Command Line + BASH Scripting

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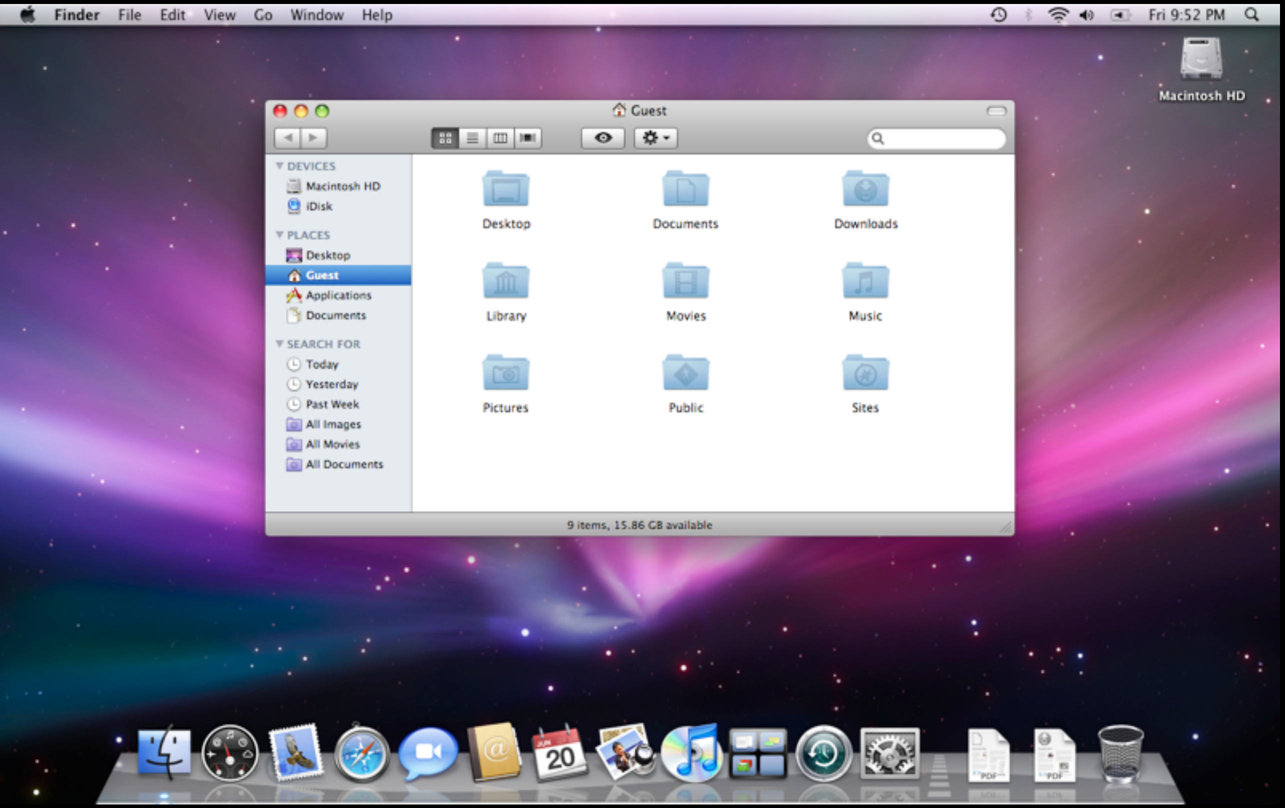
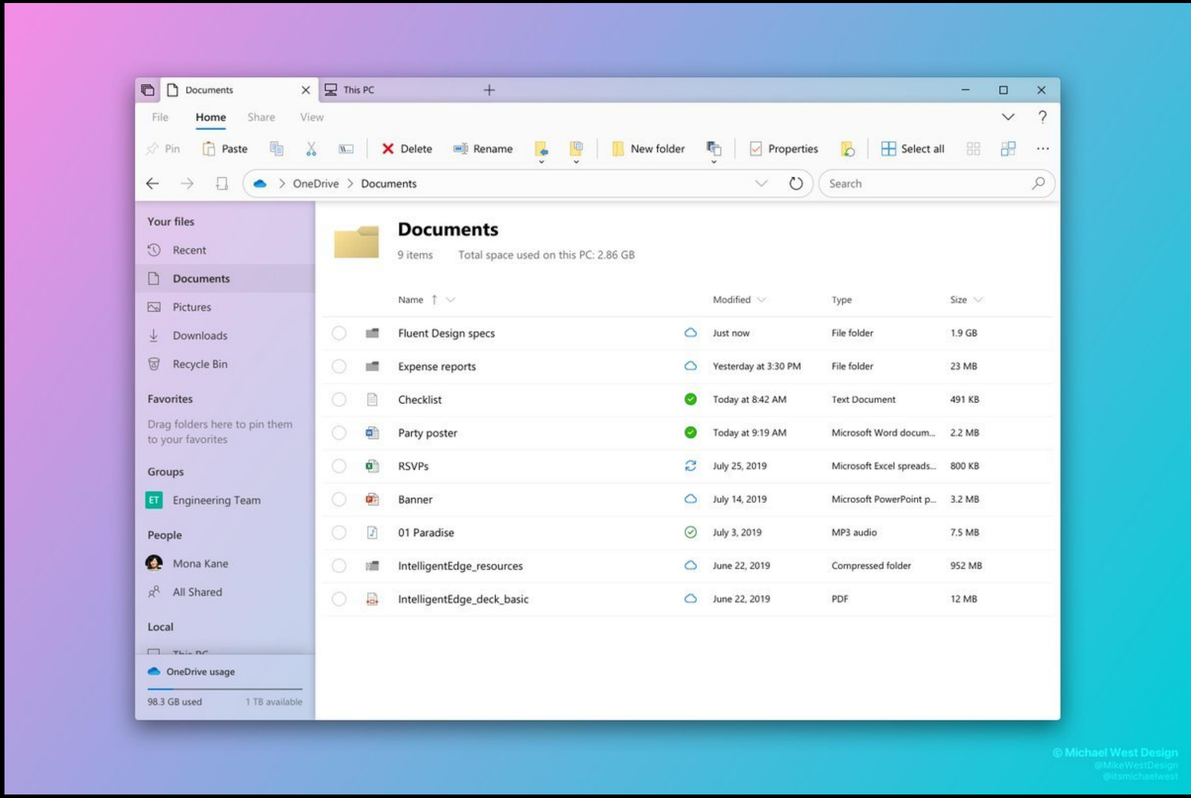
Agenda

