HPC Workshop 2022

Upward Bound – Day 3

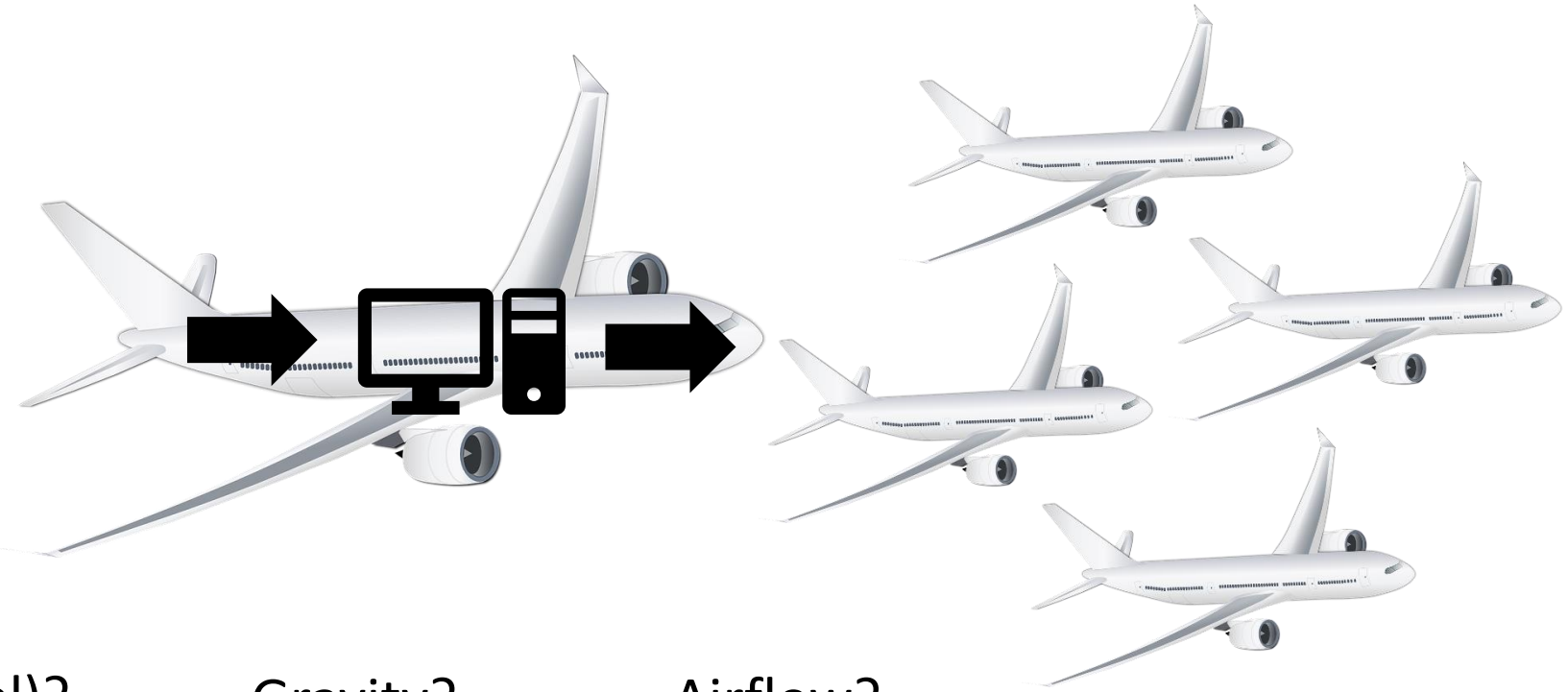
https://uwec.ly/hpcworkshop

Please log into your machine when you take a seat.

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 $f_c(z) = z^2 + c$
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

Computational Science



Weight (+Fuel)?

