Linux Overview

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VMWare

- **Installation**

VMware Workstation 17 Player

VMware Workstation Player

VMware Workstation Player is an ideal utility for running a single virtual machine on a Windows or Linux PC. Organizations use Workstation Player to deliver managed corporate desktops, while students and educators use it for learning and training.

The free version is available for non-commercial, personal and home use. We also encourage students and non-profit organizations to benefit from this offering.

Commercial organizations require commercial licenses to use Workstation Player.

Need a more advanced virtualization solution? Check out Workstation Pro.

Try Workstation 17 Player for Windows

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Try Workstation 17 Player for Linux

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VMWare

- **Setting**

VMWare

- **Login**
  - ID : osboxes.org
  - PW : 1

Overview

- **Cheat sheet**

https://www.guru99.com/linux-commands-cheat-sheet.html

Connecting

SSH

Windows users: PuTTY
(http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html)

Mac/Linux users: Use 'ssh' command at terminal

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

Files

Windows: Tectia file transfer

Mac/Linux users: Use 'scp' command at terminal:

scp –r andrewid@unix.andrew.cmu.edu:~private/myfolder /some/local/folder

scp myfile.c andrewid@unix.andrew.cmu.edu:~private/myfolder

Welcome!

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

Some Nice Terminal Shortcuts

- Pressing *tab* will autocomplete file and folder names!
- `Control+C` will stop execution of your current program!
- `Control+R` will let you search your command history!
- `Control+L` will clear your screen!
- `cmd arg1 … argN > file1.txt` will put the output of `cmd` into `file1.txt`!
- `cmd arg1 … argN < file2.txt` will pull the input of `cmd` from `file2.txt`!
- Use the up and down arrow keys to scroll through your command history!

Linux file pathing

- **~ is your HOME DIRECTORY**
  - This is where you start from after you SSH in
  - On bash, you can also use $HOME
- **. is an alias for your PRESENT WORKING DIRECTORY!**
- **.. is the file path for the PARENT DIRECTORY of your present working directory!**
- **/ is the file path for the TOP-LEVEL DIRECTORY**
  - You probably won't use this too much in this class

`ls <dir>` - LiSt

- Lists the files in the present working directory, or, if specified, `dir`.
- `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> - Change Directory

- Changes your present working directory to `directory`
- Your main tool for navigating a unix file system

```
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 <dirname> - MaKe DIRectory

- 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> - MoVe

- 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
- Also used to re-name files without moving them
- 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>` - Tape ARchive

- Compression utility, similar to zip files on Windows
- For full list of options, see `man tar`
- As name suggests, 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
```

chmod <permissions> <src>

- **chmod is used to change the permissions of a file or directory.**
  - `777` will give all permissions
  - `src` can be either a file or a folder

```
[sgoyal@makoshark datalab-handout]$ ls
bddcheck  btest    decl.c         Driverlib.pm  fshow.c  Makefile
bits.c    btest.c  dlc            driver.pl     ishow    README
bits.h    btest.h  Driverhdrs.pm  fshow         ishow.c  tests.c
[sgoyal@makoshark datalab-handout]$ chmod 777 btest
[sgoyal@makoshark datalab-handout]$
```

scp <src> <dest>

- **Allows files to be copied to/from or between different hosts.**
  - The full path to the remote host needs to be specified
  - Use the `-r` option to copy folders

```
[sgoyal@makoshark datalab-handout]$
[sgoyal@makoshark datalab-handout]$
[sgoyal@makoshark datalab-handout]$
[sgoyal@makoshark datalab-handout]$ scp -r bovik@shark.ics.cs.cmu.edu:/afs/andrew
.cmu.edu/usr/bovik/private/15213/datalab-handout some/local/folder
```

`rm <file1> <file2> … <filen>` - ReMove

- **Essentially the delete utility**
- **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.**
    - **If someone asks you to use `rm -rf /` ignore them**

