

# Linux Boot Camp

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# Connecting

**SSH**

Windows users: PuTTY (or SSH Tectia)

Mac & Linux users: Terminal (Just type `ssh`!)

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**Files**

Windows, Mac, Linux users: Filezilla

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Discouraged for use with text editing - more on that later

# Welcome!

```
$ ls
$ cd private
$ mkdir 15-213
$ cd 15-213
$ mv ~/Downloads/datalab-handout.tar .
$ tar xvf datalab-handout.tar
$ cd datalab
```

# Terminal Shortcuts

- ~ is an alias to your *home directory*.
  - Ex: `cp foo.txt ~`
- . is an alias to your *present directory.*
  - Ex: `cp ~/foo.txt .`
- .. is an alias to the *parent directory.*
  - Ex: `cp ~/foo.txt ..`
- * will match *as many characters as it can.*
  - Ex: `cp ~/*.txt .`
  - Ex: `objdump -d *`
  - Ex: `rm *.c` **(be very *very* *very* careful!!)**
    - **There is no trash with `rm`. It is gone.**

# More Terminal Shortcuts

- Pressing tab will autocomplete filenames.
- Use the up+down arrow keys to scroll through your previous commands.
- Control+R lets you search your command history.
- Control+A jumps to the beginning of the line.
- Control+E jumps to the end of the line.
- Control+U clears everything to the left of the cursor.
- Control+C kills your current program.
- Control+D (on a blank line) exits the terminal.
- Control+L clears your screen.

# Fancy Terminal Shortcuts

- Bash automatically splits things up in brackets!
  - Ex: `cp foo{1,2}.txt = cp foo1.txt foo2.txt`
  - Ex: `cp foo.txt{,.bak} = cp foo.txt foo.txt.bak`
  - For when typing the same filename gets annoying
- Bash has `for` loops!
  - Ex: Append “15-213” to every file ending in .c

```
for file in *.c; do echo “15-213” >> $file;
done
```

- Have fun, but don’t break things or lose track of time

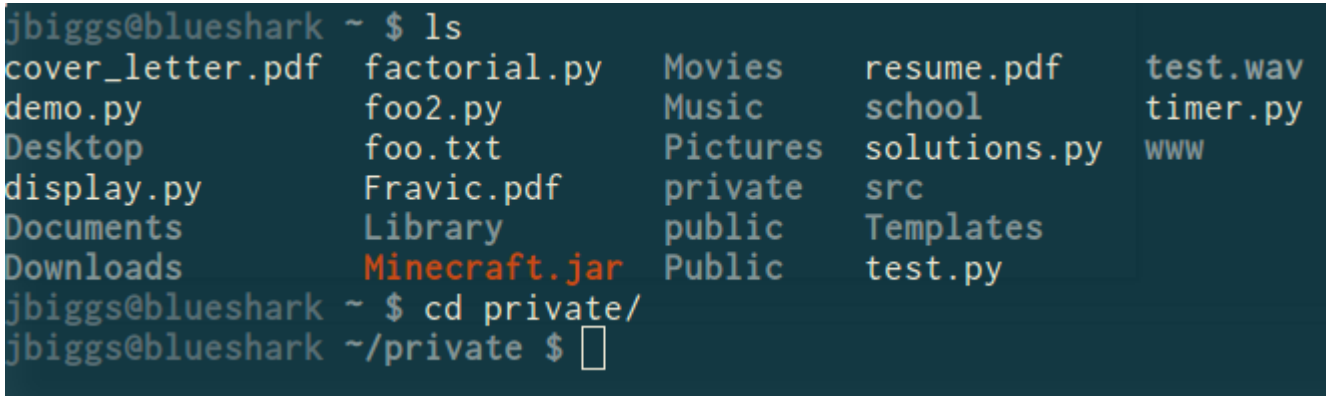
# `ls <dir>`

- Lists the files in the present working directory, or, if specified, `dir`.
  - -l lists ownership and permissions.
  - -a shows hidden files (“dotfiles”).
- `pwd` tells you your present working directory.

```
jbiggs@blueshark ~ $ ls
cover_letter.pdf  factorial.py   Movies    resume.pdf    test.wav
demo.py           foo2.py        Music     school        timer.py
Desktop           foo.txt        Pictures  solutions.py  www
display.py        Fravic.pdf     private   src
Documents         Library        public    Templates
Downloads         Minecraft.jar  Public    test.py
jbiggs@blueshark ~ $ pwd
/afs/andrew.cmu.edu/usr10/jbiggs
jbiggs@blueshark ~ $
```

# `cd <directory>`

- Try running `cd -` to return to the previous directory.
- Try running `cd ..` to return to the parent directory.
- Changes your present working directory.



