CS 300

Data Structures

Start VirtualBox

- Search or Windows Run

  C:\CS300

- Launches CS 300/360 Virtual Machine

- (Eventually) Logon with Zeus password

Syllabus

http://zeus.cs.pacificu.edu/chadd/cs300f18/syllabus.html

- Data Structures in C, Kalicharan

Grades:

- Homework/Quizzes: 5 %
- 3 Midterms: 35%
- 1 Final : 20%
- Programming Projects: 40%

Dates:

- Midterm 1, Friday, Sept 21
- Midterm 2, Friday, Oct 19
- Midterm 3, Friday, Nov 16
- Final, Tuesday, Dec 11, 3-5:30 pm

- Policies:
- Pop Quizzes: frequent, unannounced, open-note quizzes will be given
- Late Policy: No late assignments accepted
- Grade Complaints: one paragraph summary of why the grade is wrong, within one week of receiving the graded material
- All projects are *individual* projects unless otherwise stated

Book

- Good
  - Contains concepts you need to know
  - Code examples
- Bad
  - not enough pictures / bad pictures
- Ugly
  - Bad coding style
  - Risky habits

Great Expectations

- Read the book
  - **bring questions to class**
- Class lecture
  - practical
  - ask questions
  - get questions answered before the next lecture!
- Assignments/Labs/Homeworks
  - practical
- Office Hours
  - bring questions!
- Very different than 150/250

"going to his office hours
would've been beneficial for me."

-anonymous student, every semester

CS Lab

- The Lab is clean
  - keep it that way
  - clean up your food
  - throw away your trash
  - clean out the refrigerator
- The Lab is friendly
  - moderate your volume
  - don't scare the freshmen
  - don't harass the seniors

Topics

- Data Structures
- Linux
- C Programming
- Software Development Tools/Methods
  - Invest time now for payoff later

UNIX Introduction

- UNIX is an Operating System (OS)
  - 1969 at Bell Labs
  - Thompson/Ritchie/Kernighan/McIlroy/Ossanna
  - Also a specification (Single UNIX Specification)
- GNU/Linux is “Unix-Like”
- Other operating systems are more directly related
  - MacOS X
  - Net/Free/OpenBSD
- We will be using a server called zeus
  - zeus runs OpenSUSE Leap 15.0 (64-bit)

What we discuss in this lectures applies to UNIX and Linux unless otherwise stated.

UNIX OS

- UNIX OS is made up of:
  - the kernel
  - the shell
  - the programs

GNU/Linux
Linux Kernel
GNU Tools (ls, bash, gcc)
Programs (Firefox, Chrome, Eclipse, **XFCE**)

  - Unix Philosophy
    “Write programs that do one thing and do it well. Write programs to work together. Write programs to handle **text streams**, because that is a universal interface” - Doug McIlroy

    Peter H. Salus. A Quarter-Century of Unix. Addison-Wesley. 1994. ISBN 0-201-54777-5.

Processes and Files

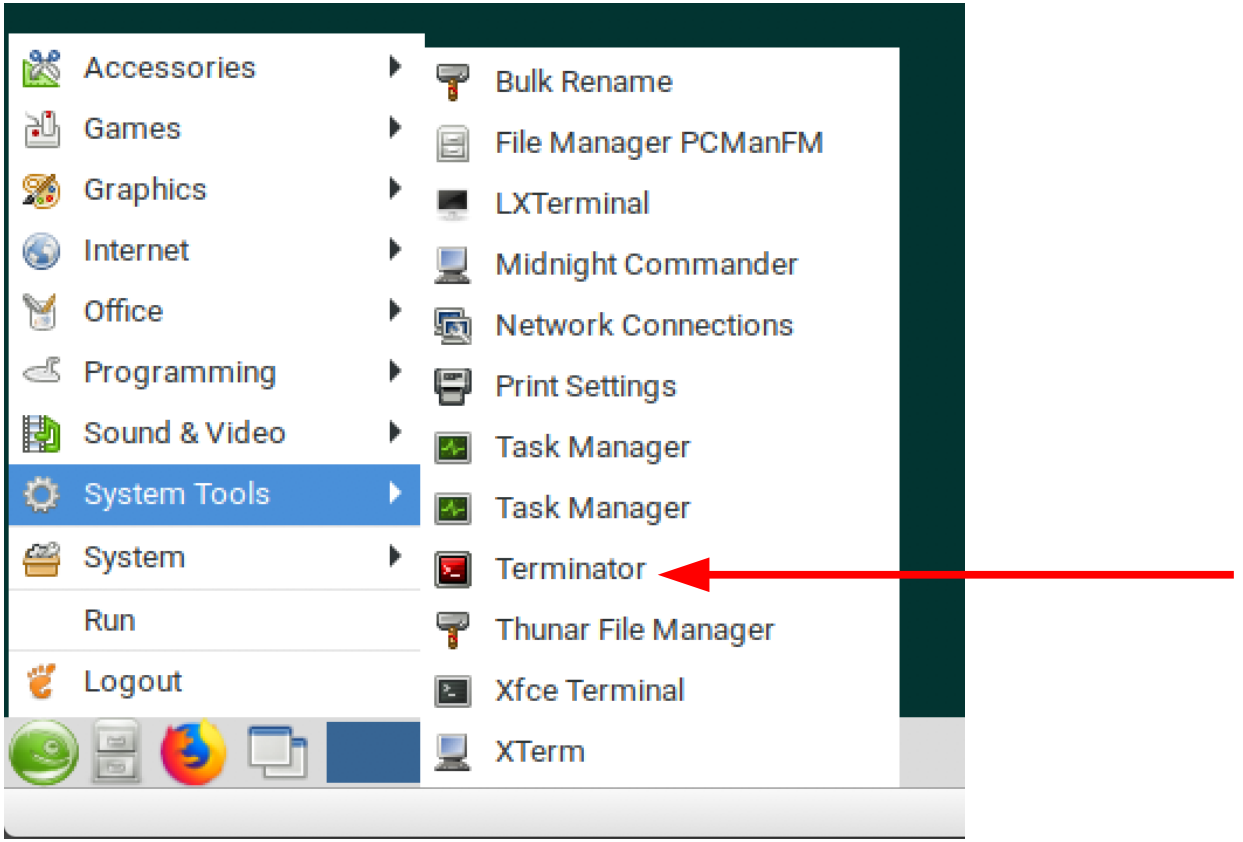
- Everything in UNIX is a process or file