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

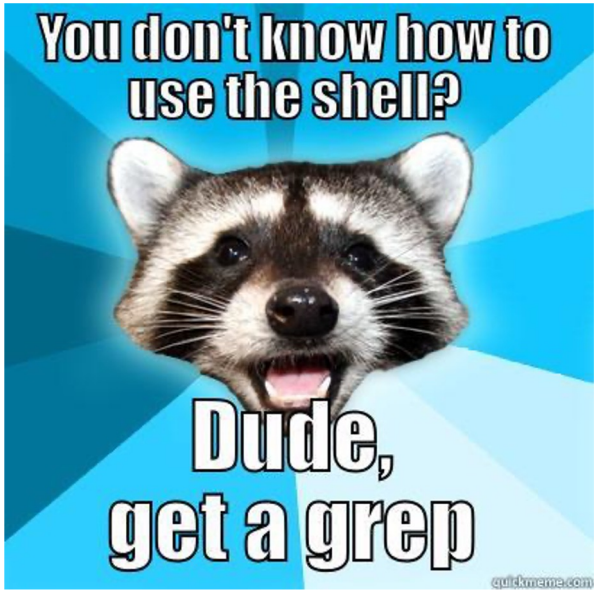
- **`cat <file1> <file2> … <filen>` lets you display the contents of a file in the terminal window.**
  - Use `cat -n` to add line numbers!
- **You can *combine* multiple files into one!**
  - `cat <file1> … <filen> > file.txt`
- **Good for seeing what's in small files.**
- **Try `cat -n bits.c`. Too 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 "`/isPower2`"**

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

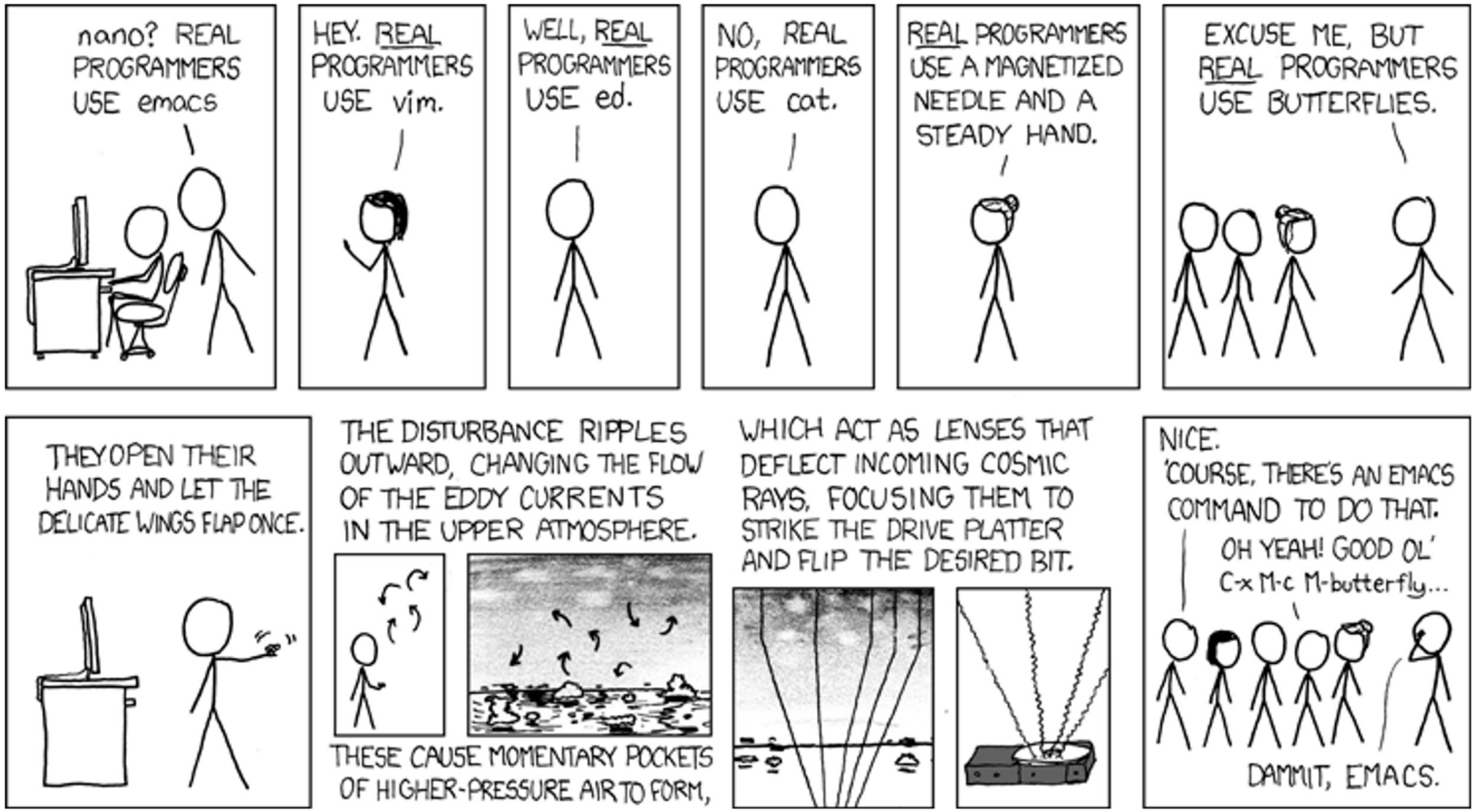
- **`grep <pattern> <file>` will output any lines of `file` that have `pattern` as a substring**
  - `grep -v` will output lines *without* pattern as substring
  - `grep -R` will search *recursively*
- **Try it: `grep 'isPower2' bits.c`**
  - `grep -v '*' bits.c`
  - `grep -R 'unsigned' .`



