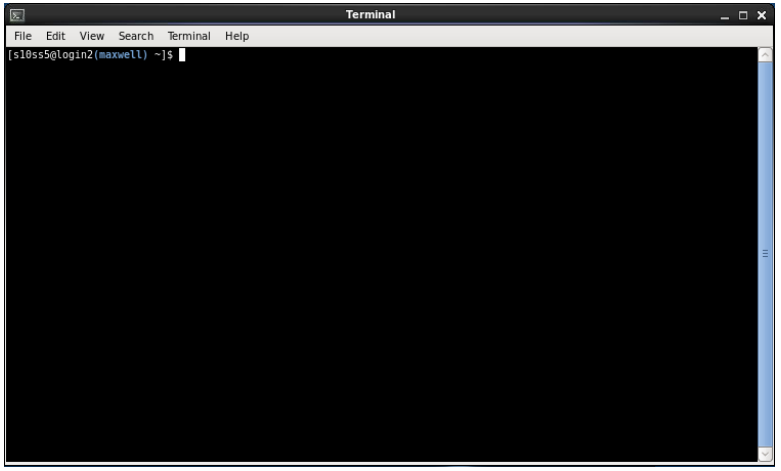
What We're Going To Do

- Why Unix?
- Cloud Computing
- Connecting to AWS
- Introduction to Unix Commands



Etiquette

- PowerPoint interspersed with Challenges
- Ask me questions
- Ask demonstrators
- Work together
- Cheat!

Unix/Linux Command Reference

FOSSwire.com

File Commands

ls – directory listing
ls -al – formatted listing with hidden files
cd *dir* - change directory to *dir*
cd – change to home
pwd – show current directory
mkdir *dir* – create a directory *dir*
rm *file* – delete *file*
rm -r *dir* – delete directory *dir*
rm -f *file* – force remove *file*
rm -rf *dir* – force remove directory *dir* *
cp *file1 file2* – copy *file1* to *file2*
cp -r *dir1 dir2* – copy *dir1* to *dir2*; create *dir2* if it doesn't exist
mv *file1 file2* – rename or move *file1* to *file2* if *file2* is an existing directory, moves *file1* into directory *file2*
ln -s *file link* – create symbolic link *link* to *file*
touch *file* – create or update *file*
cat > *file* – places standard input into *file*
more *file* – output the contents of *file*
head *file* – output the first 10 lines of *file*
tail *file* – output the last 10 lines of *file*
tail -f *file* – output the contents of *file* as it grows, starting with the last 10 lines

Process Management

ps – display your currently active processes
top – display all running processes
kill *pid* – kill process id *pid*
killall *proc* – kill all processes named *proc* *
bg – lists stopped or background jobs; resume a stopped job in the background
fg – brings the most recent job to foreground
fg *n* – brings job *n* to the foreground

File Permissions

chmod *octal file* – change the permissions of *file* to *octal*, which can be found separately for user, group, and world by adding:

- 4 – read (r)
- 2 – write (w)
- 1 – execute (x)

Examples:
chmod 777 – read, write, execute for all
chmod 755 – rwx for owner, rx for group and world
For more options, see **man chmod**.

SSH

ssh *user@host* – connect to *host* as *user*
ssh -p *port user@host* – connect to *host* on port *port* as *user*
ssh-copy-id *user@host* – add your key to *host* for *user* to enable a keyed or passwordless login

Searching

grep *pattern files* – search for *pattern* in *files*
grep -r *pattern dir* – search recursively for *pattern* in *dir*
command* | grep *pattern – search for *pattern* in the output of *command*
locate *file* – find all instances of *file*

System Info

date – show the current date and time
cal – show this month's calendar
uptime – show current uptime
w – display who is online
whoami – who you are logged in as
finger *user* – display information about *user*
uname -a – show kernel information
cat /proc/cpuinfo – cpu information
cat /proc/meminfo – memory information
man *command* – show the manual for *command*
df – show disk usage
du – show directory space usage
free – show memory and swap usage
whereis *app* – show possible locations of *app*
which *app* – show which *app* will be run by default

Compression

tar cf *file.tar files* – create a tar named *file.tar* containing *files*
tar xf *file.tar* – extract the files from *file.tar*
tar czf *file.tar.gz files* – create a tar with Gzip compression
tar xzf *file.tar.gz* – extract a tar using Gzip
tar cjf *file.tar.bz2* – create a tar with Bzip2 compression
tar xjf *file.tar.bz2* – extract a tar using Bzip2
gzip *file* – compresses *file* and renames it to *file.gz*
gzip -d *file.gz* – decompresses *file.gz* back to *file*

Network

ping *host* – ping *host* and output results
whois *domain* – get whois information for *domain*
dig *domain* – get DNS information for *domain*
dig -x *host* – reverse lookup *host*
wget *file* – download *file*
wget -c *file* – continue a stopped download

Installation

Install from source:
./configure
make
make install
dpkg -i *pkg.deb* – install a package (Debian)
rpm -Uvh *pkg.rpm* – install a package (RPM)

