

# HPCs at OU

Fabia U. Battistuzzi

[battistu@oakland.edu](mailto:battistu@oakland.edu)

Tomas Hajek

[hajek@oakland.edu](mailto:hajek@oakland.edu)

Stephen Villagonzalo

[svillagonzalo@oakland.edu](mailto:svillagonzalo@oakland.edu)

John Johnston

[jbjohnston@oakland.edu](mailto:jbjohnston@oakland.edu)

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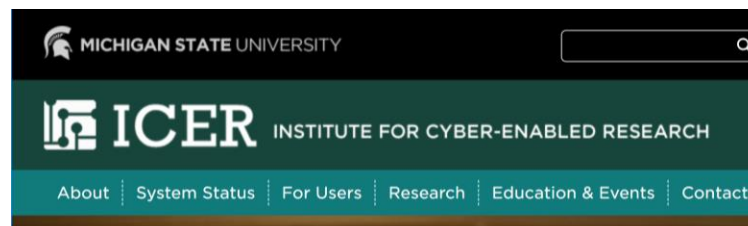
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**HPCMatilda**

MSU ICER  
*icer.msu.edu*



For general information:

[https://kb.oakland.edu/uts/ResearchComputingHPC#Introduction\\_to\\_HPC\\_clusters](https://kb.oakland.edu/uts/ResearchComputingHPC#Introduction_to_HPC_clusters)

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**RESEARCH COMPUTING AND HPC**

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**INTRODUCTION TO HPC CLUSTERS**

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To access the cluster from Windows:

[MobaXterm download \(home edition\)](#)

<https://mobaxterm.mobatek.net/download.html>

The screenshot shows the MobaXterm website with a navigation bar at the top containing links for Home, Demo, Features, Download, Plugins, Help, and Contact, along with social media icons. On the right of the navigation bar are buttons for 'Customer area' and 'Buy'. The main content area is divided into two columns. The left column, titled 'Home Edition', features a 'Free' price tag and lists features such as Full X server and SSH support, Remote desktop (RDP, VNC, Xdmcp), Remote terminal (SSH, telnet, rlogin, Mosh), X11-Forwarding, Automatic SFTP browser, Master password protection, Plugins support, Portable and installer versions, Full documentation, Max. 12 sessions, Max. 2 SSH tunnels, Max. 4 macros, and Max. 360 seconds for Tftp, Nfs and Cron. A 'Download now' button is at the bottom of this column. The right column, titled 'Professional Edition', features a price of '\$69 / 49€ per user\*' and lists features including every feature from the Home Edition, Customizable startup message and logo, Modifiable profile script, Removal of unwanted games/screensavers/tools, Unlimited sessions, Unlimited tunnels and macros, Unlimited run time for network daemons, Enhanced security settings, 12-month updates, Company deployment, and Lifetime right to use. A 'Subscribe online / Get a quote' button is at the bottom of this column. A small footnote states '\* Excluding tax. Volume discounts available'.

MobaXterm

Home Demo Features **Download** Plugins Help Contact

Customer area Buy

### Home Edition

#### Free

- Full **X server** and **SSH** support
- Remote desktop (RDP, VNC, Xdmcp)
- Remote terminal (SSH, telnet, rlogin, Mosh)
- X11-Forwarding
- Automatic SFTP browser
- Master password protection
- Plugins support
- Portable and installer versions
- Full documentation
- Max. **12** sessions
- Max. **2** SSH tunnels
- Max. **4** macros
- Max. **360** seconds for Tftp, Nfs and Cron

Download now

### Professional Edition

#### \$69 / 49€ per user\*

\* Excluding tax. Volume discounts [available](#)

- Every feature from Home Edition +**
- Customize your startup message and logo
- Modify your profile script
- Remove unwanted games, screensaver or tools
- Unlimited number of sessions
- Unlimited number of tunnels and macros
- Unlimited run time for network daemons
- Enhanced security settings
- 12-months updates included
- Deployment inside company
- Lifetime right to use

Subscribe online / Get a quote

Session settings

SSH Telnet Rsh Xdmcp RDP VNC FTP SFTP Serial File Shell Browser Mosh Aws S3 WSL

Basic SSH settings

Remote host \* pc-login.oakland.edu Specify username battistu Port 22

Advanced SSH settings Terminal settings Network settings Bookmark settings

Remote host: hpc-login.oakland.edu

Username: netid

OK Cancel

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: <https://mobaxterm.mobatek.net>

## Successful connection!

1

1

GUI of your home  
space on the cluster

2

Command line space

hpc-login.oakland.edu (battistu)

Terminal Sessions View X server Tools Games Settings Macros Help

Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help

Quick connect...

