Introduction to Unix/Linux

The goal today is to get you started with some basic Unix/Linux commands. If you are already familiar with them, then please look around and assist one of your fellow students who may need help. If you do not have previous experience with Unix-like operating systems, you may wish to have a look at the introduction at (1) as you work through the problems.

(1) https://en.wikibooks.org/wiki/A_Quick_Introduction_to_Unix

Some reminders

- Your access to and use of the Agave cluster is subject to ASU's Acceptable Use Policy (2). Violations of the policy are subject to sanction.
- The Agave class account is for your educational use in this course only. Do not use class time for your own research—use another research account.
- When you are off campus, you must run the Cisco SSL VPN (virtual private network) on your personal machine before you can log into Agave. You may download the VPN software at no charge from myapps.asu.edu.

(2) https://www.asu.edu/aad/manuals/acd/acd125.html

Learn a text editor

To use a Linux-based system effectively, you need to learn how to use a text editor from a terminal. There are three widely available editors:

- pico, which is very simple
- vi (or vim), of intermediate complexity
- emacs, which is the most sophisticated editor but also has the steepest learning curve.

I recommend that you invest the time and effort to learn one of the latter two editors; it is a useful professional skill (and will save you countless hours if you have to do significant computing on Agave or similar cluster). We will not talk about these editors in class, but there are many online resources to help you get started. You may find one of the following helpful:

- Emacs tutorial (3)
- Vi/Vim tutorial (4)

(3) https://www.gnu.org/software/emacs/tour/
(4) https://www.openvim.com/tutorial.html

Agave startup

If you are not on campus, please be sure to run the Cisco VPN before attempting to log in to Agave. In the commands below, substitute your ASURITE login name for yourname.

- You can log into Agave with your ASURITE credentials using ssh.
- From another Linux machine, or from the MacOS terminal, type

  ssh yourname@agave.asu.edu

  From a Windows machine, use PuTTY or the Windows 10 SSH client to connect. The password is the same as your ASURITE password.
- Upon successful login, you will see a lengthy login message that displays additional sources of information on the batch system (Slurm), accessing interactive nodes, and the like. All this is followed by a command-line prompt of the form

  [yourname@agave.asu.edu]$
- Type the command

  interactive

  to access an interactive node for the rest of these exercises. Please do not run programs on the login nodes.

Practice problems

These problems are not graded but are intended to help you understand the basic concepts. Reminder: Throughout this exercise, type commands exactly as they appear. Hit the return key after typing each command.

1. First create a file with some data, as follows:

   vi file.dat

   (substitute pico or emacs if you wish). Type in five lines of data, like this:

   10
   5
   -2
   1
   6

   Then save and exit.

2. Type

   ls

   and then

   ls –l

These are the basic file-listing commands; the latter provides more information.

3. Type

    more file.dat

   which displays the contents of the file a screenful at a time.

4. Type

    sort -n file.dat

   and

    sort -r -n file.dat

   What is the difference in the outputs?

5. Hit the up-arrow and down-arrow keys a few times. What do they do?

6. Type

    pwd

   This command Prints the Working Directory. You should see something like

    /home/apm525

   which is your home directory, that is, the directory you enter when you first log into the system.

   Unix file systems have a tree structure. The root directory (denoted /) is the top-level directory; it has no parent. home is a subdirectory of the root, and apm525 is a subdirectory of home. We say that home is the parent of apm525.

7. Type

    mkdir lab1

   then

    cd lab1

   Now type pwd again. You have created a subdirectory called lab1 and changed the current working directory to it.

8. Type

    cd ..

    then

    pwd

    You should be back to /home/apm525. The .. is a shorthand for "one directory up from this one." The command

    cd

    with no arguments puts you back in your home directory.

9. It is helpful to keep files from separate labs in separate directories, so that you don't access or overwrite the wrong file. To move file.dat to lab1, type

    mv file.dat lab1

    The first argument is the name of the file to be moved, and the second argument is the destination. Now change your directory to lab1 and continue your work.

10. Type

    head -3 file.dat

    and

    tail -3 file.dat

    What does each command do?

11. One of Unix's innovations is the notion of a pipe, wherein the output of one program becomes the input of another. To see how this works, type

    sort -n file.dat | head -3

    which displays the three smallest values in file.dat.

12. To log out of a shell, type exit or control-D (hold down the control key, then press D). Be sure to log out of both your interactive node and the login node before you

leave the lab today.