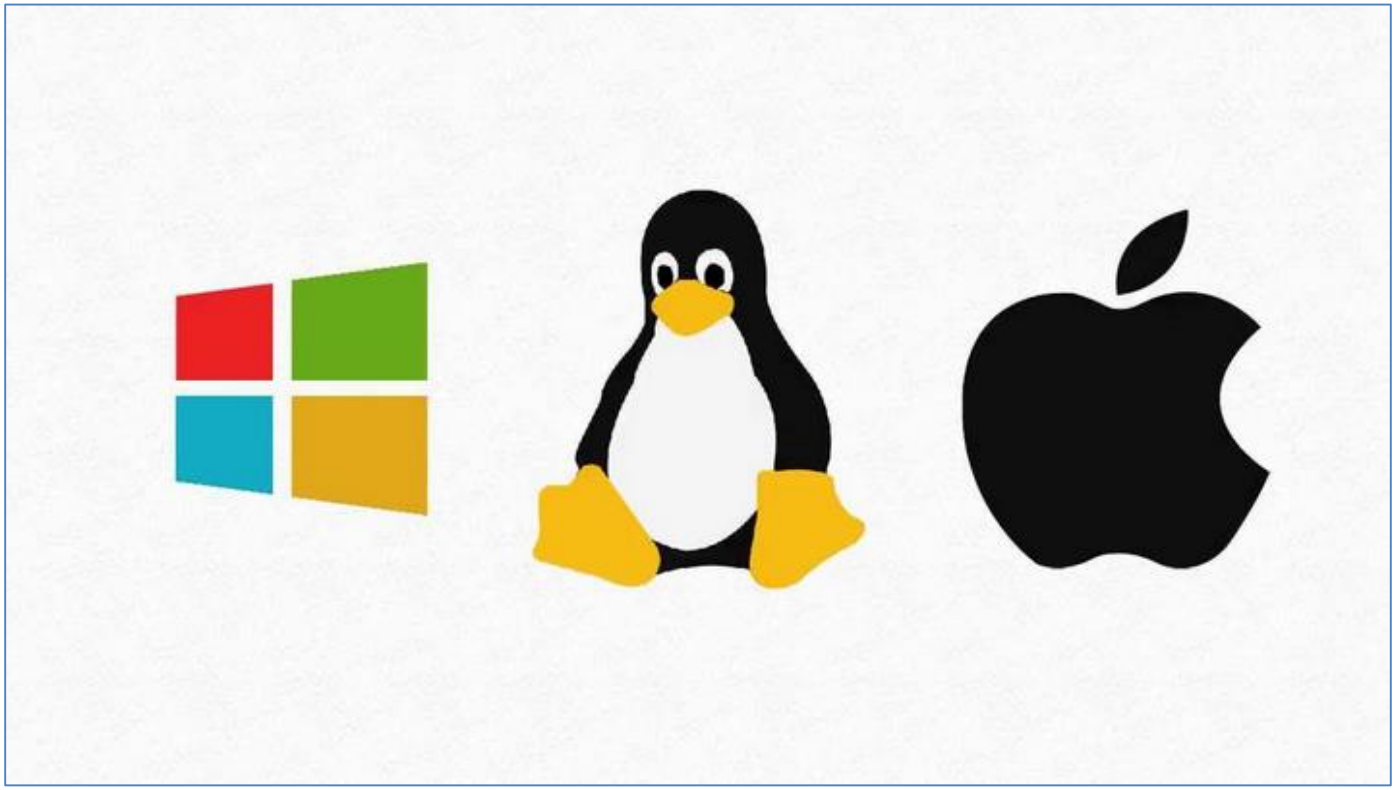
Shortcuts

Ctrl+C – halts the current command
Ctrl+Z – stops the current command, resume with **fg** in the foreground or **bg** in the background
Ctrl+D – log out of current session, similar to **exit**
Ctrl+W – erases one word in the current line
Ctrl+U – erases the whole line
Ctrl+R – type to bring up a recent command
!! - repeats the last command
exit – log out of current session

* use with extreme caution.

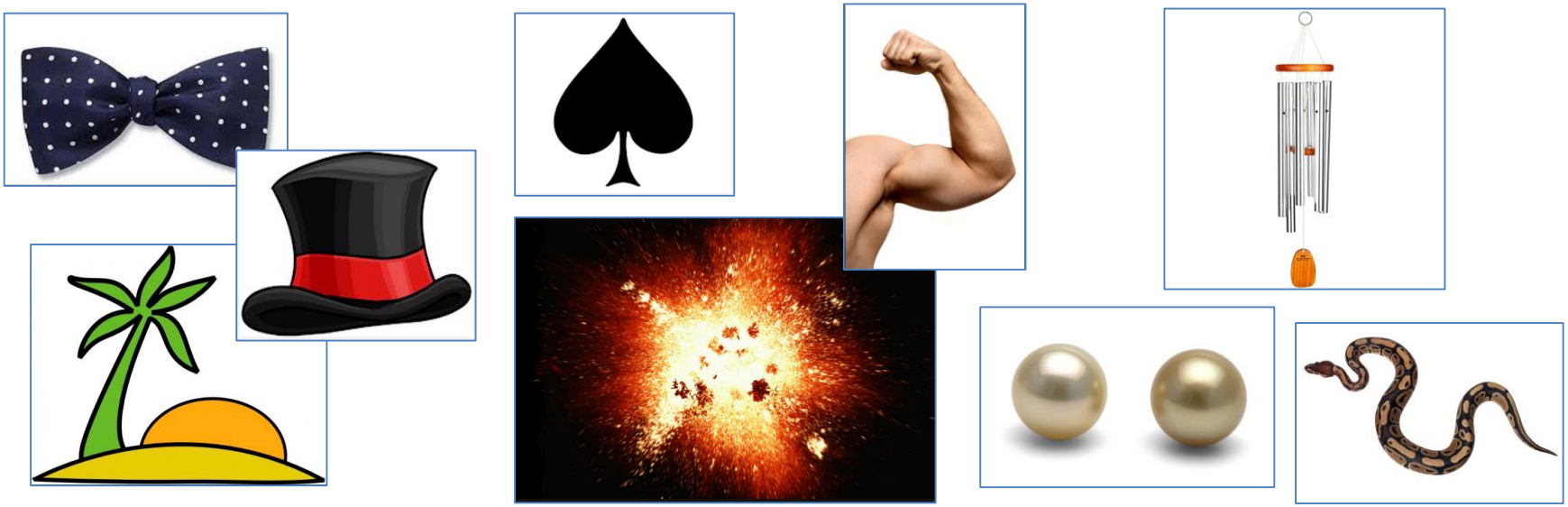
What is Unix?

- Operating System



Why Unix?

