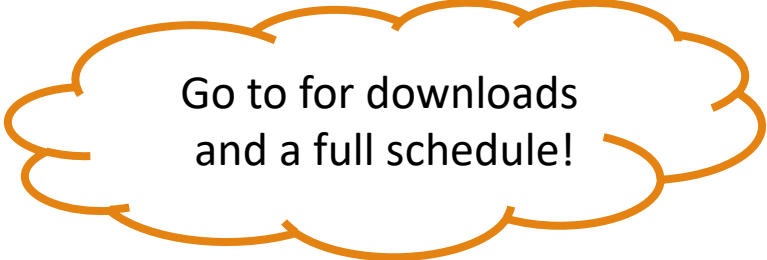


HPC Workshop 2022

Upward Bound – Day 2

<https://uwec.ly/hpcworkshop>



Go to for downloads
and a full schedule!

Please log into your machine when you take a seat.

Recap:

Putty | Linux commands | WinSCP

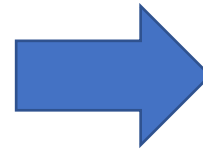
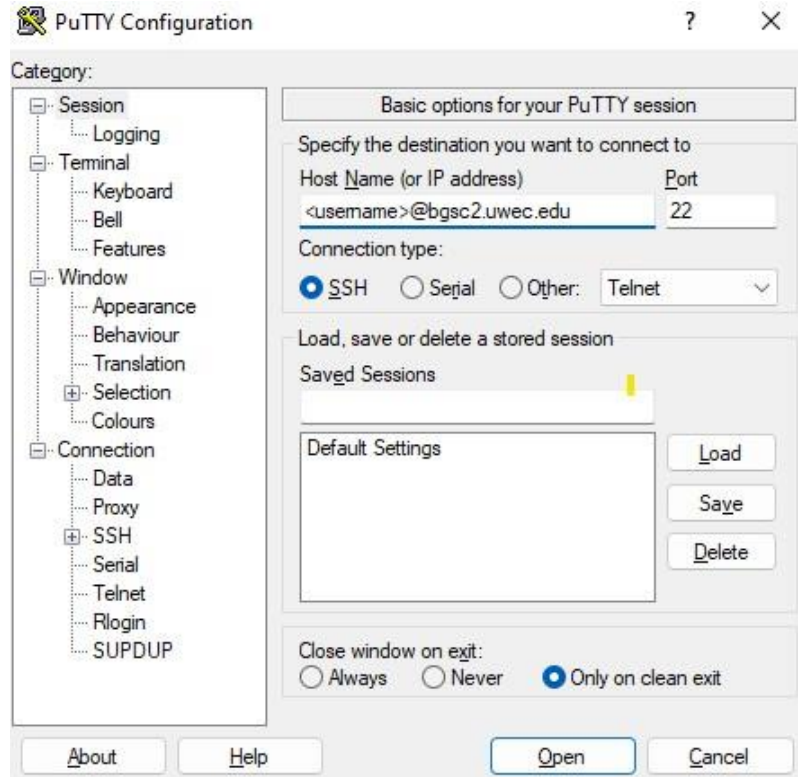
Mammoth

PuTTY

PuTTY

- SSH (Secure Socket Shell) and telnet client (use application on remote system by server application)
- Open sources software

PuTTY



Host name: bgsc2.uwec.edu

Port number: 22

Username: yourUWECusername

Password: yourUWECpassword

Basic Linux Commands

Today's first command

- `getfiles` (All lower case)

The above command copies all of today's workshop files to your own folder.

Show the directory and file

1. `ls` (All lower case. No space before and after “ls”)
2. `ls -l` (All lower case. There is a single space between “ls” and “-l”)

Note: The differences between these 2 is that “ `ls -l` ” shows the directory and files in sorted order

Change the current directory

- `cd` (All lower case. No space before and after)

Creating a folder (directory)

- `mkdir` (All lower case. No space before and after; all lower case)

Creating a file

- **vi** (All lower case. No space before and after)
- **vim** (All lower case. No space before and after)

Note: vi is a text editor of Linux. vim is more powerful (it provides unlimited undo, syntax highlighting, and import configurations for coding a program)