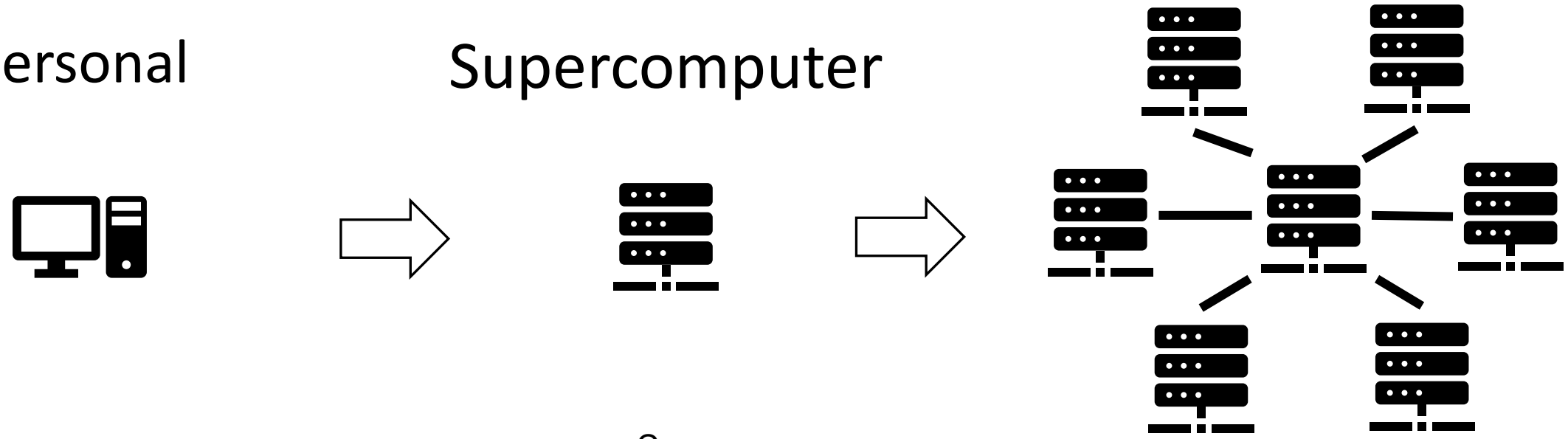
Gravity?

Airflow?

Personal

Supercomputer

Supercomputing Cluster



One

Many

High-Performance Computing

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**

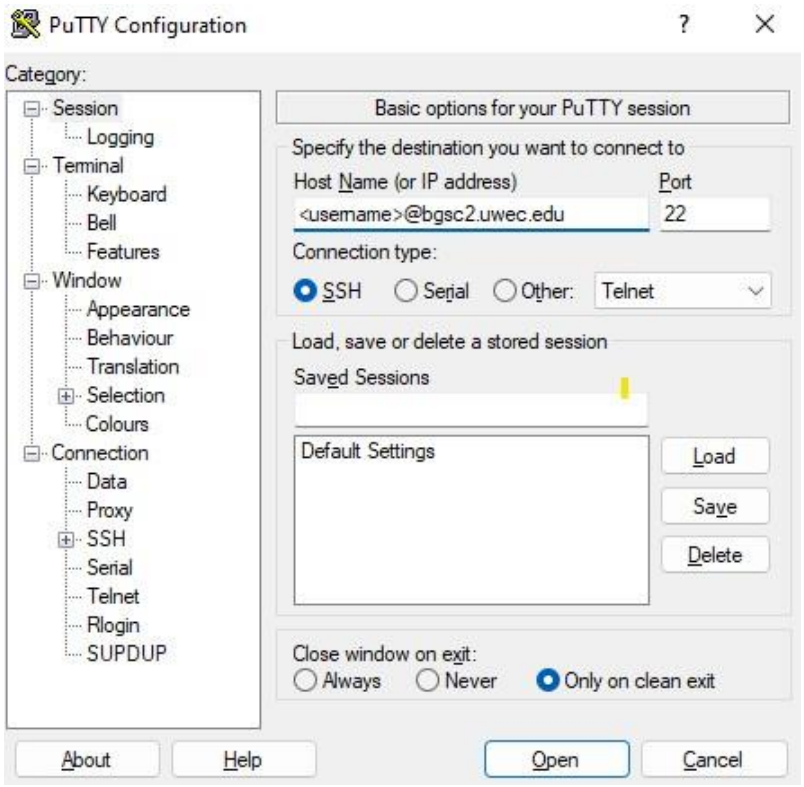
MANAGING COMPUTATIONAL RESOURCES

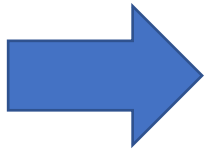
- How do you determine what jobs use what resources?
- How do you divide up nodes into groups?
- What happens if all the resources are in use, and someone wants to submit a job?