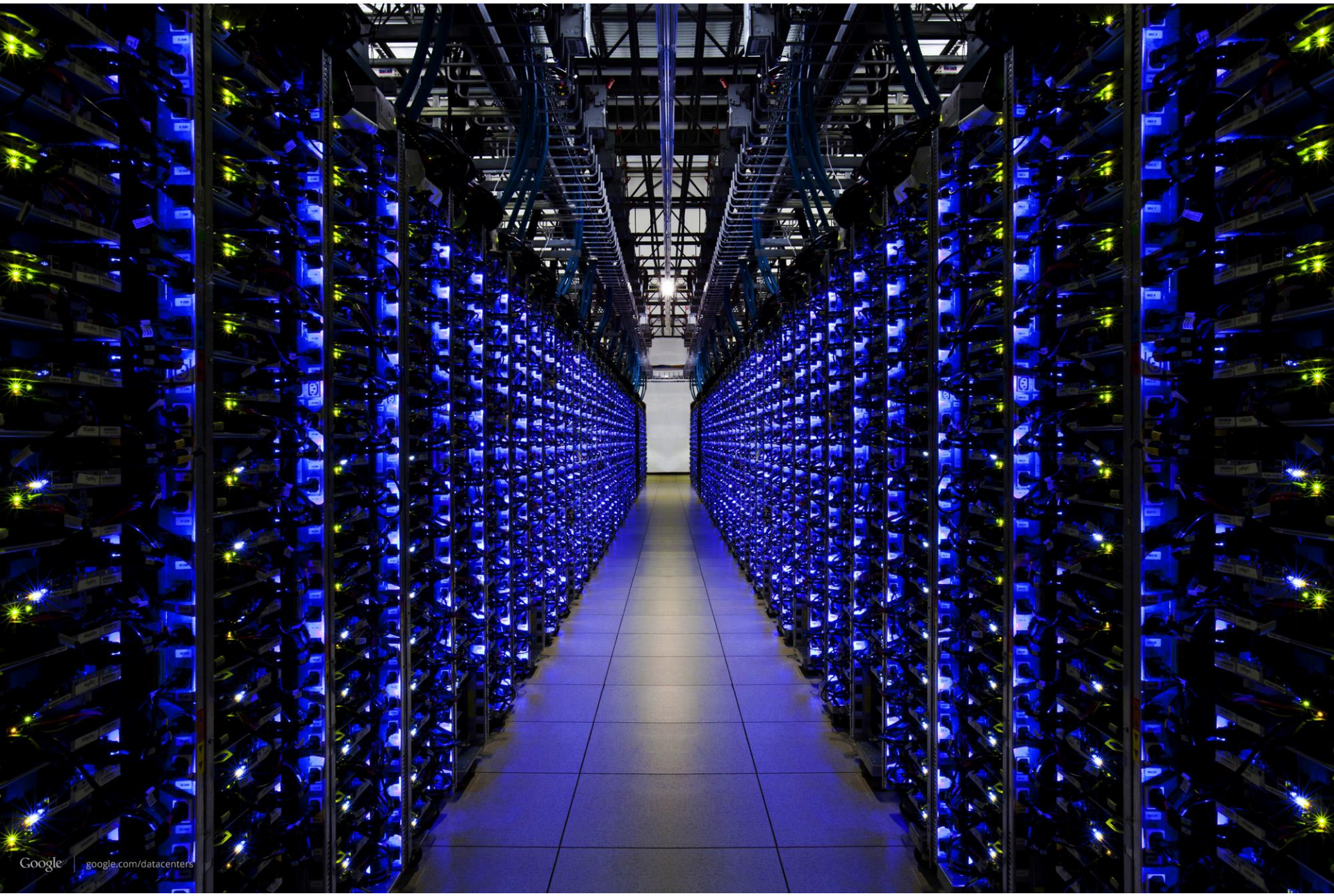
- Bioinformatics software designed to run on Unix platforms.
- Large amounts of data.
- Much faster than your Windows PC.



How Can We Use Unix?

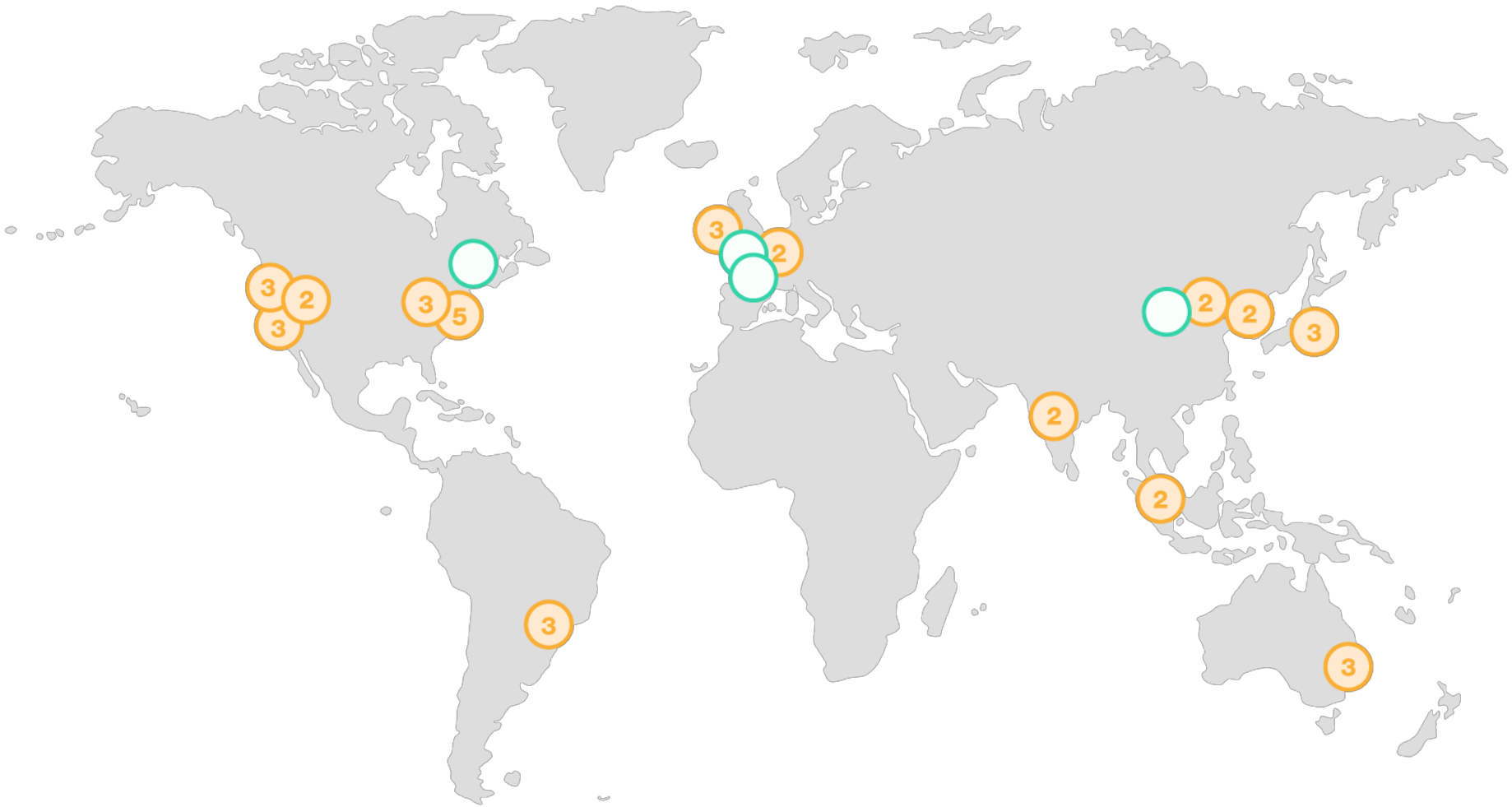
- Linux computers or servers.
- Compute clusters.
- The cloud.
  - What we're going to use this week

So What is Cloud Computing?


