Unix Tutorial
for
FreeSurfer Users

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What is Unix/Linux?

- An operating system

(like Windows and OS X)

- Linux is the free, modifiable, and redistributable version of Unix

- Why use it?

What is Unix/Linux?

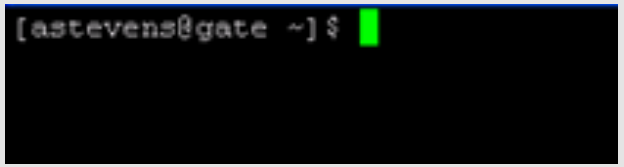
- An operating system

(like Windows and OS X)

- Linux is the free, modifiable, and redistributable version of Unix
- Why use it?
  - freedom to modify and customize
  - power to write many scripts with multiple commands to manage data
  - to use computer resources on the network efficiently, such as clusters

Getting Started

Communicate with operating system through a "shell" or terminal window.



For course-provided Linux computers:

Double click Terminal icon on Desktop

For Macs:

Applications > Utilities > XQuartz (double click)

Applications > Utilities > Terminal

Warm Up

Type:

`date` and hit enter.

Warm Up

Type:

`date` and hit enter. Should see `Mon Apr 6 8:05:24 EDT 2009`

Warm Up

Type:

`date` and hit enter. Should see `Mon Apr 6 8:05:24 EDT 2009`

Type:

`cal` and hit enter.

Warm Up

Type:

`date` and hit enter. Should see

```
Mon Apr  6 8:05:24 EDT 2009
```

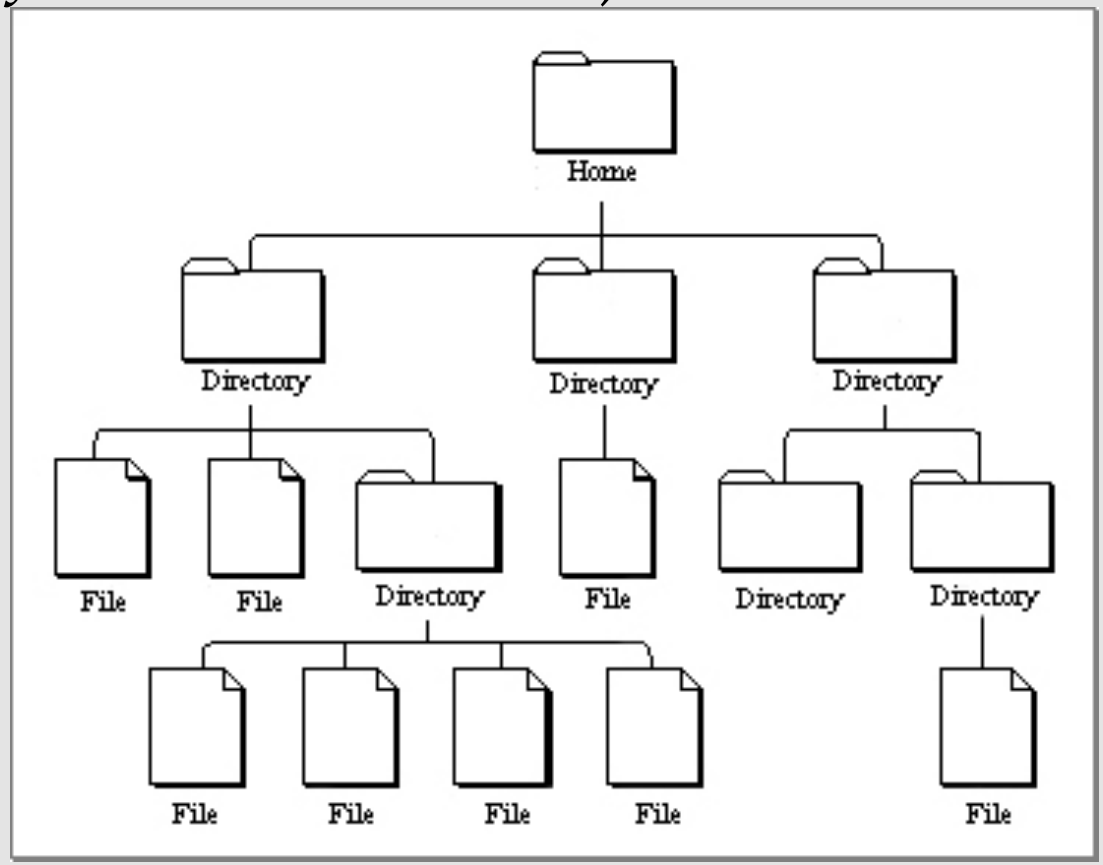
Type:

`cal` and hit enter. Should see

```
 April 2009
Su Mo Tu We Th Fr Sa
          1  2  3  4
 5  6  7  8  9 10 11
12 13 14 15 16 17 18
19 20 21 22 23 24 25
26 27 28 29 30
```

Directories

- Unix uses a hierarchical file system (*think folders in Windows*)



Directories

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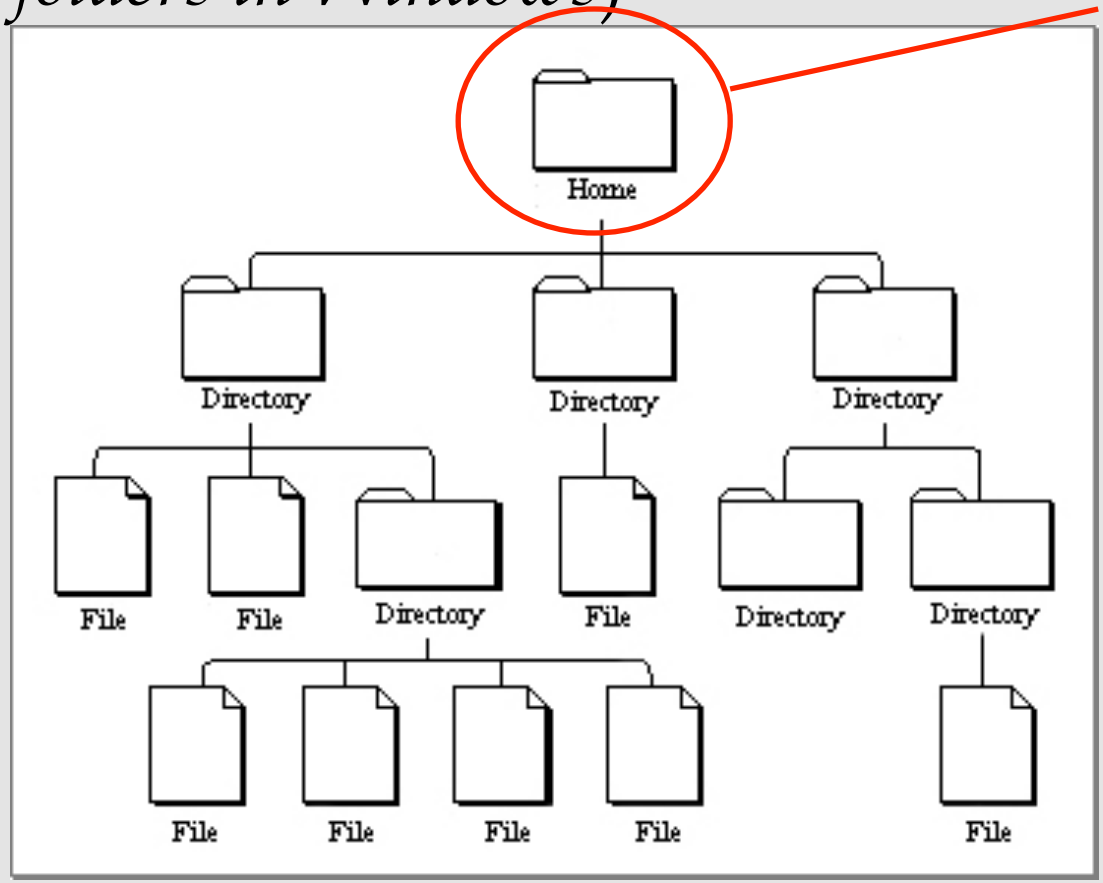

