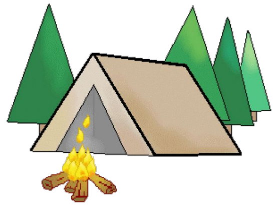

Linux and Git Boot Camp

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Jan. 22, 2017

Connecting Clients

<u>SSH</u>

Windows users: MobaXterm, PuTTY, SSH Tectia

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

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

I Need You To Make A Directory

```
$ ls
$ cd private
$ mkdir 15-213
$ cd 15-213
```

File Transfers

- Download datalab-handout.tar from Autolab
- Use MobaXTerm’s file transfer dialog if you’re on Windows
- On Linux or Mac OS X:

```
$ sftp andrew@shark.ics.cs.cmu.edu:private/15-213
sftp> help
(read help for ‘cd’, ‘lcd’, ‘pwd, ‘lpwd’, ‘get’,
‘put’, etc.)
```

Also, you can use FileZilla! Here’s a detailed guide:
http://cs.cmu.edu/~213/recitations/using_filezilla.pdf

Continue On...

```
$ ls
$ cd private
$ mkdir 15-213
$ cd 15-213
$ tar xvpf datalab-handout.tar
$ cd datalab-handout
```

Git

THIS IS GIT. IT TRACKS COLLABORATIVE WORK ON PROJECTS THROUGH A BEAUTIFUL DISTRIBUTED GRAPH THEORY TREE MODEL.
COOL. HOW DO WE USE IT?
NO IDEA. JUST MEMORIZE THESE SHELL COMMANDS AND TYPE THEM TO SYNC UP. IF YOU GET ERRORS, SAVE YOUR WORK ELSEWHERE, DELETE THE PROJECT, AND DOWNLOAD A FRESH COPY.

Git Setup

```
$   git config --global user.name "<Your Name>"
$   git config --global user.email <Your email>
$   git config --global push.default simple
```

Git Setup

```
$ git init
$ echo '*          (press enter!)
> !.gitignore      (again!)
> !bits.c' > .gitignore
$ git add .gitignore
```

When you want to save your progress:

```
$ git add bits.c
$ git commit          (opens a text editor for writing a commit message)
```

Gitlab Setup

```
$ ssh-keygen -t rsa -C "GitLab" -b 4096
```

Use the default file path (press Enter), and optionally type in a password. (press Enter if you don’t want one)

```
$ cat ~/.ssh/id_rsa.pub
```

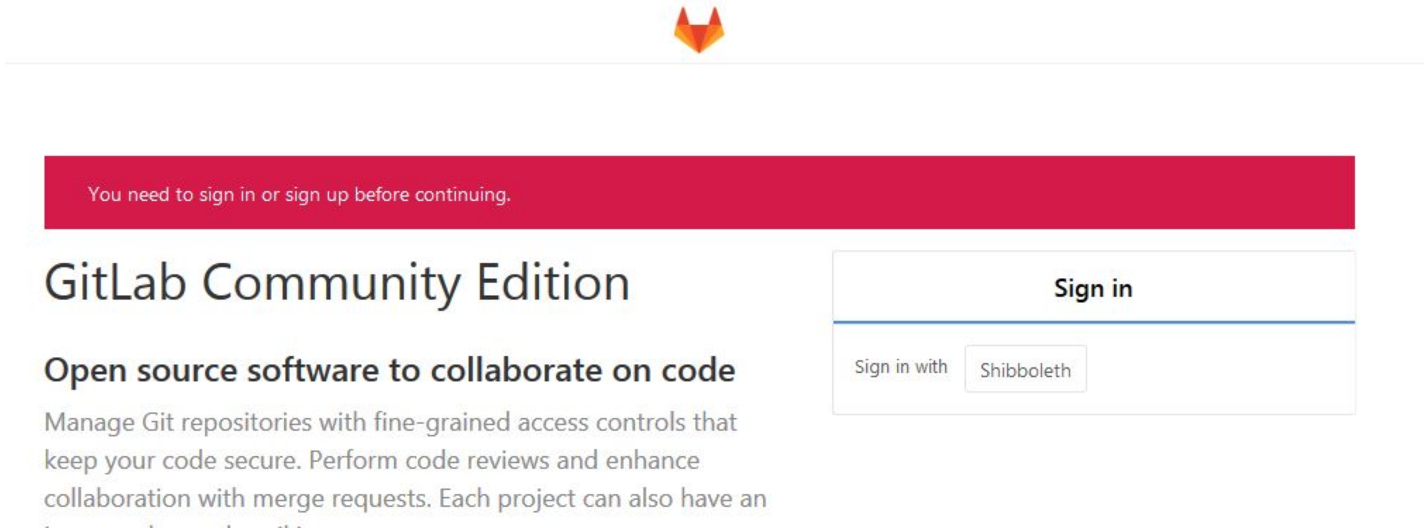
Your public key will be printed.

