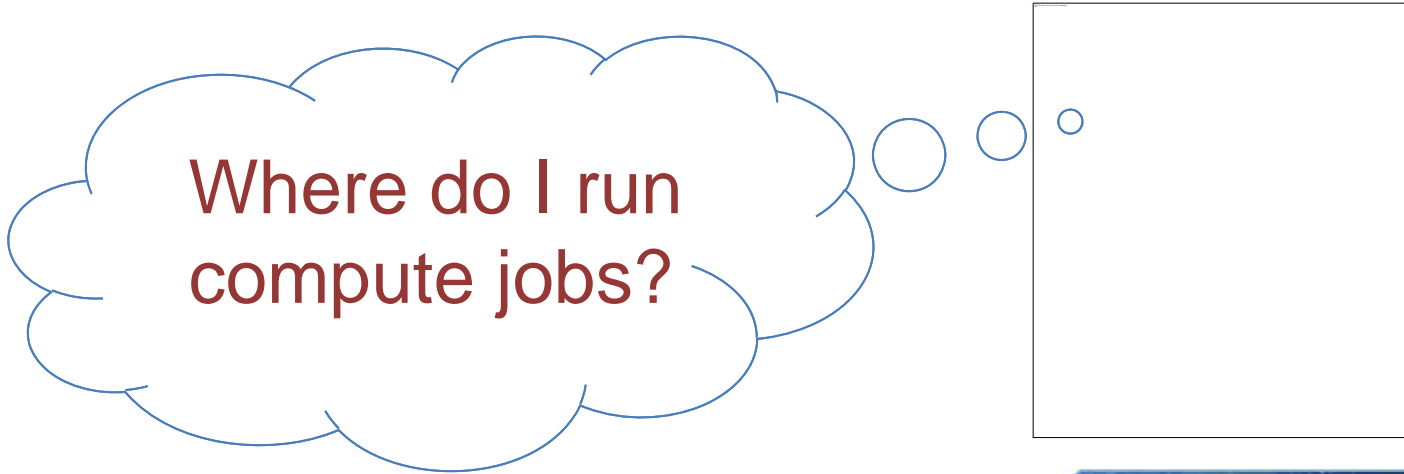
Running Jobs Overview



XSEDE

Login Nodes

- When you login to an XSEDE resource, you connect to a login node.
- Use login nodes for basic tasks such as file editing, code compilation, data backup, and job submission.
- Do not run compute jobs on the login nodes.



Where do I run
compute jobs?



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Running Compute Jobs

- Jobs are run on the **compute nodes** by submitting a **batch script** on a login node
- All jobs are placed in a **batch queue** after they are submitted.
- All XSEDE compute resources use a **batch scheduler** for running jobs.
- Resource User Guides on the XUP have details on your system's scheduler.



Batch Scripts

- Batch scripts include scheduler specific directives, comments, and executable commands, e.g.:
 - Number and type of nodes needed
 - Time needed to run the job
 - Where to write output files
- Script commands are system specific – see the resource's User Guide on the XUP for details



Batch Script for PSC's Blacklight

```
1. #!/bin/csh
2. #PBS -l ncpus=16
3. #ncpus must be a multiple of 16
4. #PBS -l walltime=5:00
5. #PBS -j oe
6. #PBS -q batch
7. set echo
8. ja
9. #move to my $SCRATCH directory
10. cd $SCRATCH
11. #copy executable to $SCRATCH
12. cp $HOME/mympi
13. #run my executable
14. mpirun -np $PBS_NCPUS ./mympi
15. ja -chlst
```

Blacklight uses the Portable Batch System (PBS) scheduler. Lines 2,4,5, and 6 are PBS directives.

Submitting Batch Scripts

- Commands are machine specific, but follow general principles
- With PBS batch scripts, use the **qsub command**

`qsub myscript.job`

- Can also specify PBS directives as command-line options:

```
qsub -l ncpus=16 -l walltime=5:00 -j oe -q batch myscript.job
```

- Command-line directives override directives in your scripts.