- Command line
  - Working with absolute and relative paths
  - Running programs
  - Redirecting program output
- Scripting
  - Automate sequences of commands!

Say Goodbye to Your Precious Windowed GUI





Documents

9 items Total space used on this PC: 2.86 GB

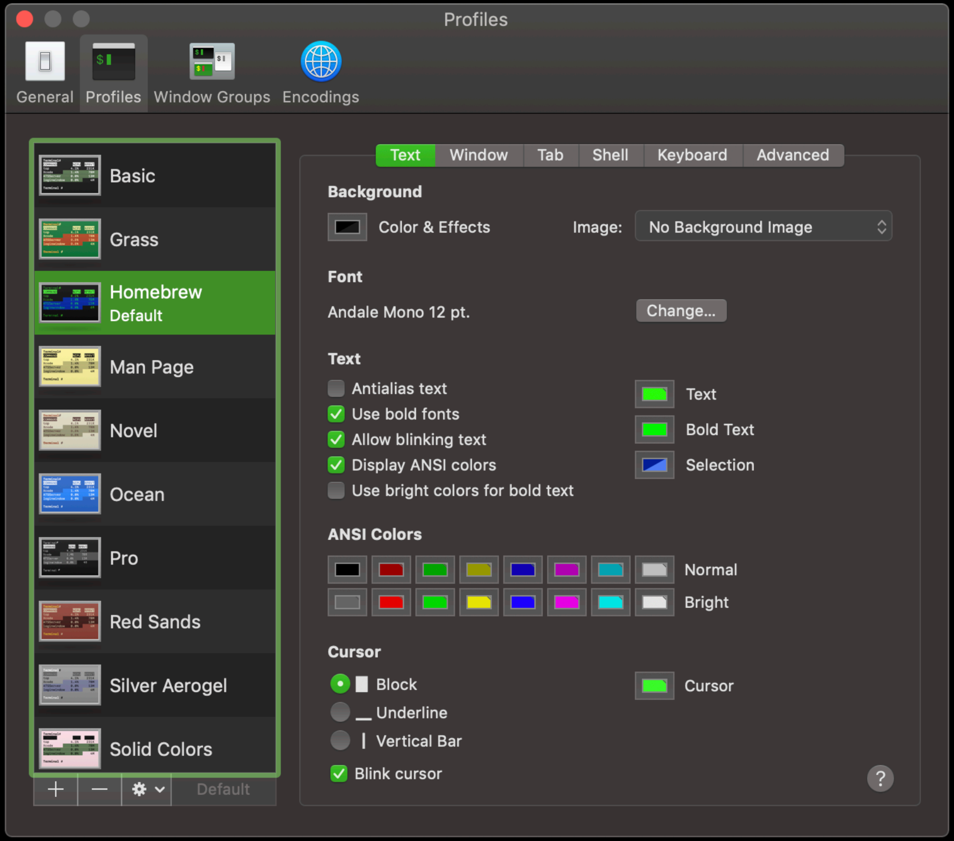
Name	Modified	Type	Size
Fluent Design specs	Just now	File folder	1.9 GB
Expense reports	Yesterday at 3:30 PM	File folder	23 MB
Checklist	Today at 8:42 AM	Text Document	491 KB
Party poster	Today at 9:19 AM	Microsoft Word docum...	2.2 MB
RSVPs	July 25, 2019	Microsoft Excel spreads...	800 KB
Banner	July 14, 2019	Microsoft PowerPoint p...	3.2 MB
01 Paradise	July 3, 2019	MP3 audio	7.5 MB
IntelligentEdge_resources	June 22, 2019	Compressed folder	952 MB
IntelligentEdge_deck_basic	June 22, 2019	PDF	12 MB

Open up the Command Line Interface

- On Mac – Terminal
- On PC – Ubuntu

Mac Users!!

- Terminal --> Preferences --> Pick a color scheme that speaks to you



Basic
Grass
Homebrew
Default
Man Page
Novel
Ocean
Pro
Red Sands
Silver Aerogel
Solid Colors

Background

Color & Effects   Image: No Background Image

Font

Andale Mono 12 pt.