Show the current working directory

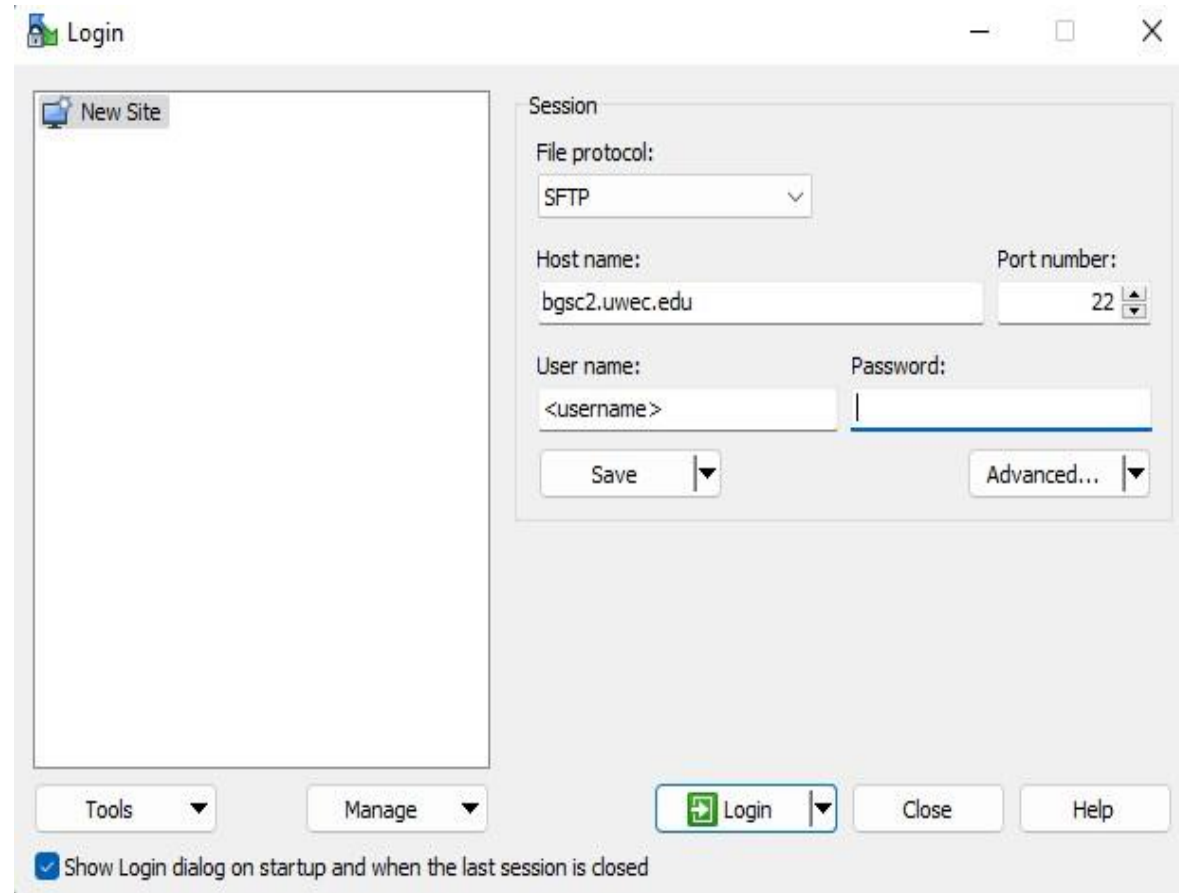
- `pwd` (All lower case. No space before and after)
- **Note:** “ `pwd` ” stands for print working directory