Putty | Linux commands | WinSCP

REVIEW

PuTTY

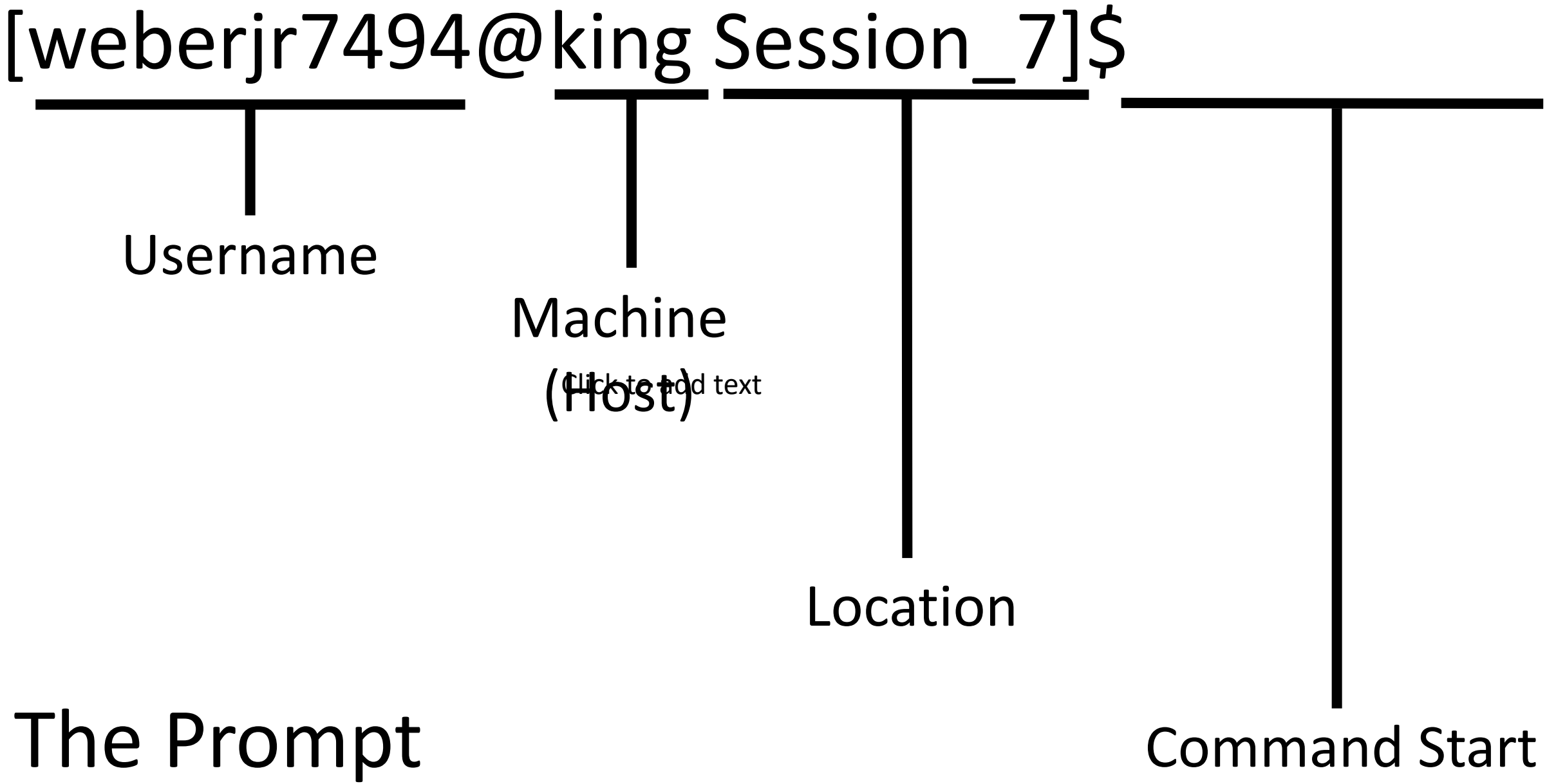




Host name: bgsc2.uwec.edu
Port number: 22
Username: <UWEC username>

Password: <UWEC password>

Basic Linux Commands (Review)


[weberjr7494@king Session_7]$
Username
Machine
(Host)
Click to add text
Location
Command Start

The Prompt

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)

type "cd Day_3"

then type "cd Session_7"

OR

type "cd Day_3/Session_7"

Pro Tips!