Google
google.com/datacenters

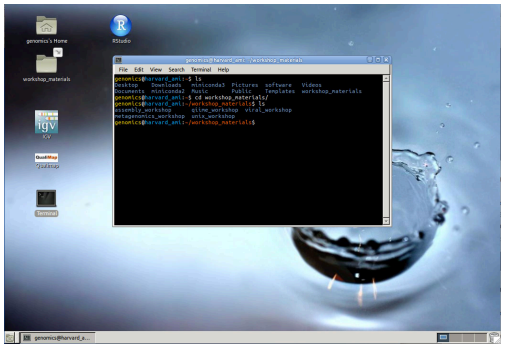
Cloud Computing Solutions

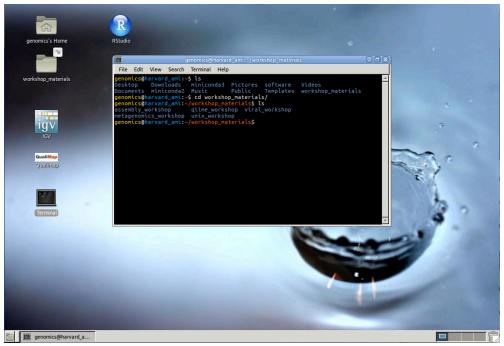
Google Compute Engine

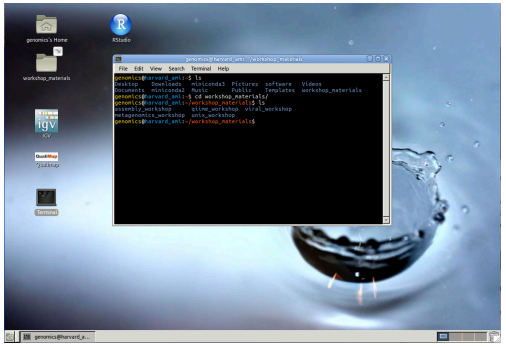


AWS “Availability Zones” and Data Centres

How it Works







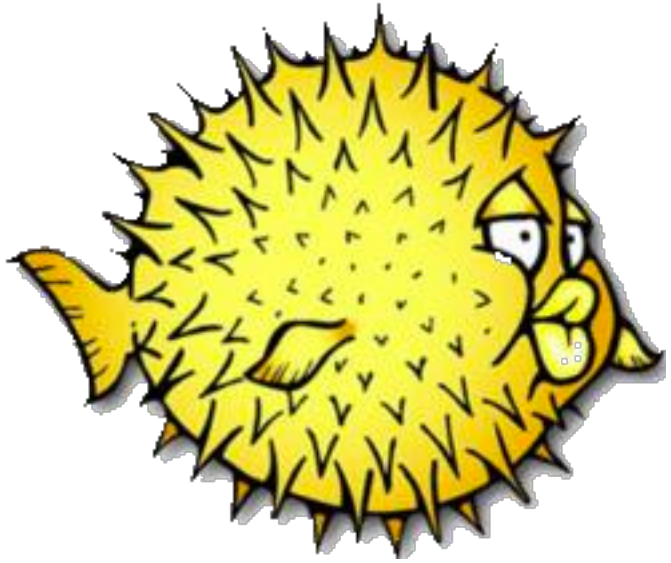
Own copy of the AMI = Instance (Virtual Machine or VM)

Terminology

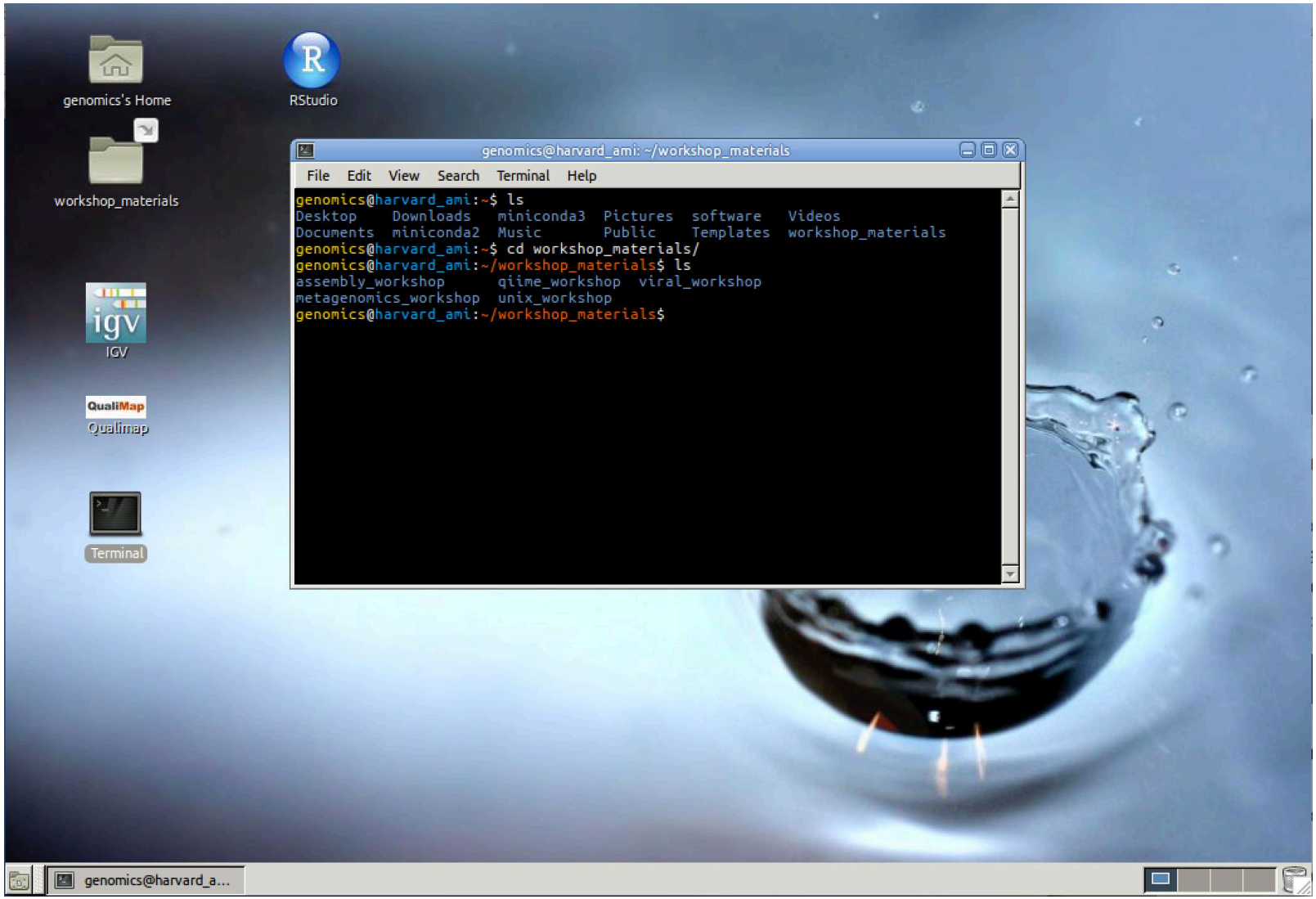
- Creating an instance – *buying a brand new computer with software already installed.*
- Starting an instance – *turning that computer on.*
- Stopping an instance – *turning that computer off.*
- Terminating an instance – *setting that computer on fire and throwing it out of the window.*

