

PG_Y: OSCER Accounts for the Schooner Supercomputer

Summary of Video #1 - High Performance Computing:

This video gives a behind-the-scenes look at a university's supercomputer. It supports advanced research across disciplines such as fluid dynamics, aerospace, genomics, astronomy, and any computation-heavy scientific work. The current system consumes significant power leading to high electricity and maintenance costs but is highly reliable. Individual nodes and disks fail regularly, but don't cause the whole system to fail. Additionally, hundreds of jobs can run simultaneously for hours, days, and even months. This requires hot and cold aisle containment to maintain temperatures across racks. Finally, in updating the system, instead of a full rip-and-replace, they keep as much of the current hardware as possible while gradually upgrading nodes as research needs evolve.

Programming Tasks:

A. Both Class

a. Logging into Schooner:

```
Last login: Tue Dec 3 09:20:06 2024 from 10.204.202.04
/usr/bin/xauth: file /home/oucspdn007/.Xauthority does not exist
OSCAR VIRTUAL Help Sessions (on-campus sessions temporarily suspended)

THURSDAYS 1:00-3:00pm and FRIDAYS 1:00-2:00pm
https://oklahome.zoom.us/j/945399928?pwd=dETgAf1odTNMXA5b05mLoZDRFUT09
ZOOM Meeting ID: 945 3999 9288
PASSWORD: 57264157

Telephone (audio only):
Dial 669 900 9288 US (US toll) OR 646 876 9923 US (US toll)
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International telephone numbers are also available:
https://zoom.us/zoomconference?m=GBPzosoLPR180557lg55m6KM95w8UxEF

FEWER THAN 10,000 FILES/SUBDIRECTORIES PER DIRECTORY
Having more than 10,000 files or subdirectories
in the same directory can cause severe slowdowns,
filesystem errors, and even loss of your data.

If you expect to output more than 10,000 files,
it's best to create subdirectories in the
directory where you'd like to put those files;
then split those files up into groups of
at most 10,000 per subdirectory.

Enterprise Linux 7 (EL7) Detected

In /home/oucspdn007/
You're using 28.00 KB of 21.47 GB allowed space.
Your /home/oucspdn007 directory is BACKED UP NIGHTLY.

Your /scratch/oucspdn007 directory is on a storage subsystem
shared with other users and other OSCER users.
It has a total capacity of 259 TB,
of which 143 TB is already consumed by the hundreds of y'all (56% full),
and 115 TB is available for y'all to share.
Files in /scratch/oucspdn007 are available for 2 weeks
and are NEVER EVER BACKED UP.

[oucspdn007@schooner3 ~]$
```

b. Submitting a Job (Read and run the examples up to “Non-Parallel Job”):