# `mkdir <dirname>`

- Makes a directory `dirname` in your present working directory.
- Directories and folders are the **same thing!**

```
jbiggs@blueshark ~ $ ls
cover_letter.pdf  factorial.py   Movies    resume.pdf    test.wav
demo.py           foo2.py        Music     school        timer.py
Desktop           foo.txt        Pictures  solutions.py  www
display.py        Fravic.pdf     private   src
Documents         Library        public    Templates
Downloads         Minecraft.jar  Public    test.py
jbiggs@blueshark ~ $ cd private/
jbiggs@blueshark ~/private $ mkdir 15-213
jbiggs@blueshark ~/private $ cd 15-213
jbiggs@blueshark ~/private/15-213 $
```

# `mv <src> <dest>`

- `cp` works in exactly the same way, but copies instead
  - for copying folders, use `cp -r`
- `dest` can be into an existing folder (preserves name), or a file/folder of a different name
- `src` can be either a file or a folder

```
jbiggs@blueshark ~ $ cd private/
jbiggs@blueshark ~/private $ mkdir 15-213
jbiggs@blueshark ~/private $ cd 15-213
jbiggs@blueshark ~/private/15-213 $ mv ~/Downloads/datalab-handout.
tar .
```

# `tar <options> <filename>`

- For full list of options, see `man tar`
- `tar` stands for **t**ape **ar**chive. Was used on tapes!
- `x` - extract, `v` - verbose, `f` - file input
- All of our handouts will be in `tar` format.

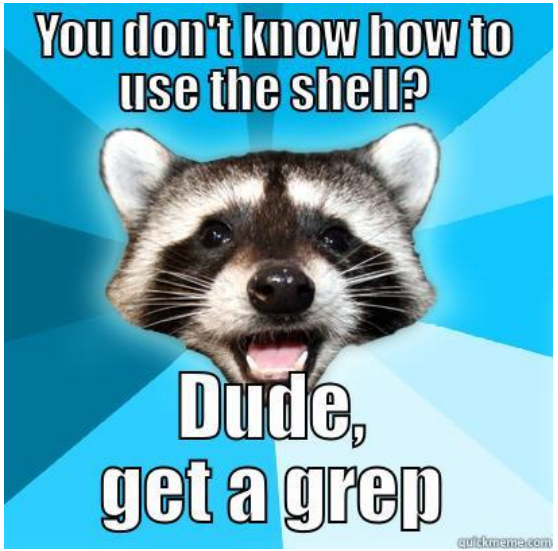
```
jbiggs@blueshark ~/private/15-213 $ tar xvf datalab-handout.tar
datalab-handout/
datalab-handout/bits.c
datalab-handout/Makefile
datalab-handout/README
datalab-handout/btest.h
datalab-handout/btest.c
datalab-handout/bits.h
datalab-handout/decl.c
datalab-handout/tests.c
datalab-handout/fshow.c
```

# Also, `rm <file1> <file2> … <filen>`

- To remove an (empty) directory, use `rmdir`
  - To remove a folder and its contents, use `rm -rf`
    - **Please be careful, don't delete your project.**
    - **There is no "Trash" here. It's gone.**
    - **Contact ugradlabs@cs.cmu.edu to restore.**
    - **Latest restore is up to a day old!**

# What's in a file? (using `grep`)

- `grep <pattern> <file>` will output any lines of `file` that have `pattern` as a substring
  - `grep -v` will output lines *without* pattern as substring
  - `grep -n` prints line numbers
  - `grep -R` will search *recursively*
- Try it: `grep 'phase' bomb.c`
  - `grep -v -n 'printf' src.c`
  - `grep -R 'unsigned' .`



# pipes and redirects

- A *pipe* redirects output from one program as input to another program.
  - Ex: `objdump -d bomb | grep "mov"`
  - Ex: `ls *.c | grep malloc`
  - Ex: `ls -l | grep jbiggs | wc -l`
- Can *redirect* output to a file.
  - Ex: `cmd arg1 … argn > file.txt` will write the output of `cmd` **over** `file.txt`.
  - Ex: `cmd arg1 … argn >> file.txt` will append the output of `cmd` to `file.txt`.