`man <thing>`

- What is that command? What is this C standard library function? What does this library do? Check to see if it has a `man` page!
- Pages viewed with `less`
- Try it!
  - `man grep`
  - `man tar`
  - `man printf`
  - `man strlen`

Editors (a touchy subject)



Vim (vi – improved) Basics

- **Some different modes:**
  - Normal mode:
    - The first mode you enter. Hit the **escape key** to return to this mode at any time
    - Everything entered here is interpreted as a *command*
  - Command-line mode:
    - Used for entering *editor commands* (necessary to save file & quit the editor)
    - Enter **":"** in Normal mode to get to this mode
  - Insert mode:
    - To edit text
    - Enter **"i"** in Normal mode to get to this mode

Vim Basics

- **Useful commands:**
  - Copying/pasting/deleting lines:
    - yy (yank) or 5 yy (yank next 5 lines)
    - dd (delete) or 5 dd (delete next 5 lines)
    - p (paste)
  - Search (/search_string or ?search_string)
- **Useful editor commands:**
  - Write (w)
  - Quit (q) quit no-save (q!)

Vimrc File

- **Stores vim configuration info**
- **Can make your editing experience even better!**
- **Notably:**
  - Smart indentation
  - Line numbers
  - Changing tabs to default to 2 or 4 spaces
  - Colors
- **To edit, type: vim ~/.vimrc**

Vim colors

- Download a .vim color scheme file from the web (or make your own)
- Copy to ~/.vim/colors folder (make this folder if it doesn't exist)
- Some useful places to download color schemes:
  - http://vimcolors.com/
  - http://cocopon.me/app/vim-color-gallery/
- Makes your editor pretty!

```ruby
require 'active_support'

module VimColors
  class RubyExample
    CONSTANT = /^[0-9]+ regex awesomes$/

    attr_reader :colorscheme

    # TODO: Bacon ipsum dolor sit amet
    def initialize(attributes = {})
      @colorscheme = attributes[:colorscheme]
    end

    def self.examples
      # Bacon ipsum dolor sit amet
      ['string', :symbol, true, false, nil, 99.9, 1..2].each do |value|
        puts "it appears that #{value.inspect} is a #{value.class}"
      end

      {:key1 => :value1, key2: 'value2'}.each do |key, value|
        puts "the #{key.inspect} key has a value of #{value.inspect}"
      end

      %w[One Two Three].each { |number| puts number }
    end

    private

    def heredoc_example
      <<-SQL
        SELECT *
        FROM colorschemes
        WHERE background = 'dark'
      SQL
    end
  end
end
```