If you ever get lost in PuTTY, you can type "cd" by itself at any time to go back to your personal folder.

Whenever you see a tilde "~" that means you're using your personal folder.

Show the current working directory

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

- Note: “ pwd ” stands for print working directory

Does your path look like this?

"/data/users/<username>/Day_3/Session_7"

Creating a folder (directory)

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

Make sure your path looks similar to "/data/users/<username>/Day_3/Session_7"

Type "pwd" to confirm this.

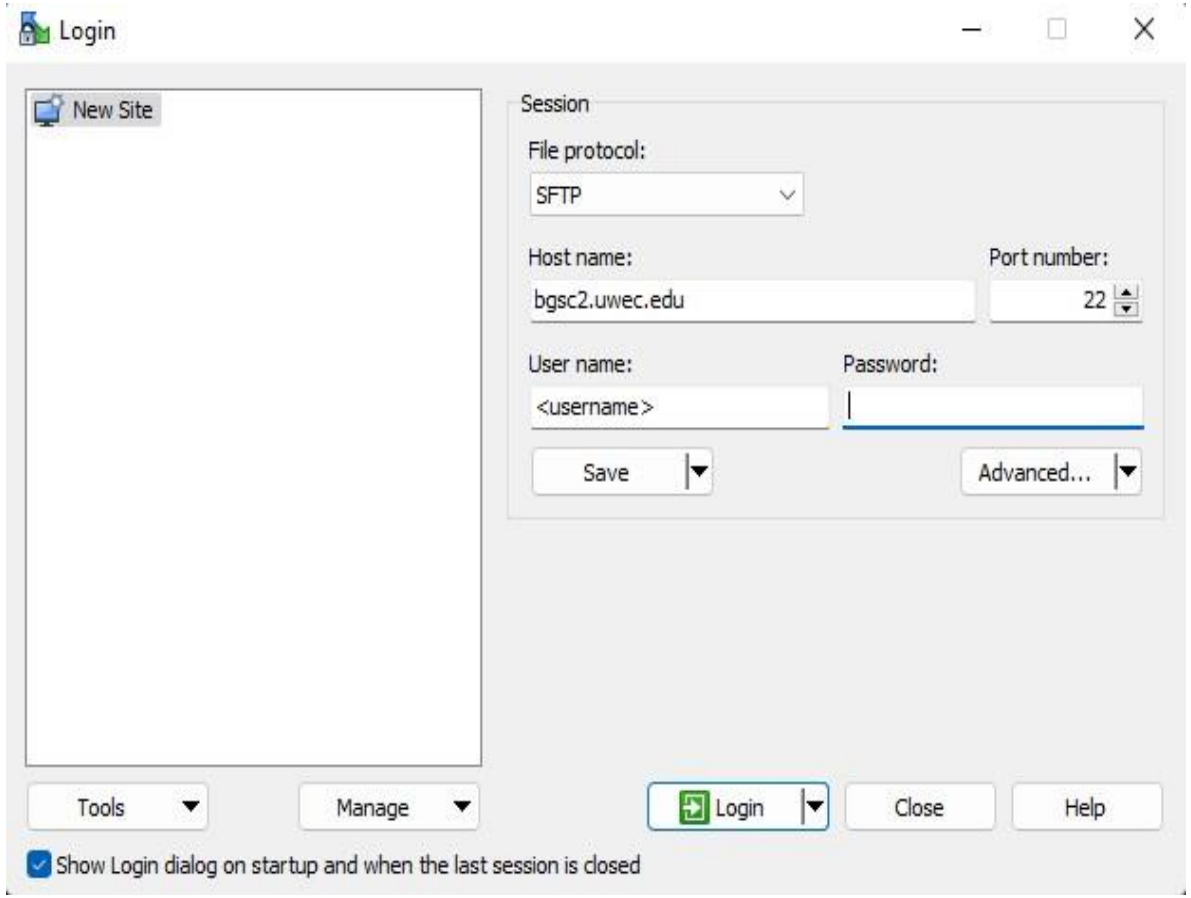
Once you know you are in the right location,

Type "mkdir plots"

