C++ Programming on Linux

CS 2308
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Slides 14-end are for your information only, you will not be tested over that material.

Except for one squarecap question…

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"
  - graphical interfaces (windows):
    - X Window System (Unix)
    - Mac OS X (Unix)
    - KDE, Unity, GNOME, etc. (Linux)

Accessing Linux at Texas State

- Requires a CS Dept Linux account
  - use your netID and password
  - https://cs.txstate.edu/resources/labs/accounts/linux/
- None of the lab machines (currently) boot up in Linux.
- You can log in to the linux servers from the lab Windows machines using an app called putty.
  - eros.cs.txstate.edu
  - zeus.cs.txstate.edu

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
- Shared file system: A user logged onto any system can make changes to their files, and those changes are visible to all systems

Basic Shell Commands

- To display the current (working) directory:

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

  This is the directory affected by the commands.

- To get help on a unix command, such as pwd:

```
[...]$man pwd
```

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

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


Basic Shell Commands

- To see more info about the files in the directory

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

- 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.
- When finished, press CTRL-X
- Follow the prompt: press Y to save

More Editing Options

- You may also use other editors:
  - vim
  - emacs
  - or find your own….
- These editors run from within the terminal window.
- Files you create and save in these text editors 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      (changes the name)
```


Basic Shell Commands
Files

- To delete (remove) a file

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

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

- zip: to put files into a zip file

```
[...]$zip myZipFile.zip file1.cpp file2.cpp
```

- sendmail: to email a text file to yourself

```
[...]$sendmail js108@txstate.edu <file1.cpp
```

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
```


Use Putty to access the Linux servers from the lab computers

- To run: click lower left window icon, scroll to Putty, then click and scroll again to Putty
- Enter a host machine in the Host Name field

  `eros.cs.txstate.edu` (or zeus)
- then click Open
- Click Yes if you get an alert
- Enter net-id and password at prompts.
- You should get a prompt at this point, where you can start entering shell commands.

Options for accessing Linux from your device

- MS Windows: install the Putty app to remotely log in to the CS department linux servers. (putty.org)
- Mac: Use the terminal app (it's Unix underneath) to access files on your system. Or log in remotely to the dept servers using the ssh command in the terminal app.
- Windows PC: you can install Linux if you want (NOT RECOMMENDED, proceed at your own risk!!).
  - Consider using virtualbox. It allows you to have windows and linux on one machine (see youtube videos).
- Tablets/Mobile phones: there are apps that let you remotely login in to Linux/Unix machines.

Secure File Transfer from Windows or Mac

- **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://eros.cs.txstate.edu
  - fill in net-id, password then click Quickconnect
  - then drag and drop files to copy between machines
- CS Lab computers have an app called **WinSCP** (icon on the desktop) that works like Filezilla.

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++ to compile c++ files.

Note: to get g++ and clang++ for Mac OSX you should install XCode, including command line tools.

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
```

- `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
```

- You can also use the secure copy command: scp (man or google it).

Or just use FileZilla …