Home is like "My Computer"

Directories

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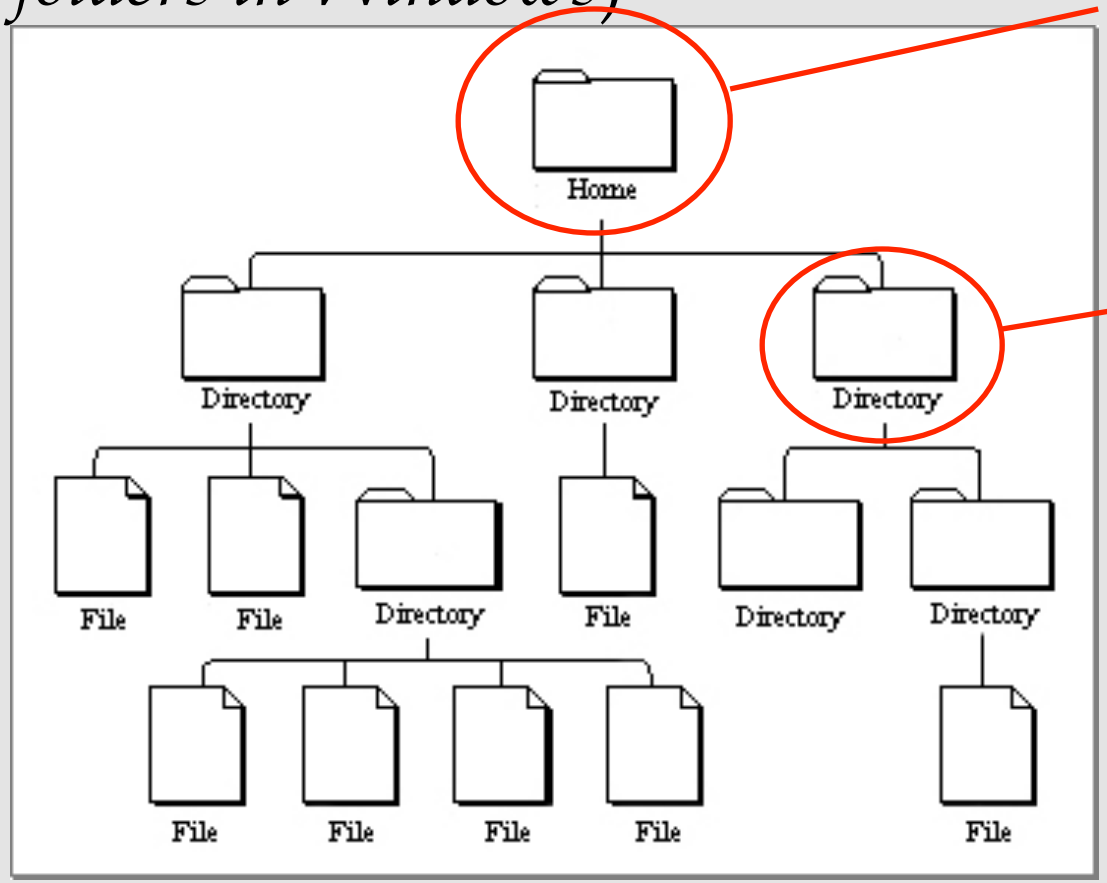


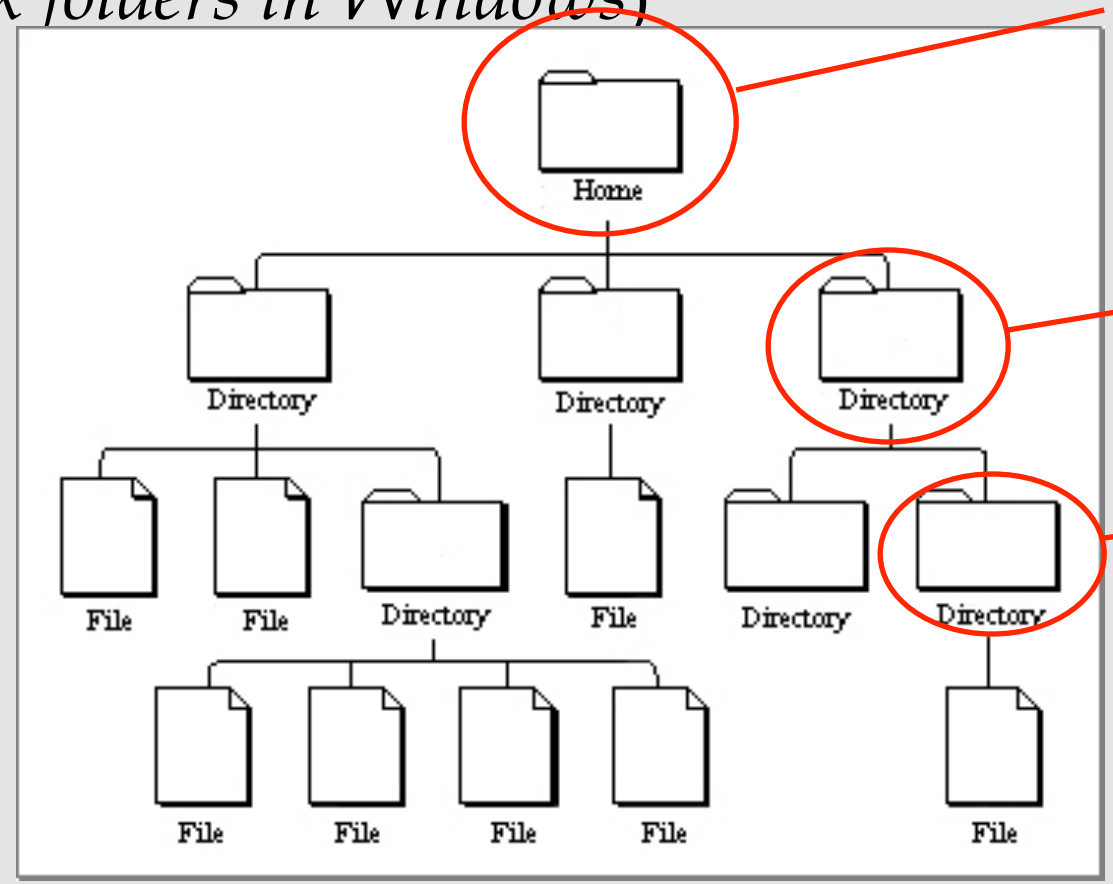
Home is like "My Computer"

