COMP 3500 Introduction to Operating Systems
Project 1 – Installing CentOS

Points Possible: 100

(Important) You can only use the PC assigned to your group in the OS laboratory (Shelby 2129). The minimum penalty for using other groups' PCs is 30 points.

There should be no collaboration among groups and/or students working individually. Students in one group should NOT share any project code with any other group. Collaborations among groups in any form will be treated as a serious violation of the University's academic integrity code.

Objectives:

- Prepare a Linux operating system for the COMP3500 projects
- Get to know your computer in Shelby 2129 and the CentOS operating system

Requirements:

- Each group should **independently** accomplish this laboratory assignment. You are allowed to discuss with your group members to solve the coding problems.
- Currently most of the computers have a 6.3 or 6.4 version of CentOS operating system installed. You should just ignore it and install a new CentOS 6.5 operating system.
- Your group members can only use the PC assigned to your group in the OS laboratory (Shelby 2129). For example, if your group ID is #6, then use the PC marked with #6. The minimum penalty for using other groups' PCs is 30 points.

1. Instructions

- Insert your CD and reboot the system, press direction key to enter the next booting page.
- Enter "Welcome to centos-6.5-x86_64-LiveCD" page, choose install.
- Choose "Basic Storage Devices" for the device and "Use All Space" for the partition.
- After you reboot the computer, please follow the steps to finish the configuration.
- Open a terminal and do "yum -y update" to update all the packages. You need to be the root to do this.

2. The script Command

The script command line tool allows you to save a session of your terminal. In addition

to saving each command per line in a text file, the script command makes a typescript of everything that happens on your CentOS terminal. Screencasting tools to a desktop session(GUI) is what script is to a terminal. Let us demonstrate the usage of script through the following example:

```
$ script
$Script started, file is typescript
$ cd
$ ls
file1 file2 file3
$ exit
exit
Script done, file is typescript
```

Then, you may use the `mv` command to change the file name from `typescript` to any name you like. Alternatively, you may specify the name of your log file upfront as below:

```
$ script sample.script
$Script started, file is typescript
$ cd
$ ls
file1 file2 file3
$ exit
exit
Script done, file is sample.script
```

2. Questions

Script the following session using the `script` command. You may save each session (i.e., each task below) in one script file. Using the *`tar`* command to submit a tarred and compressed file named `<group_ID>_project1.tgz` (see Section 3.2 for details).

2.1 (30 points) Please practice the installation of a Linux Operating System on a computer in Shelby 2129. The CentOS can be downloaded from the following web link.
http://mirrors.tummy.com/mirrors/CentOS/6.4/isos/x86_64/

- Set the root password as **os13core**, except the machine reserved for the TA/instructor.
- Please make sure the following packages are installed: **gcc, gcc-c++, vim-enhanced, emacs gdb, ethtool, hdparm, file** and **pciutils.** They most likely are already installed. You can run the following commands to confirm their availability and install as needed.

```
# yum -y install gcc
# yum -y install gcc-c++
# yum -y install vim-enhanced
# yum -y install emacs
# yum -y install gdb
```

```
# yum -y install ethtool
# yum -y install hdparm
# yum -y install pciutils
# yum -y install file
```

2.2 (20 points) When the computer system is up, you should get to know it in more detail. You are asked to find out their attributes, including **CPU frequency, cache size, memory size, the list of PCI devices, hard drive, network MAC address and link speed,** and **the devices generating interrupts**. The following system commands can help you. Many of these commands are for system administration, so you should run them as root if needed.

```
# more /proc/cpuinfo
# more /proc/meminfo
# /sbin/lspci
# /sbin/hdparm –i /dev/sda
# /sbin/hdparm –I /dev/hda
# /sbin/ethtool eth0
# /sbin/ifconfig eth0
# more /proc/interrupts
```

Please store the output from all these commands and include them as a part of your project report.

You may pipe the output of any Linux command to a file on Linux. For example:

```
#ls > test.txt
```

The above command writes all files in the current directory to a file called “test.txt” instead of displaying the files on a monitor.

