Linux Shell Programming

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Class Room: TBD

Course Description

In this fun, fast-paced class you're going to become a "Linux Rockstar". Within a few short months you'll get lots of great information to make you more employable and more efficient on Linux machines. We will learn about *nix operating systems and programming in this environment. When possible we will explore topics in depth. More complex topics will be briefly touched upon to acquaint you with important *nix vocabulary words and key concepts.

Required Materials

- Access to a Google Cloud Virtual Machine (provided and free).

Course Objectives

You will master many aspects of Linux/Unix, and acquaint yourself with others. You will learn:

1. bash
2. vim
3. awk
4. sed
5. network programming
6. file system management
7. version control
8. webservers
9. Linux account management
10. run scheduled tasks
11. (a little) C.
12. kernel driver development
13. containerization/virtualization.
14. ...and more...

Course Structure

Class Structure

This material will likely be new to you, and it's very interesting. There will be weekly lectures and assignments as well as two exams. Every week we will cover a new aspect of Linux / Unix / Programming / System Administration and there will be a related assignment due the following lecture. In the event that you miss a class there will be related reading materials posted online so you can still complete your assignment.

Lecture

Each week in class we will log on to our virtual machines and explore a specific aspect of programming in Linux.

Assessments

Weekly programming assignments based on the materials covered in class. 2 exams bringing together various aspects of topics taught. No late assignments. Lowest weekly assignment grade will be dropped. Multiple choice midterm and final exams.

Grading Policy

Grading is as follows:

- **20%** Midterm exam.
- **20%** Final exam.
- **60%** Average of weekly assignments.

For example, if you get an 80 on exam 1, an 85 on exam 2, and (to simplify assume there were only two weekly assignments) your weekly assignment scores are [90, 95], your final score will be 20pts * 0.80 + 20pts * 0.85 + 60pts * (0.90 + 0.95) / 2 = 88.5 pts, and will be translated to the appropriate letter grade following NJCU guidelines.

Schedule and weekly learning goals

The schedule is tentative and subject to change. The learning goals below should be viewed as the key concepts you should grasp after each week, and also as a study guide before each exam.

Date: 01/24 - Introduction to Linux, Bash, Vim

- Setup and connect to computer
- How to use github + git (brief intro)
- Learn basic BASH commands:

1. ls (-l -la -a)
2. hidden files
3. cd
4. cp
5. mv
6. whoami
7. which
8. mkdir
9. touch
10. rm
11. touch
12. cat (assignment1)
13. echo (assignment1)
14. man
15. wc (assignment1)
16. md5sum (assignment1)
17. df
18. du
19. uniq
20. sort
21. find
22. xargs
23. more
24. less
25. grep (no regex yet)
26. unzip (assignment1)
27. tar
28. cut (assignment1)
29. if (assignment1)
30. arrays
31. Return values and $? (assignment1)
32. tree
33. etc.

- wildcards
- bash variables (export vs without export and subshells)
- bash eq, not equal
- vim (modes, p, shif+p, :wq, :x, i, a, dd, arrows, <esc>, skipping around. set nu/nonu. ctrl+v. search+replace s///g s///gc. :sort. :sort n. u for undo, ctrl+r. ctrl+a to increment. split vs vsplit. +/- for next line. 5w = 5 words. 5l = 5 letters.)
- pipes | (assignment1)
- telnet starwars
- csh, zsh, sh, dash, etc.

Date: 01/24 - Introduction to Linux, Bash, Vim

- Review last week + a Little More Bash

- Review git usage
- File Descriptors (stdin, stdout, stderr)
- Processes

Date: 01/24 - Introduction to Linux, Bash, Vim

- cron
- more bash
- about git

Date: 01/24 - Introduction to Linux, Bash, Vim

- more bash
- ssh + sftp

Week 5

- File System Hierarchy
- Mounting and Partitioning
- Move Home directory
- PATH
- Swap space

Week 6

- FileDescriptors
- First Programs
- Signal handlers
- setuid + setgid

Week 7

- Installing software
- symlinks
- ASCII
- more bash

Week 8

- cURL
- Install cURL from source
- HTTP verbs
- REST

Week 9

- playing with curl, setting up servers
- set up a simple webserver with PythonSimpleHTTP
- set up a simple webserver with Flask
- make requests to our servers.
- set up website with Apache

Week 10

- Awk

Week 11

- UTF-8
- sed

Week 12

- init
- services
- systemd vs sysvinit vs upstart

Week 13

- gpg
- encryption

Week 14

- Set up a docker container
- Set up a personal git server