

asetapen@feynstein [2:04PM] \$ ls -lah

~/Workspace/r1d1/src/prg/innards

total 80

```

drwxr-xr-x  26 asetapen  staff   884B Sep 15 09:57 .
drwxr-xr-x   8 asetapen  staff   272B Aug 26 16:28 ..
drwxr-xr-x   8 asetapen  staff   272B Sep 16 23:03 .svn
-rwxr-xr-x   1 asetapen  staff   850B Aug 26 16:28 Clock.java
-rwxr-xr-x   1 asetapen  staff   3.6K Aug 26 16:28 Key.java
-rwxr-xr-x   1 asetapen  staff   6.9K Aug 26 16:28 NamedGroup.java
-rwxr-xr-x   1 asetapen  staff   3.1K Aug 26 16:28 NamedObject.java
drwxr-xr-x   1 asetapen  staff   476B Aug 26 16:28 appcore
drwxr-xr-x   1 asetapen  staff   238B Aug 26 16:28 buffer
drwxr-xr-x   1 asetapen  staff   176B Aug 26 16:28 design
drwxr-xr-x   1 asetapen  staff   176B Aug 26 16:28 graphics
-rwxr-xr-x   1 asetapen  staff   702B Aug 26 16:28 iStock_Keys.java
-rwxr-xr-x   1 asetapen  staff   3.5K Aug 26 16:28 iKeyInterfaces.java
-rwxr-xr-x   1 asetapen  staff   1.7K Aug 26 16:28 iNamedGroup.java
-rwxr-xr-x   1 asetapen  staff   379B Aug 26 16:28 iNamedObject.java
drwxr-xr-x   7 asetapen  staff   238B Sep  8 14:31 image
drwxr-xr-x  10 asetapen  staff   340B Sep 15 15:10 input
drwxr-xr-x  10 asetapen  staff   340B Aug 26 16:28 math
drwxr-xr-x  19 asetapen  staff   646B Aug 26 16:28 namespace
drwxr-xr-x  10 asetapen  staff   340B Aug 26 16:28 network
-rw-r--r--   1 asetapen  staff   188B Aug 26 16:28 package-info.java
drwxr-xr-x  15 asetapen  staff   510B Aug 26 16:28 providers
drwxr-xr-x   6 asetapen  staff   268B Aug 26 16:28 segments
drwxr-xr-x   4 asetapen  staff   136B Sep 15 09:57 sound
drwxr-xr-x  13 asetapen  staff   442B Aug 26 16:28 ui
drwxr-xr-x  21 asetapen  staff   714B Sep 15 15:10 util

```

Intro to the Command Line

adam.setapen - how.to.make.(almost).anything

asetapen@feynstein [2:09PM] \$ ps aux | grep iTunes

~/Workspace/r1d1/src/prg/innards

```

asetapen 47159  2.3  0.8  499404  34740  ??  S    1:52PM  0:26.00 /Applications/iTunes.app/Contents/MacOS/iTunes -psn_0_3588972
asetapen  153  0.0  0.0  2463248  1580  ??  S    Mon10PM  0:00.69 /Applications/iTunes.app/Contents/Resources/iTunesHelper.app/Contents/MacOS/iTunesHelper -psn_0_49164

```

asetapen@feynstein [2:09PM] \$ cat package-info.java

~/Workspace/r1d1/src/prg/innards

```

/**
 * base software tools, useful for code in general not very specific to robots/applications.
 * should not depend on other packages (content, research, users)
 */
package prg.innards;

```

asetapen@feynstein [2:09PM] \$

~/Workspace/r1d1/src/prg/innards

MIT Media Lab



Components of a {Uni|Linu}x System

- Kernel - The core OS code that manages physical resources (CPU, memory, hard drives, etc.)
- Shells – Programs providing a text-based interface to the OS, a.k.a. the command line interface (CLI)
- Commands, utilities, and applications – The large set of programs that perform specific tasks, e.g. moving files, printing documents, and browsing the web
- Compilers – Software development tools for converting human-understood languages into computer-understood languages
- Desktops / Window Managers – Software providing a graphical user interface (GUI)

Finding your CLI

- Linux - gnome-terminal (you should probably know this already)
- Mac OS X - /Applications/Utilities/ Terminal.app
- Windows - <http://www.cygwin.com/>

Basic Syntax

- `command -options... arguments...`
- `command` – A command understood by the shell or the name of a program
- `options` – An optional set of parameters that modify the behavior of the command
- `arguments` – Required parameters for the command

Basic Commands

- `ls` Display directory contents
- `pwd` Prints the working directory
- `cd` Change the present working directory
- `cp` Copy file(s)
- `rm` Delete file(s)
- `mkdir` Create a directory
- `rmdir` Delete an empty directory
- `chmod` Change file permissions

ls

- `ls -a`
 - displays hidden (i.e., configuration) files
- `ls -F`
 - identifies directories and executables
- `ls -l`
 - gives extra file information
- `ls -lah`
 - shows all files with extra information and human-readable file sizes

Where the F*** am I?

