

CSE 20

Beginning Programming in Python

Lab Assignment 2

The goal of this lab assignment is to learn to log on to the *Unix timeshare*, to transfer files between the timeshare your own computer, and to run python in both interactive and script mode. The Unix timeshare **unix.ucsc.edu** provides a Linux command line environment and home directory access to multiple concurrent users. To put it another way, the timeshare is a computer located on campus, that gives several hundred different users the simultaneous illusion that it is interacting with them alone. It does this by spending only a few milliseconds working on each interactive session before going to the next, and repeating the process for each user several hundred times a second, hence the name timeshare. This works because humans operate at a much slower speed than computers. Most of the time you spend on a command line interpreter consists of staring at the screen thinking about what to type. Even when you are typing, most of the time consists of the intervals between keystrokes. Every student and employee of UCSC automatically has an account on the timeshare. Your account name is your CruzID, the string before the @ in your @ucsc.edu email address.

The process of logging on to the timeshare is almost identical for both Windows and Mac. In both cases you use a program called `ssh` (Secure Shell), which is installed by default on both platforms. Open the command line environment for your system (see lab1 if you don't know how) and type `ssh` at the prompt. If you see something like

```
usage: ssh [-46AaCfGgKkMnqsTtVvXxYy] [-B bind_interface]
          [-b bind_address] [-c cipher_spec] [-D [bind_address:]port]
          [-E log_file] [-e escape_char] [-F configfile] [-I pkcs11]
          [-i identity_file] [-J [user@]host[:port]] [-L address]
          [-l login_name] [-m mac_spec] [-O ctl_cmd] [-o option] [-p port]
          [-Q query_option] [-R address] [-S ctl_path] [-W host:port]
          [-w local_tun[:remote_tun]] destination [command]
```

then `ssh` is enabled on your system. If you are on Windows, you may get an error message instead. If you do, follow the instructions [here](#) to enable `ssh`.

From either platform, log on to the timeshare by typing

```
$ ssh cruzid@unix.ucsc.edu
```

Remember that `$` stands for your Windows PowerShell prompt, or your Mac terminal prompt, and `cruzid` is your own CruzID. If your userid on your own computer happens to be the same as your `cruzid`, then it's unnecessary to type `cruzid@` as above. In that case you can just type

```
$ ssh unix.ucsc.edu
```

The first version will work in any case though. The very first time you type this command you will get a warning similar to the following.

```
The authenticity of host 'unix.ucsc.edu (128.114.104.57)' can't be established.
RSA key fingerprint is SHA256:hW2kAYb8jAp4rsiuLO79QxalZWfPikGAQb8KAarK8Sk.
Are you sure you want to continue connecting (yes/no/[fingerprint])?
```

Type `yes` in response. You will see a message saying that the RSA key has been permanently added to the list of known hosts. This warning happens only once.

Next you'll be prompted for your password. respond by entering your **CruzID Blue password**. As you type your password, your keystrokes will not be echoed to the terminal (for security reasons). After entering your password, you will see a greeting from the timeshare, followed by a Unix command prompt, most likely `bash-4.1$`. To log out, type `exit`, which brings you back to the command line environment on your own computer. Log in and log out several times, just to get used to the process.

Now log on to the timeshare. In the following examples, I will represent the Unix command prompt by `$`. Type `python3` to start Python 3.8.5 in interactive mode.

```
$ python3
```

(Note that if you type `python2` or just `python`, you'll start the Python 2.7.5 interpreter, which we are not using in this class.) You will now see the familiar `>>>` prompt for Python interactive mode. Take a screenshot at this point that shows (1) your log in to the timeshare from your computer, (2) the timeshare welcome message, (3) your command to start Python interactive mode and (4) the Python prompt `>>>`. Name your image file **image1.xxx** (where again .xxx can be the suffix of any valid image file.) Now type `exit()` to leave the Python interpreter, taking you back to the Unix prompt.