Like "My Documents"

Directories

- Unix uses a hierarchical file system

  (*think folders in Windows*)



Home is like "My Computer"

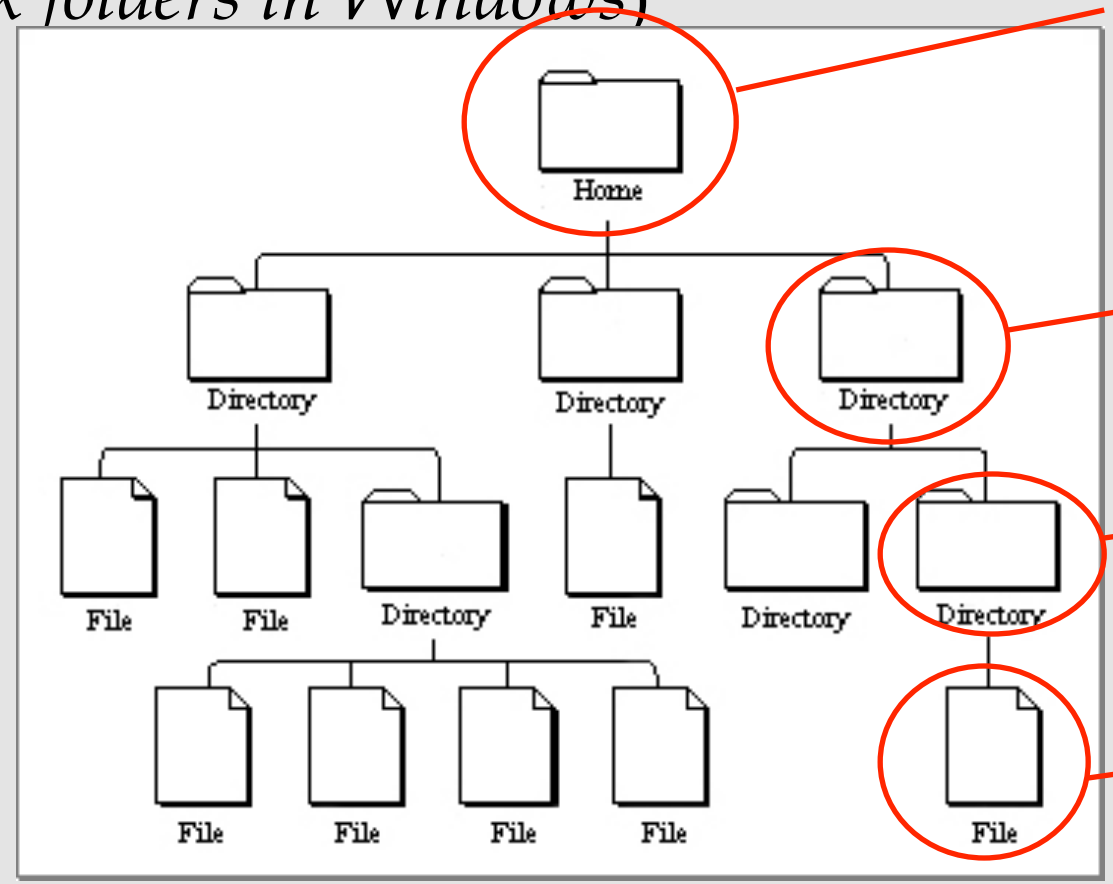
Like "My Documents"

Like "My Photos"

Directories

- Unix uses a hierarchical file system

  (*think folders in Windows*)



Home is like "My Computer"

Like "My Documents"

Like "My Photos"

picture.jpg

Location

path:
/MyComputer/MyDocuments/MyPhotos

Type:

pwd

and hit enter. Should see

/home/nmrclass

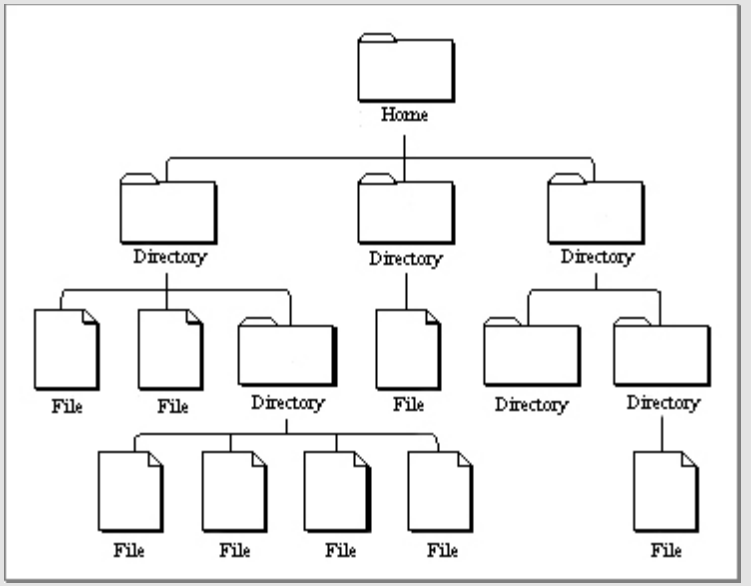
OR

/Users/YourName

shows “present working directory” or current location as a *path*

Opening a Directory

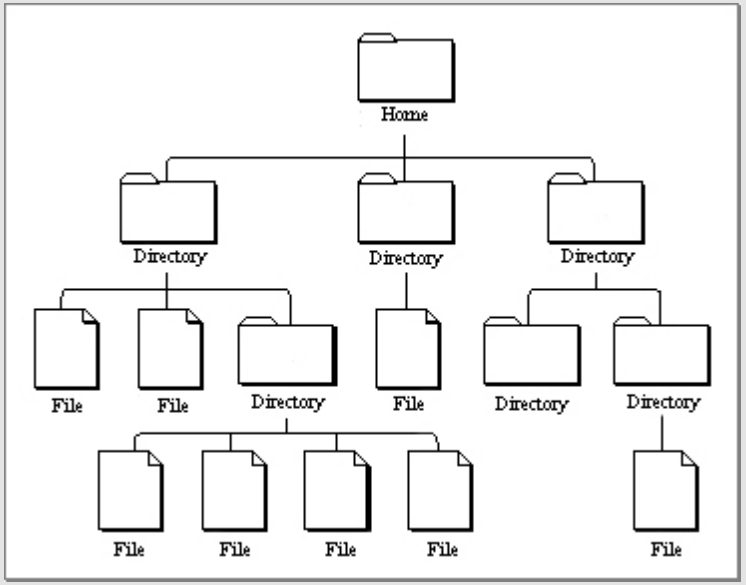
- Not double clicking
- Type command to “open”