/home/b/battistu/

Name Size (KB) L

.. 2

.cache 2

.conda 2

.config 2

.dgl 2

.keras 2

.lmod.d 2

.mozilla 2

.parallel 2

.ssh 2

.anaconda3 2

Documents 2

SEG 2

test\_SEG 2

testroary2 2

.bash\_history 39

.bash\_logout 1

.bash\_profile 1

.bashrc 1

.condarc 1

.emacs 1

.kshrc 1

.Xauthority 1

AAcounting\_LCR2.pl 8

readme.txt 1

roaryscript\_MSU\_Aero2.pl 4

slurm-19116.out 2

testMXhpc.txt 3

testMXhpc\_exactTimes.nwk 1

testMXhpc\_nexus.tre 2

testMXhpc\_relTimes.nwk 1

testMXhpc\_summary.txt 2

usageAgreement.txt 6

Follow terminal folder

Remote monitoring

hpc-login-p01 0% 9.39 GB / 376.41 GB 0.03 Mb/s 0.02 Mb/s 198 days elder

MobaXterm 12.4

(SSH client, X-server and networking tools)

> SSH session to **battistu@hpc-login-p01.sys.oakland.edu**

- SSH compression : ✓
- SSH-browser : ✓
- X11-forwarding : ✓ (remote display is forwarded through SSH)
- DISPLAY : ✓ (automatically set on remote server)

> For more **info**, ctrl+click on **help** or visit our **website**

**Matilda HPC**

This system is for authorized users only.  
Your use of this system indicates your agreement to Oakland University's policies and consent to monitoring, recording, and auditing of usage. Unauthorized use of this system is prohibited and subject to discipline and prosecution.

The Matilda HPC utilizes the Slurm workload schedule,  
see: <https://slurm.schedmd.com/quickstart.html>  
To see a list of available modules/software use: **module avail**  
To load software to your path use: **module load <module\_name>**

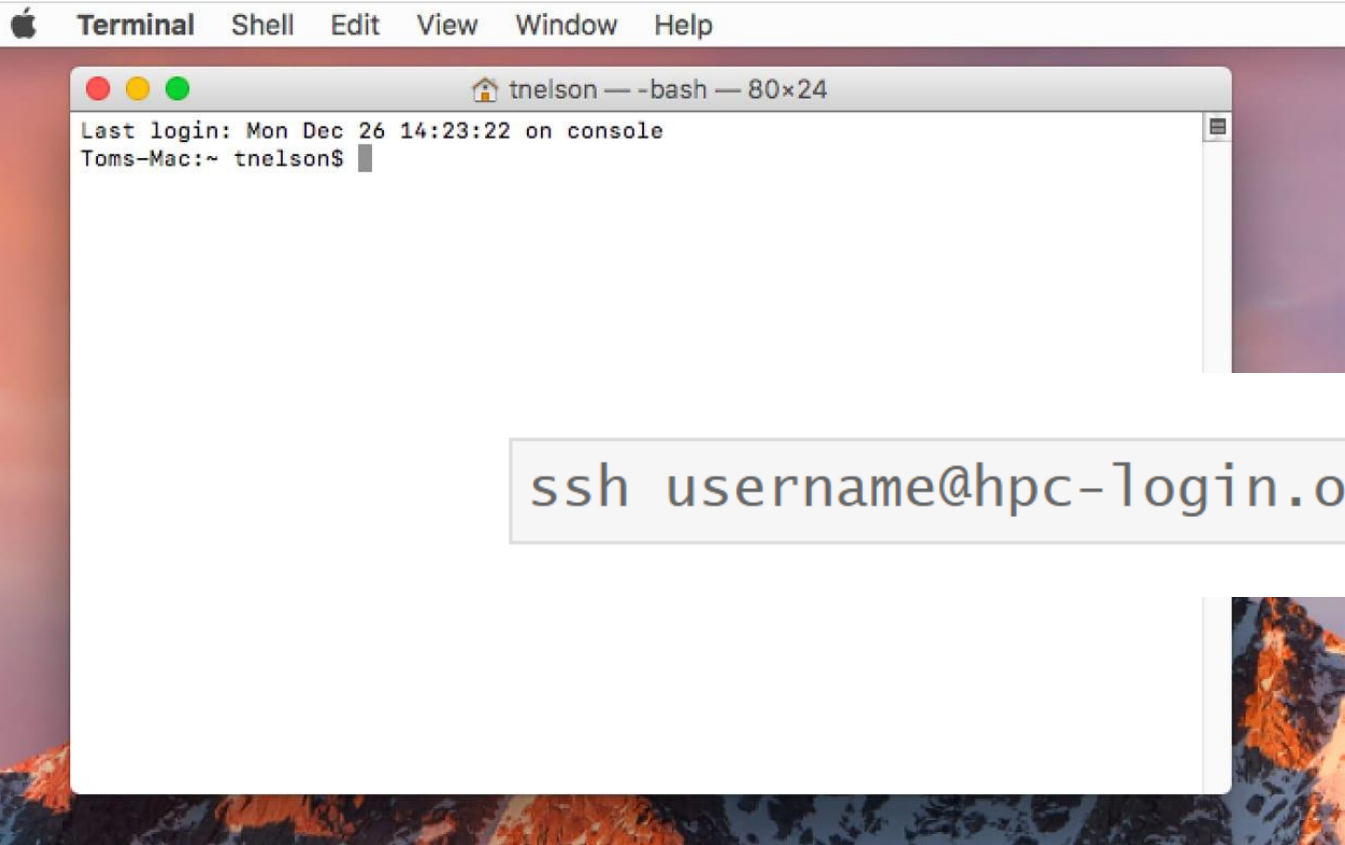
To avoid 'no space left on device' **errors** during runs please consider  
reassigning your TMP space: <https://kb.oakland.edu/uts/HPCTmp>