More PBS commands

- `qstat` - displays the status of batch jobs.

<code>-a</code>	gives the status of all jobs on the system.
<code>qstat -n</code>	lists nodes allocated to a running job in addition to basic information.
<code>qstat -f PBS_JOBID</code>	gives detailed information on a particular job.
<code>-q</code>	provides summary information on all the queues.

- `qdel` – deletes a queued job or kills a running job.
- See the `qsub` manpage for more



Example Batch Command

```
qsub amber.job
```

```
qstat -a
```

Job ID	Username	Queue	Jobname	SessID	NDS	Tasks	Memory	Time	S	Time
29668	user1	batch	job2	21909	1	256	--	08:00	R	02:28
29894	user2	batch	run128	--	1	128	--	02:30	Q	--
29895	user3	batch	STDIN	15921	1	1	--	01:00	R	00:10
29896	user2	batch	jobL	21988	1	2048	--	01:00	R	00:09
29897	user4	batch	STDIN	22367	1	2	--	00:30	R	00:06
29898	user1	batch	amber	25188	1	1	--	01:10	R	00:00

```
qdel 29668
```

- After job 29898 runs: user1 should get file amber.job.o29898 with output/errors (log file)

Job Scheduling

- All XSEDE compute resources use a **batch scheduler** for running jobs.
- All jobs are placed in a **batch queue** after they are submitted.
- Resource User Guides on the XUP have details on your system's scheduler.



Batch Schedulers

- Attempt to balance queue wait times of competing jobs with efficient system utilization.
 - Job prioritization influenced by number of cores and wall clock time requested
 - FIFO queues with fair use mechanisms to keep a single user from dominating the queue
 - Backfilling unused nodes with smaller jobs
- Will not start jobs if they will not finish before scheduled system maintenance.



Common problems encountered when running jobs:

- Invalid number of cores were requested
- Job runs out of CPU time
- Files can't be found
- Inadequate software permissions



Improving job turnaround

- Request accurate walltime
- Use flexible walltime
- Pack your job
 - Running many small jobs places a great burden on the scheduler and is also inconvenient for you.
 - Pack many executions into a single job, which you then submit to PBS with a single qsub command.



Requesting flexible walltime

```
-l walltime_min=HH:MM:SS  
-l walltime_max=HH:MM:SS
```

Example: Your job requests 64 cores and a walltime between 2 and 4 hours. If there is a 64 core slot available for 3 hours, your job could run in this slot. However, if your job had requested a fixed walltime of 4 hours it would not run until the larger time slot becomes available.



Packing Serial Jobs

Run each program execution in the background and place a wait command after each execution.

```
#!/bin/csh
#PBS -l ncpus=96
#PBS -l walltime=5:00
#PBS -q batch
dplace -c 0 ./myserial1 < serial1.dat &
dplace -c 32 ./myserial2 < serial2.dat &
dplace -c 64 ./myserial3 < serial3.dat &
wait
```

Packing Serial or MPI jobs

- The dplace command insures that each execution will run on its own set of 32 cores. The executions will run concurrently.
- Same approach using the dplace command can be used to pack MPI executables.

```
dplace -c 0 ./myserial1 < serial1.dat &  
dplace -c 32 ./myserial2 < serial2.dat &  
dplace -c 64 ./myserial3 < serial3.dat &  
wait
```


Packing OpenMP Jobs

To pack OpenMP executables, replace the dplace command with the omplace command. Sample job to pack OpenMP executables:

```
omplace -nt 32 -c 0 ./myopenmp1 < myopenmp1.dat &  
omplace -nt 32 -c 32 ./myopenmp2 < myopenmp2.dat &  
omplace -nt 32 -c 64 ./myopenmp3 < myopenmp3.dat &  
omplace -nt 32 -c 96 ./myopenmp4 < myopenmp4.dat &  
wait
```