2.3 (20 points) With the computer up and running, you should give it a try to see if you can use the utilities on the system. For a system programmer, these include at least the editor, the compiler, the libraries, and the debugger. You are asked to do the following

2.3.1. Using your favorite editor, code a program (simple.c) that processes an array of 10 numbers, calculates the average of their square roots, and prints it out. I recommend either **emacs** or **vim** as an editor for COMP 3500. If you are not yet proficient with either of them, you should be able to type the simple.c program without too much effort.

2.3.2. The GNU compile is the default open source compiler on Linux. You should check a little on what gcc you have, and then compile your program as follows. Please do not forget the flag ‘-g’ for using debugger in Step 4.

```
# gcc -v
```

```
# gcc -g -lm -o simple simple.c
```

2.3.3 Practice the command **ldd**, and understand the libraries on which your program is dependent upon for execution.

```
# man ldd
# ldd simple
```

2.3.4 The debugger is a friend you must get acquainted with to be a good programmer. Here is a little trick in using the GNU gdb debugger.
(1) First run your program, **simple**, alone
(2) Prepare a file name as .gdbinit in the current directory with the following content:

```
file simple
break main
break sqrt
info registers
```

(3) Run the gdb debugger and then type these characters ('r', 's', 'n', and 'c'), one at a time complete the program

```
# gdb
# r
# n
# s
# c
```

2.3.5 Your project report should include the source program, and the output from Steps (1)-(4).

2.4 (30 points) Now you need to install CVS – a version control system to manage your software development conducted by your group. Follow the following instructions to install and use cvs:

2.4.1 Install cvs

```
# yum install cvs
```

2.4.2 Logged in your centOS as root

2.4.3 Add group using your group ID.

```
# groupadd group_ID
```

If your group ID is `group6`, then add a group as:

```
# groupadd group6
```

2.4.4 Add users into your group. For example, if Shawn is a group member of group6, then you can add him into group6 as:

```
#useradd -g group6 shawn
```

2.4.5 Create a CVS repository

```
#cvs -d /path_to_repository init
```

2.4.6 Change ownership of the cvs repository to your group members. For example, if shawn is the member of group6, then you change the ownership as below:
chown shawn:group6 /path_to_repository

2.4.7 User command `cat /etc/services` and check is there followings exist

```
cvspserver 2401/tcp #CVS Pserver
cvspserver 2401/udp #CVS PServer
```

3. Deliverables

One of the following deliverables is acceptable. You may choose to submit a single PDF file (see Section 3.1) or a tarred and compressed file (see Section 3.2).

3.1 A single File

Please submit your project report with needed contents as specified in the questions (see Section 2). You must submit your report through Canvas (no e-mail submission is accepted. Please report any problems you have solved when you install CentOS and the utility programs.

The file name should be formatted as:

"<group_ID>_project1.pdf"

For example, suppose that I am a member of group6, my report would read "group6 _project1.pdf". Your report should indicate the names of your group members.

3.2 Multiple Script Files

If you have generated multiple script files, please save all the script files in one directory say (project1). Then, you should achieve all the script files along with your report into a single tarred and compressed file. Assume that the script files and your report are located in ~/comp3500/project1, then you can follow the instructions below to prepare a single compressed file.

```
%cd ~/comp3500/project1
%tar vfcz <group_ID>_project1.tgz .
```

Please replace `<group_ID>` in the above command with your group ID. For example, if I am a member of group 6, the above command will create a single tarred and compressed file called `group06_project1.tgz`, which will be submitted through Canvas.

3.3 Submitting the File for Your Group

Only one member of your group needs to submit the project report. After your group's report is graded, all the three members will receive the same score.

4. Grading Criteria

1) Install centOS: 30%
2) Get to know your OS: 20%
3) Use utility programs: 20%
4) Install CVS: 20%

5. Late Submission Penalty

- Ten percent (10%) penalty per day for late submission. For example, an assignment submitted after the deadline but up to 1 day (24 hours) late can achieve a maximum of 90% of points allocated for the assignment. An assignment submitted after the deadline but up to 2 days (48 hours) late can achieve a maximum of 80% of points allocated for the assignment.
- Assignment submitted more than 3 days (72 hours) after the deadline will not be graded.

6. Rebuttal period

- You will be given a period of **one week** to read and respond to the comments and grades of your homework or project assignment. The TA may use this opportunity to address any concern and question you have. The TA also may ask for additional information from you regarding your homework or project.