Introduction To Linux - Course Outline

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Part I
General

Target Students

1st year students who want to do a complete 3 year COMS major as well as anyone interested in getting started with Linux.

Time Per Week

Wednesdays (E block): 14:00 - 16:00 - Normal Lectures, 16:00 - 17:00 extra tut session

Course Goal

To help COMS students familiarize themselves with Linux - which in turn will help them in there studies. Also to spread the love of Linux around and in turn make the world a slightly better place.

Setup

Lectures will be done in one of the MSL labs. Lecture slides will be used.
For tutorials - in the beginning vmuser will be used on the local machine. Around the section about sudo ssh will be taught and then a virtual machine

server, hereby the onion server, running open nebula will be used. Each student will have his own virtual machine set up and will ssh into it.

Course Website

Public Github repository:
https://github.com/Project-Onion/Intro_To_Linux_Course

Part II
Detailed Sections

1 Introduction + general tip

1.1 Section Summary

In this section students will be told what will be taught in this course and be given general tips to keep in mind that will help them in there learning, in this course as well as in any other course.

1.2 Goal

By the end of this section students should have a general idea of what this course is about, whether they want to attend it and how to study for this course.

1.3 Time

45 minutes (1 Lecture)

1.4 Tasks

No task. We give an example of ssh and tmux to cause excitement.

1.5 Points for lessons

1. Introduction to instructors - who we are
2. What to expect from the course
3. About CHPC
4. Going over the chapters the course
5. Google and stack overflow
6. website for Linux and bash tutorial - http://linuxcommand.org/index.php

7. Formatting Linux - virtualbox vs. dual boot vs. full format
8. Things will break - a lot - don't be scared to experiment!

2 What is Linux - basic history and theory

2.1 Section Summary

In this section we will cover the basics of the origin of Linux and some other Linux basics such as what distros are.

2.2 Goal

By the end of this section students should be familiar with the term GNU\Linux, and the ideas of distros, desktop environments, software managers and file systems, as well as being familiar with some of the most popular implementations.

2.3 Time

45 minutes (1 Lecture)

2.4 Tasks

No tasks for this section

2.5 Points for lessons

1. What is GNU vs what is Linux, Richard Stalman and Linus Torvalds - a bit of history
2. What are distros (including forked distro examples)
3. what is GUI what are desktop environments
4. The idea of a file-system
5. The idea of a package manager
6. What is the Linux terminal and what is bash
7. GPL and open source

3 Basic commands

3.1 Section Summary

In this section students will be introduced to the most basic Linux commands and will start experimenting with bash for the first time

3.2 Goal

By the end of this section students should be able to navigate the file-system through the terminal and make, move and copy files.

3.3 Time

45 minutes (1 Lecture)

3.4 Tasks

Students will navigate around in there home folder, create directories and move and delete them

3.5 Points for lessons

1. general command structure
2. what are flags
3. man
4. Navigation:
   (a) pwd
   (b) ls
   (c) cd
   (d) relative pathnames vs absolute pathnames
   (e) . and ..
5. File and Directory Manipulation:
   (a) touch
   (b) mkdir
   (c) mv
   (d) cp
   (e) rm
   (f) Wildcards
6. copy paste with ctr+shift
7. cat

4 Processes

4.1 Section Summary

In this section students will learn the basic idea of a process (in user terms, not in OS terms) and be introduced to basic commands in order to manage them

4.2 Goal

By the end of this section students should be able to look at processes and stop or kill processes they determine are problematic or stuck.

4.3 Time

45 minutes (1 Lecture)

4.4 Tasks

students will run firefox, look at how many resources it takes, get its pid and kill it.

4.5 Points for lessons

1. ps
2. top
3. kill
4. sleep
5. ctr+c and ctr+z
6. fg

5 The Linux file-system

5.1 Section Summary

In this section students will be introduced to the Linux file-system, as well as each directory in root and its purpose, and be given examples of different files located in the different directories.

5.2 Goal

By the end of this section students should have the basic idea of what each folder in root is for.

5.3 Time

45 minutes (1 Lecture)

5.4 Tasks

Navigate through the file system and look at the files from the examples and other files.

5.5 Points for lessons

1. All directories are files
2. what each directory in / is
3. what ~ is
4. /root
5. file extensions don't exist

5.6 examples:

1. /dev/sda
2. /proc/meminfo
3. /proc/cpuinfo
4. /proc/partitions
5. /etc/environment
6. /etc/issue
7. /home/user/Desktop
8. /mnt
9. /bin/ls

6 Sudo make me a sandwich

6.1 Section Summary

In this section will be introduced to the term sudo and why it is important.

6.2 Goal

By the end of this section students should know what sudo is and understand why sudo is not redundant

6.3 Time

25 minutes (0.5 Lectures)

6.4 Tasks

Students will ssh into the onion server (running open nebula) into there own virtual machine and experiment with system files and restricted commands.

6.5 Points for lessons

1. What is a user and what is a superuser/root
2. The importance of sudo
3. Examples of files that require sudo to be edited
4. ssh

7 More Linux Commands

7.1 Section Summary

In this section students will be introduced to some more useful Linux commands.

7.2 Goal

By the end of this section students should have some more tools to get around Linux and be able to do most of what is required when running Linux as a primary OS.