Managing Your Environment: Modules

- Allows you to manipulate your environment.
- 'module list' shows currently loaded modules.
- 'module avail' shows available modules.
- 'module show' <name> describes module.
<http://modules.sourceforge.net/>

```
% module load gcc/3.1.1
% which gcc
/usr/local/gcc/3.1.1/linux/bin/gcc

% module switch gcc/3.1.1 gcc/3.2.0
% which gcc
/usr/local/gcc/3.2.0/linux/bin/gcc

% module unload gcc
% which gcc
gcc not found
```

For the following exercise (same steps as before):

- Check to see if connection is still live, if not:
- For ssh to XSEDE SSO login hub (**today!**)
 - `ssh -l username login.xsede.org`
 - *Username* on handout
- And from there go to your XSEDE resource, for example:
 - `gssh trestles.sdsc.edu`



SDSC trestles Cluster & Modules

- Default environment pgi compilers, mvapich2 MPI implementation
- We will swap pgi compilers with gnu compilers
 - Demo: module swap pgi gnu
 - which gcc
- And then we'll load the openMPI library
 - module load openmpi_ib
 - which mpicc



Module demo on trestles

```
[xdtr1@trestles-login2 ~]$ module swap pgi gnu
Unloading compiler-dependent module mvapich2_ib/1.9
[xdtr1@trestles-login2 ~]$ which gcc
/opt/gnu/gcc/bin/gcc
[xdtr1@trestles-login2 ~]$ module load openmpi_ib
[xdtr1@trestles-login2 ~]$ which mpicc
/opt/openmpi/gnu/ib/bin/mpicc
[xdtr1@trestles-login2 ~]$
```

Using modules in your job script

- First,
`source /usr/share/Modules/init/shell-name`
- `module load module-name`
- Check on-line documentation



Exercise

- Make sure you are on `trestles.sdsc.edu`
- Run the shallow water model code provided
- No input file needed
- Copy batch script from my home directory:
 - `cp ~ux400689/shallow-batch.sh .`



Job script

```
#!/bin/bash --login
#PBS -q shared
#PBS -N ptp_job
#PBS -l nodes=1:ppn=5
#PBS -l walltime=00:30:00
#PBS -V

MPI_ARGS="-np 5"
if [ "-np" == "${MPI_ARGS}" ] ; then
    MPI_ARGS=
fi

source /usr/share/Modules/init/bash
module swap pgi gnu
module load openmpi_ib

cd /oasis/scratch/trestles/$USER/$PBS_JOBID
cp /home/ux400689/shallow-SR1_kepler_try2/shallow .
MYSCREXE=`basename /home/ux400689/shallow-SR1_kepler_try2/shallow`

COMMAND=mpirun

if [ -n "${COMMAND}" ] ; then
    COMMAND="${COMMAND} ${MPI_ARGS} -hostfile ${PBS_NODEFILE}  ${MYSCREXE}"
else
    COMMAND="${MYSCREXE} "
fi

${COMMAND}
```



Exercise:

- Submit the job (**qsub shallow-batch.sh**)
- Monitor the job (**qstat -u *username***)
- Make sure you have the output files at job completion

```
[xdtr1@trestles-login1 ~]$ ls
```

```
Input ptp_job.e2011011 ptp_job.o2011011 Results shallow-batch.sh
```

```
[xdtr1@trestles-login1 ~]$
```

- more ptp*11 (for this case, yours will be different!)