# Looking for something? `grep -A -B`

- `grep -B <x>`: include x lines **B**efore match.
- `grep -A <y>`: include y lines **A**fter match.
- Ex: `objdump -d | grep -A 25 explode_bomb`
- Ex: `grep -B 20 return *.c`

# What's in a file? (using `cat`)

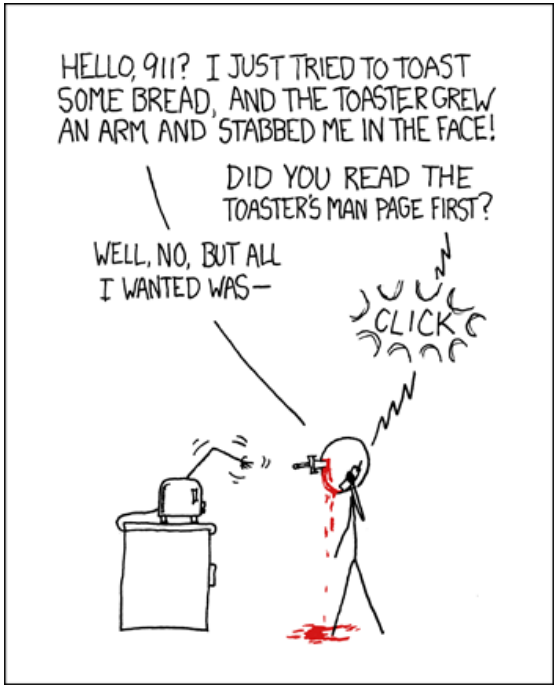
- `cat <file1> <file2> … <filen>` lets you display the contents of a file in the terminal window.
  - Use `cat -n` to add line numbers!
- You can *combine* multiple files into one!
  - `cat <file1> … <filen> >> file.txt`
- Good for seeing what's in small files.
- Try `cat -n bomb.c`. Too big, right?

# What's in a file? (using `less`)

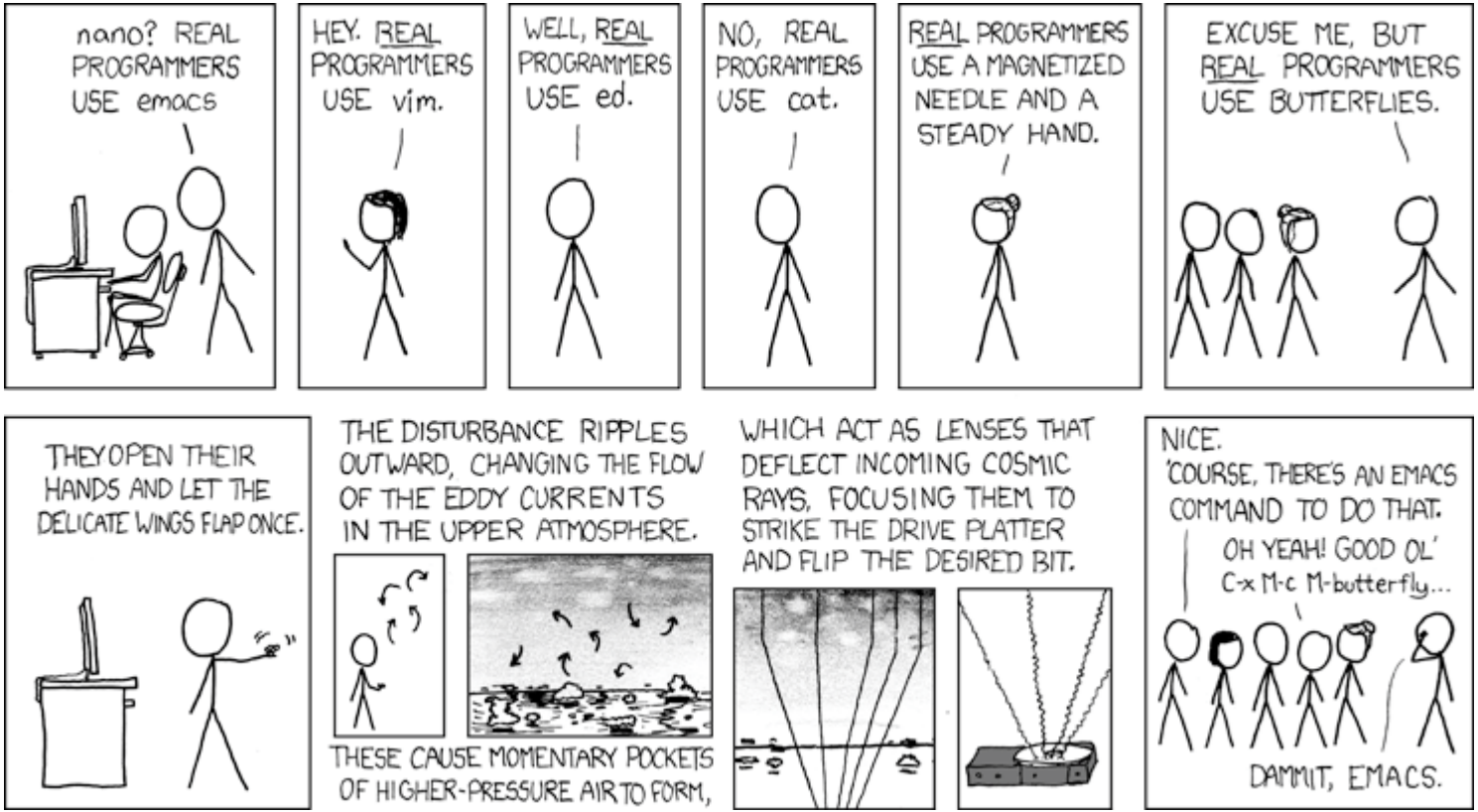
- `less <file>` will give you a scrollable interface for viewing large files **without** editing them.
  - To find something, use `/`
    - To view the next occurrence, press `n`
    - To view previous occurrence, press `N`
  - To quit, use `q`
- Try it: Type "`/phase`"

