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## csce215 — UNIX/Linux Fundamentals

### Spring 2022 — Assignment 1

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*This assignment is intended to provide some practice and additional content for the material covered in lecture on Monday, January 10. You'll sign in to your Linux account and practice moving around and looking at things using the terminal. The assignment is meant to be started in the lab sessions on Wednesday, January 12 and Thursday, January 13. It must be submitted by 11:59pm on Sunday, January 16. A total of 92 points are available.*

### ***Before we start***

Welcome to Assignment 1! This document contains instructions on what you need to do and some additional information beyond what was covered in the lecture. You should read it carefully and complete the steps as you go. **I've tried to keep these assignment documents as short as possible; everything in them is important information.**

Along the way, you'll occasionally see shaded boxes with a ☞ symbol. These boxes explain how the lab will be graded. Each one mentions a specific task that you must complete and the number of points that task is worth. The idea is to treat these like a checklist: If your submission shows that you correctly completed all of the tasks associated with each ☞, then you should receive full credit for the lab. However, keep in mind that missing one task may make later tasks impossible or more difficult. Therefore, you should try to complete all of them, in order.

If you make a mistake or need to experiment, that's OK. In fact, it's expected that you may need a few tries to get things right for some of the tasks. There is no grade penalty for making mistakes! When we grade your lab submission, we'll be checking only for whether the correct commands appear somewhere in the transcript you submit; any other commands in the transcript will be ignored.

These lab assignments will give you a chance to practice the material from the lectures and to go beyond it. So the instructions here won't repeat information from the lectures. You'll want to keep your notes handy.

Finally, please don't hesitate to ask for help from the TAs if you get stuck at any point, or if anything is unclear.

**If you do not finish the assignment** during your scheduled lab time, you can return before the deadline to complete it. The lab is available for your use at any time, except when

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classes are scheduled to meet there. You'll need the door combination, which was distributed on the first day of class and also posted on the course Slack workspace.

## 1 *Sign in and start a terminal*

The first step will be to sign in to one of the lab computers. You'll see a place to enter your user name, followed by another place for your university password. If you know your username and password, you can use them to log in. But if you don't know either of these, you can look them up by going to

<https://my.sc.edu/>

and following the link to 'View my IDs and manage my passwords'. You'll need to scroll down toward the bottom of the page to find it.

In a few rare cases, you may find that logging in with your university password does not work. If that happens, you should first try resetting the password, waiting a few minutes, and trying again. If that fails, you should send email to the CSE Department system administrator, Ryan Austin [rmaustin@cse.sc.edu](mailto:rmaustin@cse.sc.edu) with a copy to the instructor [jokane@cse.sc.edu](mailto:jokane@cse.sc.edu).

Once you've successfully signed in, you'll want to open a terminal window to practice some of the commands that we've been learning. There are several ways to start a terminal, but perhaps the easiest ways are to press Ctrl-Alt-T, or to click the button labeled 'Activities' and type terminal.



Sign in to one of the lab computers and open a terminal window.

7 points

## 2 *Start a terminal recording*

Within your shiny new terminal window, the next step will be to start a program called recbash, created specifically for this course, to record your terminal session. The purpose of recbash is to record series of commands that you execute within the bash shell. When the assignment is complete, that recording is what you'll submit for grading.

```
/class/215/recbash
```



Record a terminal session.

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To start recbash, use this command:

```
/class/215/recbash
```

Notice that, in this case, the name of the command we're giving is an absolute path. There's an executable file—that is, a program—called `recbash` in a directory called `215`, which is a subdirectory of a directory called `class`, which is a subdirectory of the root directory of the system. So this absolute path tells the system exactly where to find that program.

If the recording has started correctly, you should see a message somewhat like this:

```
Starting recording to /acct/jokane/.recbash/raw/2022-01-10_21:39:48_12076.rec.  
Use the 'exit' command or Ctrl-D to end the recording.
```

In addition, you should notice that the prompt now starts with `[.]`. These characters at the start of the prompt, designed to look a bit like the standard 'record' symbol, are another indication that `recbash` is indeed recording your work.