Note: Please **DO NOT close PuTTY**. We will use them again

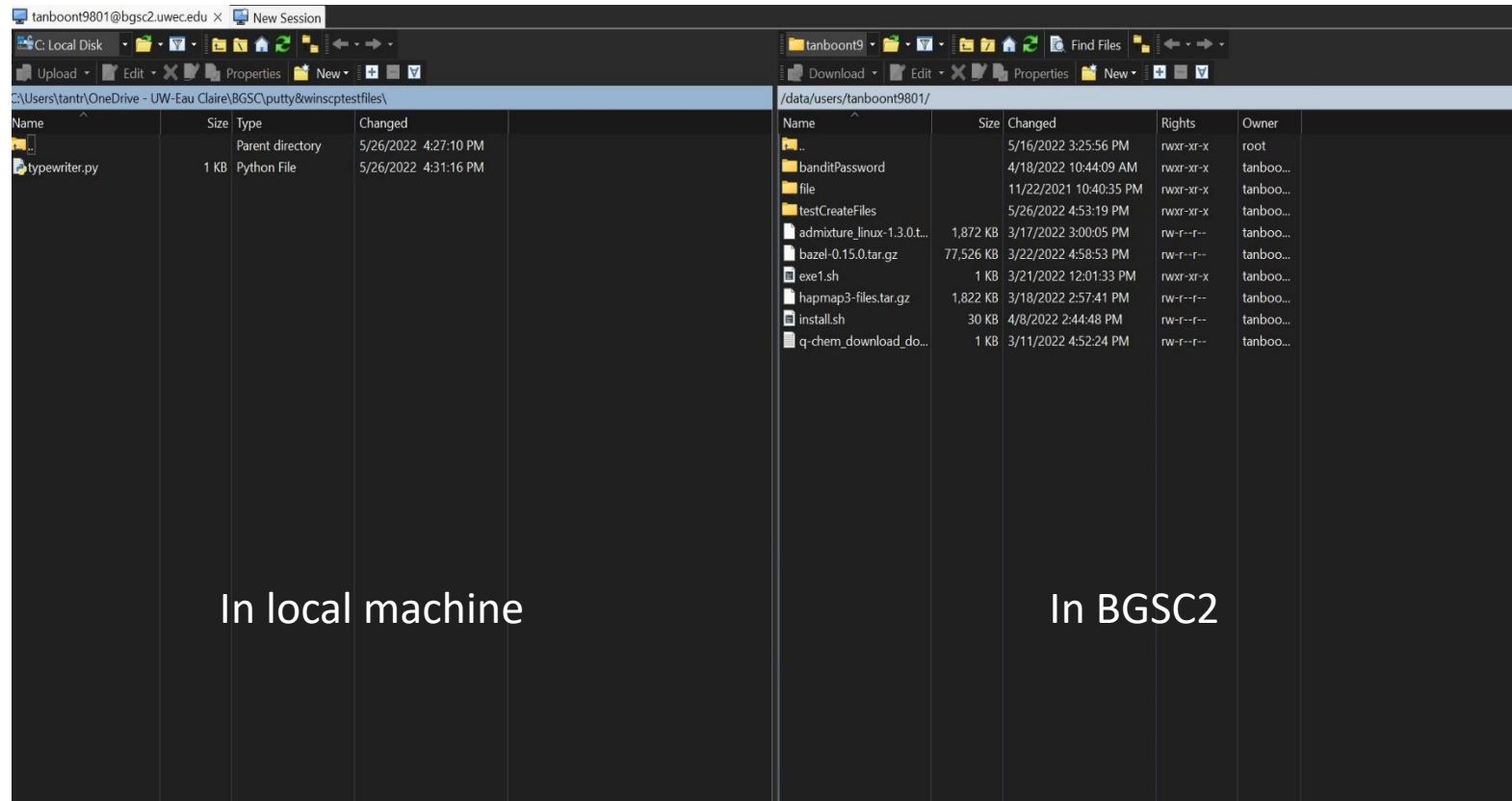
WinSCP

WinSCP

Host name: bgsc2.uwec.edu
Port number: 22
Username: yourUWECusername
Password: yourUWECpassword




WinSCP



Successful login


SLURM INTRO



MITCHELL EWAN
STUDENT HPC
ADMINISTRATOR

BEFORE WE GET STARTED....

Make sure you have the relevant files for this presentation!

1. Go to this link to download the presentation (optional)  <https://uwec.ly/hpcworkshop>
2. Copy the files from the workshop directory to your home directory using `'cp -r /data/groups/UB_Workshop/Day_2 ~ '`

WHAT ARE COMPUTATIONAL RESOURCES?

"Computational Resources" are any resources on a computer that can be used by software.

Examples of computational resources you will find in almost any computer:

- ❖ CPU Cores
- ❖ GPU Cards
- ❖ Random Access Memory (RAM)
- ❖ Storage Space

BGSC: 17 Nodes with **404 CPU Cores**, **1316GB of RAM**, and **12 GPU cards**



MANAGING COMPUTATIONAL RESOURCES

- ❖ How do you determine what jobs use what resources?
- ❖ How do you divide up nodes into groups?
- ❖ What happens if all the resources are in use, and someone wants to submit a job?

