Basic Tools for Parallel Computing

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Office Hours

TA office hours are from 4:00-5:00pm every week day in CH 275.

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Accessing the Terminal

- Mac
  - Go to spotlight search and search terminal
- Linux
  - On the left panel, go to "Search your computer and online sources" and search for terminal
  - Or: do Ctrl + Alt + t
- Windows
  - Download the software PuTTY from putty.org (this software is available on all lab machines)
  - Open up PuTTY and in the blank box underneath "Host Name (or IP address)" type "imagine.mines.edu" and click Open. If prompted with the PuTTY security alert pop up box, simply choose yes.
  - Login using the username and password you use to access computers on campus.

Accessing Lab Machines

- If on campus or on the server imagine.mines.edu, you can switch to other lab machines
  - For the lab machines in CH 215, you can switch to other lab machines by typing: "ssh ch215l-XX", where XX is replaced with the number of the lab machine you want to change to. For the Ryan Sayers Lab, XX can be between 01 and 16
  - For the lab machines in CH 275, do "ssh ch275l-XX", where XX can be between 01 and 08
  - If you are on a lab machine and want to go to a different lab machine, it may be required that you use "ssh ch215l-XX.mines.edu" instead
- If off campus, ssh into the server imagine.mines.edu. If on a mac or linux computer, this is done by typing "ssh username@imagine.mines.edu". If on a windows computer, simply follow the steps for windows provided on the previous slide
- If a lab machine is turned off, you will not be able to login to it.

Common Linux Commands

- man
    - The manual command is used to show the manual of the inputted command
    - "man cd" gives the manual or all relevant information for the cd command
- ls
    - Lists the files and folders of the current directory
- pwd
    - Provides the current working directory path
- The keyboard command "tab" allows you to autocomplete the rest of a file or folder name, while in the terminal
- mkdir
    - Makes a directory, "mkdir math440" would make the folder math440 in the current path.

Common Linux Commands Cont.

- cd
  - Changes directory
  - "cd math440" would change the directory to math440, if math440 was a folder in the current directory

- ..
  - Denotes the directory before the current directory. "cd .." would go to the previous directory

- .
  - Denotes the current directory

- mv
  - Moves a file to a folder or directory i.e. "mv file.txt home" would move file.txt from the current directory to the folder home
  - "mv -r home /home_copy" moves the folder home to the directory home_copy.

Common Linux Commands Cont.

- rm
  - BE VERY CAREFUL WHEN USING THIS COMMAND!!!!!!!!
  - Removes a file, "rm file.txt" would remove the file, file.txt, if it is contained in the current directory
  - rm -r, is a recursive remove. It is used to remove folders. "rm -r home" would remove the folder home

- cp
  - Copies a file. "cp file.txt file2.txt" copies all of the contents of file.txt to file2.txt
  - "cp -r" copies whole folders

- tar
  - Creates a zip file
  - "tar -czvf home.tar.gz home" would create a zip file containing all the contents of home
  - "tar -xzvf home.tar.gz" would extract all of the contents of the zip file home.tar.gz and put them in the folder home in the current directory

Text Editor

- When one is working from the terminal and wants to create or edit a file, one must use a text editor. Popular text editors:
  - Emacs
  - Vim
  - Nano
- On your own time, explore these text editors and choose the one that you are most comfortable with.
- The linux lab machines open a GUI interface for emacs and vim, but when working on HPC systems, this is not the case.
- To make life easier, get very well acquainted with the commands (such as copy, paste, remove, etc.) of the text editor of your choice

Linux Exercise

1. In the math440 folder, create the folder linux_exercise
2. In the current directory create the FORTRAN 90 file "hello_world.f90", using "emacs hello_world.f90", with the contents:

```fortran
program hello_world
  implicit none

  integer :: i

  !set the value of the integer i to 5
  i = 5

  !Output Hello World and the integer i to the terminal
  print *, 'Hello World, i =',i

end program hello_world
```

3. Move the file "hello_world.f90" to the folder linux_exercise
4. Change directory to linux_exercise ''

Linux Exercise Cont.

5. Compile and run the Fortran program:
   1. In the terminal, type: gfortran hello_world.f90 -o run.exe
   2. To run the executable type: ./run.exe
6. Remove the executable run.exe
7. Move back a directory and copy the folder linux_exercise to completed_exercise
8. Remove the folder linux_exercise
9. Create a zip file of the folder completed_exercise
10. Remove the folder completed_exercise
11. Extract the contents of the zip file completed_exercise.tar.gz
12. Use the "man" command to see what the command "more" does

HPC Systems

1. To login to Mio, do "ssh mio.mines.edu" from the server imagine.mines.edu
2. To login to Aun, go to Mio and "ssh aun.mines.edu"
3. scp
   - Copies files between HPC systems and lab machines (or personal machines)
   - While on a lab machine and in the directory you would like to copy a file to, do "scp mio.mines.edu:/u/af/ao/breyes/test.f90 .", to copy the file test.f90 in the path /u/af/ao/breyes to the lab machine
   - "scp -r" will copy whole folders

To Do

1. Get familiar with Linux commands and opening a terminal
2. Choose a text editor and get comfortable using it
3. If using Fortran 90 for this class (highly recommended), go through Fortran 90 tutorials
4. Email or come to my office hours for help!!

Questions?