When you logged on to the Unix timeshare, your location was automatically set to be your home directory in the timeshare file system. The name of your home directory is your CruzID. Type `pwd` to see the full name of your current directory. It should look something like this.

```
$ pwd
/afs/cats.ucsc.edu/users/f/cruzid
```

Your result will look different in that `cruzid` will be your own CruzID, and the letter `f` may be replaced by some other letter. Type `ls` to list the contents of your home directory. Use the command `mkdir` to create a new directory called `cse20`. Type `ls` again to see the new `cse20` directory listed. Make `cse20` your current working directory by doing `cd cse20`, then `pwd` to verify your new location. Here are the five commands again.

```
$ ls
$ mkdir cse20
$ ls
$ cd cse20
$ pwd
```

You can learn about any Unix command by using the `man` (manual) command. Try:

```
$ man mkdir
$ man ls
$ man cd
$ man pwd
$ man man
```

As mentioned in lab1, man pages are notoriously difficult to read, since they assume a great deal of background knowledge. Nevertheless, you should get used to reading them as they are an invaluable resource. Use man pages to build up your vocabulary of Unix commands. Also try reading (at least the beginning of) one of the Unix tutorials linked on the class webpage. Another good way to learn new Unix

commands is to just use Google. For instance, a Google search on the phrase “Unix copy” brings up a reference to the `cp` command. Research the following Unix commands using any of the above methods: `man`, `ls`, `pwd`, `cd`, `mkdir`, `more`, `less`, `cp`, `cat`, `rm`, `rmdir`, `mv`, `echo`, `date`, `time`, `alias`, `history`. You can also just try typing the command and see what happens.

The Unix timeshare is a good place to learn about command line environments, because unlike your personal computing device, you have no GUI (Graphical User Interface) to fall back on. If you can't do it on the command line, then you can't do it. For instance, the only text editors available are of a seemingly primitive type, when compared to the GUI editors you use on your computer. The three most popular ones are: `vi`, `emacs` and `nano`. Some tutorials for these editors are linked on the class webpage. By far the simplest of these is `nano`. Read the very short introduction to `nano` [here](#). Now do

```
$ nano HelloWorld.py
```

and type in the code for the hello world program (or any other Python program you feel like running). Save it by doing `ctrl-o` (simultaneously press the control key and the letter 'o') then enter, and exit `nano` by doing `ctrl-x`. Now run the program by typing

```
$ python3 HelloWorld.py
```

and observe the expected output. You can now log on to the timeshare and run Python in both interactive and script mode.

There's just one more thing to learn in this assignment. While you should eventually learn at least one of the more sophisticated Unix editors (`vi` or `emacs`), it's still a hassle to depend entirely on these tools for writing complex programs on the timeshare. More to the point, if you already have a complex program written on another computer, you may want to transfer it to the timeshare to run it on that platform. *FileZilla* is a very good (and free) application for transferring files between computers. It's available on both Windows and Mac. Go [here](#) to download and install FileZilla for your system. (Warning to Windows users: do not use the installer found [here](#), since it also installs Bloatware on your computer.) Start the FileZilla application, set Host to **unix.ucsc.edu**, Username to your **CruzID**, Password to your **Blue password** and Port to **22**, then hit Quickconnect. The left pane shows your local file system, and the right pane shows the remote file system on **unix.ucsc.edu**. Simply drag and drop files from one pane to the other to transfer files.

Now go to the class webpage, and download the program `Sort3.py`. As in lab1, use your browser's save function to do this (i.e. do not copy and paste into an editor.) Use FileZilla to transfer the file `Sort3.py` from your computer to your `cse20` directory on the Unix timeshare. Log on to the timeshare (if you're not already logged on), and `cd` into `cse20`. Type `pwd` then `ls` to show your location and the contents of `cse20`. Run the program by doing

```
$ python3 Sort3.py
```

Enter three numbers, and observe that they are printed in increasing order. Take another screenshot of your open terminal window, being sure to include the results of `pwd` and `ls`. Save the screen shot as **image2.xxx**. Submit your files image files (`image1.xxx` and `image2.xxx`) to lab2 on Gradescope before the due date.

If you run in to any problems along the way you cannot surmount, get help for TAs, Course Tutors, the LSS Tutor, or myself in office hours.