Connecting to Your Instance

Remote Desktop
Software
e.g. X2Go



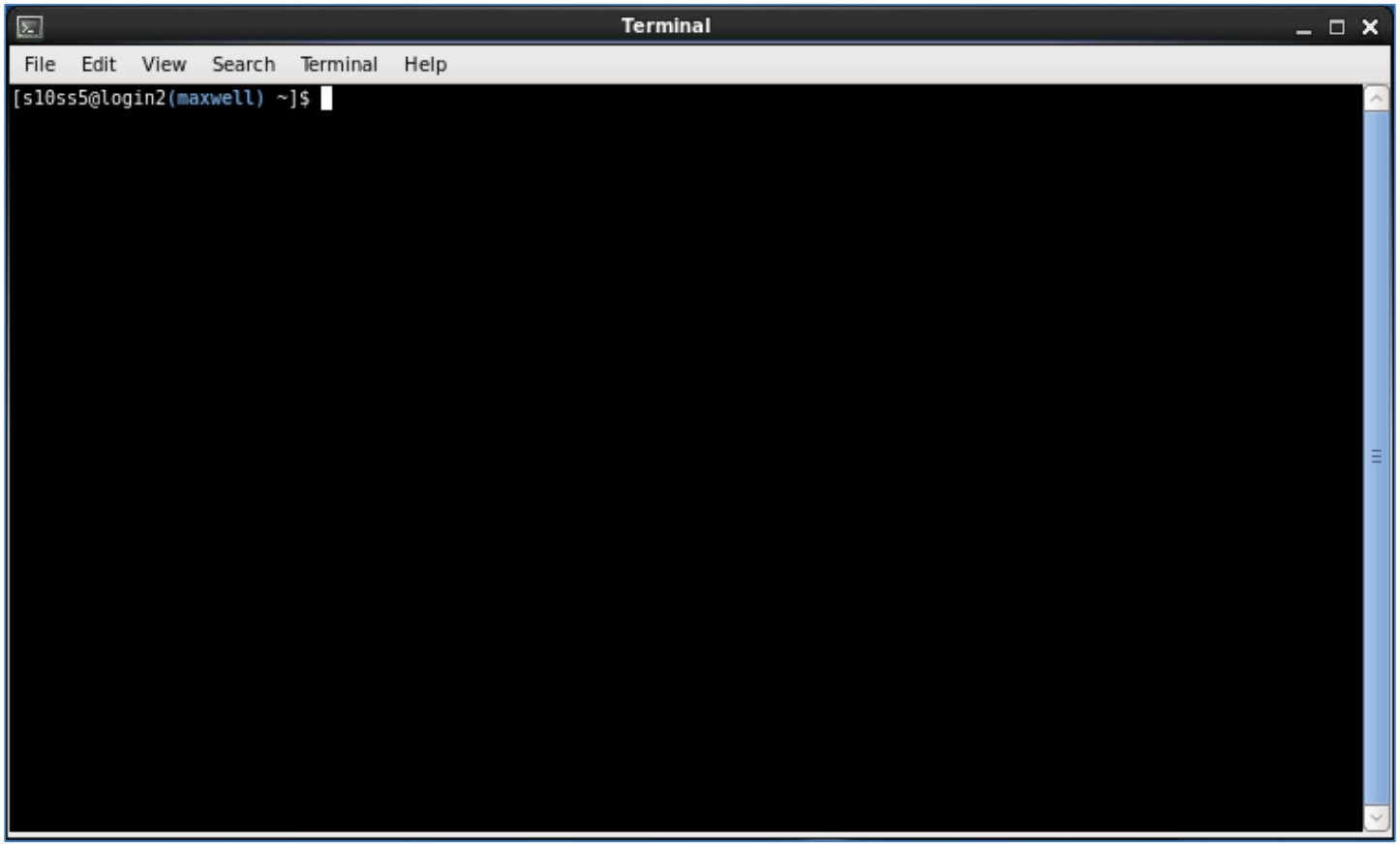
Secure Shell –
“SSH”
e.g. SSH or PuTTY



You're now connected to your instance and you're ready to learn some Unix!