Text

- [ ] Antialias text
- [✓] Use bold fonts
- [✓] Allow blinking text
- [✓] Display ANSI colors
- [ ] Use bright colors for bold text

Text
Bold Text
Selection

ANSI Colors

Normal
Bright

Cursor

- [✓ ●] Block
- ○ Underline
- ○ Vertical Bar
- [✓] Blink cursor

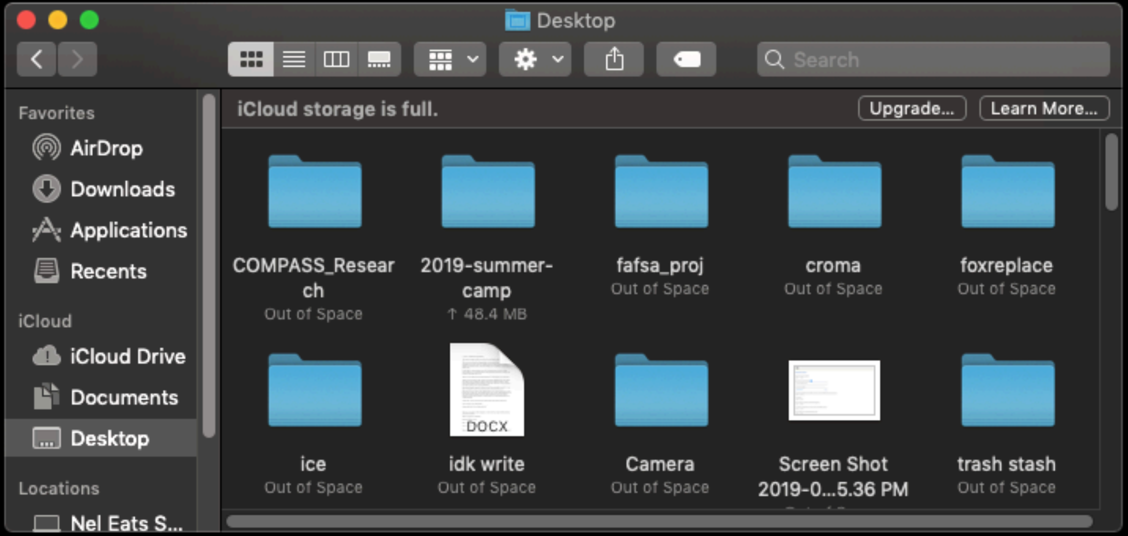
Cursor

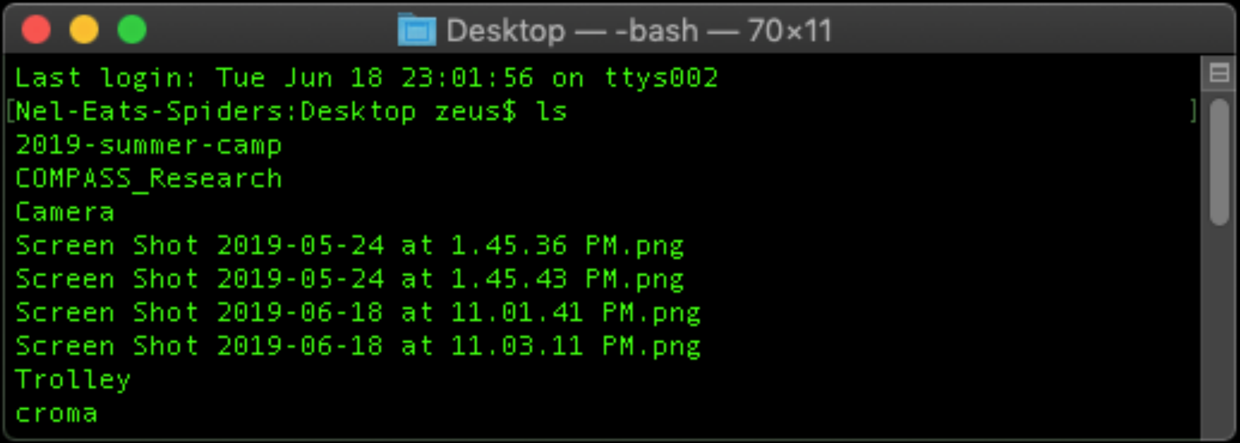
The Shell

- You type commands into the shell
- Operating system performs those commands

- The jobs of a shell
  - Spawn (launch) new programs
  - Handle input and output to programs
  - Kill and clean up old programs

Navigating the file system





```
Last login: Tue Jun 18 23:01:56 on ttys002
Nel-Eats-Spiders:Desktop zeus$ ls
2019-summer-camp
COMPASS_Research
Camera
Screen Shot 2019-05-24 at 1.45.36 PM.png
Screen Shot 2019-05-24 at 1.45.43 PM.png
Screen Shot 2019-06-18 at 11.01.41 PM.png
Screen Shot 2019-06-18 at 11.03.11 PM.png
Trolley
croma
```

Absolute paths

- A path that specifies the location of a file or directory from the root directory (/)
- **To write an absolute pathname:**
  - Start at the root directory (/) and work down.
  - Write a slash (/) after every directory name