- Commands to open files will differ

Navigating Directories

cd __	"change directory": move into a folder
ls	"list": see contents of directory
ls __	



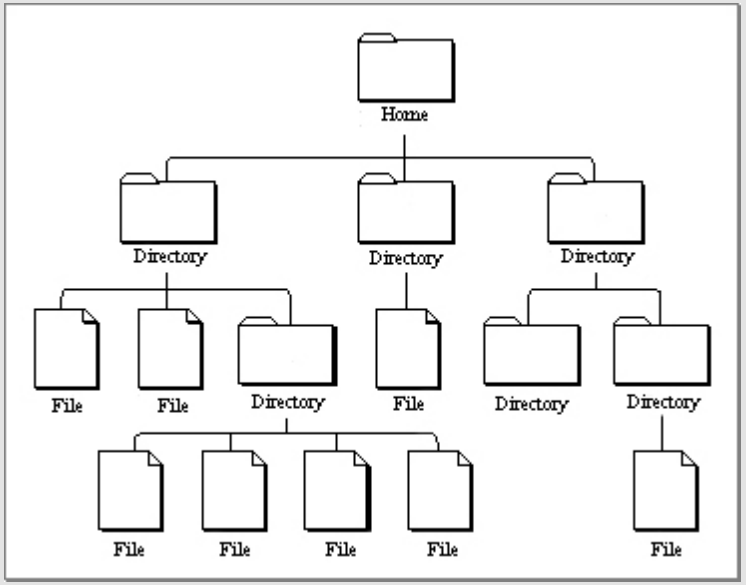
Navigating Directories

cd __	"change directory": move into a folder

ls	"list": see contents of directory

ls __	

Desktop matlab tmp TUTORIAL_DATA



Anatomy of a Command

```
command   -option1   –option2    file
```

```
command   - -help
```

Anatomy of a Command

command -option1 –option2 file

command - -help

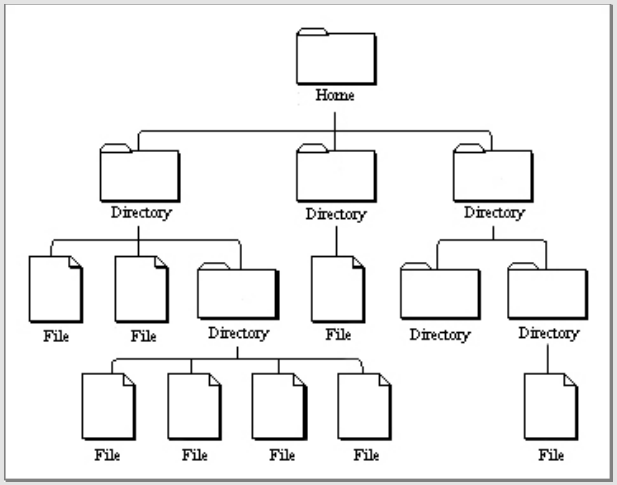
Try:

ls --help **or** man ls

Directory Contents

- List contents of directory you are in

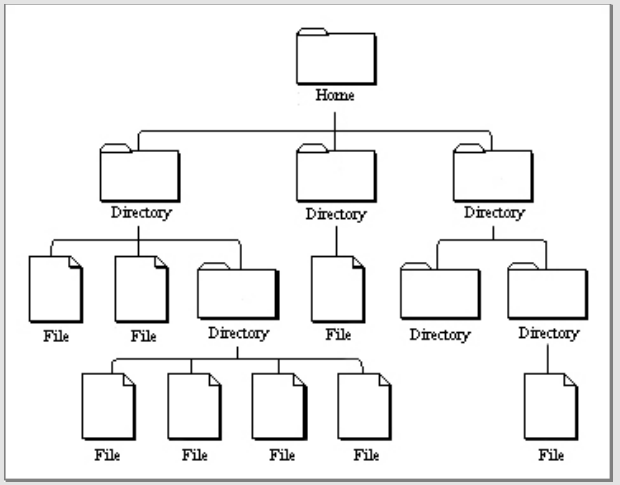
ls	*lists names of directories/files*
ls -a	
ls -l	
ls -lrt	



Directory Contents

- List contents of directory you are in

ls	*lists names of directories/files*
ls -a	*lists hidden files too*
ls -l	
ls -lrt	

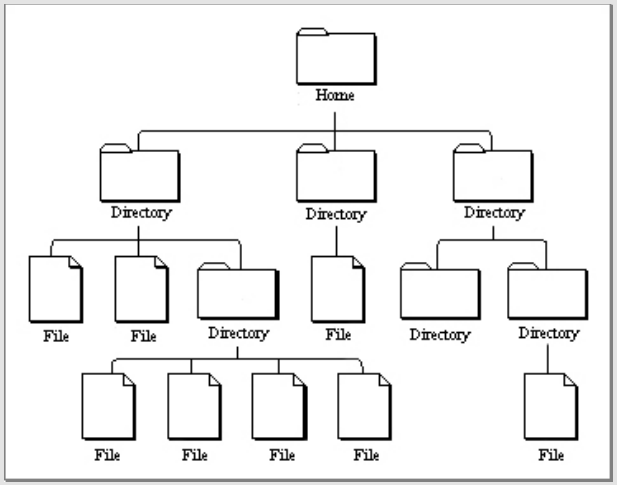


.cshrc
.bashrc
.alias

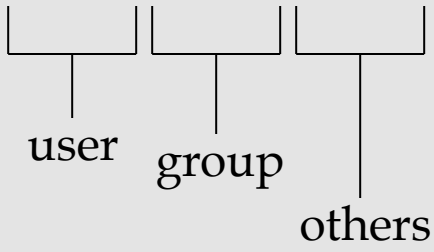
Directory Contents

- List contents of directory you are in

ls	*lists names of directories/files*
ls -a	*lists hidden files too*
ls -l	*lists file details*
ls -lrt	