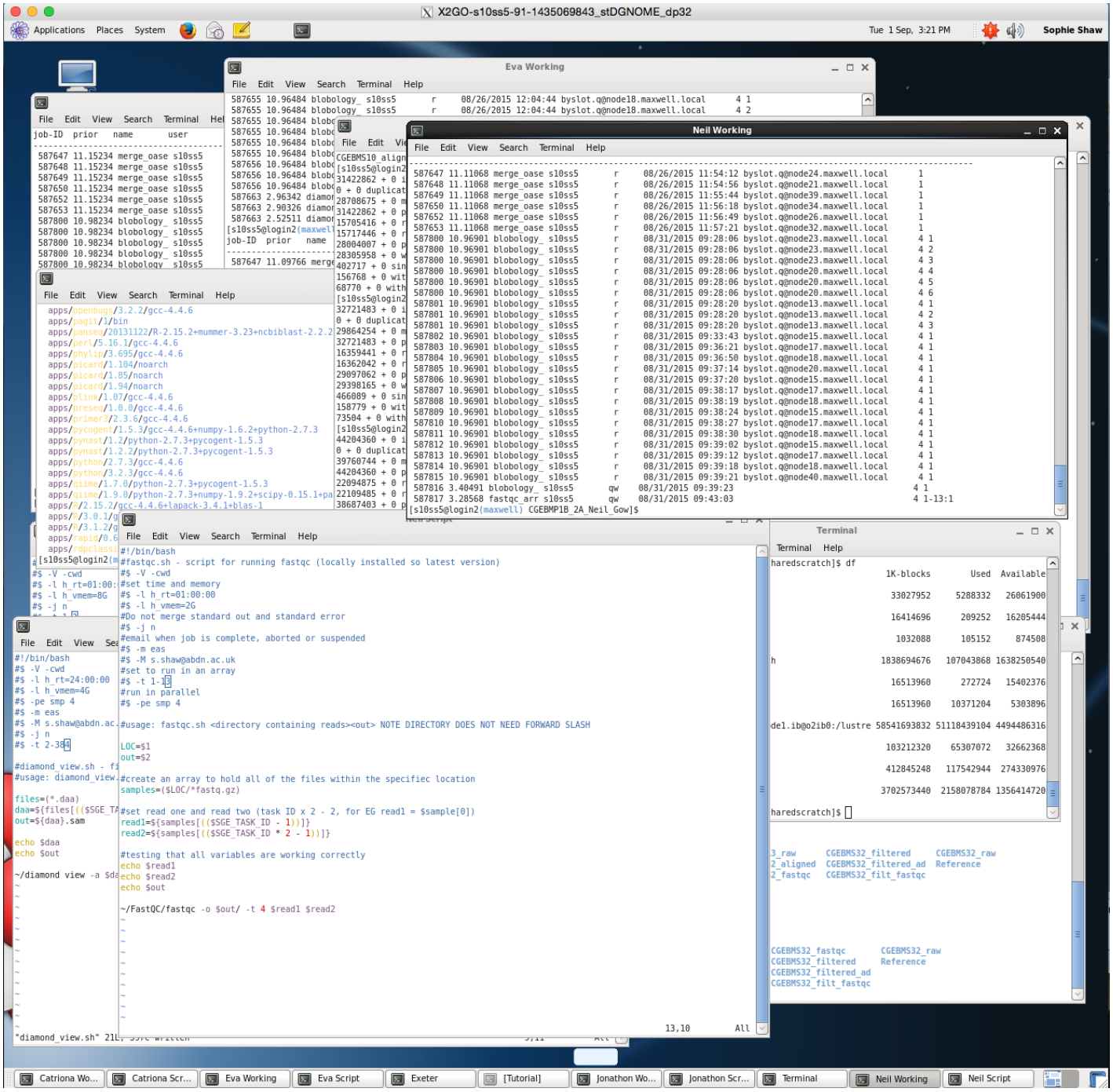
Any Questions So Far?

The Terminal Window



The Command Line, The Shell, The Prompt

Where you see this “$” followed by text, I want you to type the text on your command line


X2GO-s10ss5-91-1435069843_stDGNOME_dp32
Applications Places System
Tue 1 Sep, 3:21 PM
Sophie Shaw
Eva Working
Neil Working
Terminal
Catriona Wo...
Catriona Scr...
Eva Working
Eva Script
Exeter
[Tutorial]
Jonathon Wo...
Jonathon Scr...
Terminal
Neil Working
Neil Script

Location is Important

First Task – Where am I?

```
$ pwd
```

```
genomics@harvard_ami:~$ pwd
/home/genomics
genomics@harvard_ami:~$
```

This is your “present working directory”