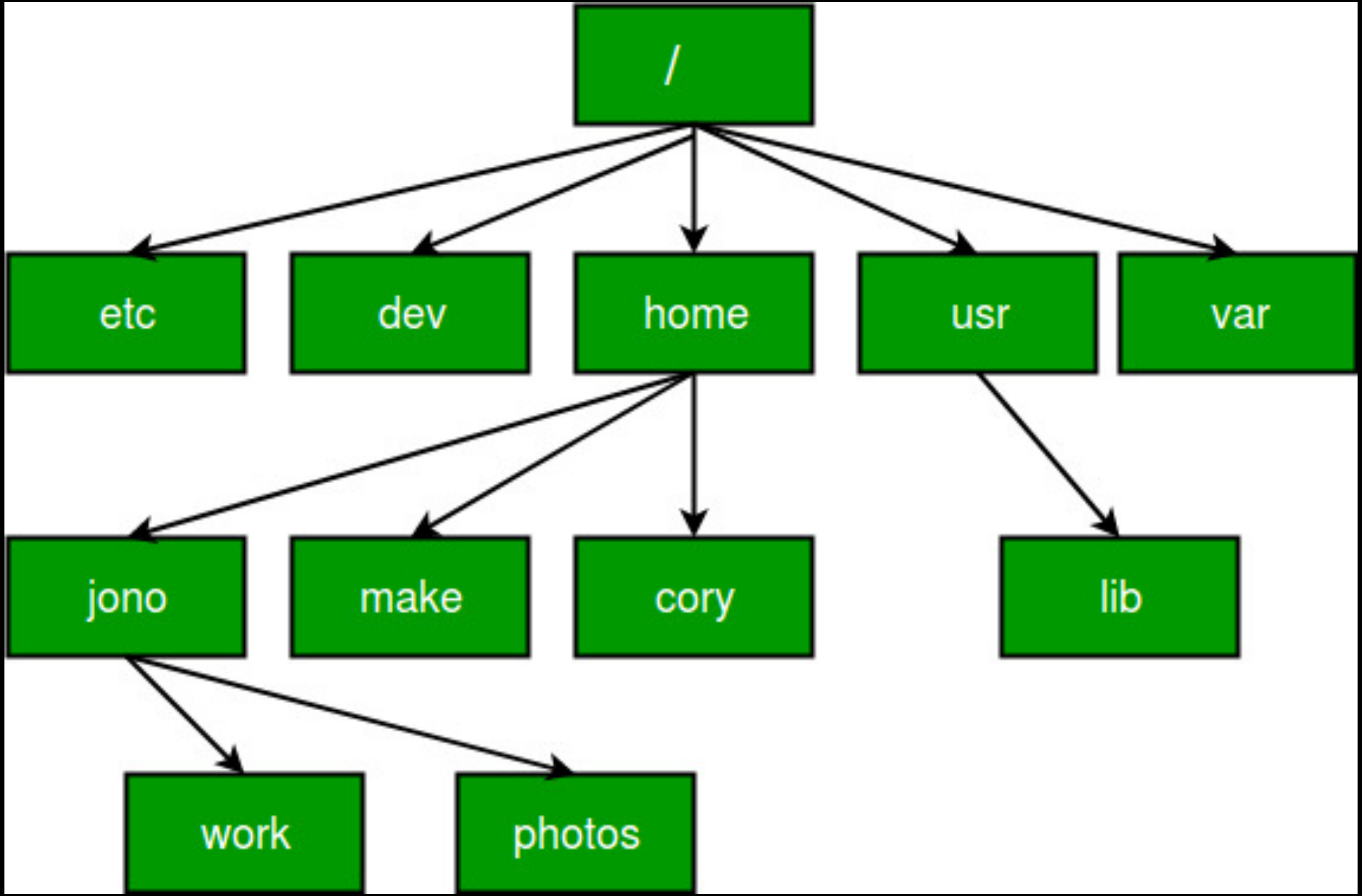
```
/Users/root/Desktop/
/Users/root/Documents/DataCamp/
/Users/root/Documents/DataCamp/shell_slides.pdf
```

Relative paths

- Relative path is defined as the path related to the present working directly. It starts at your current directory and never starts with a / .

Documents/

Documents/DataCamp/

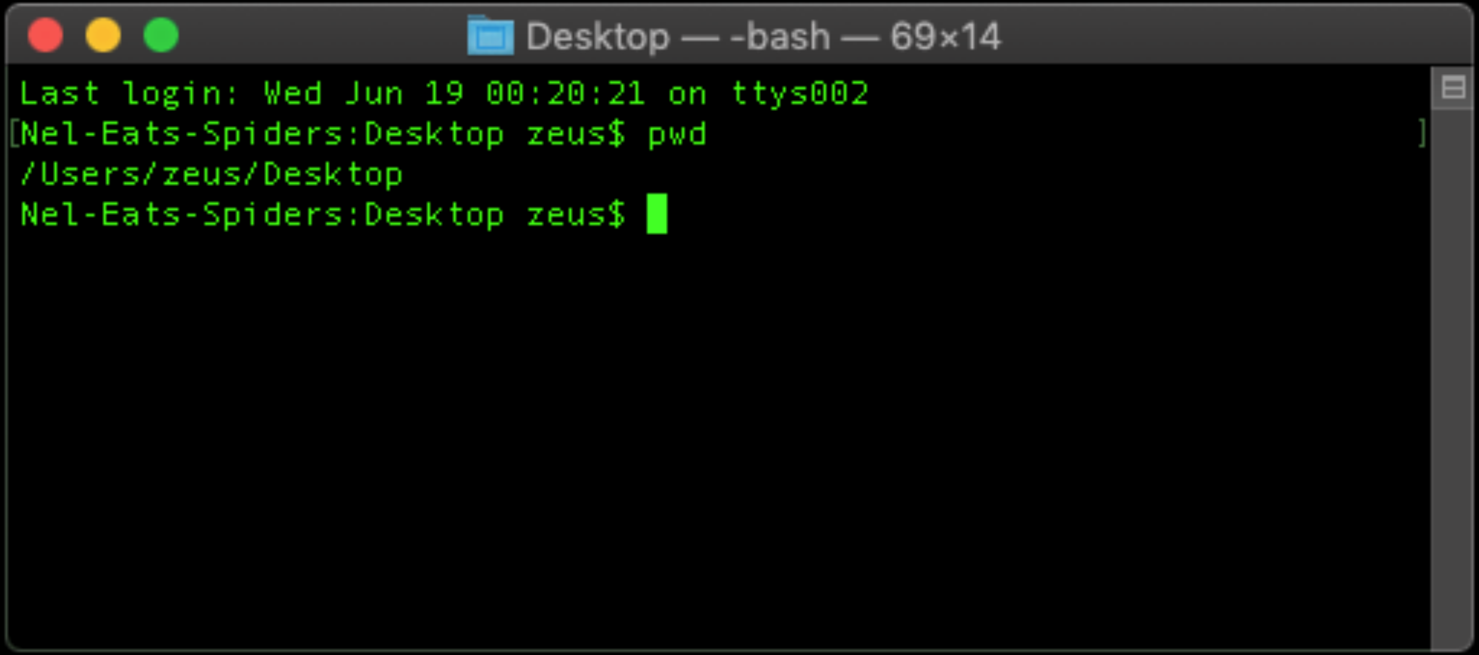


- if we are looking for photos then absolute path for it will be provided as */home/jono/photos* **but assuming that we are already present in jono directory then the relative path for the same can be written as simple** *photos*.

