Unix for Telecommunications

Portfolio Task – P-Lab-01-Introduction

Pass Level Task

I. Introduction

In this lab you will learn about Unix like operating systems, in particular the FreeBSD operating system (http://www.freebsd.org/). You will be covering some basic system navigation and configuration tasks that you will need for future lab sessions. Labs are completed using the Remote Unix Lab Environment (RULE) accessed from a PC in a Swinburne lab or from a home computer.

Additionally the lab component will cover reconfiguring your shell environment, modifying your ssh server configuration, and configuring your system to support remote X forwarding.

II. Purpose

To gain and/or enhance the following practical skills:

- Introduction to Unix common commands
- Understanding the general principles of navigation and operation of the Unix command line environment
- Modifying the shell environment of a user
- Making changes to the SSH server configuration
- Enabling remote X forwarding

III. Preparation

You can prepare for this lab by reading some of the FreeBSD documentation available at http://www.freebsd.org/. You should also review the basic concepts of:

- Unix common commands
- SSH
- Remote X forwarding

IV. Methodology

Your lab supervisor will provide you with login details to two (or more) RULE hosts. You will have full administator (`root`) access to these hosts for the duration of the semester, you should change your password(s) to one that is easier to remember. You must use your lowest numbered RULE host to complete your lab work. If your project requires the use of two RULE hosts, you must use the two highest numbered RULE hosts to complete your project. If your project requires the use of only one RULE host, you must use the second lowest (or highest if you have only been allocated two hosts) RULE host for your project.

A. Software

1) Open the `PuTTY` program and take a quick look at the available preferences in the opening dialog box. Since you will be spending most of your lab sessions in this program, you may want to explore and change some of its default settings. You will need the login details supplied to you by the lab demonstrator to SSH (secure shell) into your (*lowest numbered*) FreeBSD RULE host and login.
2) You should note that you can login to your RULE host using multiple concurrent sessions
3) Become familiar with copying and moving files to and from your RULE host "`student`" home directory using the windows program WinSCP.

B. Command syntax

1) The syntax of Unix command lines is `command <options(s)>`
2) Enter the command

   ```
   date
   ```

   Now enter the command

   ```
   date "+DATE: %Y-%m-%d TIME: %H:%M:%S"
   ```

   What is the output in each case?
3) Explore the following commands and become familiar with them:
   - The `ls` (list) command retrieves a listing of the contents of your current directory.
   - Run the `ls` command with the option "`-al`", eg. `ls -al`
   - The `pwd` (print working directory) command shows your current location in the file system.
   - You can move around using the `cd` (change directory) command. Eg. `cd /` (move to the root directory) or `cd ../` (move 'up' a directory) or `cd mydirectory` (move into mydirectory, assuming mydirectory folder exists in the correct directory). Before you move on, make sure you understand the difference between relative and absolute paths.
4) Use the `man` (manual) command with the option ls, eg. `man ls` . Look though the manual page to work out what lowercase 'a' and 'l' do to the ls command. The 'q' key exits a man page. Use the man command with some of the other commands you have already used. Eg. `man pwd` and `man date`.

C. File manipulation

1) Create a new directory in your home directory (`/home/student`) called "`test`" by using the command `mkdir test`. Be sure that you are in the '`student`' home directory before you try and create this directory by issuing and checking the output of the `pwd` command.

D. Text file editing

1) Inspect a text file with the program `cat`
   eg. `cat /usr/local/www/apache24/data/index.html`
2) Inspect a text file with the program `less`
   eg. `less /usr/local/www/apache24/data/index.html`
   Up and down arrows move through the file and 'q' key exits the program.
3) Create a text file called "`test.txt`" in your home directory (`/home/student/`) by issuing the command `ee test.txt` (after making sure you are in the right directory with `pwd`). Take some time to learn the basic features of the `ee` (easy edit) program.

E. Moving and deleting files

1) Delete a file from you home directory with the command `rm <filename>`
2) Delete a directory from your home directory with the `rm` command. What option did you have to use with the `rm` command to successfully remove the directory?
3) Rename a file in your home directory with the command `mv`

F. Output redirection

1) Issue the command `sysctl -a`?
   What happens?
   Issue the command `sysctl -a | less`
2) Issue the command `sysctl -a | grep "net"`
   What does this do?

3) Create two text files (`textfile1.txt` and `textfile2.txt`) with a small amount of content in each, issue the command `cat textfile1.txt >> textfile2.txt`
   Look at `textfile2.txt` what has happened here?
4) Now issue the command `cat textfile1 > textfile2.txt`
   What has happened this time?

G. Becoming the super user

1) Issue the command `su` to change to "super user" (or "administrator" in Widows terminology). You will be asked for your "`root`" password.
2) Edit the file "`motd`" (message of the day) in the `/etc` directory using the `ee` program. You should only be able to do this as the `root` user.
3) Exit `su` mode by typing `exit`. Exit your `student` user login session by typing `exit` again. Your PuTTY window will close. Login again to make sure your 'message of the day' has changed.
4) To log out of your RULE host type `exit` or `Ctrl^d` at a blank command line.