Output files: need to show successful completion

```
Remote System Details Tasks Terminals Remote Environments
login.xsede.org
jstart=0, jend=7, next=2, prev=4
jstart=8, jend=15, next=3, prev=1
jstart=16, jend=23, next=4, prev=2
jstart=24, jend=31, next=1, prev=3

Shallow water weather model - Distributed Memory Version 0.6

Number of points in the X direction      32
Number of points in the Y direction      32
Grid spacing in the X direction          100000.00
Grid spacing in the Y direction          100000.00
Time step                                90.000
Time filter parameter                     0.001
Cycle number      1      Model time in days  0.00
  Potential energy      0.000  Kinetic Energy  48036.828
  Total Energy          48036.828  Pot. Enstrophy  0.000000e+00

Cycle number      50      Model time in days  0.05
  Potential energy      1256.284  Kinetic Energy  46526.969
  Total Energy          47783.254  Pot. Enstrophy  -nan

Cycle number      100      Model time in days  0.10
```

1,1 Top

Need help? Reporting and Tracking Issues

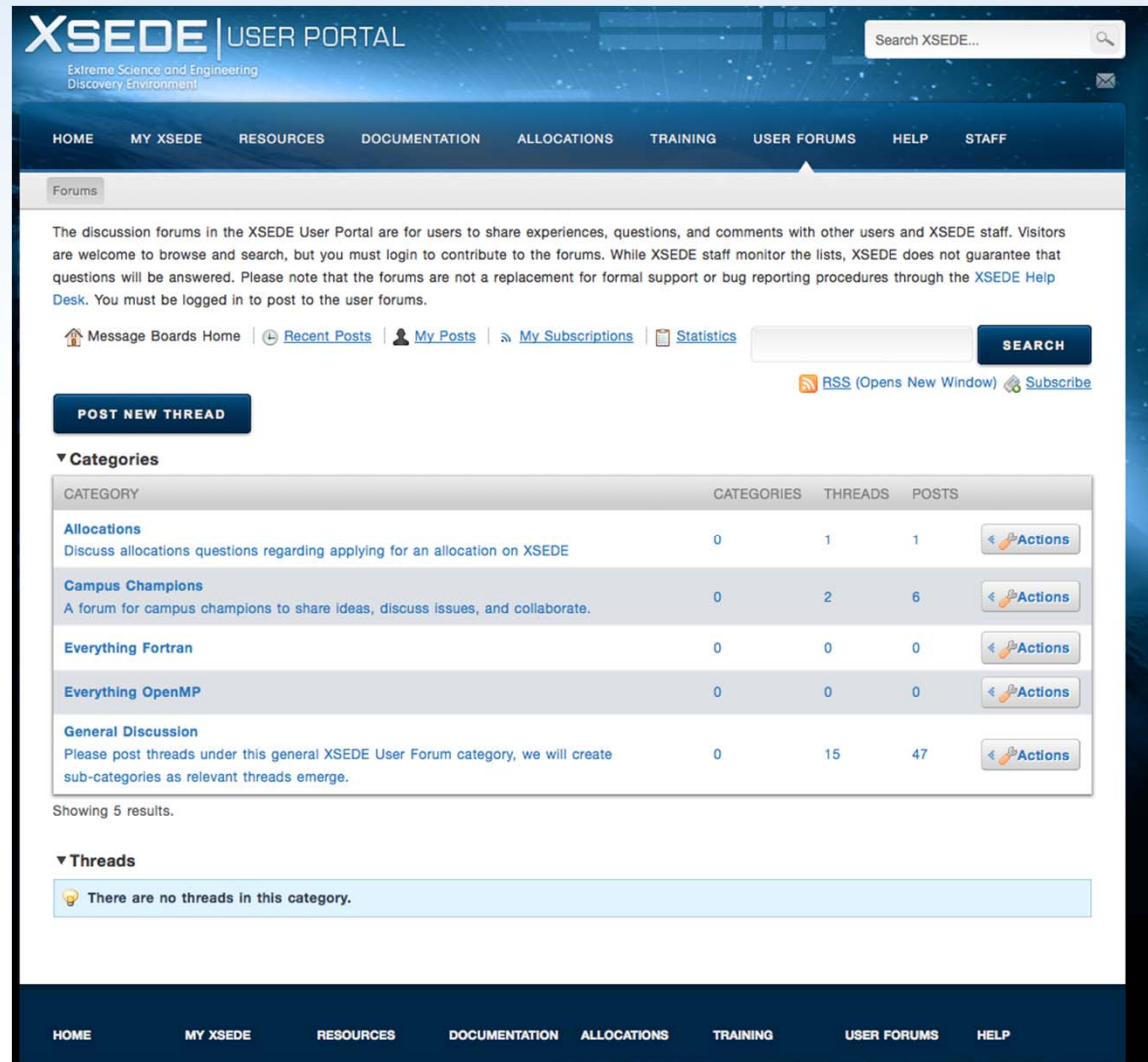
- portal.xsede.org → Help
Submit ticket
- portal.xsede.org → My XSEDE → Tickets
 - Submit ticket
 - View past tickets (both open and closed)
- Can also email help@xsede.org or call 1-866-907-2383, at any hour (24/7)