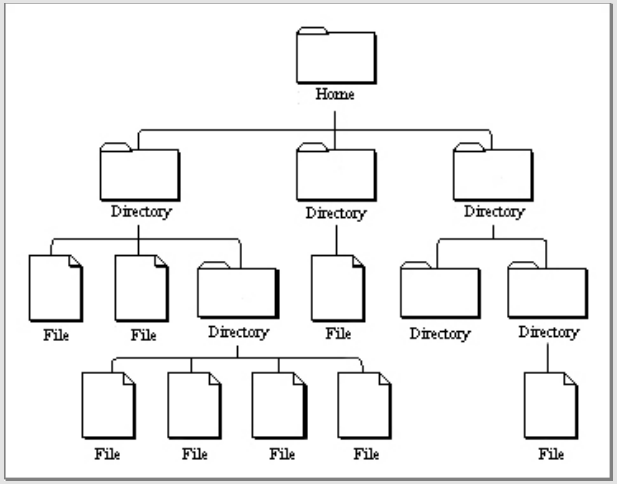
drwxrwx---



Directory Contents

- List contents of directory you are in

ls	*lists names of directories/files*
ls -a	*lists hidden files too*
ls -l	*lists file details*
ls -lrt	*lists recent files last*



Save Some Time

Filename Completion

`ls Des` *hit Tab key*

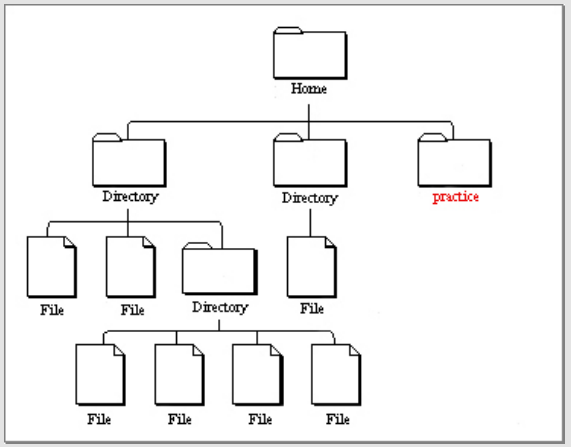
should see `ls Desktop` *hit enter*

History

hit ↑ *key* *should see* `ls Desktop`

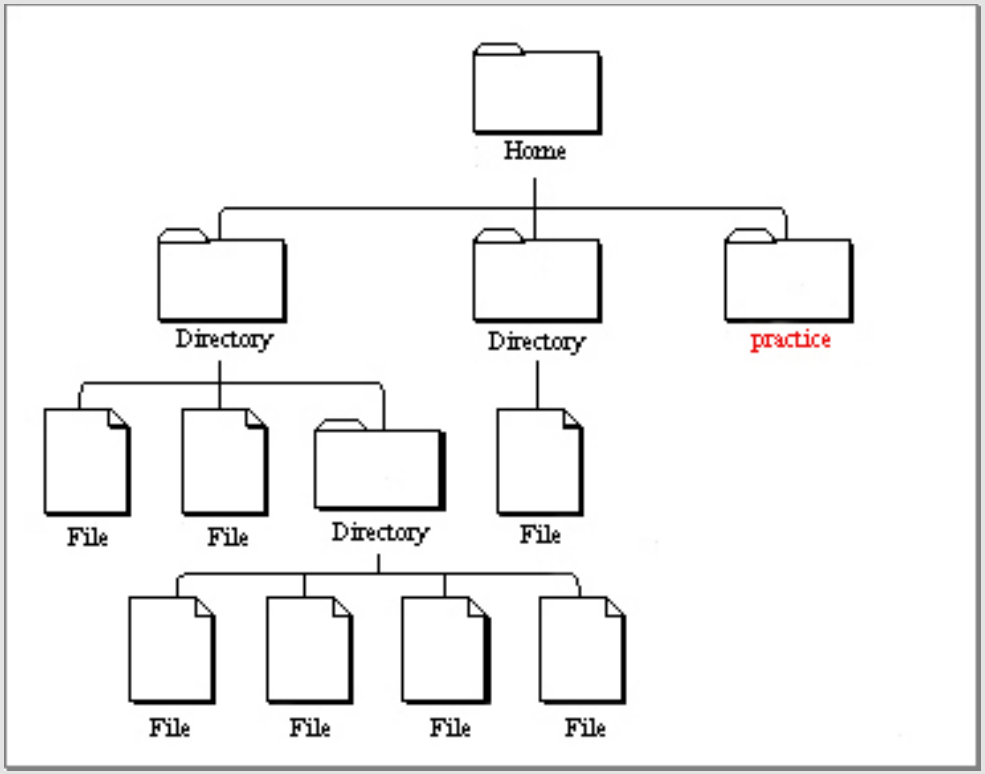
Changing Directories

`mkdir practice`	*makes a new directory "practice"*	
`ls -lrt`		
`pwd`	*should see*	`/home/nmrclass`



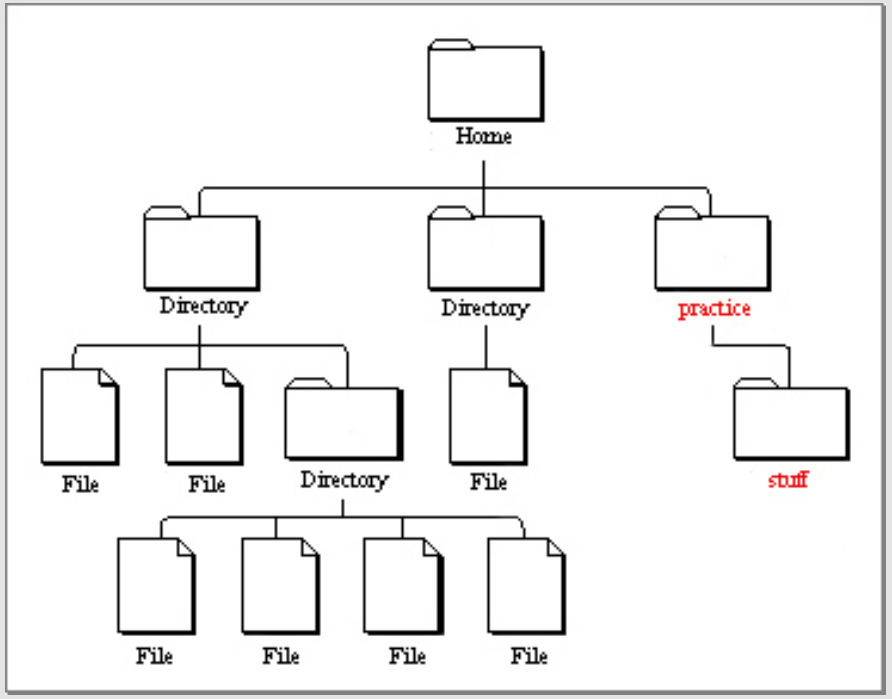
`cd practice`	*changes to directory "practice"*	
`pwd`	*should see*	`/home/nmrclass/practice`
`ls`	*should see*	*Nothing!*