Highlight it with the mouse and press

- Cmd+c if you are on a mac
- Ctrl+c if you are on windows

GitLab Setup

Sign into GitLab through Shibboleth


You need to sign in or sign up before continuing.

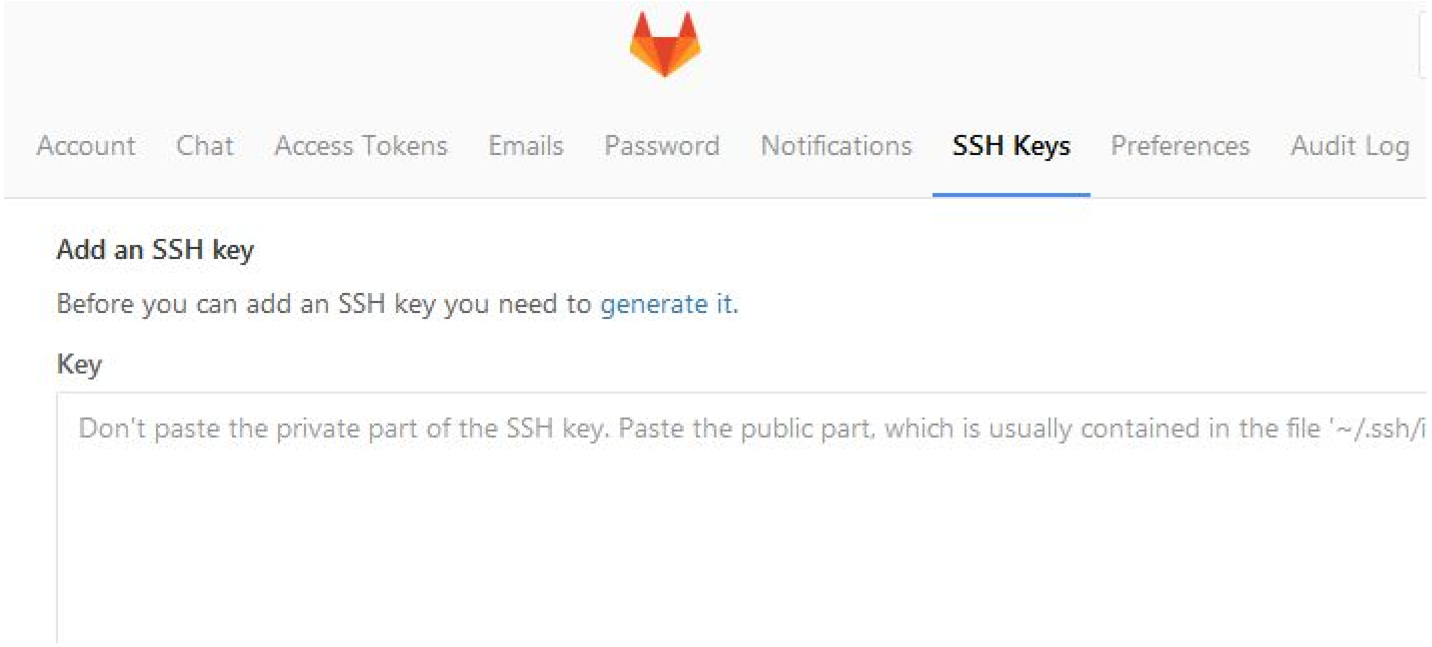
GitLab Community Edition

Open source software to collaborate on code

Manage Git repositories with fine-grained access controls that keep your code secure. Perform code reviews and enhance collaboration with merge requests. Each project can also have an

GitLab Setup

Paste the public SSH key into the text field here.



Add an SSH key

Before you can add an SSH key you need to generate it.