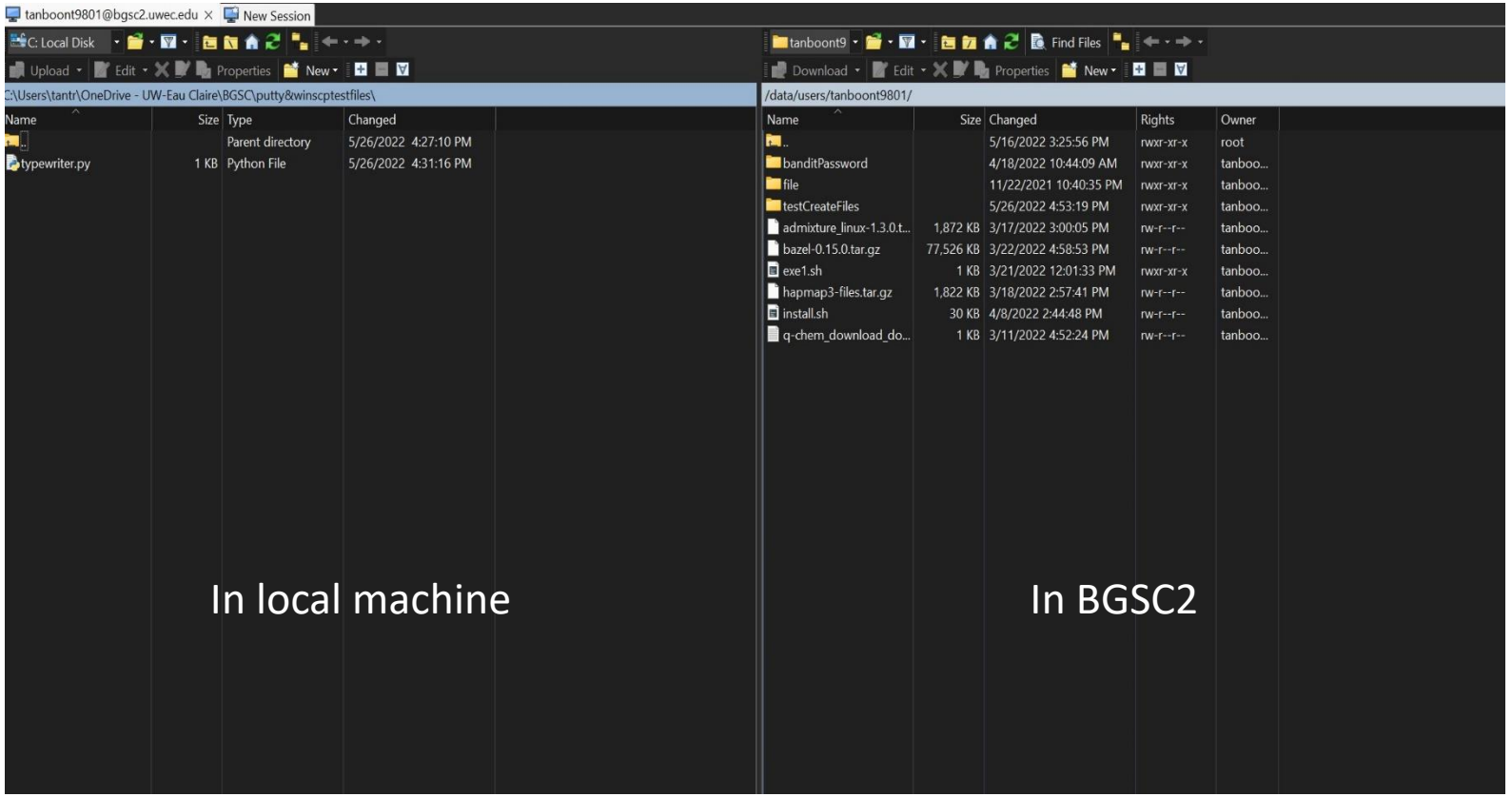
Note: Please **DO NOT close PuTTY**. We will use them again

WinSCP

Host name: bgsc2.uwec.edu
Port number: 22
Username: <your UWEC username>
Password: <your UWEC password>



WinSCP



Successful login

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

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

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!