Changing Directories



Changing Directories

mkdir stuff	*makes folder "stuff" inside practice*
ls	*should see "stuff"*



Using an Editor

```
emacs   mynotes.txt
```

If using a Mac:

```
open  -e   mynotes.txt
```

Format > Make plain text
File > Save

Type: I could write a script.
File > Save (Buffer)

File > Exit emacs

```
ls
```

should see "mynotes.txt"

Using an Editor

`gedit mynotes.txt`

If using a Mac:

`open -e`

Format > Make plain text
File > Save

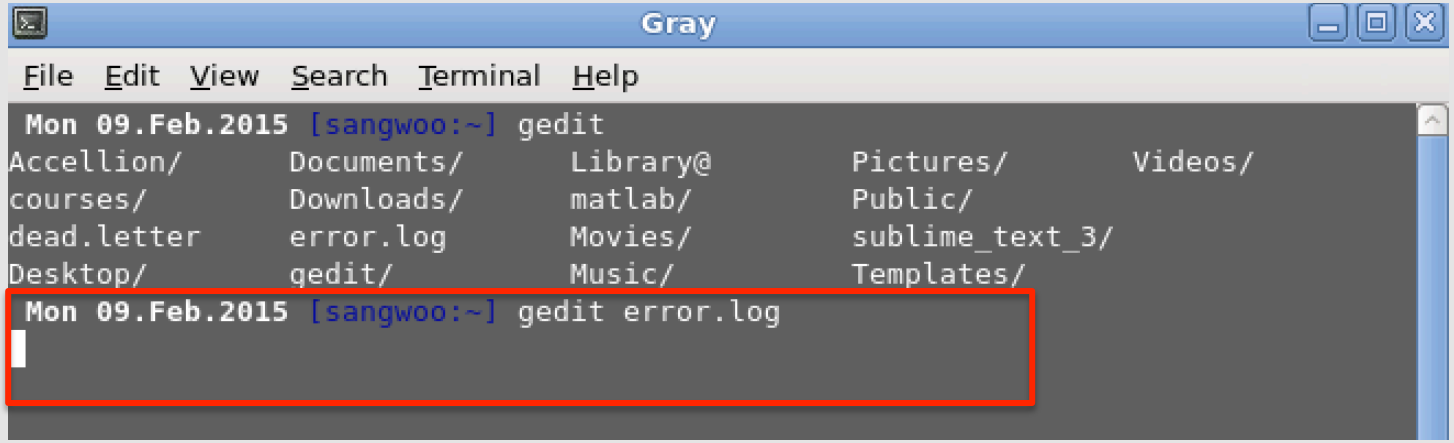
Type: I could write a script.
File > Save (Buffer)

File > Exit gedit

`ls` *should see* "mynotes.txt"