Key

Don't paste the private part of the SSH key. Paste the public part, which is usually contained in the file '~/.ssh/i

GitLab Setup

Create a new project in GitLab, call it “datalab-213s17”

GitLab Setup

```
$ git remote add origin git@git.ece.
   cmu.edu:andrewid/datalab-213s17.git
$ git push -u origin master
```

Git Setup

```
$ git init
$ echo '*        (press enter!)
> !.gitignore   (again!)
> !bits.c' > .gitignore
$ git add .gitignore
```

When you want to save your progress:

```
$ git add bits.c
$ git commit          (opens a text editor for writing a commit message)
$ git push
```

Git Commands

`add`	Stage new or changed files	`rebase`	Modify, combine, delete, ... previous commits
`commit`	Save current staged files	`merge`	Combine commits from specified branch into current branch
`push/pull`	Push/pull local index to/from the remote server	`checkout`	Examine a different commit/branch/file
`log`	Show history of git commits	`stash`	Temporarily save your current uncommitted changes
`status`	Shows working directory status (added/modified/deleted files)	`stash pop`	Restore previously stashed changes
`show`	Show a file from a different commit or branch	`diff`	Show changes between commits, files, unstaged changes, ...
`branch`	Create a new branch (use a new branch for experimenting safely)	`clone`	Clone a git repository (like a remote GitLab repo)

More Git

Getting help:

- `git help <command>`
- Piazza/Office hours

Git tutorials:

- https://www.atlassian.com/git/tutorials
- https://try.github.io

Terminal Shortcuts

The command line operates on one directory at a time (the "working directory").

You can use these shortcuts whenever a directory or file path is expected.

	Meaning	Example
`~`	Home directory	`cp foo.txt ~`
`.`	Working (current) directory	`cp ~/foo.txt .`
`..`	Parent directory	`cp ~/foo.txt ..`
`-`	Previous directory	`cd -`

`*`	Match as many characters as possible	`cp ~/*.txt`
		`rm *.c`

- **Be very *very* *<u>very</u>* careful with rm!!!**
  - **There is no trash with `rm`. It is <u>gone.</u>**

More Terminal Shortcuts

- Pressing tab will autocomplete file/directory names.
- 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.

`ls <dir>`

- Lists 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.

`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!**

`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

`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, `p` - keep perms
- All of our handouts will be in `tar` format.

`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!**

- **Restore most recent version yourself if you use git!**

pipes and redirects

- A *pipe* redirects output from one program as input to another program.
  - Ex: `ls *.c | grep malloc`
  - Ex: `ls -l  | grep jbiggs | wc -l`
- Can *redirect* output to a file.
  - Ex: `echo hello >  file.txt` writes "hello" **over** `file.txt`.
  - Ex: `echo hello >> file.txt` *appends* "hello" to `file.txt`.

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

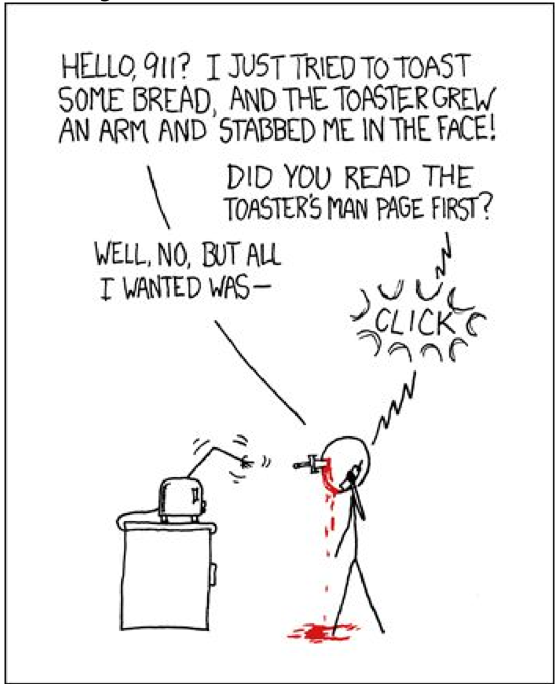
- `cat <file1> <file2> … <filen>` lets you display the contents of a file in the terminal window.
  - Use `cat -n` to add line numbers!
- You can *combine* multiple files into one!
  - `cat <file1> … <filen> >> file.txt`
- Good for seeing what's in small files.
- Try `cat -n bomb.c`. Too big, right?