https://www.geeksforgeeks.org/absolute-relative-pathnames-unix/

pwd

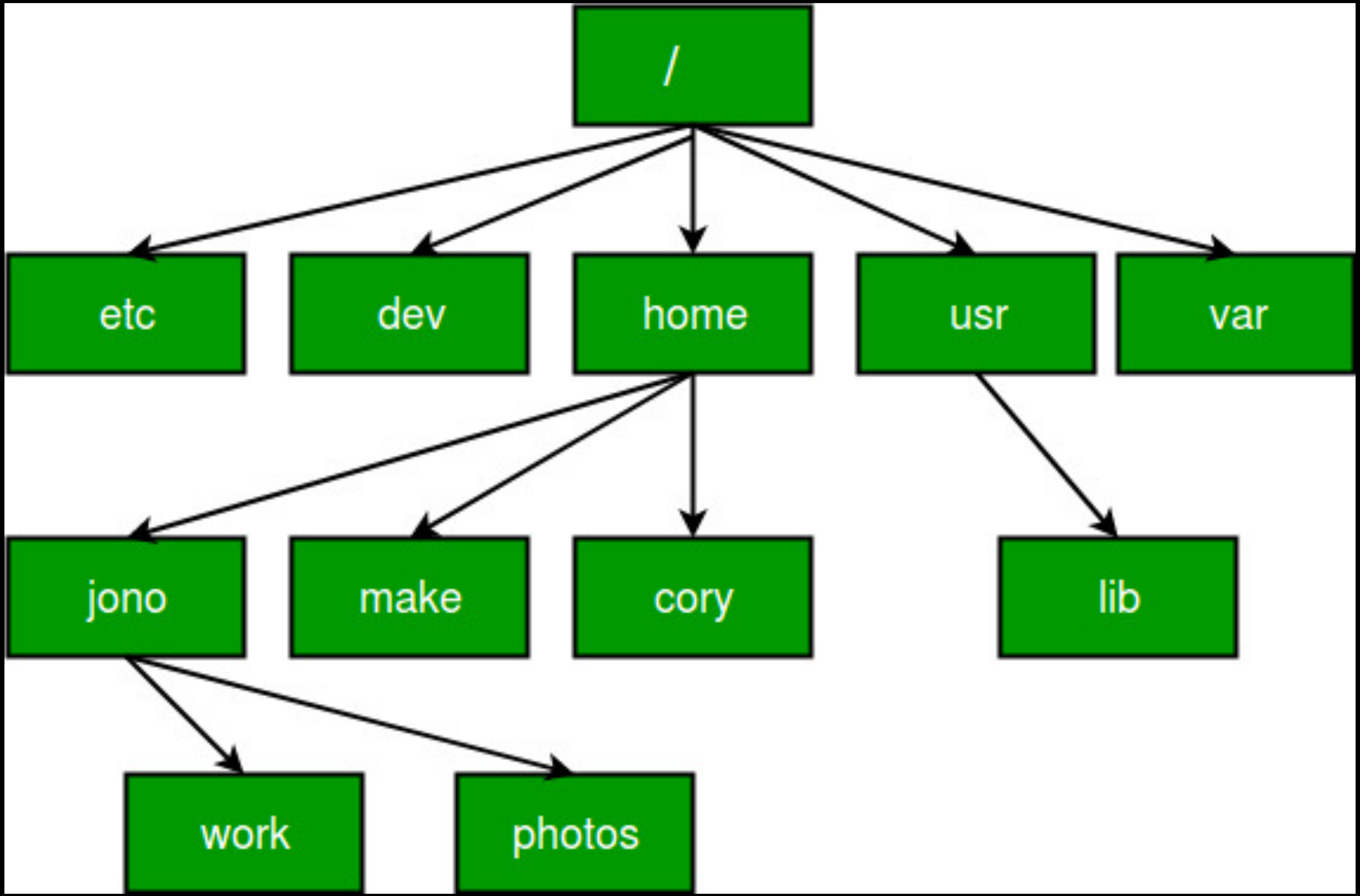
- **P**rint **W**orking **D**irectory
- Prints the absolute path of the working directory, starting from the root



```
Last login: Wed Jun 19 00:20:21 on ttys002
Nel-Eats-Spiders:Desktop zeus$ pwd
/Users/zeus/Desktop
Nel-Eats-Spiders:Desktop zeus$ 
```

