C++ Programming on Linux

CS 2308
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What is Linux?

- an operating system
- Unix-like
- Open source
- created in 1992 by Linus Torvolds
- can be installed on a wide variety of hardware
  - mobile phones
  - desktop/laptop computers (PCs)
  - mainframes
  - supercomputers

Using Linux

- Common user interfaces:
  - Command line ($ prompt)
    - User enters commands at the prompt
    - results displayed on following lines
    - often referred to as a "shell"
    - Demo: terminal app in Mac OSX
  - graphical interface: X Window System
    - Similar to MS Windows or Mac OS X
    - KDE: K Desktop Environment (used in our linux lab)

Accessing Linux at Texas State

- Derr 231: Texas State CS Dept Linux Lab
- Requires a CS Dept Linux account
  - use your netID and password
  - http://cs.txstate.edu/labs/Linux/Accounts.php
- The lab machines start up in KDE (windows).
- To open a terminal window :
  - Click on the kaleidoscope, select: System Tools > Terminal
- You can also log in remotely from MCS590 or your own computer (windows/mac/linux/etc.)

Linux File System

- Common hierarchical system.
- Root directory of the system: /
- Directories can contain:
  - Files
  - Other Directories
- Each user has a home directory:
  - /home/Students/js108

Basic Shell Commands

- To display the manual page for a linux command

```
[...]$man <command-name>
```

- To display a list of options that work with the command:

```
[...]$<command-name> --help
```

- To clear the screen

```
[...]$clear
```


Basic Shell Commands

- To display the current (working) directory

```
[...]$pwd
/home/Students/js108
```

- To display a listing of the contents of the current directory

```
[...]$ls
```

- To see more info about the files in the directory

```
[...]$ls -l
```


Basic Shell Commands

- To display all the files, including the hidden ones

```
[...]$ls -a
```

- To display a listing of the contents of some other directory

```
[...]$ls /etc
```

- To change the current (working) directory

```
[...]$cd /etc
```

Basic Shell Commands

- To create a new directory (in the current one)

```
[...]$mkdir projects
```

- To remove a directory (must be empty)

```
[...]$rmdir projects
```

- Some shortcuts
  - ~ is your home directory
  - .. is the parent directory
  - . is the current directory

```
[...]$cd ~/projects
[...]$cd ..
```


Basic File Editing

- To use the nano editor to create a file and start editing it:

```
[...]$nano myFile.txt
```

- This begins an editor within the terminal window.
- You can type to enter text, navigate with the arrow keys, use the backspace/delete keys.
- Other commands, listed at bottom of window, are activated with the control key and a letter.

Basic File Editing

- When finished, press CTRL-X
- Follow the prompt: press Y to save
- You may also use other editors:
  - vim
  - emacs
- All of these editors run from within the terminal window.

More Editing Options

- There is also a text editor in KDE (the graphical interface)
- Find it in the menu system
- Files you create and save in the KDE text editor are stored to your linux home directory and can be accessed using the shell commands.

Basic Shell Commands
Files

- To view the contents of a file (pick one)

```
[...]$more myFile.txt
[...]$less myFile.txt
[...]$cat myFile.txt
```

- To make a copy of a file

```
[...]$cp myFile.txt someFile.txt
[...]$cp myFile.txt ~/projects/anotherFile.txt
```

- To move or rename a file (or both)

```
[...]$mv myFile.txt ~/projects    (keeps original name)
[...]$cd ~/projects
[...]$mv myFile.txt bFile.txt
```


Basic Shell Commands
Files

- To delete (remove) a file

```
[...]$rm myFile.txt
[...]$rm *.txt
```

- The file is gone, there is no trash can.

Compiling and Running C++ Programs

- Create a file containing a C++ program.

```
[...]$nano hello.cpp
```

- To compile the file using the gnu compiler:

```
[...]$g++ hello.cpp
```

(if you get compiler errors, fix in editor, run g++ again)

- To run the executable file:

```
[...]$./a.out
```


Using Unix on a Mac

- Mac OS X is built on top of Unix (no need to log in to another computer).
- Use the Terminal app to run the shell commands.
- Use the TextEdit app to edit programs/files.
- You can use g++ or clang++ (more up to date) to compile c++ files.

Note: to get g++ and clang++ for Mac OSX you should install XCode, then command line tools (XCode preferences)

Remote Access
from MS Windows

- Two options:
  - secure shell client
  - putty
- These both allow you to remotely log-in to unix/linux machines and enter shell commands.
- Download either from the CS departmental download server
  http://downloads.cs.txstate.edu
- Select os then windows then remote_access, then secure shell client OR putty
- Install on your machine
- Or go to putty.org to find putty

Secure Shell and Putty

- Secure Shell:
  - To run: double click on Secure Shell Client icon
  - Click Quick Connect and enter a host machine:

    hercules.cs.txstate.edu
  - Enter username and password.
- Putty
  - To run: All Programs > SSH > PuTTy
  - Enter a host machine in the Host Name field (see above for names) then click Open
  - Click Yes if you get an alert
  - Enter username and password.

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zeus
eros
hercules

Secure File Transfer from Windows PC

- Secure Shell: If you are currently connected and would like to transfer files with Secure FTP:
  - click the Windows menu,
  - then New File Transfer
- Filezilla, a free app for transferring files and runs on windows or mac. http://filezilla-project.org
  - select View menu, check Quickconnect bar
  - fill in host: sftp://hercules.cs.txstate.edu
  - fill in username, password then click Quickconnect
  - then drag and drop files to copy between machines

Remote Access
from unix/linux shell

- The ssh command (secure shell) allows you to securely connect to a remote computer within a shell.

  `[...]$ssh js108@hercules.cs.txstate.edu`

  (You will be asked to enter your password)
- Current directory will be your home directory
- Can use all the standard linux commands
- Type exit to logout of the secure shell session

  `[...]$exit`

Secure File Transfer

from unix/linux shell

- Secure FTP allows you to securely connect to a remote computer to transfer files.

```
[...]$sftp js108@hercules.cs.txstate.edu
```

(You will be asked to enter your password)

- `ls` will display files on remote machine
- use `get` to transfer a file to your local machine

```
sftp>get myFile.txt
```

- Type `exit` to logout of the secure ftp session

```
sftp>exit
```