# `man <thing>`

- What is that command? What is this C standard library function? What does this library do?
  - Pages viewed with `less`
  - Try it!
    - `man grep`
    - `man tar`
    - `man strlen`
    - `man 3 printf`
    - `man stdio.h`
    - `man man`



# Editors (a touchy subject)



# Editors (a touchy subject)

- `vim` is nice, made for very powerful text editing
  - Try running `vimtutor` to get started learning
- `emacs` is nice, made to be more versatile
  - Definitely do the emacs tutorial in emacs, “ctrl-h t”
- `gedit` has a GUI, but requires X Forwarding setup. Too platform-dependent to show here, sadly.
- I **strongly** recommend editing on the terminal.
- **Gist**: Use an editor with auto-indent and line numbers

# `screen`

- Run simultaneous programs in different “tabs”
- <Control-a>, then press c: create new tab
- <Control-a>, then press k: kill current tab
  - Consider exiting bash rather than killing window (bad)
- <Control-a>, then press n: go to next tab
- <Control-a>, then press p: go to previous tab
- <Control-a>, then press <number>: go to tab <number>
- <Control-a>, then press a: send “Control-a” to window
- <Control-a>, then press ?: help
- All other shortcuts stay, `screen` only binds to <Control-a>

# Editors (if you really really just want a GUI)

- Simple answer: Go to a Linux cluster on-campus, open a terminal, and run:

```
ssh -Y andrewid@shark.ics.cs.cmu.edu
```

- Now you can run `gedit <filename> &`
- `&` *forks* your process into the background so you can use the prompt without waiting for `gedit` to finish