THE RESULTS

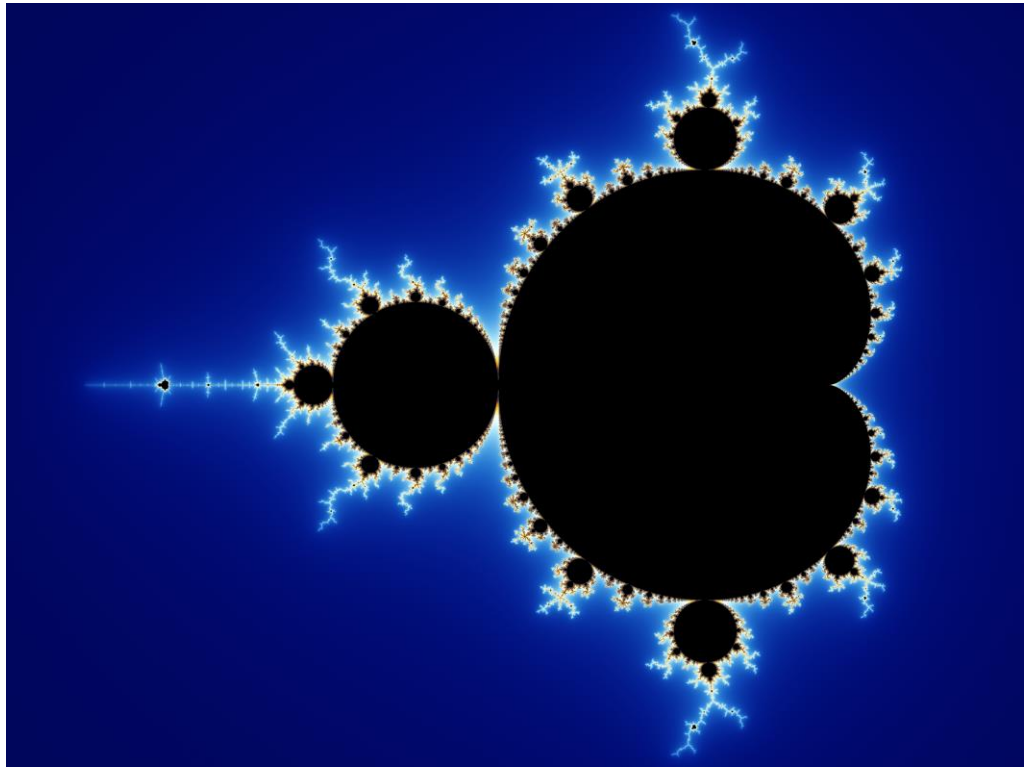
Your Job

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

Ssample.out (slurm output)

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

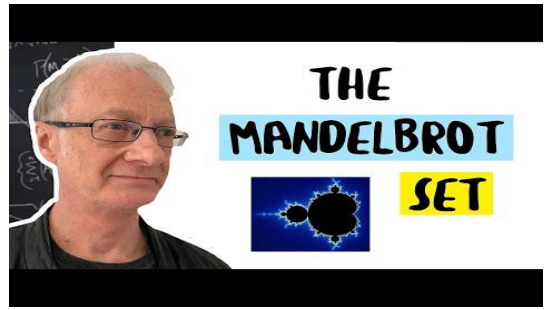
MANDELBROT SET



MANDELBROT SET

$$f_c(z) = z^2 + c$$

z = recurring value of the function
c = a set of complex numbers



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!

ONE. LAST. JOB.

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

'sbatch submit2.sh’

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

Next Up

How to Teach a Machine to Detect Sentiment
A Machine Learning Approach

Dr. Rakib Islam, Ph.D.
Computer Science
Assistant Professor

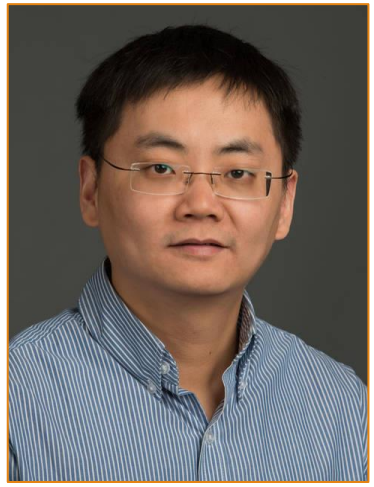
Pull up the website if you haven't already!

Website: https://uwec.ly/hpcworkshop

Lunch Break

BE BACK BY 1:00PM

Welcome Back! Next Up…



How to engineer a super-bouncy ball

Dr. Ying Ma, Ph.D.
Materials Science and Biomedical Engineering
Associate Professor

Please log back into your machine.

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