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: Open your datalab file, search for strings

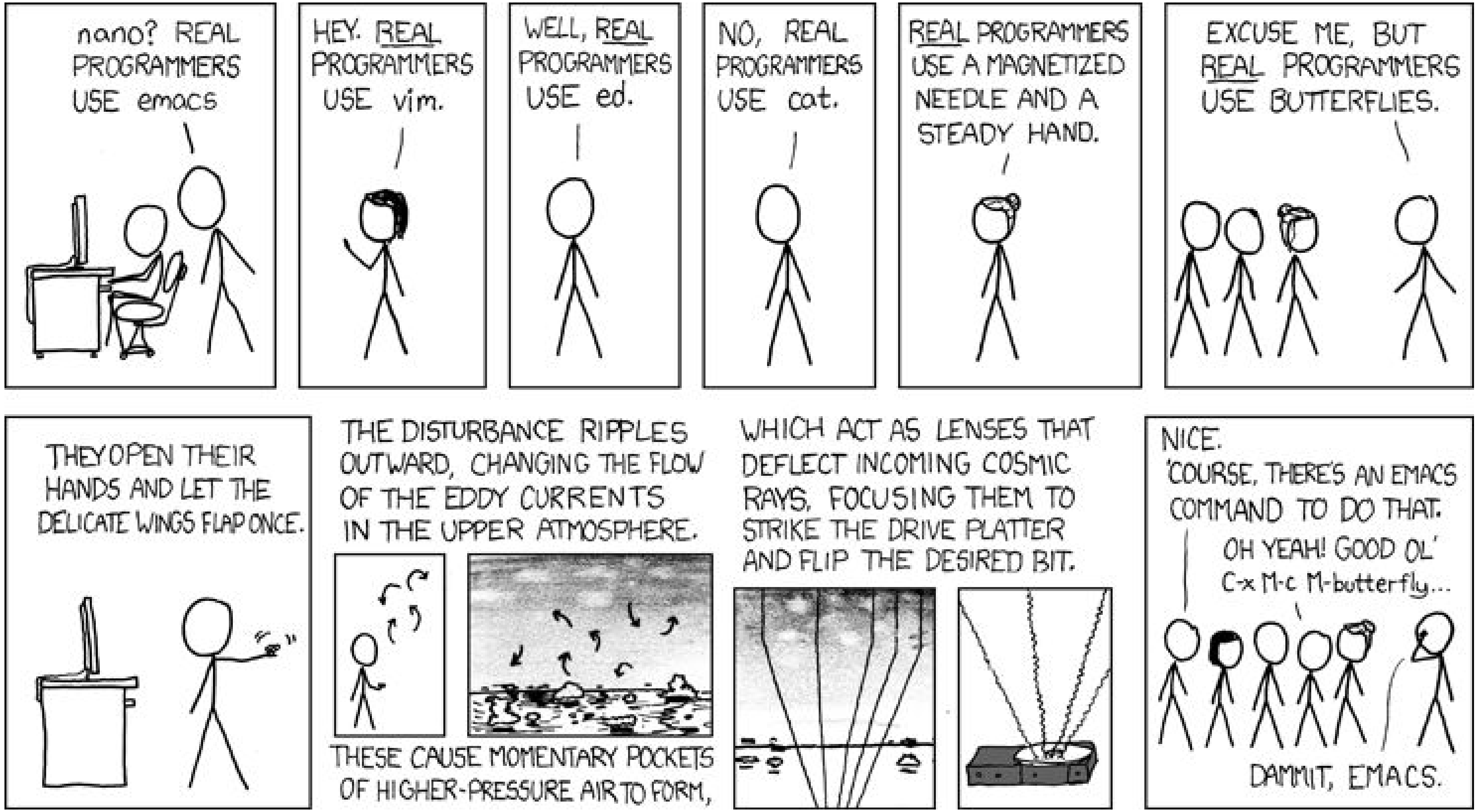
`man <thing>`

- 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`


HELLO, 911? I JUST TRIED TO TOAST SOME BREAD, AND THE TOASTER GREW AN ARM AND STABBED ME IN THE FACE!
DID YOU READ THE TOASTER'S MAN PAGE FIRST?
WELL, NO, BUT ALL I WANTED WAS—
CLICK