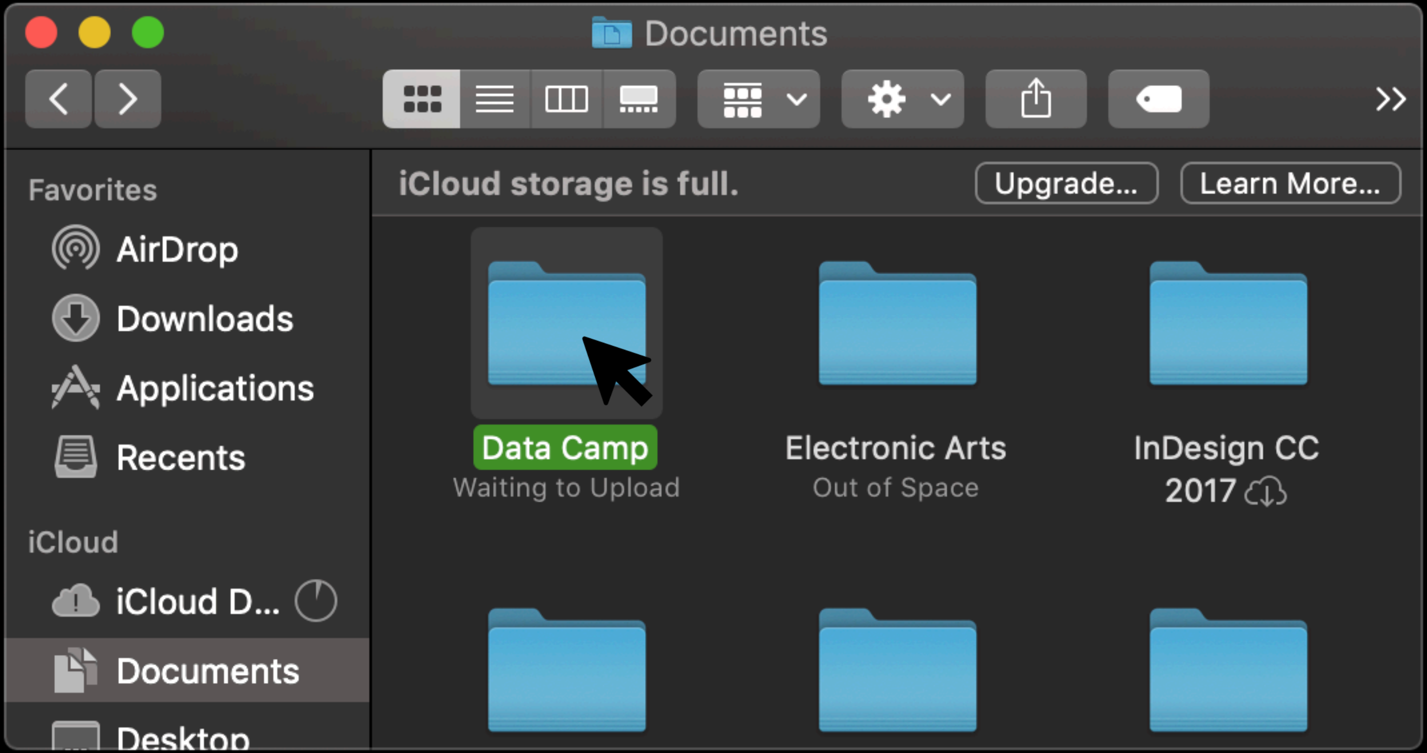
cd

- Change directory
- `cd directory_name/`
  - Change directory “down” a level to a folder inside working directory
- `cd ..`
  - Change directory “up” a level to the folder that contains the working directory