Join us on Slack  
Sign up here: [https://join.slack.com/t/ouhpc/shared\\_invite/zt-vkpch2rn-xcjQhAI7olP-dvzxAjZONg](https://join.slack.com/t/ouhpc/shared_invite/zt-vkpch2rn-xcjQhAI7olP-dvzxAjZONg)

[battistu@hpc-login-p01 ~]\$



To access the cluster on Mac:




The image shows a Mac Terminal window with the title bar 'Terminal' and menu items 'Shell', 'Edit', 'View', 'Window', and 'Help'. The window title is 'tnelson — -bash — 80x24'. The terminal output shows a successful SSH login: 'Last login: Mon Dec 26 14:23:22 on console' followed by the prompt 'Toms-Mac:~ tnelson\$'.

```
Terminal  Shell  Edit  View  Window  Help
tnelson — -bash — 80x24
Last login: Mon Dec 26 14:23:22 on console
Toms-Mac:~ tnelson$
```

```
ssh username@hpc-login.oakland.edu
```

To visualize/transfer files to and from the cluster on Mac:


**FileZilla**
The free FTP solution

[Home](#)

**FileZilla**  
[Features](#)  
[Screenshots](#)  
[Download](#)  
[Documentation](#)  
[FileZilla Pro](#)

**FileZilla Server**  
[Download](#)

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**Development**  
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[Issue tracker](#)


**Other projects**


## Download FileZilla Client


The latest stable version of FileZilla Client is 3.36.0 (64-bit)




Please select the file appropriate for your platform:


**macOS**



 Requires macOS 10.13.2 or newer






**More download options**

Other platforms:   

Not what you are looking for? [Show additional download options](#)

### Please select your edition of FileZilla Client

	FileZilla	FileZilla with manual	FileZilla Pro	FileZilla Pro + CLI
Standard FTP	Yes	Yes	Yes	Yes
FTP over TLS	Yes	Yes	Yes	Yes
SFTP	Yes	Yes	Yes	Yes
Comprehensive PDF manual	-	Yes	Yes	Yes
<a href="#">Amazon S3</a>	-	-	Yes	Yes
<a href="#">Backblaze B2</a>	-	-	Yes	Yes
<a href="#">Dropbox</a>	-	-	Yes	Yes
<a href="#">Microsoft OneDrive</a>	-	-	Yes	Yes
<a href="#">Google Drive</a>	-	-	Yes	Yes
<a href="#">Google Cloud Storage</a>	-	-	Yes	Yes
<a href="#">Microsoft Azure Blob + File Storage</a>	-	-	Yes	Yes
<a href="#">WebDAV</a>	-	-	Yes	Yes
<a href="#">OpenStack Swift</a>	-	-	Yes	Yes
<a href="#">Box</a>	-	-	Yes	Yes
<a href="#">Site Manager synchronization</a>	-	-	Yes	Yes
<a href="#">Command-line interface</a>	-	-	-	Yes
<a href="#">Batch transfers</a>	-	-	-	Yes

