This assignment assumes you have read Chapters 2, 3, 4 and 5 of Sobell. Some specific cross-references may also be given in the questions below.

CentOS Setup and Configuration

For this assignment, you will set up a working local CentOS 8 Stream[1] installation, and then perform some basic shell configuration tasks. You will duplicate several of the configuration tasks on your rlogin account. These are intended to make your Linux account more user-friendly and more secure.

In recent terms, we have required a live demonstration with a TA in order to confirm your completion of the tasks given below.

- Each of you will be assigned to a specific TA via an announcement on the course Forum board.
- You will then show your assigned TA that you have completed these tasks, live or via a Zoom session, no later than the posted due date[2] for this assignment.

Task 1

If you already have installed a CentOS 8 Stream virtual machine, or you are running a CentOS 8 Stream install as your primary OS, you may skip this part, unless you prefer to start off with a clean installation.

There are copious notes on the course website showing how to install VirtualBox[3], and instructions for installing CentOS on it. Most of the errors students encounter doing this can be solved by correctly following the instructions in those notes.

Task 2

Download the supplied tar file and upack it in your home directory on your local CentOS 8 Stream installation [4]. Modify the `.bash_profile` and/or `.bashrc` files, and otherwise use Linux commands, so that the following hold for your local CentOS account:

1. Set the bash shell prompt so that it includes the current command number, your user name, the host name, and the current working directory, like so:

   ```
   1020 wmcquain@centosvm in stuff >
   ```

2. Set the default file permissions so that newly-created files will allow NO access privileges for users in either category `group` or category `other`. (This is <u>really</u> important for your rlogin account. Hint: see `umask`.) You can test this by using the `touch` command to create a new, empty file and then using `ls` to view the permissions for that file.
3. Create a subdirectory `~/2505`, with a subdirectory `~/2505/L02` to use when working on the next Linux assignment. I suggest you create a subdirectory for each subsequent course assignment, unless the assignment requires working on rlogin.
4. Create a subdirectory `~/bin` to hold useful utility programs you may create or receive, and a directory `~/temp` to hold files you create for some temporary purpose.
5. Add the current working directory (`./`) to be the <u>last</u> directory in your path. This way, if you create a program yourself that has the same name as a system utility, your program will not run unless you prefix a path (e.g., `'./'`).
6. Add the directory `~/bin` to be the first directory in your path. This way, if you create or receive special utilities and place them in your `bin` directory, they will, by default, override system utilities with the same name.
7. You will have to explore the available Linux commands for this part. Define some aliases so that:
   a. the command shortcut `h` can be used to display a listing of recently-used commands

b. the command shortcut `hg` can be used to display commands stored in the history that contain a specified string; for example, to display recent calls to `tar`:

```
hg tar
```

I find this to be very useful when I'm compiling and testing code.

For an added challenge (but not extra credit)… implement this so that it shows only commands that contain the specified string as the actual command. That is, `hg tar` might show these commands:

```
214  tar cvf ../c04Files.tar *
220  tar tvf c07Files.tar
293  tar xf /media/share/2505Fall2019.tar -C ./previous/
```

but it would not show these:

```
324  cp c08Files.tar ~/2505/c08
341  man tar
```

I implemented my version as a *shell function*, not as an alias, in order to achieve the extra challenge above. You'll have to do some extra reading in Sobell if you want to do that.

Some of the changes required above are related to the discussion of aliases in Chapter 8 of Sobell.

If your changes to the settings in the configuration files do not take effect immediately, you may need to use the `source` command (e.g., `source .bash_profile`); if your settings don't take effect automatically when you open a new terminal, see the last slide in the CentOS installation notes.

Task 3

Make all of the changes from Task 2 in your rlogin account. Most of those changes are just a convenience or a matter of taste, but the default permissions are vital for accounts on a shared machine! The simplest way to apply these changes to your rlogin account is to use `scp` to transfer the relevant configuration files from your local CentOS to rlogin[5].

Notes

[1] As mentioned, assignments will be graded in the CentOS 8 Stream environment maintained by the CS Department on the rlogin cluster. In my experience, you are likely to encounter substantial difficulties if you develop solutions on other distributions of Linux. We will not provide any accommodations for students who use other distributions.

Note that CentOS 7 (or earlier) will NOT be acceptable; the CS Department has updated its servers to CentOS 8 Stream, and all grading of assignments will be performed on CentOS 8 Stream; since CentOS 8 Stream has much newer versions of some critical tools than CentOS 7, the use of CentOS 7 will likely encounter difficulties, and we will not compensate for those.

Install VirtualBox 6.1.30[3] and 64-bit CentOS 8 Stream on your own computer. Alternatively, you may run a bootable installation of CentOS 8 Stream on your computer, or on a flash drive. Earlier distributions of VirtualBox are acceptable; so is using other virtualization tools (such as VMware), but we do not support doing so.

[2] The due date for this assignment is set to be late enough to give you time to deal with any issues that arise. Based on past experience, it is likely that you will encounter some issues along the way, and it may be difficult for you to resolve those issues without help. Therefore: do not wait until the last few days to start this!

We will allow demos to be completed after the due date, but those will be subject to a substantial late penalty (to be specified later)

[3] My personal experience has been that VirtualBox 6.1.30 seems to be fine. Earlier versions of VirtualBox are likely to encounter issues, in particular with installing the Guest Additions.

However, if you are running Windows 10 as your host OS, and Hyper-V is enabled, you are likely to encounter problems, because Hyper-V does not coexist peacefully with other hypervisors.

Recent releases of VirtualBox are claimed to be compatible with Hyper-V. My experience, so far, does not confirm that claim.

Links on the course website provide some advice for dealing with those.

My experience is that, although I can create a CentOS virtual machine on Hyper-V, that installation runs too slowly to be usable. In that case, if you must deal with the conflict between Hyper-V and VirtualBox, I advise either setting up a bootable installation of CentOS **on a flash drive**, or disabling Hyper-V and running VirtualBox with Hyper-V turned off.

[4] The names of the configuration files begin with a period, so on a Linux system they are hidden files. You can view hidden files in a directory by using the `-a` switch with the `ls` or `ll` commands. I recommend following the instructions in the following note, and copying the original configuration files (if any) into a temporary subdirectory before you actually begin modifying anything. That way, if things go badly wrong, you can easily revert to the original ones.

[5] Occasionally, a student manages to mess up their settings on rlogin in such a way that their PATH variable is empty or invalid, and that may make it seem impossible to do anything to fix your rlogin configuration. One way to deal with that:

- Before you make any changes, copy the initial `.bashrc` and `.bash_profile` files from your rlogin account to your local machine, using `scp` or using an `ssh` client. Do not put these files into the home directory on your local machine, since that would overwrite the configuration files you have created there.
- If your rlogin account is messed up, use `scp` or an `ssh` client to transfer the backup files from your local machine back to rlogin.

If all else fails, email techstaff@cs.vt.edu and request that your account be fixed. The course staff cannot do this, since it requires root administrative privilege on rlogin.