The screenshot shows a MobaXterm window titled "schooner.oscer.ou.edu (oucspdn007)". The terminal session displays the following commands and their output:

```
HOME DIRECTORY PURPOSE: SMALL, PERMANENT FILES
Your home directory is for small input files, software etc
that you need to retain for months or even years.

NOTE: Your home directory is /home/oucspdn007

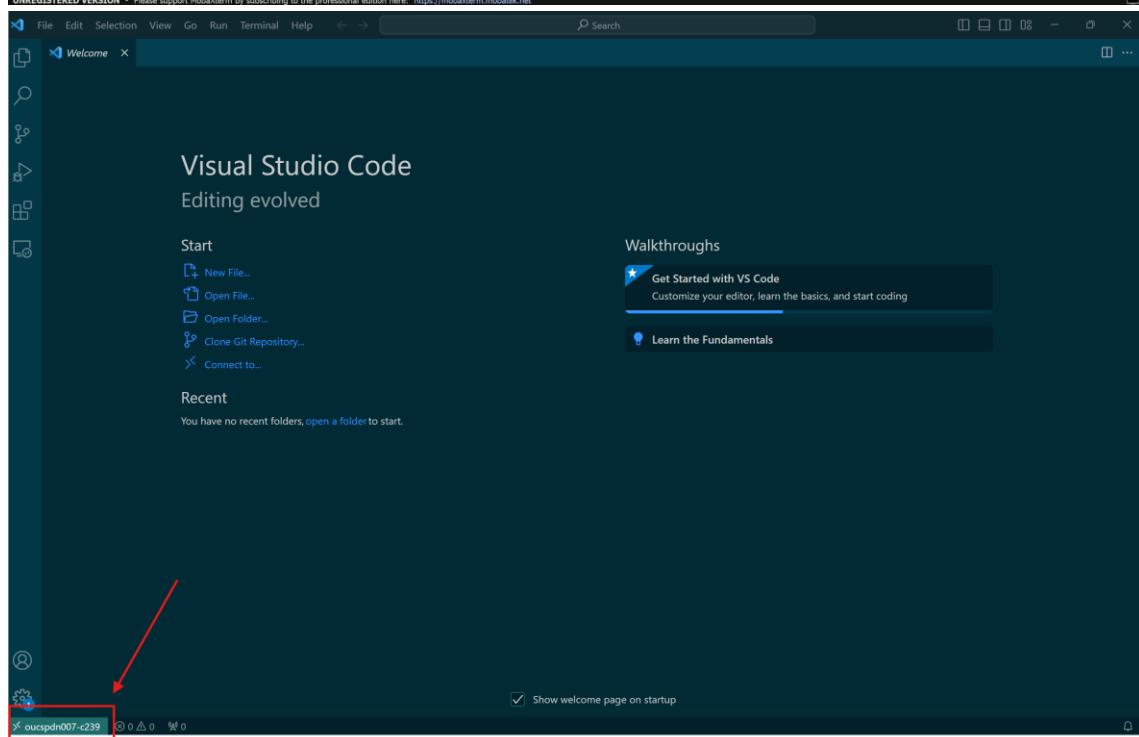
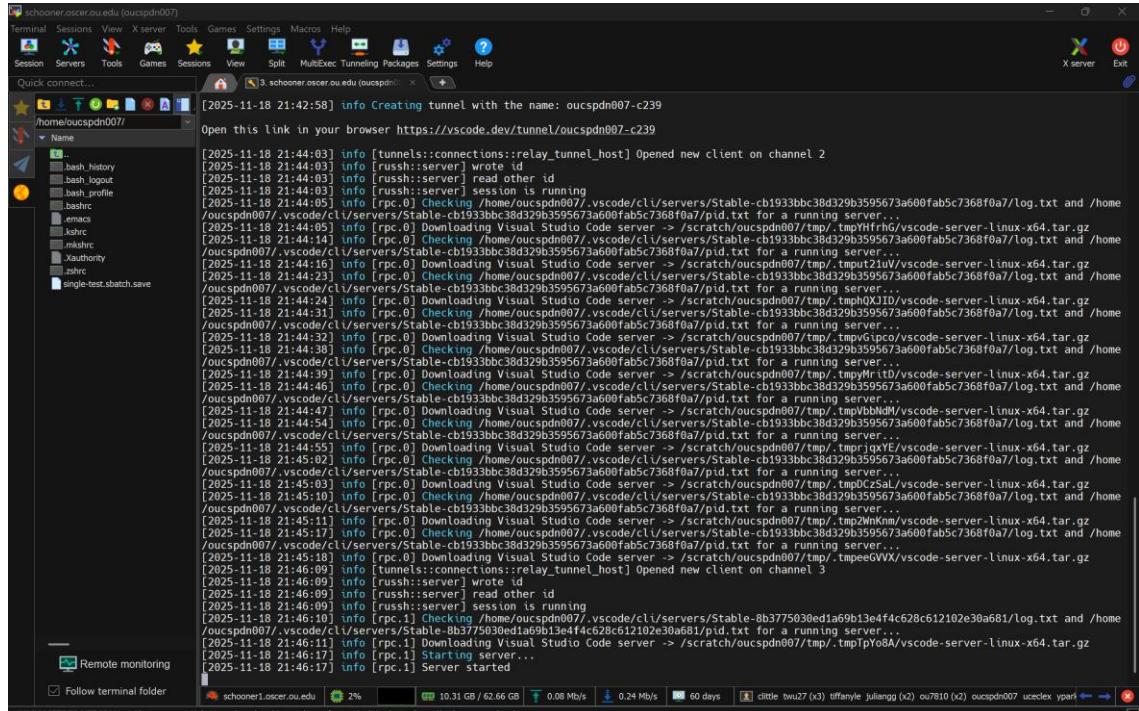
Enterprise Linux 7 (EL7) Detected
In /home/oucspdn007:
You're using 44.00 KB of 21.47 GB allowed space.
Your /home/oucspdn007 directory is BACKED UP NIGHTLY.

Your /scratch/oucspdn007 directory is on a storage subsystem
that you share with hundreds of other OSCER users.
It has a total capacity of 259 TB,
of which 143 TB is already consumed by the hundreds of y'all (56% full),
and 115 TB is available for y'all to share.
Files in /scratch/oucspdn007 are available for 2 weeks
and are NEVER EVER BACKED UP.

[oucspdn007@schooner1 ~]$ ls
single-test.sbatch
[oucspdn007@schooner1 ~]$ nano
.bash_history .bash_logout .bash_profile .emacs .mkshrc .Xauthority
.bash_logout .bashrc .kshrc single-test.sbatch.save .zshrc
[oucspdn007@schooner1 ~]$ nano
.bash_history .bash_logout .bash_profile .emacs .mkshrc .Xauthority
.bash_logout .bashrc .kshrc single-test.sbatch.save .zshrc
[oucspdn007@schooner1 ~]$ nano single-test.sbatch
[oucspdn007@schooner1 ~]$ e19
bash: command not found
[oucspdn007@schooner1 ~]$ chmod +x single-test.sbatch
[oucspdn007@schooner1 ~]$ sbatch single-test.sbatch
sbatch: error: This does not look like a batch script. The first
sbatch: error: line must start with #! followed by the path to an interpreter.
sbatch: error: for instance#!/bin/sh
[oucspdn007@schooner1 ~]$ nano single-test.sbatch
[oucspdn007@schooner1 ~]$ #SBATCH --partition=s19_partition
[oucspdn007@schooner1 ~]$ #SBATCH --container=s19w
[oucspdn007@schooner1 ~]$ #SBATCH --chdir=/path/to/working/directory
[oucspdn007@schooner1 ~]$ sbatch single-test.sbatch
Submitted batch job 27591786
[oucspdn007@schooner1 ~]$
```