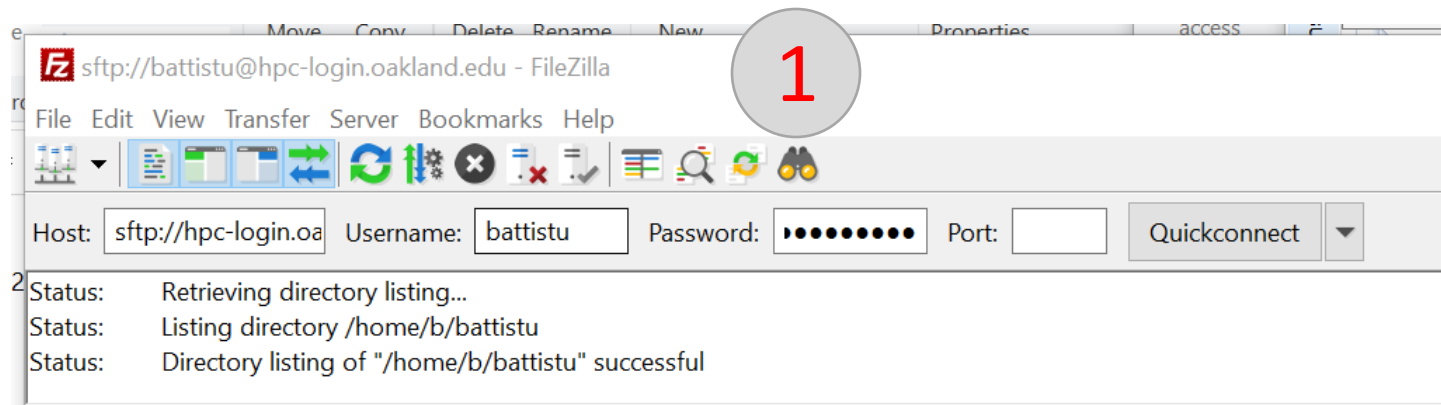


# To visualize/transfer files to and from the cluster on Mac:

The screenshot shows the FileZilla interface with the following components:

- Top Bar (Callout 1):** Contains the Host, Username, Password, Port, and Quickconnect fields. The Host is set to `sftp://battistu@hpc-login.oakland.edu`, Username is `battistu`, and Password is masked with dots.
- Local site (Callout 2):** Displays the local file system structure under `C:\Users\battistu\`. It lists various folders including `.cpanm`, `.eclipse`, `.matplotlib`, `.oracle_jre_usage`, `.spss`, `.ssh`, `3D Objects`, `AppData`, `Application Data`, `b2gFiles`, `b2gWorkspace`, `BEAST`, `Contacts`, `Cookies`, `Desktop`, `Documents`, `DownloadDir...`, `Downloads`, `Favorites`, `igv`, and `My Recent Places`.
- Remote site (Callout 3):** Displays the remote file system structure under `/home/battistu`. It lists folders including `.cache`, `.conda`, `.config`, `.dgl`, `.ipython`, `.jupyter`, `.keras`, `.lmod.d`, `.local`, `.mozilla`, `.parallel`, `.ssh`, `anaconda3`, `core_gene_all...`, `Documents`, `EffectorProts`, `HPC-worksh...`, `ORTHOSCOPE...`, `ORTHOSCOPE...`, `SEG`, and `Software`.
- Status Bar:** Shows the number of files and directories on both sides. Local: 33 files and 38 directories, Total size: 50,085,285 bytes. Remote: 17 files and 25 directories, Total size: 1,119,559,969 bytes.
- Bottom Panel:** Includes tabs for Queued files, Failed transfers, and Successful transfers. The Queue is currently empty.