Other Editors: pico

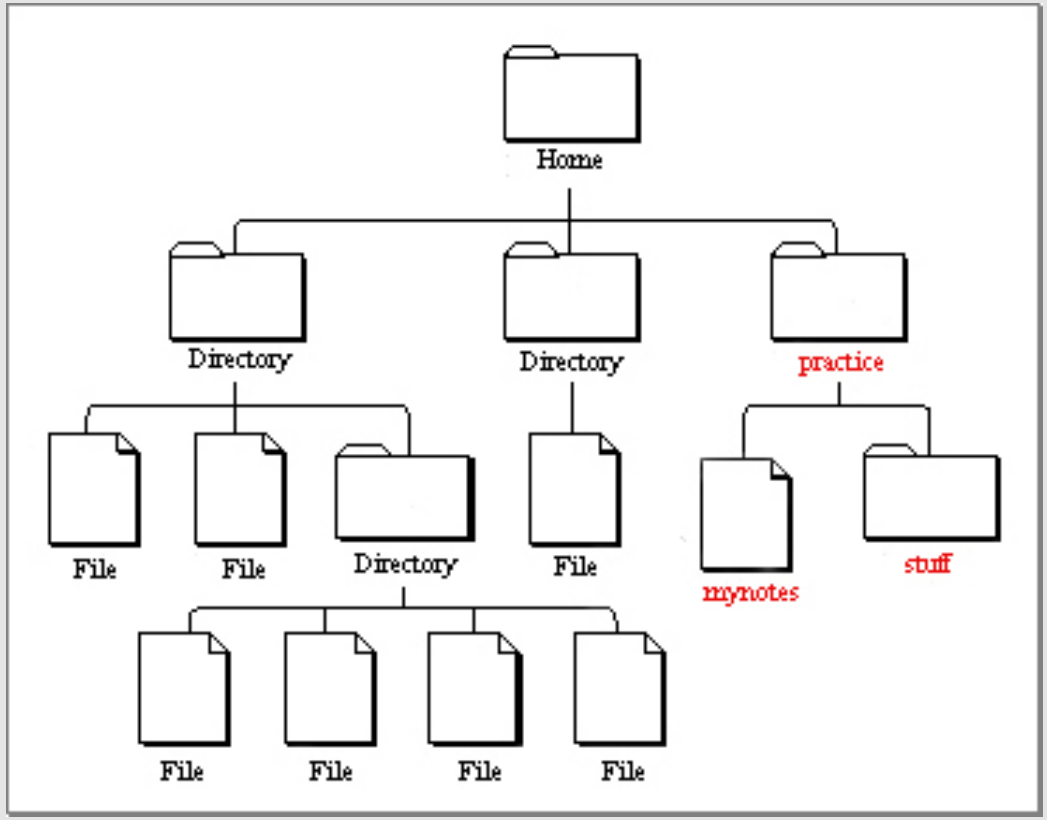
Using an Editor



Ctrl+C	Returns prompt
&	Runs program in background

gedit error.log &

Using an Editor



Copying files

`cp` *is the copy command*

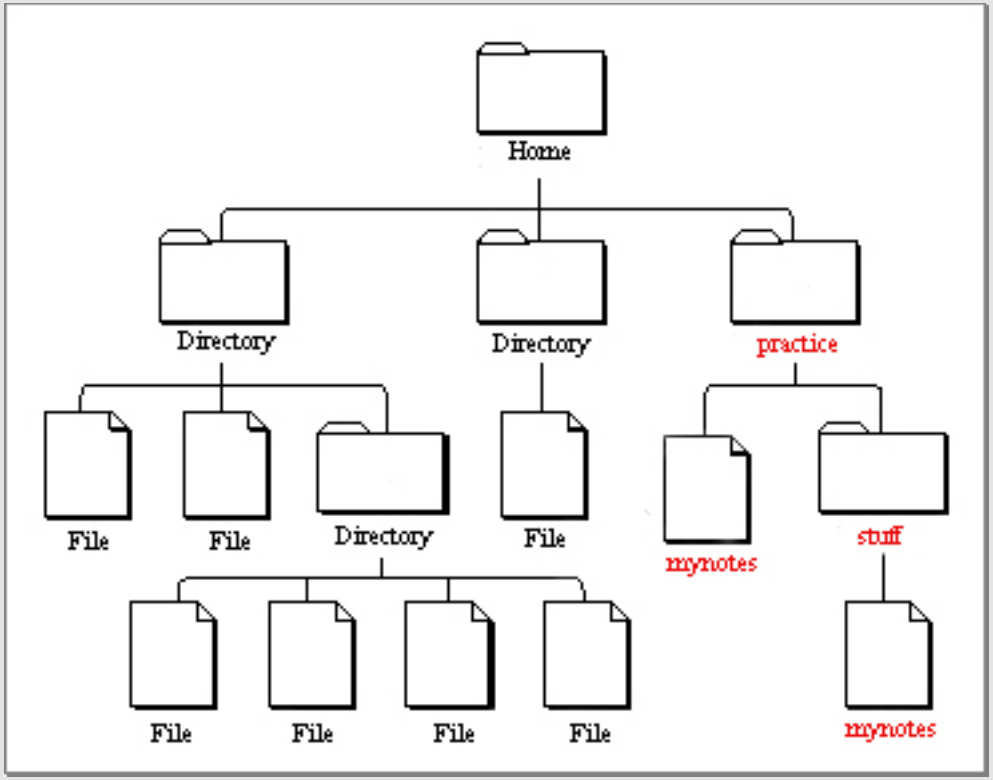
`cp --help` *learn all the options or "arguments"*

`cp mynotes.txt stuff`

`cd stuff`

`ls`

`more mynotes.txt`



Copying files

`cp` *is the copy command*

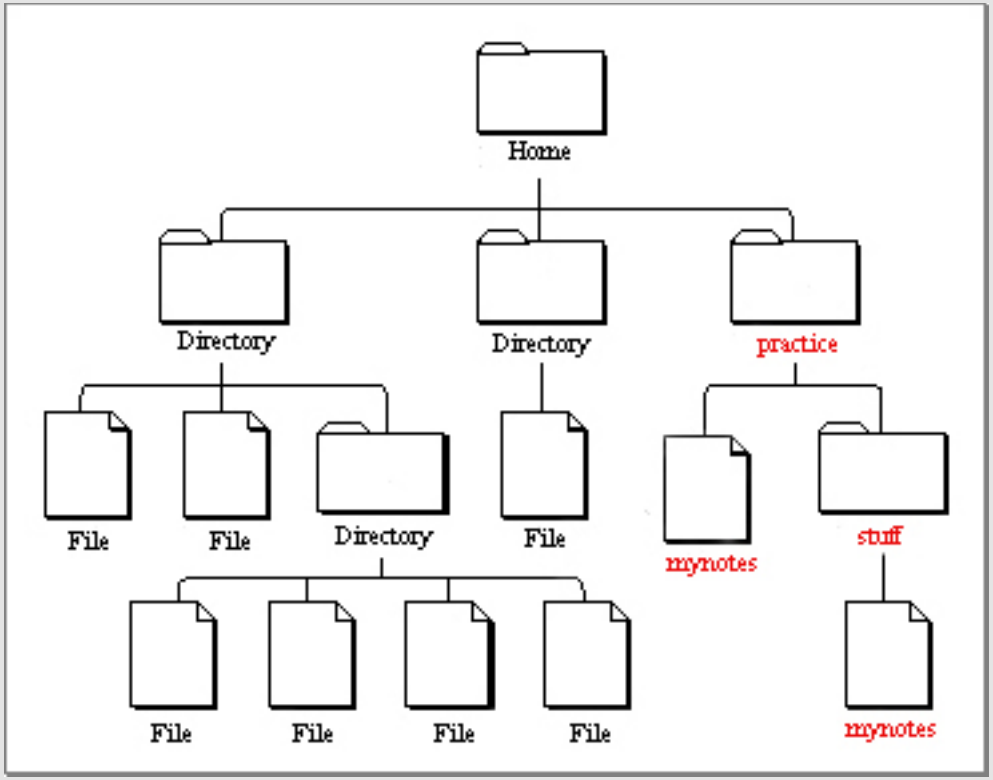
`cp --help` *learn all the options or "arguments"*

`cp mynotes.txt stuff`

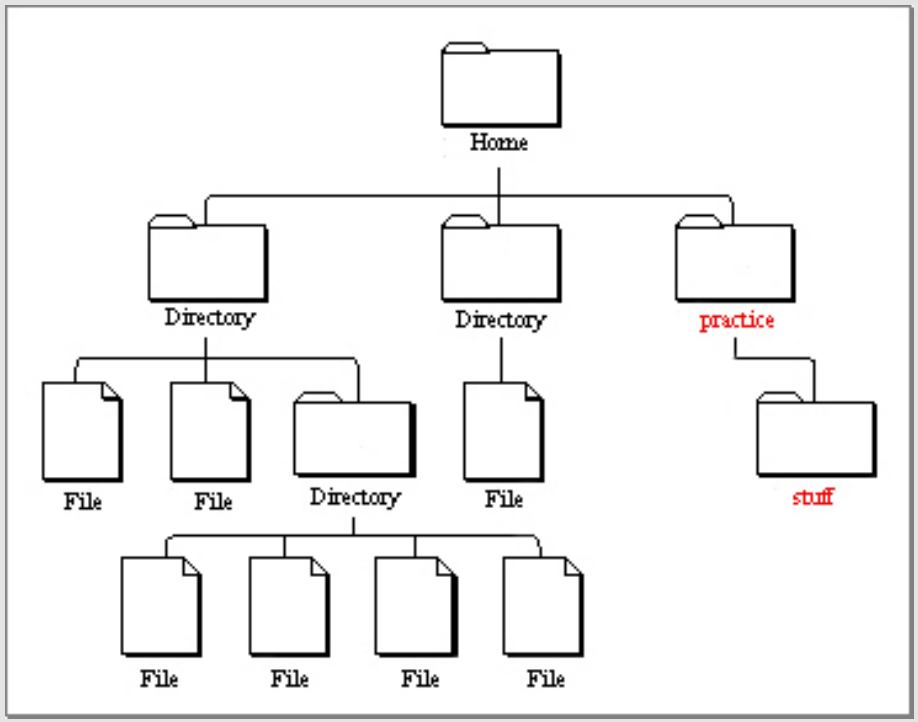
`cd stuff`

`ls`

`less mynotes.txt`



Changing Directories



ls ..

