CMPT 214: Programming Principles and Practice
Term 1 2016-17
Lab 1 – Introductory LINUX/UNIX

At the beginning of the lab period the instructor will cover the following aspects of using the lab facilities:

- the location of home directories on the server when logging in on the Apple Macintosh computers and when logging in to a LINUX computer (e.g. tuxworld);
- how to start a virtual terminal on a Macintosh computer using the *Terminal* application in the `Utilities` folder;
- how to start a remote login on tuxworld from a Macintosh computer (within a *Terminal* window);
- how to start a remote login or remote session on MacTS1 or MacTS3 from an on-campus machine.

Much of the information to be presented can be found at http://www.cs.usask.ca/support/index.php and then expanding the "How to Access Your Files from Computer Science Lab Computers", "Remove Access to LINUX", and "Remove Access to Apple Mac" items.

Perform each of the tasks below in a *Terminal* window on a Macintosh computer in the instructional laboratory. For each task, copy-and-paste the contents of your virtual terminal window (including the commands that you typed, as well as any output produced by the commands you gave) into a text file called `lab1.txt`. However, do not include extraneous or superfluous commands or output; only include content relevant and essential to the specified task. Unless otherwise specified, all commands should be run using the `bash` shell. Then, with a text editor, **add text and identifying information to clearly distinguish which commands/output/code correspond to each task.** Submit `lab1.txt` through moodle when done. This lab is out of a total of 13 marks, with each question (1a, 1b, ..., 3b) being worth one mark. Questions 2b and 4 are also each worth one mark. Marks may be docked for extraneous, irrelevant, or superfluous content. The submission is due at 11:55 p.m. on Thursday, September 15.

Remember to put your name, student number, and NSID at the beginning of `lab1.txt`. Make sure that you submit a text file and not, for example, an RTF or MS Word file.

You cannot use the `exec` command to answer any of these questions (complete any of these tasks). If you do not know what the `exec` command is, you can safely ignore it for now.

Note that, by default, *Finder* on Mac OS X does not show the existance files whose names start with "`.`" (dot).

1. (a) Use a UNIX command to create directories called `214bin` and `214lab1` under your home directory. Both new directories should be subdirectories of your home directory.

   (b) Download the file `ls` for this lab. (Note that, depending on what browser and operating system you use, the name of the downloaded file might have a dot (period) appended to it; i.e., the downloaded file might be called called "`ls.`" rather than "`ls`".) Then use the UNIX `mv` command to move the downloaded `ls` file to your new `214bin` subdirectory. Make sure it is called `ls` in the destination directory (e.g. does not include a trailing '`.`' character). Finally, use the UNIX command

`chmod u+x`

with an appropriate argument to change the permissions of your newly-downloaded `ls` file so that you can execute it. (Note that a "usage" message from the `chmod` command at this point might indicate that the command given was incomplete; i.e. the intended operation was not performed.) Assistance with the `chmod` can be found on pages 741-745 of the Sobell text (3rd edition) for the class.

You do not need a log of downloading `ls` in your `lab1.txt` file. A log of the other portions of this question does need to be present, however.

(c) Change your current working directory to the `214lab1` directory created in step 1a.

(d) Without changing your current working directory from what it was in step 1c use a UNIX command to list the files in your home directory. Do not use any options in the chosen command. This command should work no matter what your current working directory is.

Hint: consider using an environment variable.

(e) Use a UNIX command to alter your `PATH` environment variable such that the pathname for the `214bin` directory that you created in step 1a is the first one in the list of directories. Make sure to add to the list of directories, rather than replacing it. Assistance with performing this step can be found on pages 132 and 308 of the Sobell text (3rd edition) for the class.

Note that you will need to use a pathname (for the `214bin` directory) that does not depend on the current working directory being any particular directory. For instance, the simple relative pathname `214bin` will only work if your current working directory is the parent of `214bin`. The setting of `PATH` should cause that directory to be search no matter what your current working directory is.

(f) Execute again the exact same command you used in step 1d.

(g) Use a UNIX command involving `which` to help explain the output of Step 1f. That is, use the `which` command to determine the program that was executed when you gave the `ls` command in step 1f.

(h) Use a UNIX command to output the contents of the downloaded file called `ls` (which you placed in `$HOME/214bin` in step 1a) to the terminal.

At this point, you may wish to redefine your `PATH` environment variable (undoing the modification made in step (d)). Alternatively, you can terminate your virtual terminal window, and create a new one. You do not have to show this in your `lab1.txt` file.

2. This question assumes that students are not using `tcsh` as their login shell. If you are, then make sure to backup any `.tcshrc` you have before performing this question, and restore the backed up version afterward.

(a) Use a UNIX command to start `tcsh`. Then use another UNIX command to exit from `tcsh` (so that you are using your original login `bash` again).

(b)
i. Devise a UNIX command that will simply output the string "You have started tcshrc" to the standard output.

ii. Using a text editor, create a file in your home directory called `.tcshrc` with the contents consisting of precisely the command from part i. You do not need a log of this step in `lab1.txt`. Make sure your new `.tcshrc` is in your home directory.

iii. Output the content of your `.tcshrc` file to the standard output (e.g. your virtual terminal window).

iv. Start `tcsh` (again).

v. Exit `tcsh` (so that you are using your original login `bash` again).

Depending on the text editor used to create the file in step ii, you may end up with a file having carriage return characters delimiting lines rather than newline characters. This may cause unusual or unexpected behaviour in this question. If you experience such behaviour, check for this problem.

3. (a) Use a UNIX command and standard output redirection to create a file called `editor.txt` containing a list of all the entries in the `whatis` database whose description contains the word "editor".

   (b) Issue a command to `bash` that will disable the overwriting of existing files when using standard output redirection, and then repeat the command from step 3a. Make sure that `editor.txt` already exists when you begin this task.

4. Determine the version of `bash` present on the lab Macintosh computer you are using. Do this by invoking `bash` as a command with a suitable option.