Because you will submit the recording to obtain a grade for the lab, it is essential that all of the commands you use *for the entire lab* are entered while `recbash` is running. The next thought is quite important, so I'll put it in boldface.

**We cannot award points for things that are not included in the recording that you submit.**

One thing to keep in mind is that `recbash` records only a single terminal. So if your terminal window closes for some reason (a mistake, logging out to finish later, etc.), you'll need to start a new recording. Do this by running the `recbash` command again, and be sure to submit all of your recordings when you submit your completed assignment.



Start `recbash` to record your terminal session.

5 points

### 3 Looking around your home directory

Your new terminal window will start out with your home directory as its current directory. Even if you haven't used this account before, you'll likely find a few files in your home directory.

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Recall that we learned three main commands for looking around: `ls` to show the files in the current directory, `cd` to change the current directory, and `pwd` to show the name of the current directory. Use these commands to find answers to the following questions:

1. What files and subdirectories are in your home directory?
2. What is the full name of your home directory? This will start with a `/` and include your username at the end.
3. Files whose names begin with a period are often treated as 'hidden' files. What hidden files are in your home directory?



Execute commands that answer the three questions above. We'll check the recording you submit for outputs that answer each of them. 12 points

## 4 *Moving to parent, root, and home directories*

Now let's try out those special directory names we learned.

First, use `cd ..` to move to the parent directory of your home directory. Then use `pwd` to confirm that you've done this correctly, and `ls` to see what's there. As an example, my home directory in this system is `/acct/jokane`, so its parent directory is `/acct`.



From your home directory, use `cd ..` to move up one level. Use `pwd` to confirm that you are in `/acct`. Then use `ls` to see what is in `/acct`. 7 points

Hmm... looks like `/acct` contains the home directories of *every* user in the system. Interesting; could it be a security problem that we can see everyone else's home directory? Let's take a look at the detailed directory listing, which includes information about permissions, to find out.



Within `/acct`, use `ls -l` to see a detailed directory listing. 5 points

The output of '`ls -l`' shows lots of lines, including one like this describing your instructor's home directory:

```
drwx-----x 107 jokane      domain^users 12288 Aug 22 13:29 jokane
```

We'll look at permissions in more detail later, but for now notice those ----- characters, which indicate that certain permissions are not enabled for that directory. So, for example, if you try to use `cd jokane` to visit my home directory, you'll see an error message.



From `acct`, use the command `cd jokane` to try to navigate to the home directory of the user `jokane`. Receive an error message stating 'Permission denied'. *5 points*

We also learned the special character `/` which refers to the root directory on the system. Let's see what's there.



Use `ls` to list the contents of the root directory. You'll need to either move to the root directory first, or give `ls` a parameter that tells it to look at the root directory. *5 points*

Finally, we can use `~` to refer to our home directory. Use that to return to your home directory.



Use the command `cd ~` (or, if you are lazy, just `cd` without any argument) to navigate to your home directory. Then use `pwd` to see that you are indeed in your home directory. *5 points*

## 5 Looking around elsewhere

Now let's have a peek at some other parts of the system.

One interesting place is a directory called `/usr/share/dict` —that is a directory called `dict`, inside a directory called `share`, inside a directory called `usr`, which is contained in the root directory. For context, `usr` —short for 'user'— is a directory that contains quite a few files that support various user programs, `share` contains files that don't depend on the specific hardware platform (i.e. files that can be 'shared' between different platforms), and `dict` is short for 'dictionary'. Anyway, go to that directory and take a look at what files are there.



Navigate to `/usr/share/dict` and show a list of the files in that directory. *7 points*

You should see several files, including separate files for American English and British English. Use `cat` to take a look at the American English one.



Use `cat` to display the contents of the American English dictionary. *5 points*

Yikes, that was a huge file that went by too fast to read. Let's try `less` instead.



Use `less` to view the contents of the American English dictionary one page at a time. Use the arrow keys to look around a little. *5 points*

Aha! Looks like this is a file that is meant to be a complete list of words in the English language. (Can you imagine what such a file might be useful for?)