- `pwd`
 - print working directory
- `~`
 - home directory
- `.`
 - current directory
- `..`
 - parent directory
- absolute paths: `/home/username/test_directory`
- relative paths: `./test_directory`

cd

- `cd ~`
 - goes to home directory
- `cd /home/username/jiggle`
 - changes the **working directory**
- `cd ..`
 - changes working directory to `/home/username`

cp, mv

- `cp test.txt test2.txt`
 - makes a copy of test.txt to test2.txt
- `cp ~/Desktop/test.txt ~/Documents/shopping_list.txt`
 - makes a copy of test.txt to another directory
- `mv test.txt test2.txt`
 - renames test.txt to test2.txt
- `mv ~/Desktop/test.txt ~/Documents`
 - moves test.txt from ~/Desktop to ~/Documents
- `mv ~/Desktop/test.txt ~/Documents/shopping_list.txt`
 - moves test.txt from ~/Desktop to ~/Documents, and then renames it shopping_list.txt

rm

- NO RECYCLE BIN!!!
- `rm test.txt`
 - deletes test.txt
- `rm directory_name/`
- `rm: cannot remove `directory_name': Is a directory`
- `rm -rf directory_name`
 - poof!

mkdir, rmdir

```
$> ls
```

```
test.txt
```

```
$> mkdir foo
```

```
$> ls
```

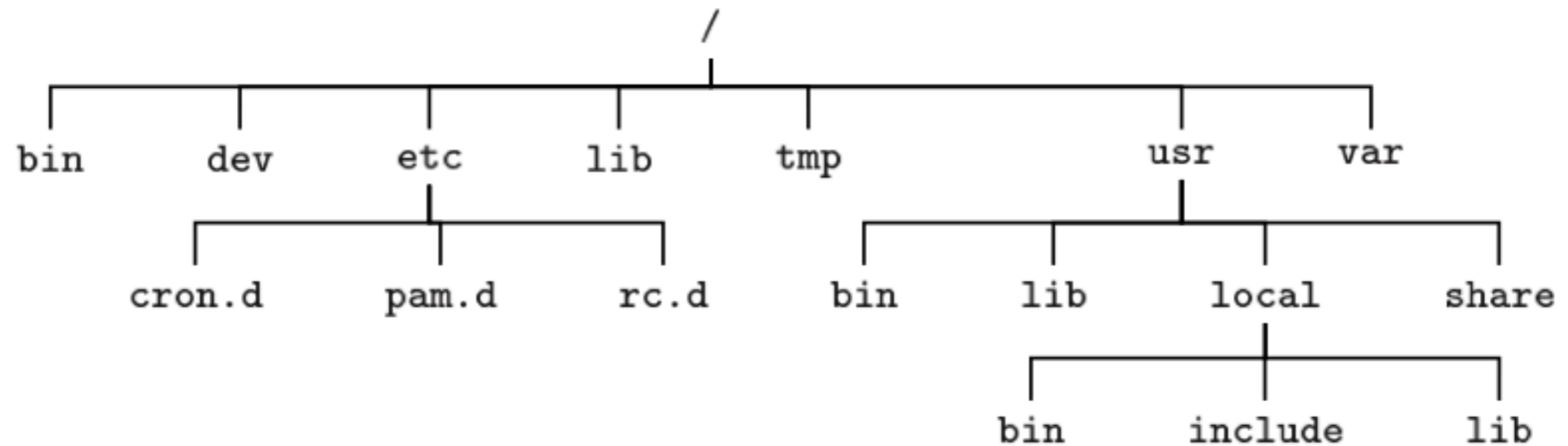
```
foo/ test.txt
```

```
$> rmdir foo
```

```
$> ls
```

```
test.txt
```

Filesystem



- bin: binaries
- dev: devices
- etc: configuration scripts
- lib: libraries
- usr: user space
- var: logs

