CS 300 Data Structures

Introduction
Course Topics

• Data Structures
• Linux
• C Programming
• Software Development Tools
• Software Development Methods
Introductions
How to Succeed in CS 300

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UNIX/Linux/GNU

- UNIX is an Operating System (OS)
  - 1969 at Bell Labs
  - Thompson/Ritchie/Kernighan/McIlroy/Ossanna
- UNIX Operating Systems include:
  - MacOS X
  - Sun Solaris
  - OpenBSD
- GNU/Linux is “Unix-Like”
- We will be using a server called zeus
  - Zeus runs OpenSUSE 13.2 64-bit OS
UNIX OS

• UNIX OS is made up of:
  – The kernel
  – The shell
  – The programs

• Linux
  – is just a kernel

• Linux distributions (suse, ubuntu, red hat, ...) include:
  – GUI system
  – GNU utilities (cp, mv, ls, ...)
  – GNU c/c++ compilers
  – Applications (OpenOffice, Firefox, ...)

CS300 Data Structures (Fall 2015)
Processes and Files

• Everything in UNIX is a process or file
  – Process is an executing program
  – File is a collection of data
• Directory is a hierarchical structure that groups files
  – Windows = folder
  – UNIX = directory
Login!

Start a terminal

Select either Xcfe Terminal or XTerm. I will use Xcfe.
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

  shereen@linux:~> 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
• Your environment is customizable by editing .bashrc .profile

shereen@linux:~>alias ls=’ls -al’
Window Manager

• Xfce
  – default in the lab
• GNOME
• KDE
• Lightweight window manager
  – LXDE
How to add an Icon

• Right Click Desktop widget
• Create new | Link to Application
• Eclipse
• Application
  – Command : /usr/local/share/eclipse/eclipse
• General
  – Wrench | Click icon box on left
  – choose Icon

If the icon does not stick, right click the icon | Properties click the icon on the Left.
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 /`

```
/  
  |  
  |  
  etc  dev  home  usr  var  
  |  |  |  |  |  |  
  jono  mako  cory  lib  
  |  |  |  
  work  photos  ```
# File and Directory Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Type</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>pwd</code></td>
<td>program</td>
<td>display present working directory</td>
</tr>
<tr>
<td><code>which</code></td>
<td>program</td>
<td>display which program provides a command</td>
</tr>
<tr>
<td><code>ls</code></td>
<td>program</td>
<td>list contents of present directory less special files beginning with a .</td>
</tr>
<tr>
<td><code>ls -al</code></td>
<td>program</td>
<td>show an extended list of all files and directories</td>
</tr>
<tr>
<td><code>cd ..</code></td>
<td>shell builtin</td>
<td>change to parent directory</td>
</tr>
<tr>
<td><code>cd</code></td>
<td>shell builtin</td>
<td>change to home directory</td>
</tr>
<tr>
<td><code>cd ~</code></td>
<td>shell builtin</td>
<td>change to home directory</td>
</tr>
<tr>
<td><code>mkdir backup</code></td>
<td>program</td>
<td>make a directory called backup</td>
</tr>
<tr>
<td><code>rmdir backup</code></td>
<td>program</td>
<td>removes an empty directory</td>
</tr>
<tr>
<td><code>passwd</code></td>
<td>program</td>
<td>change your current password</td>
</tr>
</tbody>
</table>
Specific File Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>cp file1 file2</td>
<td>makes a copy of file1 and names the copied file file2</td>
</tr>
<tr>
<td>mv file1 file2</td>
<td>moves (or renames) file1 to file2</td>
</tr>
<tr>
<td>rm file1</td>
<td>removes (or deletes) file1 DANGER DANGER DANGER DANGER rm -i</td>
</tr>
<tr>
<td>rmdir directory</td>
<td>removes (or deletes) an empty directory</td>
</tr>
<tr>
<td>clear</td>
<td>clears the display screen</td>
</tr>
<tr>
<td>cat file1</td>
<td>displays the contents of a file to the screen</td>
</tr>
<tr>
<td>less file1</td>
<td>displays the contents of file1 to the screen one screen at a time</td>
</tr>
<tr>
<td></td>
<td>spacebar – advances another page</td>
</tr>
<tr>
<td></td>
<td>q - quits</td>
</tr>
<tr>
<td>diff file1 file2</td>
<td>display the differences between file1 and file2</td>
</tr>
</tbody>
</table>
In Class Problems

1. Change your password

2. Using ls, list the contents of your present working directory

3. Create a directory called CS 300 (Linux is case-sensitive) in your home directory
scp

• Copy a file from linux to zeus assuming you are logged in to linux

  `scp message punetid@machinename:destination`
  `shereen@linux:~> scp message shereen@zeus:Documents/CS300`

• Copy a file from zeus to your present working directory on your local machine

  `scp shereen@zeus.cs.pacificu.edu:/home/CS300Public/2015/message`
In Class Problems

• On Zeus, in the directory /home/CS300Public/2015 is a file called “message”.
  
  ssh zeus.cs.pacificu.edu
  cd /home/CS300Public/2015

• Copy the file ‘message’ to the directory CS300 in your home directory on your local machine
  
  scp message punetid@machinename:CS300

• List the contents of this file

• Make a backup of this file and call the backup message.bk

• Remove message.bk
Homework
See Me With Questions

1. Watch the video Basic Linux Commands at http://zeus.cs.pacificu.edu/PacificCSVideos/linux/basiclinux.html. Write down any questions that you have on the content.
2. Find a program to take screenshots. What is the name of that program?
3. What does the command df do? Use man df and/or the Web.
4. What does the -h option to df do?
5. What does the command cal do?
6. How would you copy the file prog.c from the present working directory to the parent directory? That is, list the linux command to do so. There is more than one command.
7. Make a folder CS300 in your Documents folder. Copy the file Hound.txt from /home/CS300Public/2015 on zeus into CS300. List the commands that you used to accomplish those steps.
8. The command grep -i hound Hound.txt | wc -l outputs the number of lines containing the word hound. Run the command and state the number of lines containing hound.
9. In your own words, describe the difference between ssh and scp.

Turn in a printout of your typed answers to the above questions at the start of class on Wednesday, September 1.