To visualize/transfer files to and from the cluster on Mac:



Host: hpc-login.oakland.edu

Username: netID

Password: netID password

Port: 22

# To visualize/transfer files to and from the cluster on Mac:

1

2

3

The computer you are connecting from

Your home directory in the cluster

33 files and 38 directories. Total size: 50,085,285 bytes

17 files and 25 directories. Total size: 1,119,559,969 bytes

Queued files Failed transfers Successful transfers

Queue: empty

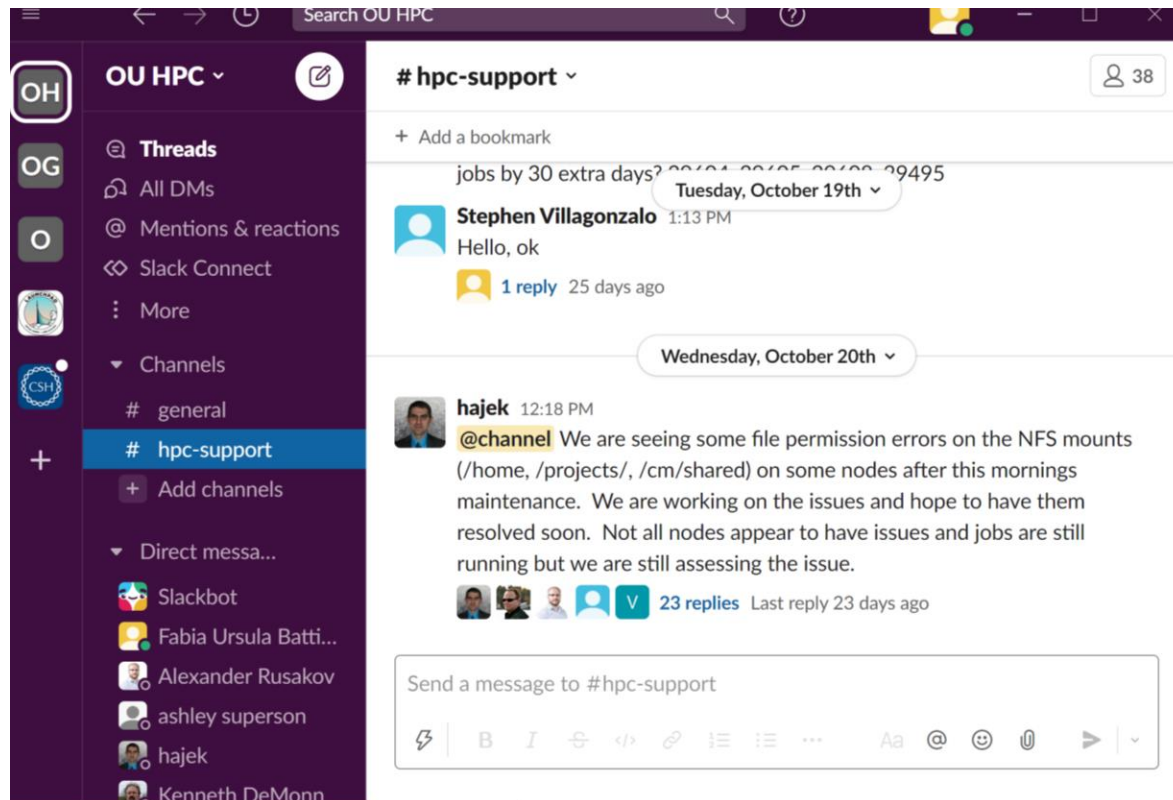


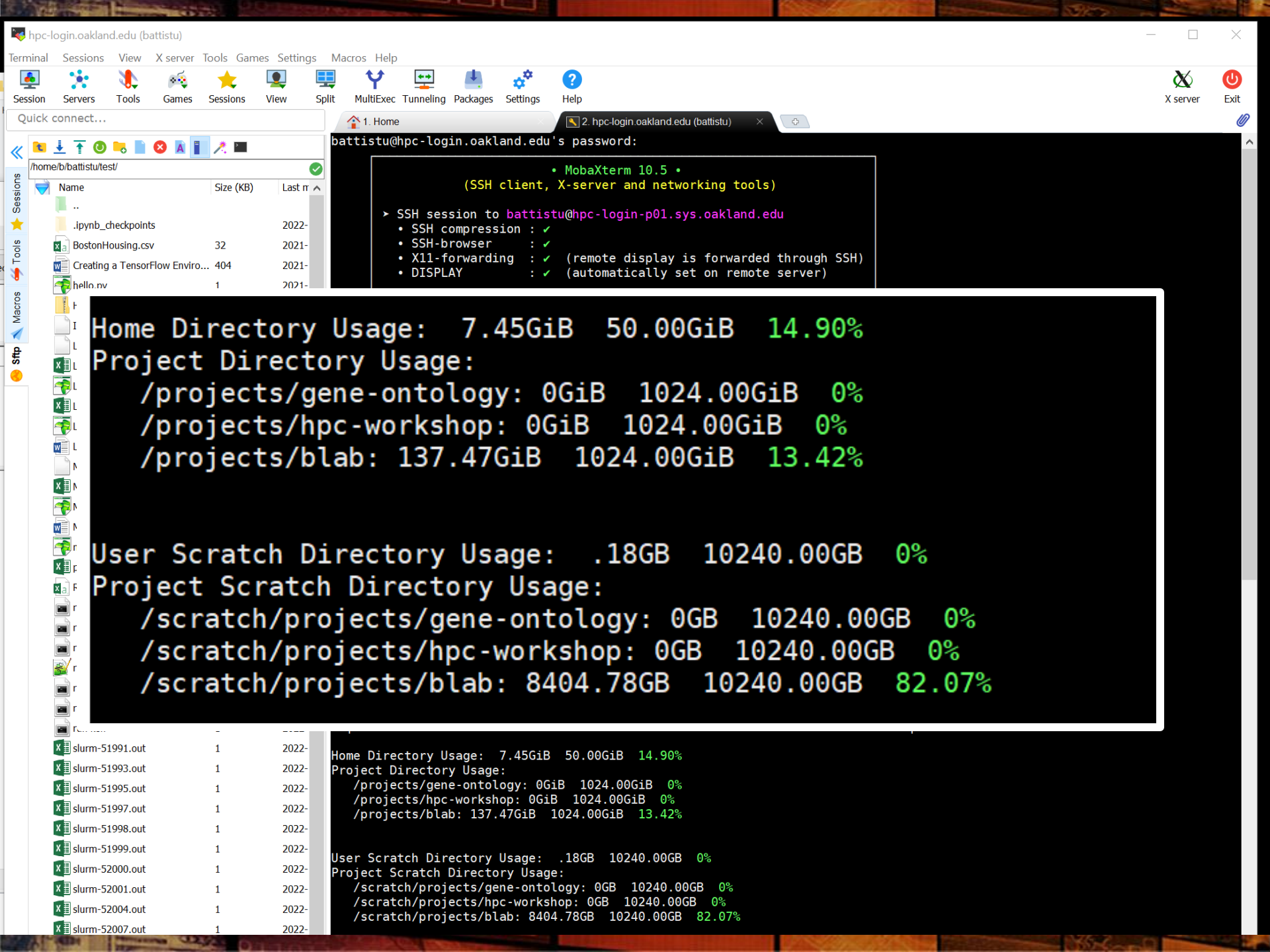
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Technical support:





To get a Matilda account:  
*forms.oakland.edu*

If you had an account created just for this workshop, it will be deactivated Dec. 6. To request a long-term account follow the instructions

M

[MarketPlace Access Request](#)

[MarketPlace Account Unlock/Password Reset Request](#)

[MarketPlace Product Request](#)

[Matilda HPC Cluster Access Request](#)

[Miscellaneous Pay - Staff Employees Only](#)

[Modify an Approved Undergraduate Program](#)

[MSDNAA Student Account Request \(No Login\)](#)

[My PUB Alumni Profile and Impact Statement](#)

N

[NetID Guest Account Request](#)

[NetID Shared Account Request](#)

O

[Oakland University On-Campus Accident Form \(No Login\)](#)



To access Matilda from outside of campus: *forms.oakland.edu*

Request a VPN account, set up DUO authentication with your phone (or another device)



[Software & Hosted Solution Purchasing Checklist \(No Login\)](#)

[Special Account Request](#) (pdf)

[Special Credit Offering Request](#)

[Student Employee/Intern Confidentiality Agreement](#)

T

[Technology Control Plan Template](#)

[Touchnet Unlock Account / Password Reset](#)

[Travel Authorization Request \(UTS\)](#)

[Tuition Assistance Application](#)

[Tuition Assistance Application for Faculty](#)

V

[Vendor/Consultant Account Access Request](#)

[Virtual Labs Change Request](#)

[VPN Access Request](#)

Y

[Youth protection Approval Request](#)

Z

[Zoom HIPAA Request](#)

To execute an analysis:

Use SLURM to schedule your job in the cluster. This will make the job go in a queue and allow to request resources (# nodes, # of CPUs, types of nodes, etc)

For testing purpose, you can skip the cue and run the job on the login node (**only** for testing purposes!)