Appendix

Editors (a touchy subject)


nano? REAL PROGRAMMERS USE emacs
HEY. REAL PROGRAMMERS USE vim.
WELL, REAL PROGRAMMERS USE ed.
NO, REAL PROGRAMMERS USE cat.
REAL PROGRAMMERS USE A MAGNETIZED NEEDLE AND A STEADY HAND.
EXCUSE ME, BUT REAL PROGRAMMERS USE BUTTERFLIES.
THEY OPEN THEIR HANDS AND LET THE DELICATE WINGS FLAP ONCE.
THE DISTURBANCE RIPPLES OUTWARD, CHANGING THE FLOW OF THE EDDY CURRENTS IN THE UPPER ATMOSPHERE.
THESE CAUSE MOMENTARY POCKETS OF HIGHER-PRESSURE AIR TO FORM,
WHICH ACT AS LENSES THAT DEFLECT INCOMING COSMIC RAYS, FOCUSING THEM TO STRIKE THE DRIVE PLATTER AND FLIP THE DESIRED BIT.
NICE.
'COURSE, THERE'S AN EMACS COMMAND TO DO THAT.
OH YEAH! GOOD OL' C-x M-c M-butterfly...
DAMMIT, EMACS.

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
  - Emacs tutorial in emacs: “Ctrl-h t”
- `gedit` has a GUI
  - Requires X Forwarding: See Appendix
- I **strongly** recommend editing on the terminal.
- **Gist**: Use an editor with auto-indent and line numbers

Configuring bash

The file `~/.bashrc` is run every time you log in.

Put the following code:

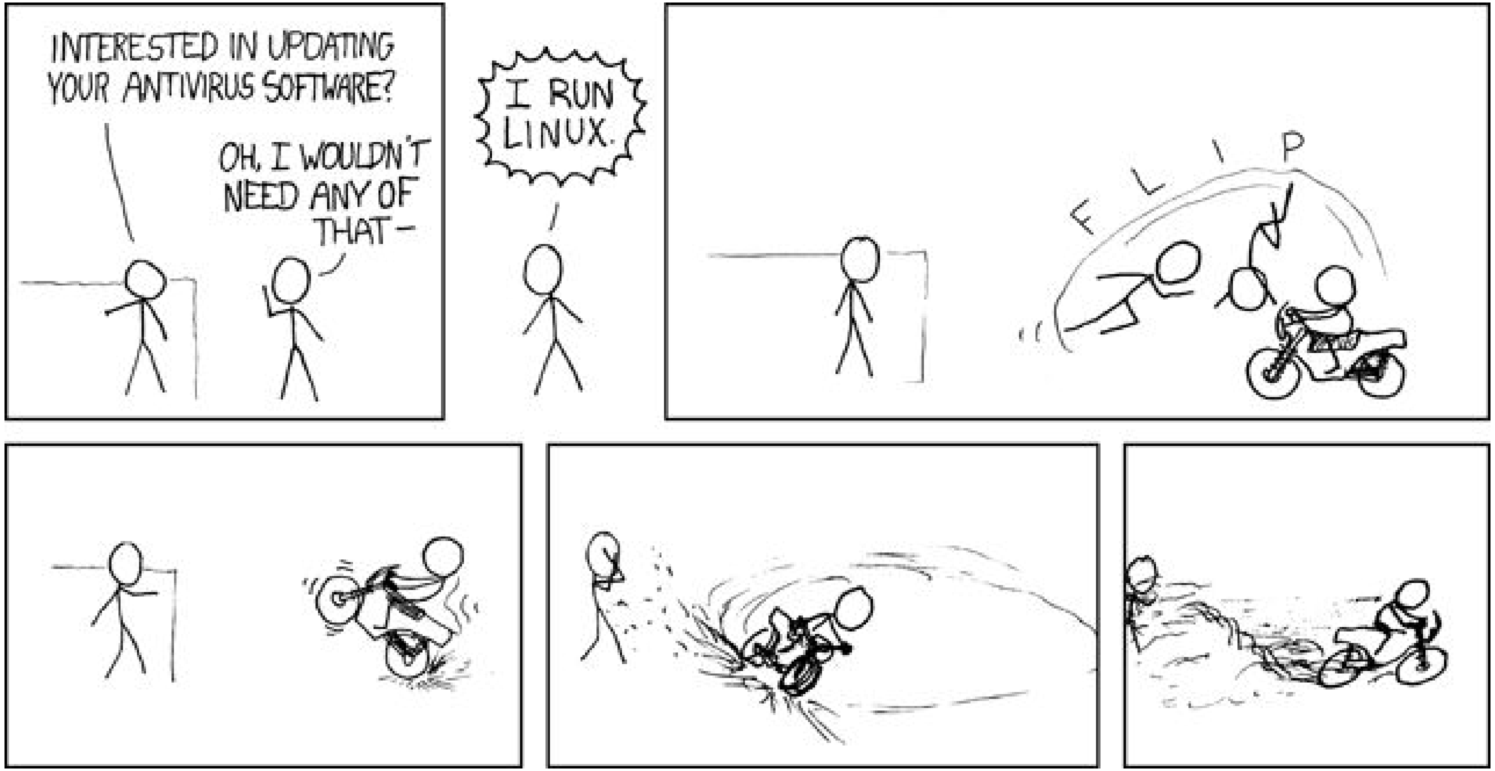
```
PS1="[\u@\h:\w] \$ "
alias ls='ls --color=auto'
```