SLURM WORKLOAD MANAGER

Open-source, scalable cluster
resource manager and job
scheduler.

Very General-purpose,
flexible, and stable

And it's free!





SLURM'S FUNCTIONS

- ❖ 3 Main functions:
 - ❖ Allocate resources (compute nodes) to jobs
 - ❖ Facilitate starting, executing, and monitoring jobs
 - ❖ Resolve situations where more resources than available are requested.
- ❖ Slurm also functions as a comprehensive logging system for all our jobs.
- ❖ A built-in database system allows accounting, and for the purchase of cluster time



EXAMPLE SCENARIO

John and Abby both have jobs they want to run, but the cluster is almost completely full of jobs already. Abby's job will take about 10 minutes to run, so she set the time limit to 15 minutes. John's job could take a very long time, so he set the time limit to 3 days. Both jobs require about the same cores and memory.

How does Slurm handle this?

1. Determine how many resources are free on the cluster
2. Check the resources each job is requesting
3. Decide to run Abby's job, and add John's job to the queue

PARTITIONS

When you submit a job,
you must select a partition
for it to run on

BGSC partitions:

Partition Name	Time Limit	Purpose
week	7 days	General-Purpose partition
batch	30 days	Long-run partition
GPU	7 days	For jobs which require a GPU
extended	104 days	Special partition for extremely long jobs
scavenge	5 days	Test partition for unimportant jobs

SBATCH – JOB PROPERTIES

```
cat testJob.sh
```

Keyword	Action	Example
--partition	Specifies partition	#SBATCH --partition=yourPartition
--time	Maximum runtime	#SBATCH --time=dd-hh:mm:ss
--nodes	# of requested nodes	#SBATCH --nodes=1
--mem	Set memory limit (in MB)	#SBATCH --mem=512
--ntasks-per-node	# of CPUs to use per node	#SBATCH --ntasks-per-node=4
--job-name	Name of your job	#SBATCH --job-name="My Job"
--output	Name of the output file	#SBATCH --output=output.txt
--error	Name of the error file	#SBATCH --error=error.txt
--mail	Sets the user's email notifications	#SBATCH --mail=user@uwec.edu
--mail-type	Type of email notifications to get (BEGIN, END, FAIL, ALL, QUEUE)	#SBATCH --mail-type=ALL
--gpus <u>(BOSE ONLY)</u>	Number of GPUs requested (max 3)	#SBATCH --gpus=1

SLURM COMMANDS

Command	Purpose
squeue	Show all pending + running jobs
myjobs	Show all your own jobs
sinfo	Show status of all nodes
savail	Show resource availability
sbatch my-script.sh	Submit a job
scancel jobid	Cancel a job

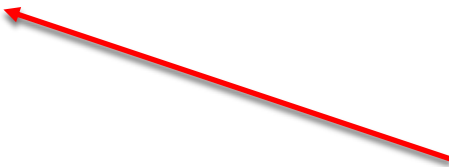
LET'S SUBMIT A JOB!

First, use the sbatch command to submit the job file you copied earlier

```
'sbatch testJob.sh'
```

Now you can use the 'myjobs' command to see your job as it is running!

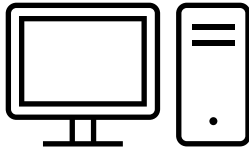
```
[ewanml0687@bose Slurm]$myjobs
JOBID PARTITION NAME USER ST TIME NODES NODELIST (REASON)
14028 week UB Test ewanml06 R 0:09 1 cn06
```