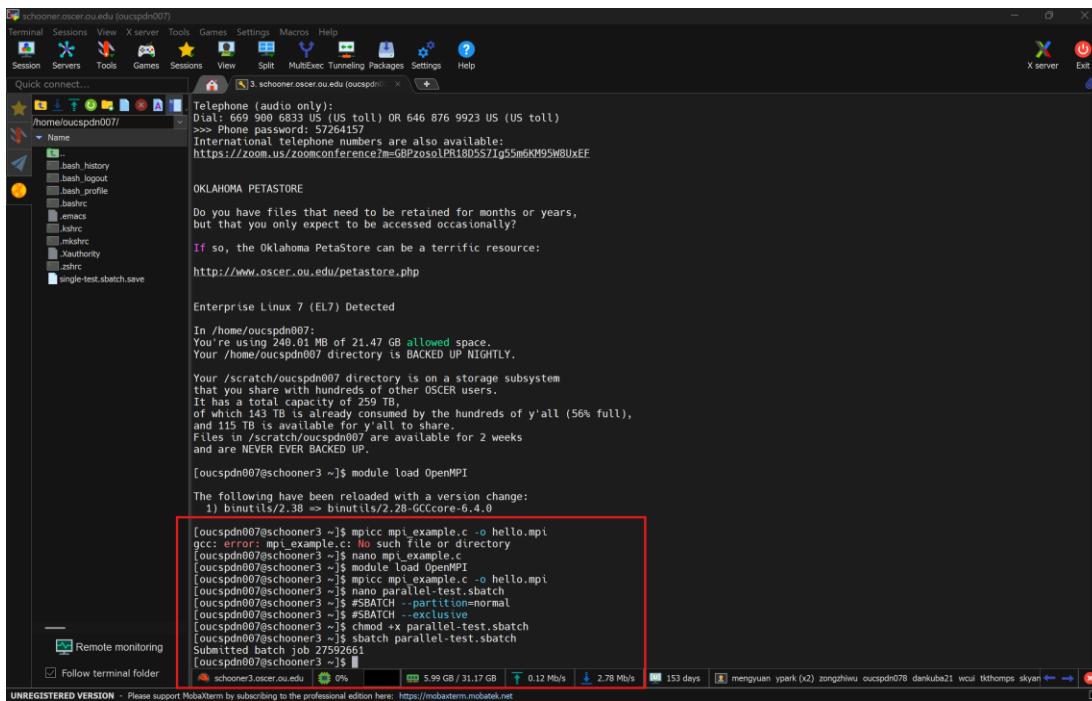
A red box highlights the command and its output where the user specifies the partition and container.