to change your prompt to look like:

```
[szz@makoshark:~/private/15213] $ ls
attacklab  bomblab  lab-answers
```

Commands related to 15-213

- `gdb`, the **G**NU **Deb**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.
FLIP

Vimtutor Walkthrough

- Chapters 1-3
- Cheatsheet: `http://bit.ly/2cl0lJ0`

Resources

Ask the Course Staff!

http://cs.cmu.edu/~213/help/

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

tmux

```
$ tmux
```

Ctrl+b, then c: create a new tab

Ctrl+b, then n: move to next tab

Ctrl+b, then p: move to previous tab

Ctrl+b, then x: kill the current tab

Ctrl+b, then ?: help

Ctrl+b, then ": split horizontal

Ctrl+b, then %: split vertical

Ctrl+b, then arrow keys: move between panes

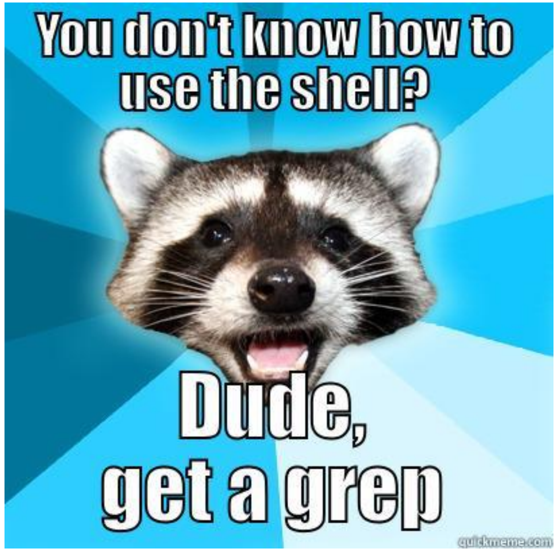
Fancy Terminal Shortcuts

- 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

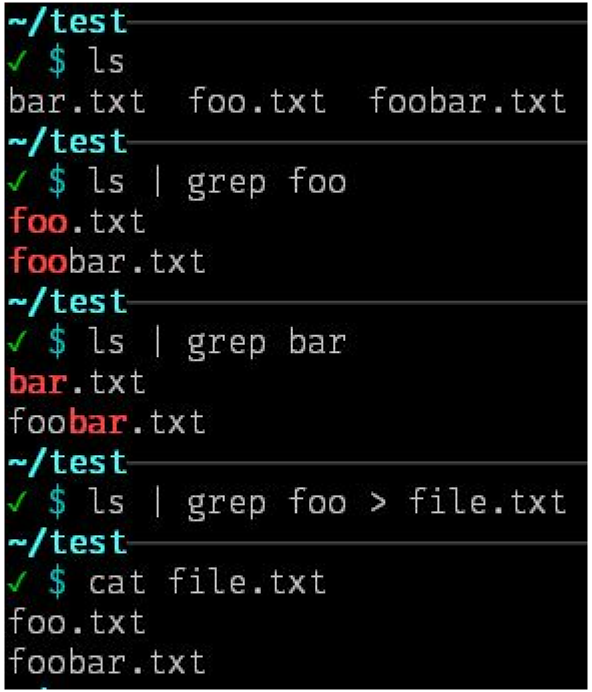
    ```
    for file in *.c; do echo "15-213" >> $file; done
    ```
- Have fun, but don’t break things or lose track of time

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 -n 'printf' src.c`
  - `grep -R 'unsigned' .`



Looking for something? `grep -A -B`



```
~/test
✓ $ ls
bar.txt   foo.txt   foobar.txt
~/test
✓ $ ls | grep foo
foo.txt
foobar.txt
~/test
✓ $ ls | grep bar
bar.txt
foobar.txt
~/test
✓ $ ls | grep foo > file.txt
~/test
✓ $ cat file.txt
foo.txt
foobar.txt
```

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