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Let's run "Hello world"

**> Hello, world!\_**



“Hello world” is a script written in Python.

To run you will need:

1. The script
2. Python loaded on the cluster

**To write the script on windows:**

1. Open Notepad++ on Windows (do not use Word) or BioEdit on Mac on your computer (not the cluster)
2. Type: `print(“Hello world”)`
3. Save as “helloworld.py”
4. Upload (or drag and drop) the file into your home directory in the cluster

**To write the script in Linux:**

1. In your home directory type: `nano` (this is a text editor in linux)
2. Type: `print(“Hello world”)`
3. `Ctrl+x`, give a file name and follow instructions to save it

“Hello world” is a script written in Python.

To run you will need:

1. The script
2. Python loaded on the cluster (python is automatically loaded when you log in but for practice let's go through the process)

In the cluster type:

```
module spider python
```

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hpc-login.oakland.edu (battistu)

Terminal Sessions View X server Tools Games Settings Macros Help  
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help

X server Exit

Quick connect...

Name	Size (KB)	L
...	2	2
.cache	2	2
.conda	2	2
.config	2	2
.dgl	2	2
.keras	2	2
.lmod.d	2	2
.mozilla	2	2
.parallel	2	2
.ssh	2	2
anaconda3	2	2
Documents	2	2
SEG	2	2
test_SEG	2	2
testroary2	2	2
.bash_history	39	2
.bash_logout	1	2
.bash_profile	1	2
.bashrc	1	2
.condarc	1	2
.emacs	1	2
.kshrc	1	2
.Xauthority	1	2
pl.AAccounting_LCR2.pl	8	2
helloworld.py	1	2
readme.txt	1	2
roaryscript_MSU_Aero2.pl	4	2
slurm-19116.out	2	2
testMXhpc.txt	3	2
testMXhpc_exactTimes.nwk	1	2
testMXhpc_nexus.tr	2	2
testMXhpc_relTimes.nwk	1	2
testMXhpc_summary.txt	4	2
usageAgreement.txt	6	2

```
[battistu@hpc-login-p01 ~]$ module spider python

Python:
-----
Versions:
  Python/2.7.18
  Python/3.6.8-emcee
  Python/3.7.3
  Python/3.8.7
  Python/3.9.0
-----
For detailed information about a specific "Python" package (including how to load the modules) use the module's full name. Note that names that have a trailing (E) are extensions provided by other modules.
For example:
  $ module spider Python/3.9.0
-----
ml-pythondeps-py37-cuda10.2-gcc: ml-pythondeps-py37-cuda10.2-gcc/4.0.8
-----
You will need to load all module(s) on any one of the lines below before the "ml-pythondeps-py37-cuda10.2-gcc/4.0.8" module is available to load.

  shared

Help:
  Adds Python libraries for Machine Learning to your environment variables,

python3: python3
-----
Description:
  Python is a programming language that lets you work more quickly and integrate your systems more effectively. - Homepage:
  https://www.python.org/
```

☐ Follow terminal folder

Remote monitoring

hpc-login-p01 0% 9.43 GB / 376.41 GB 0.20 Mb/s 0.15 Mb/s 198 days elder elder mahmood mahmood rusakov mahmood sugumara mahmood mahmood battistu rusakov sher



“Hello world” is a script written in Python.

To run you will need:

1. The script
2. Python loaded on the cluster

```
[battistu@hpc-login-p01 ~]$ module spider Python/3.9.0
```

```
Python: Python/3.9.0
```

```
You will need to load all module(s) on any one of the lines below before the "Python/3.9.0" module is available to load.  
shared
```

```
Help:  
  Adds Python3.9.0 to path,
```

```
[battistu@hpc-login-p01 ~]$
```

“Hello world” is a script written in Python.

To run you will need:

1. The script
2. Python loaded on the cluster

```
battistu@hpc-login-p01 ~]$ module list
Currently Loaded Modules:
 1) shared      2) DefaultModules  3) dot  4) slurm/slurm/19.05.8  5) default-environment  6) gcc/9.2.0
battistu@hpc-login-p01 ~]$
```

“Hello world” is a script written in Python.