Jenna's Vimrc File

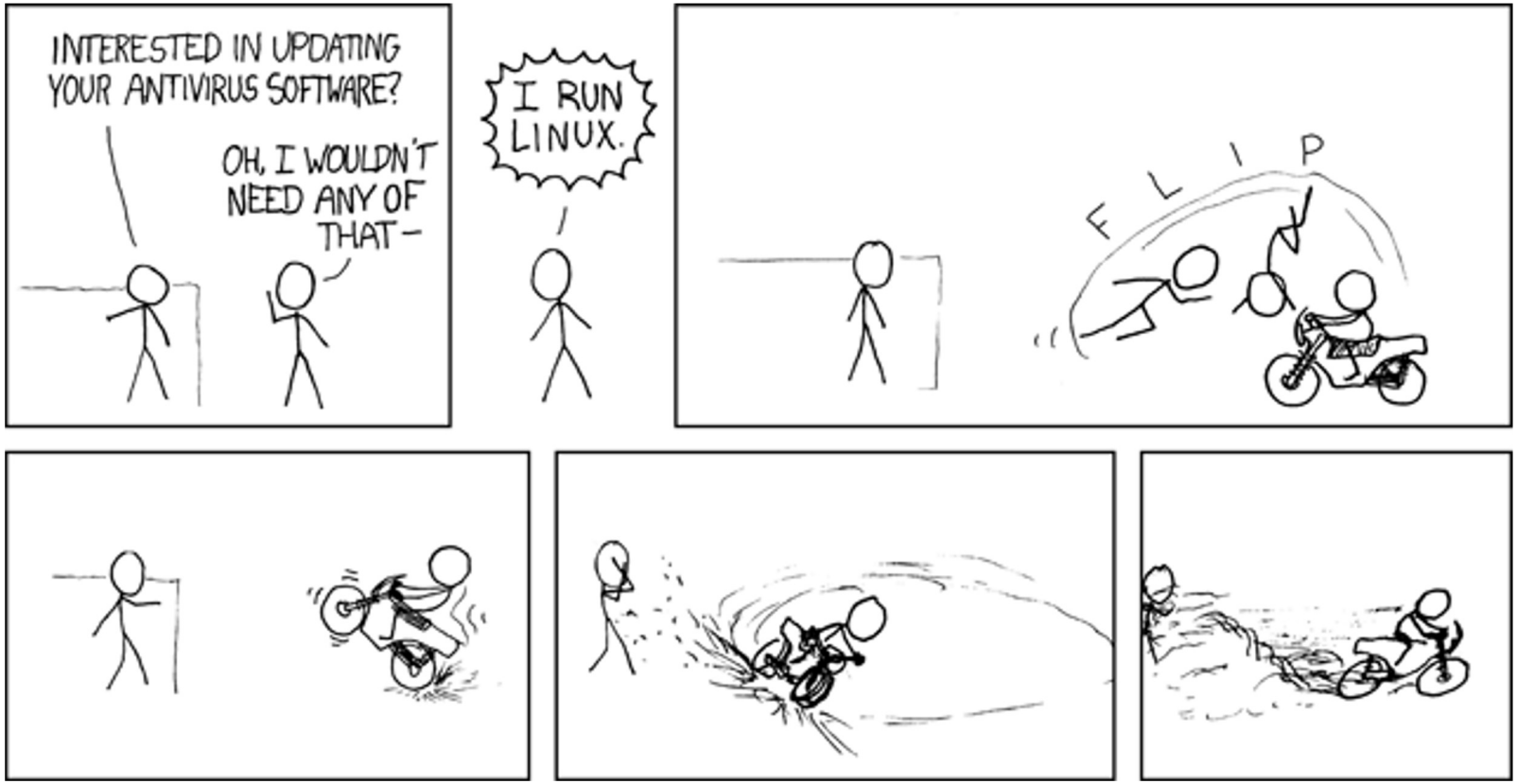
```
set tabstop=2
set shiftwidth=2
set expandtab

set viminfo='100,h
colorscheme desertedocean
set number
syntax on
filetype on
filetype indent on
filetype plugin on
set smartindent
```

More resources on Vim

- A good intro tutorial: http://www.engadget.com/2012/07/10/vim-how-to/
- An interactive tutorial: http://www.openvim.com/
- man vim
- Google

Commands related to this class

- `gdb`, the GNU Debugger, will be used for bomb lab.
- `objdump -d` displays the symbols in an executable.
- `gcc` is the GNU C Compiler.
- `make` reads a configuration file to run a series of commands. Often used for compiling your 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