# Editors (if you really, **really** just want a GUI)

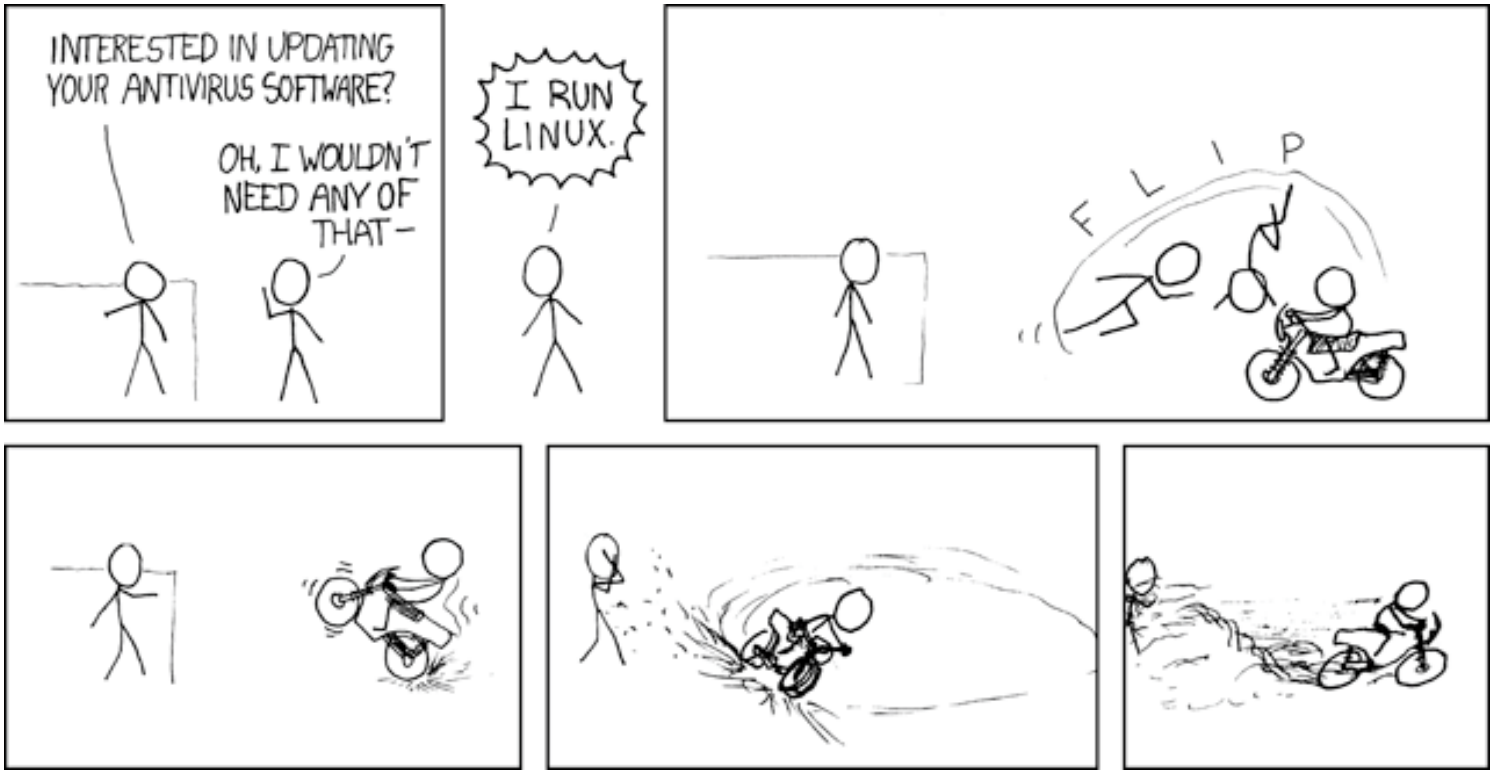
- Not-so-simple answer: Google “How to install X Forwarding on <platform>”
  - Mac: You need XQuartz
  - Windows: You need XMing and PuTTY
- This allows you to execute GUI applications on the shark machines, but have the GUI appear on your computer.

# A word about editing locally and using (S)FTP

- We heavily discourage this.
- It is a pain.
- You will ***waste time***.
  - Edit the file
  - Save the file
  - Upload the file
  - FTP: “Do you want to replace this file?”
  - Every **single *time!*** (ノ °□° )ノ ⌒ ┻━┻)
- You will likely have to have a console on the shark machines open for `gdb` and compilation anyway.
  - Use `screen`!

# Commands related to 15-213

- `gdb`, the **G**NU **D**e**b**ugger, will be used for bomb lab.
- `objdump` displays the symbols in an executable.
- `gcc` is the **G**NU **C** **C**ompiler.
- `make` is a configurable build system often used for compiling programs.
- We will provide other tools in the handouts as well


INTERESTED IN UPDATING YOUR ANTIVIRUS SOFTWARE?
OH, I WOULDN'T NEED ANY OF THAT-
I RUN LINUX.
F L I P

# Vim Tutorial

- Basics (Quick `vimtutor` walkthrough)
- Splits & Tabs
  - Splitting the same file
- Specific, useful shortcuts (gd, %, null register, indent)
- Visual mode
- Find
  - Basic Regular Expressions
- Find-and-Replace
- Macros (super awesome!)
- Materials: http://cs.cmu.edu/~213/recitations/bootcamp.zip

# Git Tutorial

- GitLab hosting: https://git.ece.cmu.edu/
- `git clone git@git.ece.cmu.edu:<andrewid>/<repo>`
- `git status`
- `git add`
- `git commit -a`
- `git push`
- `git log`
- `git rm`
- `git diff`
- `git pull`
- Visit a TA if you need help or want to do something advanced.

# Resources

- Quick references: cs.cmu.edu/~213/resources.html
- CMU Computer Club
  - www.contrib.andrew.cmu.edu/~sbaugh/emacs.html
  - club.cc.cmu.edu/talks/fall15/power-vim.html
  - club.cc.cmu.edu/talks/fall15/power-git.html
- Great Practical Ideas
  - www.cs.cmu.edu/~15131/f15/topics/bash/
  - www.cs.cmu.edu/~15131/f15/topics/git/
- Official manuals
  - `info bash / info emacs`
  - `:help` in Vim
  - `git help`