7.3 Time

30 minutes (0.5 Lectures)

7.4 Tasks

Students will create a file and change the permissions to it and see how the changes take effect. They will also take a look at the man page for apt-get

7.5 Points for lessons

1. apt-get / yum / pacman / etc..
2. wget
3. tar
4. chmod

5. head/tail
6. ln

8 Pipelines and streams

8.1 Section Summary

In this section students will be introduced to the concept of pipelines and the useful combination with grep

8.2 Goal

By the end of this section students should know how to use grep

8.3 Time

45 minutes (1 Lecture)

8.4 Tasks

Students will practice using grep on outputs of cat, such as 'cat /proc/meminfo | grep Total'

8.5 Points for lessons

1. Explanation on what pipelines are
2. grep
3. less
4. sed
5. Explanations of streams
6. >>
7. <<
8. echo

9 vim

9.1 Section Summary

In this section students will be taught the basics of using the vim text editor

9.2 Goal

By the end of this section students should feel comfortable creating or modifying a text file and editing it.

9.3 Time

45 minutes (1 Lecture)

9.4 Tasks

Students will create a text file and edit it, trying out the different capabilities of vim

:setnumber
vim config file
end of page

9.5 Points for lessons

1. Existence of alternatives such as nano and emacs gedit
2. Entering insert mode
3. Saving and exiting
4. Showing that it automatically color codes different file types
5. Delete with dd
6. go to line using :<number>
7. / for search
8. .swp files

10 Important files

10.1 Section Summary

In this section students will be introduced to some useful files and will experiment in editing them.

10.2 Goal

By the end of this section students should be acquainted with some system files and feel comfortable editing them.

10.3 Time

45 minutes (1 Lecture)

10.4 Tasks

Students will add environment variables using /etc/config and using .bashrc

1. /etc/hostname

10.5 Points for lessons

1. .bashrc and .bash_profile
2. /etc/profile
3. /etc/environment + explanation of environment variables (e.g. adding reposetories for installations)
4. /etc/hosts + explanation of conversion of ip to urls
5. ifcfg + /etc/NetworkManager/system-connections/
6. vim /etc/resolv.conf
7. /dev/null
8. /dev/zero
9. source

11 Mounting

11.1 Section Summary

In this section students will get acquainted with the term of mounting

11.2 Goal

By the end of this section students should know how to manually mount and unmount via terminal a device like a usb flash drive if it is not automatically mounted or unmounted. The students should know the purpose of /etc/fstab but wont know how to edit it themselves.

11.3 Time

25 minutes (0.5 Lecture)

11.4 Tasks

Students will have a look at /etc/fstab. If they have a usb available they will also plug it in, and mount and unmount it.

11.5 Points for lessons

1. Explain the concept of mounting
2. why mount /home?
3. Example of mounting
4. dmesg
5. df
6. /etc/fstab

12 ssh and remote copy

12.1 Section Summary

In this section students will learn how to enter a remote computer via terminal, as well as copy files off of a remote computer.

12.2 Goal

By the end of this section students should be able to access remote computers.

12.3 Time

25 minutes (0.5 Lectures)

12.4 Tasks

Students will take turns and ssh to there neighbors computer and create a file on the desktop while there neighbor sees the file being created. they will then copy that file to there own desktop using rcp and see it being created.

12.5 Points for lessons

1. Basic ssh
2. rcp
3. rsync

13 tmux

13.1 Section Summary

In this section students will learn how to improve productivity and share a terminal using tmux.

13.2 Goal

By the end of this section students should have a basic idea of the advantages of tmux and how to use it.

13.3 Time

45 minutes (1 Lecture)

13.4 Tasks

Students will create a tmux session and in it split the screen into three, 1st split horizontally and 2nd split the top screen vertically. They will run 'top' on the lower screen, 'cat ~/.bashrc' in the top left and 'man mkdir' in the top right. They will then create a new window and run 'vim' in it.

change window sizes

13.5 Points for lessons

1. alternatives such as screen
2. Splitting screen
3. Creating new window
4. Attaching and detaching
5. Logging in multiple times using ssh

14 Shell Scripting Using Bash

14.1 Section Summary

In this section students will learn the basics of bash scripting, and bash syntax.

14.2 Goal

By the end of this section students should be able to create basic bash scripts to automate basic tasks.

14.3 Time

90 minutes (2 Lectures)

14.4 Tasks

Create a bash script that downloads files of game data from the snake server.

14.5 Points for lessons

1. What is a scripting language?
2. How to run a command in a bash script - you just write it!
3. # !/bin/bash
4. Variables in bash
5. if statements
6. for and while loops
7. using ssh -t in bash scripts

15 Git and Github

15.1 Section Summary

In this section students will be introduced to git and github and how to manage code and do version control.

15.2 Goal

By the end of this section students should be able to open a github repository for a new project and manage it.

15.3 Time

90 minutes (2 Lecture)

15.4 Tasks

Students will create a github account, create a repository, initialize a local copy of the repository, add a file, add, commit and push to the repository. They will then go online and see the file appear in the GUI interface.

15.5 Points for lessons

1. What is github
2. what repositories and what are branches
3. setup git username and email
4. git init
5. git add
6. git commit
7. git push

16 Even More Linux Commands

16.1 Section Summary

In this section students will be introduced to linux commands that are good to know, but not necessary for daily Linux use.

16.2 Goal

By the end of this section students should be comfortable trying out different Linux commands and duckduckgo/googling for them.

16.3 Time

25 minutes (0.5 Lecture)

16.4 Tasks

Students will try out the different Linux commands mentioned and try to see which hardware pieces they can see using 'lspci' and how much memory is left on /home using 'df'

16.5 Points for lessons

1. lspci
2. dh
3. date
4. zip
5. export
6. service network restart

17 More Advanced Linux Theory

17.1 Section Summary

In this section students will be introduced to some more in depth Linux terms.

17.2 Goal

By the end of this section should be able to watch a Linux sucks' presentation and understand and laugh about most of it.

17.3 Time

25 minutes (0.5 Lecture)

17.4 Tasks

No tasks for this section

17.5 Points for lessons

1. install from source
2. systemd
3. X and wayland