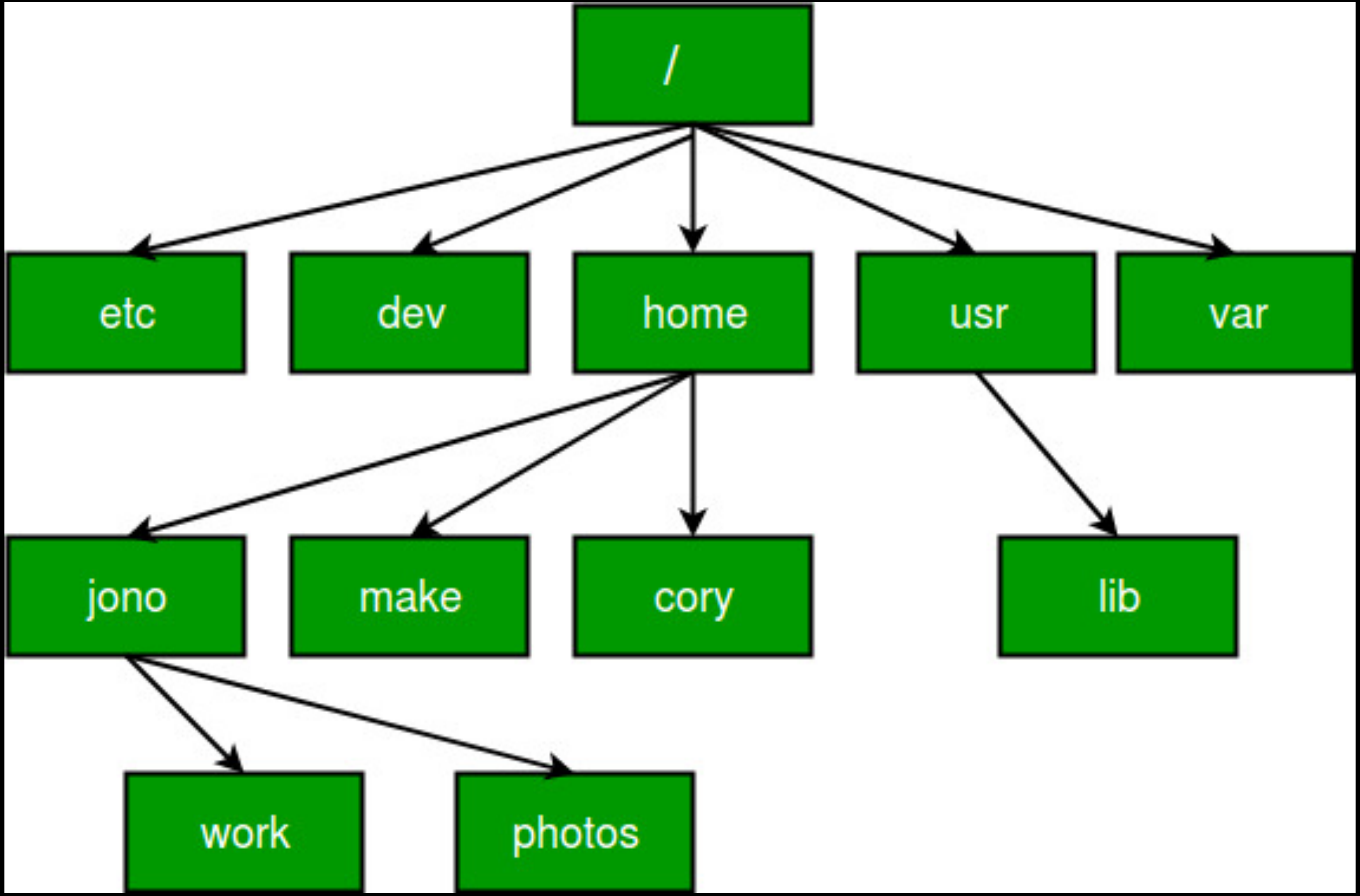


```
cd work/
```

- if **we are already present in jono directory, then after issuing the command we will be in the work directory**

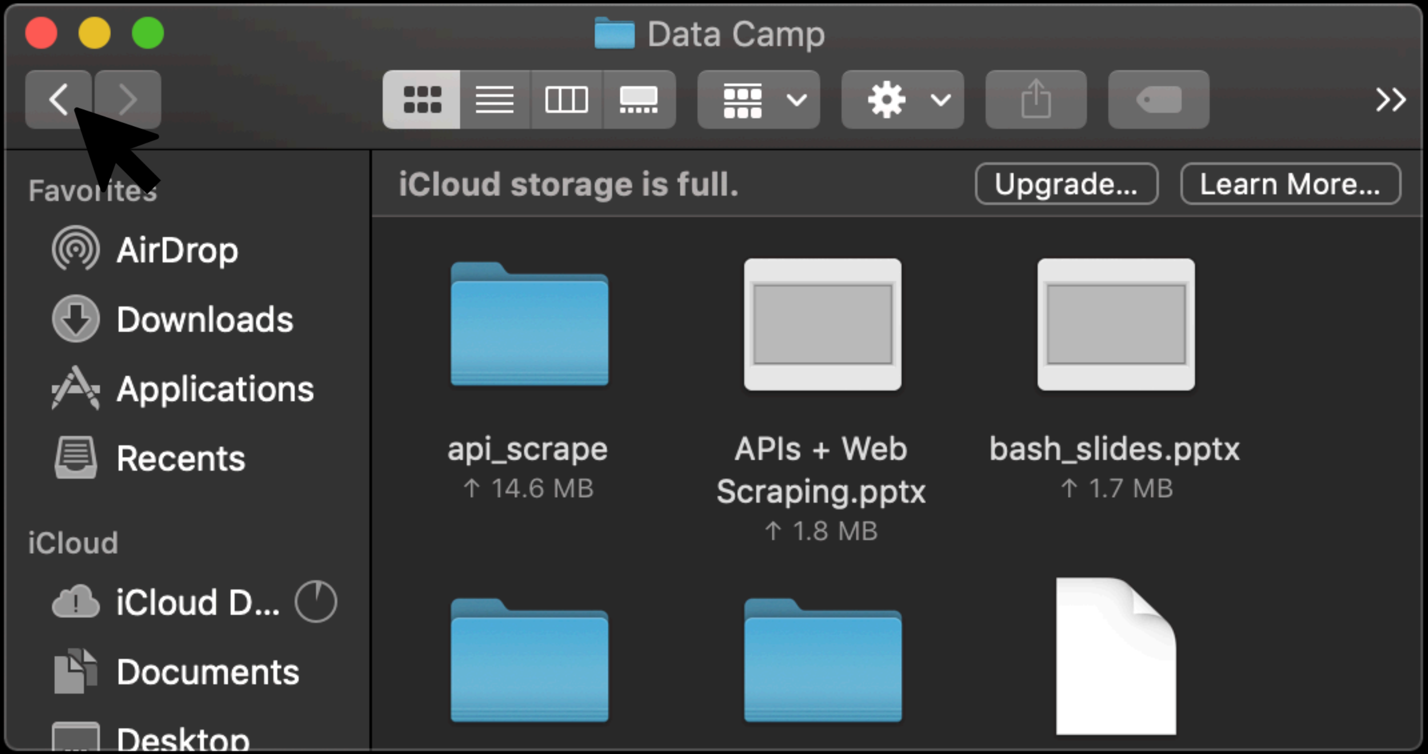


It’s a similar idea to a GUI folder interface
My working directory is Documents/
By double clicking, I’ll change directory (cd) to Data\ Camp/



```
cd ..
```

- if **we are already present in jono directory, then after issuing the command we will be in the home directory**



My working directory is Data\ Camp/
By clicking the back button, I'll change directory to the Documents/ folder (like cd ..)

Commands

- `pwd`
  - Print working directory
- `ls`
  - List files and directories
- `cd`
  - Change directory
- `cat [filename]`
  - E.g. `cat clue1.txt`
  - Print the contents of the file

Scavenger Hunt

- `cat [filename]`
  - E.g. `cat clue1.txt`
  - Print the contents of the file
- `ls`
  - List files and directories inside working directory
- `cd directory_name/`
  - Change directory “down” a level to a folder inside working directory
- `cd ..`
  - Change directory “up” a level to the folder that contains the working directory
- `pwd`
  - Print working directory
  - Use this if you get lost!