Discussing your problems...

User Portal: User Forums

- The User Forums are a great place to ask questions, get help, or discuss ideas about XSEDE.



The screenshot shows the XSEDE User Portal interface. At the top, the XSEDE logo is followed by "USER PORTAL" and the tagline "Extreme Science and Engineering Discovery Environment". A search bar is in the top right. Below the header is a navigation menu with links: HOME, MY XSEDE, RESOURCES, DOCUMENTATION, ALLOCATIONS, TRAINING, USER FORUMS (highlighted), HELP, and STAFF. The main content area is titled "Forums" and contains a welcome message. Below the message are links for "Message Boards Home", "Recent Posts", "My Posts", "My Subscriptions", and "Statistics", along with a "SEARCH" button. There are also links for "RSS (Opens New Window)" and "Subscribe". A "POST NEW THREAD" button is visible. The "Categories" section lists five categories with their respective thread and post counts, and an "Actions" link for each. The "Threads" section shows a message that there are no threads in the selected category.

XSEDE USER PORTAL
Extreme Science and Engineering
Discovery Environment

Search XSEDE...

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Forums

The discussion forums in the XSEDE User Portal are for users to share experiences, questions, and comments with other users and XSEDE staff. Visitors are welcome to browse and search, but you must login to contribute to the forums. While XSEDE staff monitor the lists, XSEDE does not guarantee that questions will be answered. Please note that the forums are not a replacement for formal support or bug reporting procedures through the [XSEDE Help Desk](#). You must be logged in to post to the user forums.

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POST NEW THREAD

▼ **Categories**

CATEGORY	CATEGORIES	THREADS	POSTS	
Allocations Discuss allocations questions regarding applying for an allocation on XSEDE	0	1	1	Actions
Campus Champions A forum for campus champions to share ideas, discuss issues, and collaborate.	0	2	6	Actions
Everything Fortran	0	0	0	Actions
Everything OpenMP	0	0	0	Actions
General Discussion Please post threads under this general XSEDE User Forum category, we will create sub-categories as relevant threads emerge.	0	15	47	Actions

Showing 5 results.

▼ **Threads**

💡 There are no threads in this category.

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More “helpful” resources

xsede.org → User Services

- Resources available at each Service Provider
 - User Guides describing memory, number of CPUs, file systems, etc.
 - Storage facilities
 - Software (Comprehensive Search)
- Training: portal.xsede.org → Training
 - Course Calendar
 - On-line training
- Get face-to-face help from XSEDE experts at your institution; contact your local Campus Champions.
- Extended Collaborative Support (formerly known as Advanced User Support (AUSS))



XSEDE Training Survey

- Please complete a short on-line survey about this module. The survey can be found at <http://bit.ly/XSEDEATLANTA>
- We value your feedback, and will use your feedback to help improve our training offerings.



April 22, 2014

**Thanks for listening and welcome to
XSEDE!**

XSEDE

Extreme Science and Engineering
Discovery Environment