- process – executing program
- file – collection of data

- directory is a hierarchical structure that groups files
  - Windows = folder
  - UNIX = directory

Login!

- Start a terminal



The kernel

- kernel – code that manages access to shared resources
  - CPU/network/hard drive/RAM
- kernel is responsible for managing system resources through system calls
  - process management
  - memory allocation
  - hardware access

More info about the kernel is in files in /proc!

```
chadd@ralph:~> uname -a
```

The shell

- Interface between the user and kernel
  - command line interface (CLI)
- The shell interprets commands
- Many different shells exist such as bash, tcsh,..
  - each has slightly different commands
- My examples use bash
- You environment is customizable by editing .bashrc

```
chadd@ralph:~> alias ls='ls -al'
```

Window Manager

- XFCE
  - default in the lab
- KDE
- GNOME
- LXDE
  - In Virtual Box

File System

- The file system is arranged in a hierarchical structure where the top of the hierarchy is called the root
- The root is signified by / (forward-slash)

- ls /
  ls /home

File and Directory Commands

Command	Type	Meaning
pwd	program	display present working directory
which	program	display which program provides a command
ls	program	list contents of present directory less special files beginning with a .
ls -al	program	show an extended list of all files and directories
cd ..	shell builtin	change to parent directory
cd	shell builtin	change to home directory
cd ~	shell builtin	change to home directory
mkdir backup	program	make a directory called backup
rmdir backup	program	removes an empty directory
passwd	program	change your current password

Problems

1) Change your password

2) Create a directory called CS300 (Linux is case-sensitive)

3) Other than your directory, name two other directories at the same level as yours

   Change to the root of the file system by cd /

4) What do you think is the meaning of ls ~/..

   Write your answer down before testing

Specific File Commands

Command	**Meaning**
cp file1 file2	makes a copy of file1 and names the copied file file2
mv file1 file2	moves (or renames) file1 to file2
rm file1	removes (or deletes) file1 DANGER DANGER DANGER rm -i
rmdir directory	removes (or deletes) an empty directory
clear	clears the display screen
grep string file	print each line in file that contains string
cat file1	displays the contents of a file to the screen
less file1	displays the contents of file1 to the screen one screen at a time spacebar – advances another page q - quits
diff file1 file2	display the differences between file1 and file2
Which are programs and which are shell commands? How do you know?	

File System Security

- In the directory that contains the file message, type the command ls -al

```
chadd@zeus:/home/CS300Public/2011> ls -al
total 9780
drwxrwxr-x 2 chadd faculty     4096 Aug 26 09:18 .
drwxrwxr-x 5 ryand faculty     4096 Aug 26 09:16 ..
-rw-r--r-- 1 chadd users         24 Aug 26 09:18 message
-rw-r--r-- 1 chadd users   10000000 Aug 26 09:13 pi-10million.txt
chadd@zeus:/home/CS300Public/2010>
```

Permissions

```
-rw-r--r-- 1 chadd users   13 2011-08-29 19:56 message
```

- The first – is either – for file or d for directory
- rw- is the user's permissions
- -r- is the group's permissions
- r-- is the other's permissions

- Note : Every file or directory has read, write, and execute permissions

chmod

- **chmod** is used to change the permissions of a file or directory

Symbol	Meaning
u	user
g	group
o	other
a	all
r	read
w	write
x	execute
+	add permission
-	subtract permission

- **groups** will tell you what groups you belong to

Problems

1)What is the meaning of chmod g+rx file ?

2) Set the permissions for message to -rwxr-xr-x

3) What are the permissions of your home directory?

4) What are the permissions of the file /etc/passwd ?

5) Who owns the file?

6) Are you a member of the group that owns the file? Why or why not?

Homework

- Practice posted online
- Due Friday, 9:15 am