ls ../..

shows one directory up

goes up two!

can also do (but don't right now):on

cd ..

cd ../..

pwd *should see* /home/nmrclass/practice/stuff

Copying / Moving files

Could also use do:

```
cp   mynotes.txt   myothernotes.txt
```

```
mv   myothernotes.txt   hernotes.txt
```

```
mv   hernotes.txt     ..
```

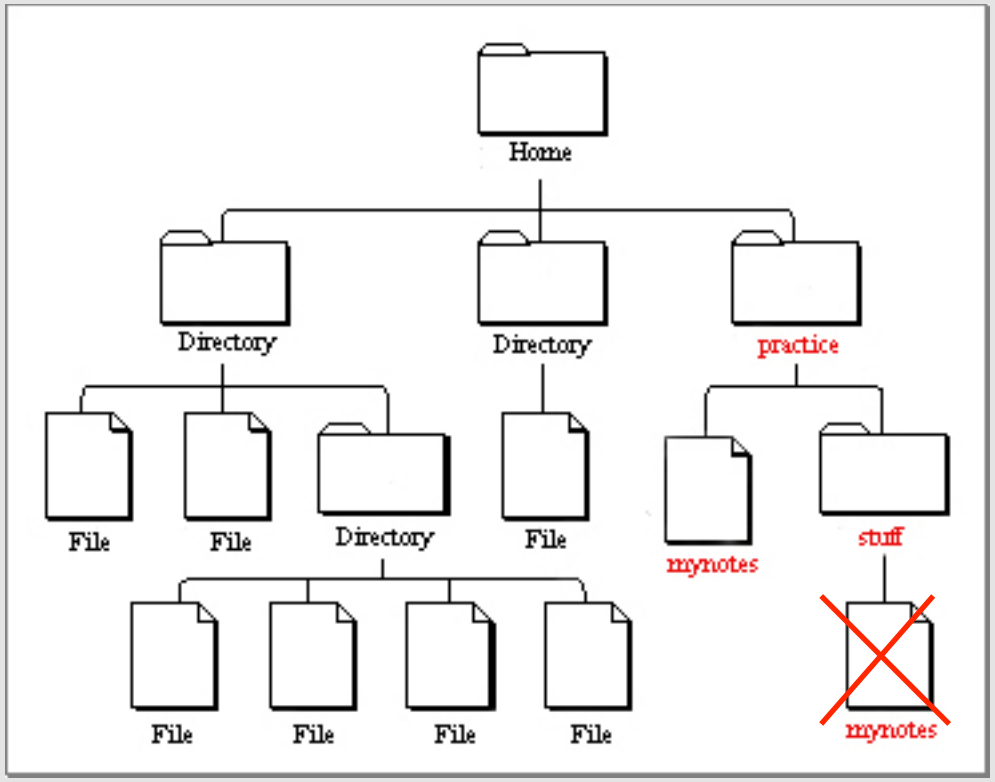
Removing Files

pwd *should be in "stuff"*

ls

rm mynotes.txt

ls



Things to know

- Case sensitive
- Does not like spaces in file names

  (e.g. filename.txt vs. file name.txt)
- Ctrl+c kills a process & brings back command prompt
- Type ‘q’ to quit the program ‘less’
- Highlight & middle click to copy & paste
- Use ‘&’ to open a program in the background

  Cannot open a 2nd program if do not have a command prompt

Review

- no double clicking
- mkdir
- ls
- cd
- pwd
- emacs, gedit, vi, pico
- cp
- rm

Using FreeSurfer

With FreeSurfer, certain variables must be set in order to use it correctly:

FREESURFER_HOME

tell Operating System where FreeSurfer is

SUBJECTS_DIR

tell FreeSurfer where data is

Required Variables

- To use FreeSurfer you'll have to do:

```
setenv    FREESURFER_HOME      /home/apps/freesurfer
```

tell Operating System where FreeSurfer is

```
source      $FREESURFER_HOME/SetUpFreeSurfer.csh
```

source this script to get your computer ready to use FreeSurfer (sources other scripts & sets other variables)

```
setenv    SUBJECTS_DIR   /path/to/data
```

Required Variables

- To use FreeSurfer you'll have to do:

```
export   FREESURFER_HOME=/home/apps/freesurfer
```

tell Operating System where FreeSurfer is

```
source     $FREESURFER_HOME/SetUpFreeSurfer.csh
```

source this script to get your computer ready to use FreeSurfer (sources other scripts & sets other variables)

```
export    SUBJECTS_DIR=/path/to/data
```

Required Variables

```
setenv    SUBJECTS_DIR   /path/to/data
```

To go to location of your data:

```
cd   $SUBJECTS_DIR
```

$ means take the value of the variable

Required Variables

setenv SUBJECTS_DIR */path/to/data*

To go to location of your data:

cd $SUBJECTS_DIR
aka
cd /path/to/data

$ means take the value of the variable

$

How ‘echo’ works:

```
echo   Allison is cool.
```

To set a variable:

```
setenv   TEST_VARIABLE   yourfirstname
```

To check what a variable is set to:

```
echo   $TEST_VARIABLE
```

Required Variables

With FreeSurfer, certain variables must be set in order to use it correctly:

FREESURFER_HOME

tell Operating System where FreeSurfer is

SUBJECTS_DIR

tell FreeSurfer where data is

```
echo    $FREESURFER_HOME
```

← To check variables

```
echo    $SUBJECTS_DIR
```

More Help

http://surfer.nmr.mgh.harvard.edu/fswiki/FsTutorial/CommandLineNavigation

Links on Wiki under “Unix Tutorial”

Glossary of Unix commands

More Help

- **UNIX Tutorial For Beginners:**
  http://www.ee.surrey.ac.uk/Teaching/Unix/

- **Linux in a Nutshell:**
  http://docstore.mik.ua/orelly/linux/lnut/ch01_01.htm

- **UNIX Cheat Sheet:**
  http://tux.cs.unlv.edu/refs/linux_commands.html

- **Command Line Tutorial:**
  http://surfer.nmr.mgh.harvard.edu/fswiki/FsTutorial/CommandLineNavigation

The End

Good Luck!

Intro to FreeSurfer Jargon

voxel

surface

volume

vertex

surface-based

recon

cortical, subcortical

parcellation/segmentation

registration, morph, deform, transforms
(computing vs. resampling)

More Help

alias e emacs

man alias

ls file* → lists file1, file2, file3

ls file[12] → lists file1 and file2 but not file3

command >>& file.txt → save output to screen and errors in text file