c. Setting up your environment. The following instructions will show you how to set up an interactive session through VSCode. Most of the time you will not use this, but in the situations where you need to debug your code interactively this will save you a mountain of time.



B. PDN

a. Submitting an MPI Job. Read and run “Parallel Job”:



The screenshot shows a terminal window titled "schooner.oscer.ou.edu (oucspdn007)". The window contains the following text:

```
Telephone (audio only):
Dial: 669 900 6833 US (US toll) OR 646 876 9923 US (US toll)
>>> Phone password: 57264157
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https://zoom.us/zoomconference?m=GBPzosdLPR1805571g55m6KM95WBUXEF

OKLAHOMA PETASTORE

Do you have files that need to be retained for months or years,
but that you only expect to be accessed occasionally?

If so, the Oklahoma Petastore can be a terrific resource:
http://www.oscer.ou.edu/petastore.php

Enterprise Linux 7 (EL7) Detected

In /home/oucspdn007:
You're using 240.01 MB of 21.47 GB allowed space.
Your /home/oucspdn007 directory is BACKED UP NIGHTLY.

Your /scratch/oucspdn007 directory is on a storage subsystem
that you share with hundreds of other OSCER users.
It has a total capacity of 259 TB,
of which 143 TB is already consumed by the hundreds of y'all (56% full),
and 115 TB is available for y'all to share.
Files in /scratch/oucspdn007 are available for 2 weeks
and are NEVER EVER BACKED UP.

[oucspdn007@schooner3 ~]$ module load OpenMPI
The following have been reloaded with a version change:
  1) binutils/2.38 => binutils/2.38-GCCcore-6.4.0
[oucspdn007@schooner3 ~]$ mpicc mpi_example.c -o hello.mpi
gcc: error: mpi_example.c: No such file or directory
[oucspdn007@schooner3 ~]$ nano mpi_example.c
[oucspdn007@schooner3 ~]$ module load OpenMPI
[oucspdn007@schooner3 ~]$ mpicc mpi_example.c -o hello.mpi
[oucspdn007@schooner3 ~]$ sbatch parallel-test.sbatch
[oucspdn007@schooner3 ~]$ #SBATCH --partition=normal
[oucspdn007@schooner3 ~]$ #SBATCH --exclusive
[oucspdn007@schooner3 ~]$ chmod +x parallel-test.sbatch
[oucspdn007@schooner3 ~]$ sbatch parallel-test.sbatch
Submitted batch job 27592661
[oucspdn007@schooner3 ~]$
```

At the bottom of the terminal window, there is a status bar with the following information:

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