Recall that inside of `less`, we can search through the file, from the current location forward, by pressing `/` and typing the word to search for. Let's use this method to search for some important words, to see if this dictionary is any good. (We'll learn better methods to search through files in the future; for today, just practice using `/` within `less`.) Don't forget that this tool is case-sensitive, and that correct spelling is important.



Use search method built into `less` to search the American English dictionary for the names of each of the four ninja turtles:

Leonardo, Raphael, Donatello, Michelangelo

(Hint: All four turtles are indeed in there.) *7 points*

When you've finished with `less`, press `q` to quit.

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## 6 *Getting more information*

This last exercise will give you a chance to use the `man` command to figure out how to do something new.

On Linux systems, there is a directory called `/etc` that contains various system configuration files. Suppose we wanted a list of the files and subdirectories in `/etc`, *ordered from smallest to largest*. Sounds like a job for `ls`, but the usual behavior of `ls` is to sort its output by name, and the options we know so far don't help with changing the order.

Let's use the `man` command to get more information about `ls`. What options to `ls` might help? Find out by skimming the manual page for `ls` (but it's pretty long) or by using the `/` search function to search within the manual page for keywords that might be used to describe the option you're looking for. Remember that all of the keys that work in `less` work in `man` as well.



Use the `man` command to view the documentation for `ls`. *7 points*

Just like with `less`, when you've finished reading from a man page, press `q` to quit.

Based on what you found in the manual, you should be able to give a command that shows the contents of `/etc` from smallest to largest. (Hint: There are a few ways to do this, but perhaps the simplest one requires two options: one sort by file size and one to reverse the sort order.)



Use `ls` with appropriate options to obtain a list of files and subdirectories in `/etc`, ordered from smallest to largest. *10 points*

## 7 *Finishing the recording and submitting*

Now that we've finished all of the tasks, it's time to finish the recording so you can submit it. To do this, recall the instructions from when you first began the recording:

```
Use the 'exit' command or Ctrl-D to end the recording.
```

To explain this a bit more, your original recbash command started a new copy of the bash shell, running inside the original one. Either of these, Ctrl-D or the exit command, will terminate this 'inner' shell. You should see a message like this when the inner shell has finished and recbash has completed its work.

```
Finished recording to /home/jokane/.recbash/raw/2022-01-10_22:00:07_2164928.rec.  
Finalizing  
  /home/jokane/.recbash/raw/2022-01-10_22:00:07_2164928.rec  
to  
  /home/jokane/.recbash/2022-01-10_22:00:07_2164928.zip  
Recorded to /home/jokane/.recbash/2022-01-10_22:00:07_2164928.zip.
```

The most relevant part of this message is the .zip filename, which is the finalized recording that you should submit.

Before you submit, you'll probably want to check the transcript of the recording, to verify that all of your work has been captured correctly. The easiest way to do this is to use the system's graphical file browser. Use the command

```
nautilus ~/.recbash
```

to open the file browser showing the directory in which recbash stores its recordings, each one a .zip file containing the raw recording data and a human-readable transcript. If you open one of these .zip files, you'll see that it contains a file called transcript.txt, which you can inspect to see what will be graded. If everything is in order —Perhaps you'd like to double check that you've completed each of the tasks mentioned in  boxes?— you should proceed to the submission process. If you notice something missing, you can initiate a new recording that includes anything you missed the first time through, and submit both recordings.

The last step is to go to the CSE department dropbox site

<https://dropbox.cse.sc.edu/>

to submit your work. Navigate to CSCE 215-80X-F2021, choose Assignment 1, and follow the instructions to upload the zip file(s) created by recbash. Keep in mind the (strict) deadline on Sunday at 11:59pm.



Upload your completed recording(s) to submit your assignment. *(No points specifically for this, but if you do not submit, we cannot grade your work.)*

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## *Signing out*

Now that you've completed the lab, you should be sure to sign out. You can do that using the drop-down menu in the top right of the screen, shaped like a downward-facing triangle. In that menu, click your last name, and then choose 'Log Out'.



Sign out of the lab computer when you are finished.