H. Changing the Unix shell

1) We will now change the `student` user from using the simple shell '`sh`' to the slightly better '`csh`'.
2) Issue the command `vipw` as the root user.
   - This will take you into the editing program `vi` – this can be difficult to use at first, in preference we would normally use `ee`.
   - Move the cursor to the very end of the line that reads (`.../home/student:/bin/sh`)
   - Press the '`i`' key to shift the program into insert mode
   - Change the end of the line to read – `.../home/user:/bin/csh`
   - Press `Esc` to exit insert mode, and then `:wq` to exit the editor and save the changes.
   - Restart your putty session. You should find that on your next login you have a different prompt indicating that you are now using `csh`.
3) Edit the text file (use `ee` rather than `vi`) `.cshrc` in your home directory – the `.cshrc` file is the configuration file for csh when run by the nominated user.
4) Why can you not see the `.cshrc` file when you run the `ls` command?
5) Under the line that reads (`alias ll ls -la`) add a new line that reads:
   `alias foo ls -lAh`
6) Re-login into your rule host again and issue the command `foo`. What is returned? Why?
7) Feel free to add any further alias you feel may be useful or rename the `foo` command to something that makes more sense.
8) If you don't like using `pwd` to constantly see which directory is the current directory, you may wish to search the Internet to work out how to add the current path to the shell prompt.

I. SSH

1) Try to log into your rule host as the user `root` directly using your `root` password. What does/doesn't happen?
2) Log in as `student` and run `su` to become `root`.
3) The configuration file for the ssh server (`sshd_config`) can be found in the directory `/etc/ssh`. We wish to edit this file.
4) There is a line in this configuration file that reads (`#Port 22`). What do you think editing this line would do?
5) Find the line that reads:
   `#PermitRootLogin no`
   and change it to read:

`PermitRootLogin yes`

What do you expect this to do? What does the '#' at the beginning of the line do?

6) Try to login to your rule host again as `root`. Does this work this time?
7) The `ssh` server needs to be restarted so it can re-read its configuration file. There are three ways to do this:
   - Kill the `ssh` server and then start it again. Read the manual pages (`man ps`) and (`man kill`) to determine how to locate a process ID for the `ssh` server and how to kill it. The ssh server can then be restarted using the command `sshd`. When locating the `ssh` program to terminate, you must kill the correct one.
   - Instead of actually stopping the server, you can send it the HUP signal to tell the server to reload its configuration and restart itself. How is this done using the kill command?
   - A better approach is to use the provided "`/etc/rc.d/sshd`" script to `stop`/`restart`/`start` any services your system provides. Given that your `ssh` server was automatically started using this approach, this is what you should use to restart the server service sshd restart
8) Restarting the `ssh` server on a remote computer is a risky proposition, if you made an error in your configuration the `ssh` server will not be able to restart and you will be unable to log back in. You should always test your changes by initiating a **second** login via `ssh` before exiting your current login, this allows you to fix the problem without losing access.

J. X and the GUI

1) Do some brief research on the X Windowing System.
2) Do some brief research on the **XMing** Windows Application.
3) Try executing the command `xcalc` on your RULE host. What happened?
4) We need to edit our `sshd_config` file again, this time changing the line that reads (`#X11UseLocalhost yes`) to read (`X11UseLocalhost no`).
5) Don't forget to restart the `ssh` server.
6) Launch the **XMing** application on your Windows computer.
7) Log back into your RULE host and try executing `xcalc` again.
8) Close the `xcalc` and this time execute the command `xeyes &`. What is the purpose of the `&`?
9) While `xeyes` is running, issue the command `ps -ax`
10) Where is `xeyes` doing it's processing? What about `xcalc`?

K. Automatically Starting SSH at System Boot

Note: *The following setup is already configured for your SSH server, however you will want to do this for other servers you configure during semester*

1) Once a service is properly configured and running, we often want to:
   - Start it automatically at boot-time, in case the system is rebooted for whatever reason
   - Enable starting/stopping/restarting the service via the use of the rc scripts – this simplifies the procedure and ensures that any dependent are also started if required
2) To configure both these tasks you need to edit the `/etc/rc.conf` file and add the line:

   ```
   sshd_enable="YES"
   ```

3) You will now be able to start and stop SSH using the command: /usr/local/etc/rc.d/sshd <start | stop>

/etc/rc.d/sshd <start | stop | restart>
or
service sshd <start | stop | restart>

V. Assessment

The due date for completion of this lab is via a demonstration to your lab supervisor **before** the end of the lab class in **Week 3**. Upon demonstration, your tutor will discuss your work with you in order to assess you on your competence

A. Completion of task in Doubtfire

Your tutor will assess you in class. In order for the submission to be marked as complete, you must discuss your work with the tutor.