To run you will need:

1. The script
2. Python loaded on the cluster

```
battistu@hpc-login-p01 ~]$  
battistu@hpc-login-p01 ~]$ module load Python/3.9.0  
battistu@hpc-login-p01 ~]$ module list  
  
Currently Loaded Modules:  
 1) shared    2) DefaultModules    3) dot    4) slurm/slurm/19.05.8    5) default-environment    6) gcc/9.2.0    7) Python/3.9.0  
  
battistu@hpc-login-p01 ~]$
```



“Hello world” is a script written in Python.

To run you will need:

1. The script
2. Python loaded on the cluster

Case sensitive  
Do not use spaces  
Meaningful names

To run your script type:

```
python3 helloworld.py
```



```
[battistu@hpc-login-p01 ~]$ python3 helloworld.py
Hello world
[battistu@hpc-login-p01 ~]$
```

“Hello world” is a script written in Python.

To submit your job you will need:

1. The script
2. The SLURM file
3. Python loaded on the cluster

```
#!/bin/bash --login
```

```
##### SBATCH Lines for Resource Request #####
```

```
SBATCH --time=00:01:00      # walltime
```

```
#SBATCH --nodes=1           # number of nodes
```

```
#SBATCH --ntasks=1          # number of tasks
```

```
#SBATCH --cpus-per-task=40   # number of CPUs (or cores) per task
```

```
#SBATCH --mem-per-cpu=2G     # memory required per allocated CPU
```

```
#SBATCH --job-name HelloWorld # job name for easier identification
```



##### Command Lines to Run #####

```
module load Python/3.9.0
```

```
cd /home/b/battistu      ### directory where your code is located
```

```
python3 helloworld.py > output.txt    ### call your executable
```

```
scontrol show job $SLURM_JOB_ID    ### write job info to output file
```

```
1 #!/bin/bash --login
2
3 ##### SBATCH Lines for Resource Request #####
4
5 #SBATCH --time=00:01:00           # limit of wall clock time - how long the job will run in hrs:min:sec (same
  as -t). Max 168:00:00 (7 days)
6 #SBATCH --nodes=1                # number of different nodes - could be an exact number or a range of nodes
  (same as -N)
7 #SBATCH --ntasks=1               # number of tasks - how many tasks (nodes) that you require (same as -n)
8 #SBATCH --cpus-per-task=40        # number of CPUs (or cores) per task (same as -c). Max for most nodes: 40
9 #SBATCH --mem-per-cpu=2G          # memory required per allocated CPU (or core) - amount of memory (in bytes)
10 #SBATCH --job-name HelloWorld    # you can give your job a name for easier identification (same as -J)
11
12 ##### Command Lines to Run #####
13 module load Python/3.9.0
14
15 cd /home/b/battistu              ### change to the directory where your code is located
16
17 python3 helloworld.py > outut.txt      ### call your executable
18
19 scontrol show job $SLURM_JOB_ID        ### write job information to output file
20
```

Upload the SLURM file into your home directory  
Run the job:

```
sbatch MatildaSLURM_example.sb
```

```
battistu@hpc-login-p01 ~]$  
battistu@hpc-login-p01 ~]$ sbatch MatildaSLURM_example.sb  
sbatch: error: Batch script contains DOS line breaks (\r\n)  
sbatch: error: instead of expected UNIX line breaks (\n).  
battistu@hpc-login-p01 ~]$
```



```
module spider dos2unix  
module load shared  
module load dos2unix/7.4.2  
dos2unix MatildaSLURM_example.sb
```



Repeat sbatch command



```
battistu@hpc-login-p01 ~]$  
battistu@hpc-login-p01 ~]$  
battistu@hpc-login-p01 ~]$  
battistu@hpc-login-p01 ~]$ sbatch MatildaSLURM_example.sb  
submitted batch job 31287  
battistu@hpc-login-p01 ~]$ squeue -u battistu  
      JOBID PARTITION      NAME      USER ST       TIME  NODES NODELIST(REASON)  
battistu@hpc-login-p01 ~]$
```

pl AAccounting\_LCR2.pl  
helloworld.py  
MatildaSLURM\_example.sb  
MatildaSLURM\_example2l.sb  
MatildaSLURM\_examplemod.sb  
output.txt  
readme.txt  
pl roaryscript\_MSU\_Aero2.pl  
slurm-19116.out  
slurm-31284.out  
slurm-31285.out  
slurm-31286.out  
slurm-31287.out

squeue -u netid to check job status  
scancel job# to cancel a job

Output is created as expected

Slurm-job#.out: check how the job ran; this is  
where you will find error messages



You just completed your first HPC analysis