Filesystem commands

- file Identify file content type
- find Search for file(s)
- locate Quickly search for files using a pre-generated database
- id Display user and group information
- du Calculate disk usage
- df Display available disk space statistics
- mount Mount a file system

Dealing with text files

- `cat` Send file(s) to stdout
- `echo` Send command line to stdout
- `more` Paginate input
- `less` Paginate input. (and less is more)
- `head` Send the first few lines of input to stdout
- `tail` Send the last few lines of input to stdout
- `tee` Send stdin to stdout and to file(s)

File permissions

- Read permission allows directory listing
- Write permission allows creating, deleting, and renaming of files within the directory
- Execute permission allows “traversing” the directory, a.k.a. using `cd` to change into the directory or including the directory’s contents in a path.
- Order: user, group, others
- New non-executable files have permission `666(rw-rw-rw-)`
- New executable files and directories have permission `777(rwxrwxrwx)`

chmod

```
feynstein:~/Desktop> ls -l textfile.txt
```

```
-rw-r--r-- 2 asetapen staff 382 Aug 31 15:32 textfile.txt
```

```
feynstein:~/Desktop> chmod 666 textfile.txt
```

```
-rw-rw-rw- 2 asetapen staff 382 Aug 31 15:32 textfile.txt
```

```
feynstein:~/Desktop> chmod 700 textfile.txt
```

```
-rwx----- 2 asetapen staff 382 Aug 31 15:32 textfile.txt
```

```
feynstein:~/test2> ls -l textfile.txt
```

```
-rwx----- 2 asetapen staff 382 Aug 31 15:32 textfile.txt
```

```
feynstein:~/test2> chmod go+rx textfile.txt
```

```
-rwxr-xr-x 2 asetapen staff 382 Aug 31 15:32 textfile.txt
```

```
feynstein:~/test2> chmod a-w textfile.txt
```

```
-r-xr-xr-x 2 asetapen staff 382 Aug 31 15:32 textfile.txt
```

```
feynstein:~/test2> chmod ugo-x textfile.txt
```

```
-r--r--r-- 2 asetapen staff 382 Aug 31 15:32 textfile.txt
```


wildcards

- `ls *.jpg`
 - lists all files with the `.jpg` extension
- `mkdir images`
- `mv *.jpg images/`
 - moves all files with the `.jpg` extension to the `images` folder

grep

- the google of the command line
- `grep wienermobile file.c`
 - searches file.c for the string “wienermobile”
- `grep -R “how to make” *`
 - recursively searches all files for the string “how to make”

diff

- `diff foo.txt bar.txt`
 - compares the content of `foo.txt` and `bar.txt`
 - if nothing is output, they are the same!
 - otherwise, it will give you line numbers of which the files differ

SSH

- Secure shell - logs you in to a remote computer
- `ssh username@linux.mit.edu`
- `ctrl+d` to logout (or type 'logout')
- Note: look up the program `scp`, which allows copying files to/from a remote computer

processes

- A process is an OS entity associated with a running program.
- Each running program is executed as a separate process.
- Processes maintain many important pieces of information about themselves, including:
 - PID - Process identification number, a unique identifier.
 - UID - The identity of the user executing the program.
 - State - Current status of the process, e.g. running, waiting, stopped, etc.
 - Priority - A rank guiding CPU time allocation.
 - Resources - Memory, files, devices, etc.

examining processes

- There are three primary commands for viewing process information.
- `ps` - Highly customizable display of processes.
- `ps tree` - Displays the process hierarchy.
- `top` - A real-time display of CPU-intensive processes.

I/O redirection

- `stdin, stdout, stderr`
- `<`
 - redirect `stdin` to a file
- `>`
 - redirect `stdout` to a file
- `>>`
 - redirect `stdout` to a file (append)
- `|`
 - redirect `stdout` of one program to `stdin` of another
- examples
 - `ps aux | grep iTunes`
 - `cat chapter1.txt chapter2.txt > novel.txt`

editors

- vim
- emacs
- pico

- Learn one! It will make your life a lot easier.

history

- history
- !N - executes line number N from history
- ctrl+r : backwards search
- TAB completion is your friend

aliases

- Shortcuts!
- `alias lab='ssh username@linux.mit.edu'`

shell configuration file

- can house environment variables, aliases, and much more
- Ex: `~/.bashrc`
- note: `~/.hgrc` is a mercurial config file

Everything Else

READ THE MAN PAGE