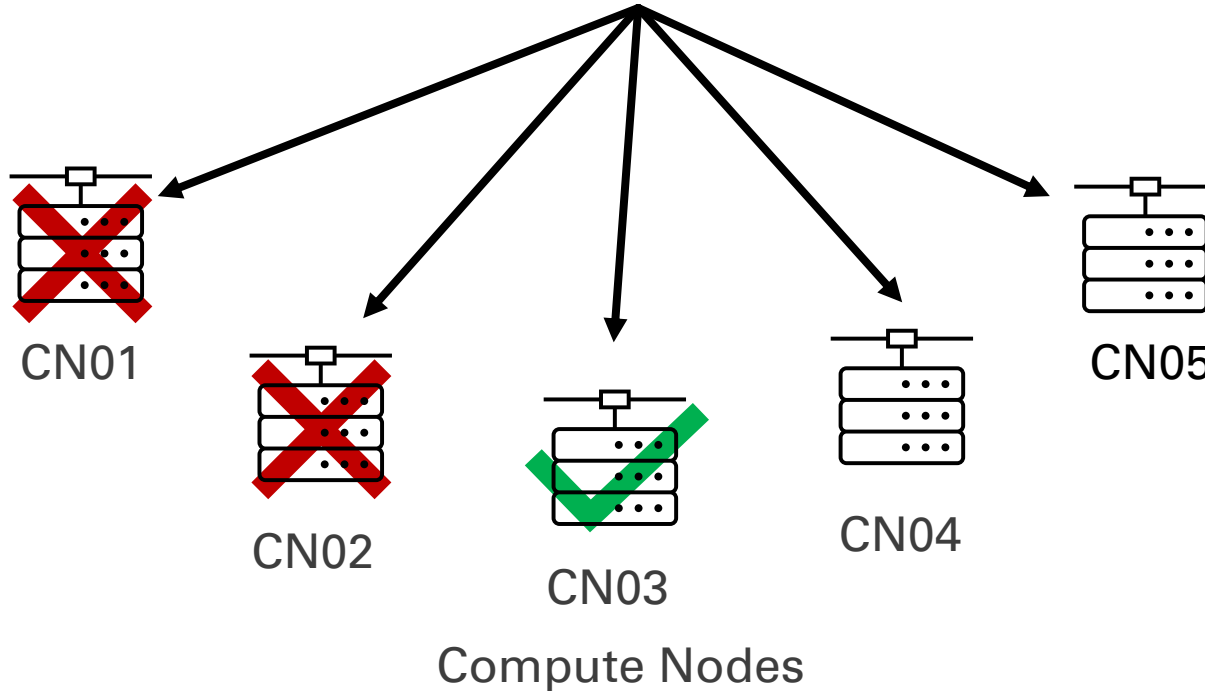
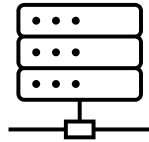
Node your job is using!

WHAT HAPPENED?

Local Machine (you)



BGSC Head Node (running Slurm)



Compute Nodes

THE RESULTS

Your Job

```
# Job Commands Below  
echo "Hello from $(hostname) "  
sleep 60
```

Ssample.out (slurm output)

```
[ewanml0687@king Session_4]$ cat ssample.out  
Hello from compute62
```



LET'S SUBMIT ANOTHER JOB!

First, use the sbatch command to submit the job file you copied earlier

```
'sbatch submit.sh'
```

You can use the 'myjobs' command again to see your job running!

LET'S TRY YOUR OWN IMAGE

Website: unsplash.com

Find a photo you want to try and place it in the Session_4 folder.

(Warning – Keep it clean and appropriate!)

Run “sbatch submit.sh” again!

Today's Schedule

Time	Who	What
9:00 – 10:15	Blugold Center for HPC	Recap; Submitting jobs to a supercomputer using Slurm.
10:30 – 12:00	Dr. Bill Wolf	The Lives of Stars
12:00 – 1:00	LUNCH	LUNCH
1:00 – 2:30	Dr. Wufeng Tian	Cryptocurrency Trading Strategies Based on Market Signals and Deep Learning Approach
2:30 – 2:45	Blugold Center for HPC	Wrap Up

Next Up



The Lives of Stars

Dr. Bill Wolf, Ph.D.
Physics + Astronomy
Assistant Professor

Pull up the website if you haven't already!

Website: <https://uwec.ly/hpcworkshop>

Lunch Break

BE BACK BY 1:00PM

Welcome Back! Next Up...



Cryptocurrency Trading Strategies Based on Market Signals and Deep Learning Approach

Dr. Wufeng Tian, Ph.D.
Mathematics
Associate Professor

Please log back into your machine.

Website: <https://uwec.ly/hpcworkshop>

Next Time - July 8th

Time	Who	What
9:00 – 10:15	Blugold Center for HPC	Review of high performance computing, Linux commands, and submitting jobs using Slurm.
10:30 – 12:00	Dr. Rakib Islam	How to Teach a Machine to Detect Sentiment - A Machine Learning Approach
12:00 – 1:00	LUNCH	LUNCH
1:00 – 2:30	Dr. Ying Ma	How to engineer a super-bouncy ball
2:30 – 2:45	Blugold Center for HPC	Wrap Up