Hot tip! Use the tab button to autocomplete file + folder names

```
scavenge
├── athletic
│   ├── big_house
│   │   ├── u
│   │   ├── v
│   │   └── w
│   ├── crisler
│   │   ├── s
│   │   └── t
│   └── yost
│       ├── x
│       ├── y
│       └── z
└── central
    ├── angell
    │   ├── o
    │   └── p
    ├── hatcher
    │   ├── m
    │   └── n
    └── ross
        ├── q
        └── r
```

The Python Program: The Interactive Interpreter

- `cd` into the python/ folder
- Start up the python program by running the `python` command

```
$ python
```

- You can try running lines of python code in this interactive interpreter

```
>>> (10 * “dog”)
```

- When you want to go back to the command line

```
>>> exit()
```

Running Python Files

- Format of the command:

```
$ python <filename>.py
```

- Run the python program and pass it the file hello.py

```
$ python hello.py
```

Try it!

- Run the python program and pass it the file hello_lots.py

Passing Command Line Arguments to Python Files

- For some programs, you can change behavior by providing additional arguments
- Run the python program and pass it the file hello_name.py and a string

```
$ python hello_name.py nel
```

We're running the python program

Python file we're going to run

Argument provided to to hello_name.py

Try it!

- Run the python program and pass it the file hello_name.py and the name of your dearest pal

Passing Relative Paths as Command Line Arguments to Python Files

Make use of relative paths if you wish to pass in a file that is in a different directory!

```
$ python cleaner.py data/dracula.txt
```

OR

```
$ cd data/
$ python ../cleaner.py dracula.txt
```

File Redirection

- **Operators**

  < send file as input

  > send output to file (create/overwrite)

- Try it!

```
$ python hello_lots.py > hello_lots_out.txt
$ cat hello_lots_out.txt
```

Run the python program, pass it the file hello_name.py and your name, and save the output in a file `hello_to_me.txt`

Putting it together

```
$ python3 cleaner.py data/dracula.txt > intermediate/cleaner_dracula.out
$ cat intermediate/cleaner_dracula.out
```

Try it out! Can you clean up huckleberry.txt and save the cleaner version as cleaner_huckleberry.out in the intermediate/ folder?

What are some other cool programs that can be run at the command line?

- git
  - Version control!
  - Good for collaborating on coding projects
- vi
  - Text editor you can use inside the shell
- diff
  - Compare two different files and get the lines where they are different

Programs you write yourself!

Flags

- Sometimes you can change how a program or command works by including flags

```
$ ls
native packages props repCache systemDialogs
weka.log
$ ls –a
. native props systemDialogs wekaMetaStore ..
packages repCache weka.log
```

How do I know what I can do with a program?

- `man`
    - Manual
    - Has documentation for programs

```
$ man python
```

- `help`
    - Provides help for bash built-in commands

```
$ help cd
```

What about scripting?

- Surprise! You've been scripting this whole time!
- Typing commands into the bash shell and running a bash script are the same

```
$ cat test.sh
    python hello.py > hello.txt
    cat hello.txt
$ chmod +x test.sh # makes your file an executable
$ ./test.sh
```

How to write a bash script?

- Try things out in the terminal
- Copy things that work into a file ($ history)
- Run that file
- Repeat

Bash

- Bash is old...
- But useful, especially for really short things
- But has ugly and finicky syntax
- But running programs is really easy
- (it's what it was built for after all)
- `g++ -O3 -m32 thread.o libinterrupt.a test1.cpp -ldl -o test1`
- `./test1`

Scripting

- First line of scripts:

  ```
  #!/bin/bash
  ```

- Special variables
  - $0 current script
  - $n script args 1, 2, 3...
- Other variables, math, if/then, etc. are available

Let’s run a script!

Make sure yr working directory is the python/ folder

```
$ chmod +x bin/hello.sh
$ ./bin/hello.sh
```

Try it out! Try to run the script located at bin/excessive_greetings.sh

Let’s run a cooler script!

Make sure yr working directory is the python/ folder

This script takes two arguments

```
$ chmod +x bin/hello_cooler.sh
$ ./bin/hello_cooler.sh nel hi_to_nel.txt
```

Try it! Run the script with your own name and filename. Use `cat` to verify file contents

Then, open up the `hello_cooler.sh` file in a text editor (Sublime, Atom, Notepad, etc.) and take a look at the syntax

Scripting exercise – the main idea

- We will be making a script that runs a series of python commands
- Given a book that has chapters, we will count up how many times each word appears in each chapter

input

CHAPTER I.

YOU don't know about me without you have read a book by the name of The Adventures of Tom Sawyer; but that ain't no matter. […]

output

```
   chapter    word  count
0        i     you      9
1        i    dont      4
2        i    know      3
3        i   about     15
4        i      me     24
```

Scripting exercise – the python files

INPUT

OUTPUT

`cleaner.py`

- Takes in a text file
- Outputs that text file in all lowercase and common punctuation removed

```
CHAPTER I.
YOU don't know
```

```
chapter i
you dont know
```

`chapter_word.py`

- Takes in a text file that contains chapters
- Outputs each word in the text file along with the chapter in which it appears (a key/value pair)

```
chapter i
you dont know
```

```
i you
i dont
i know
```

`key_val_total.py`

- Takes in a key value pair
- Prints that key value pair and how many times that key value pair

```
i you
i dont
i know
```

```
i you 9
i dont 4
i know 3
```

Now you make a script!

- Your bash script will take two arguments – the file you want to process and the location of the final output
  - Reference the first argument to the scripts using $1
  - Reference the second argument to the scripts using $2
- Tip: try running these three python files on the command line before sticking them in your script
  - (Follow the comments in `process_book.sh` for implementation details)

Example runs:

```
$ ./bin/process_book.sh data/huckleberry.txt output/huckleberry.out
$ ./bin/process_book.sh data/dracula.txt output/dracula.out
```

Check out that sweet sweet data

```
$ python
>>> import pandas
>>> data = pandas.read_csv('output/huckleberry.out',
sep=" ", header=None, names=['chapter', 'word',
'count'])
```