/

= ROOT

home

bin

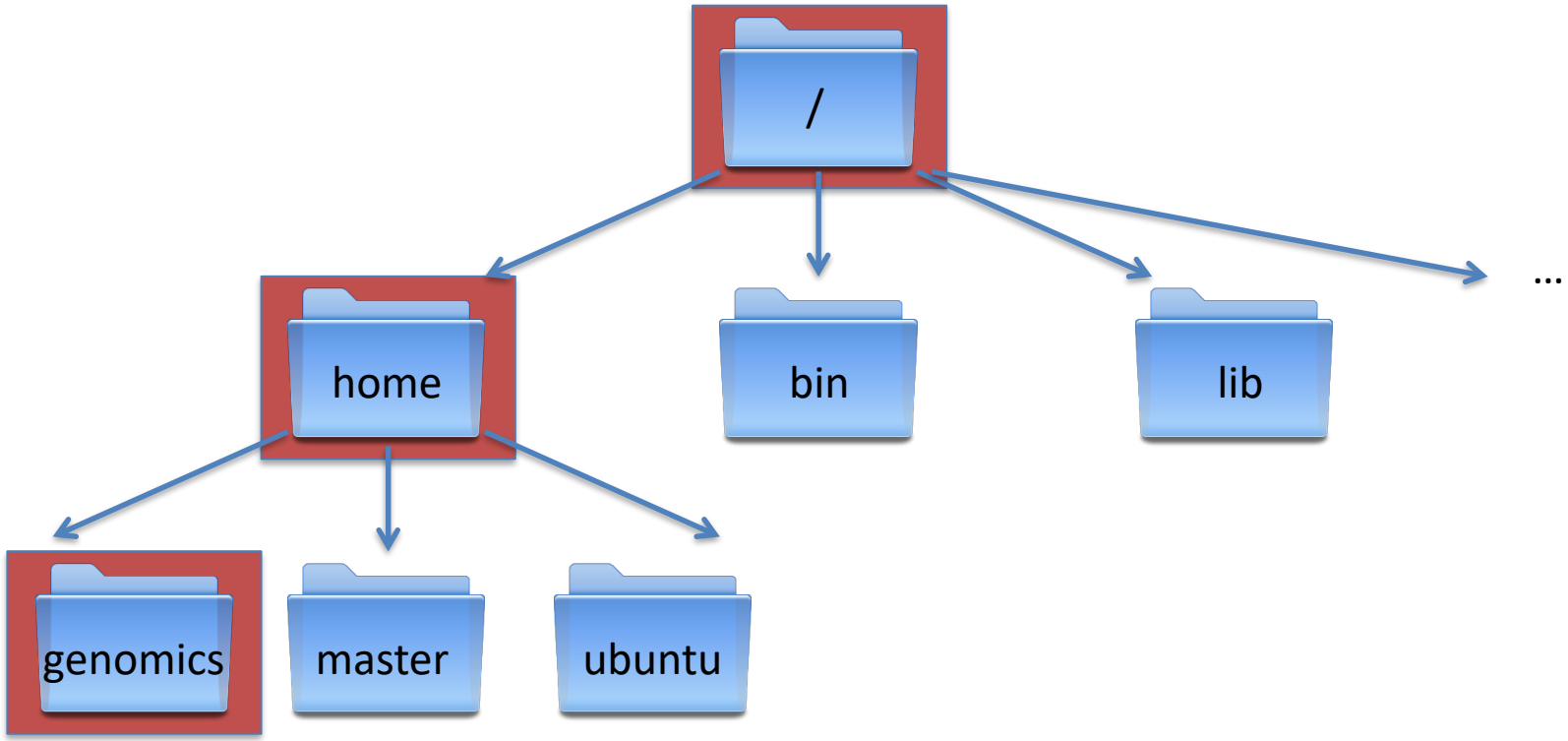
lib

...

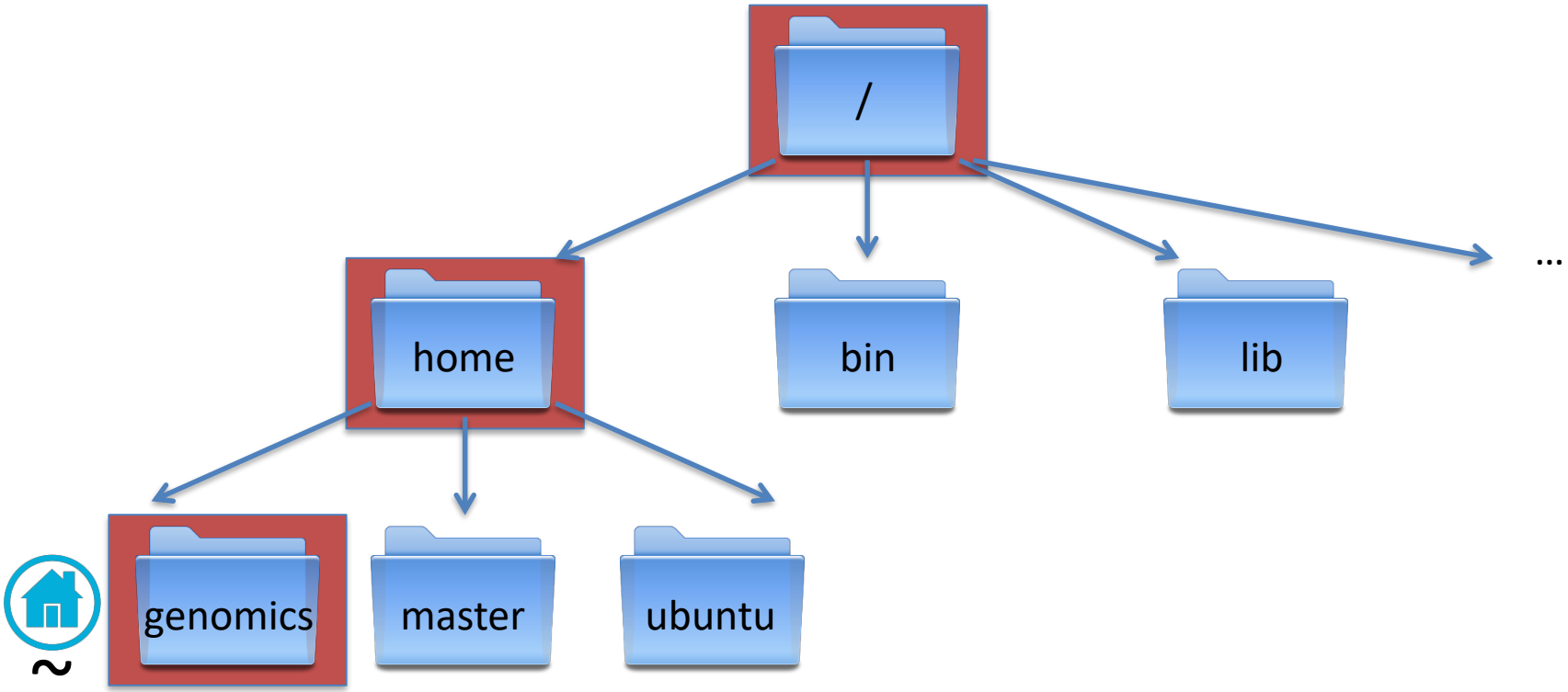
genomics

master

ubuntu




```
genomics@harvard_ami:~$ pwd
/home/genomics
genomics@harvard_ami:~$
```




```
genomics@harvard_ami:~$ pwd
/home/genomics
genomics@harvard_ami:~$
```

This location is also known as your Home Directory

Tilde is shorthand for Home:

~

Now let's create some directories and files

Make a directory

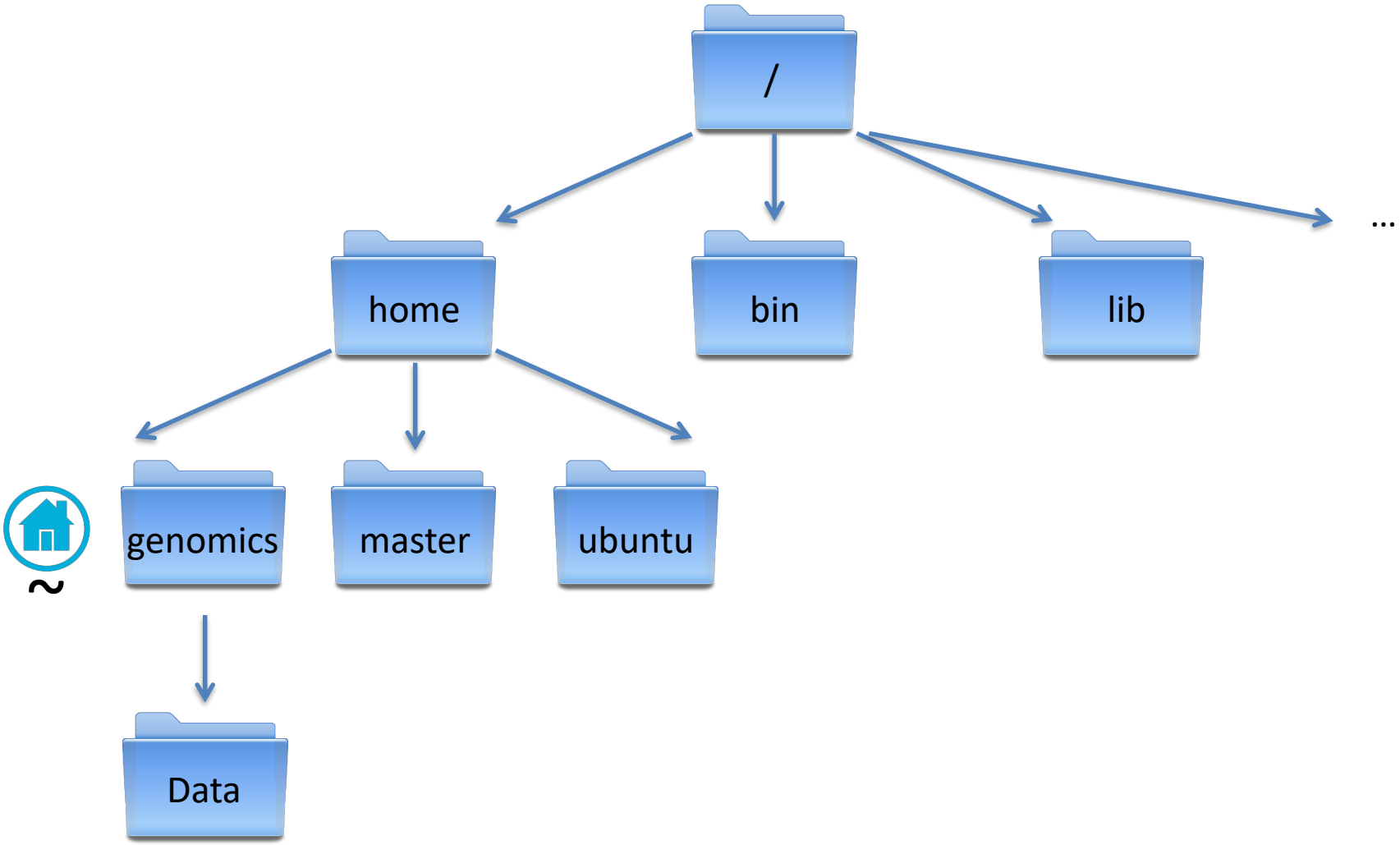
```
$ mkdir Data
```

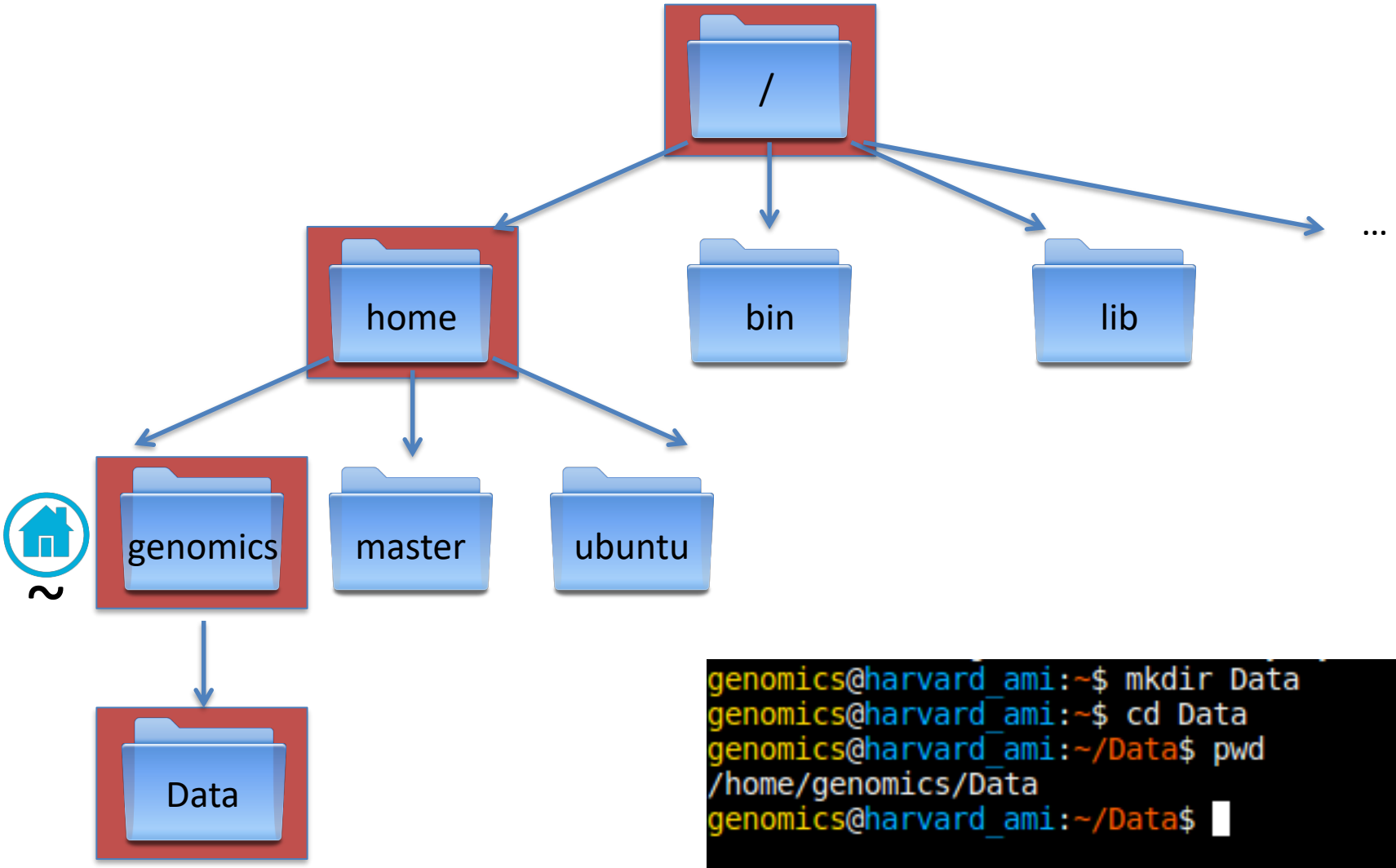
Change into this directory

```
$ cd Data
```

Now what is your present working directory?

NOTE! Directory names (and file names for the matter) can not contain spaces.
Underscores are often used instead if you want to separate words.


/
home
bin
lib
...
genomics
master
ubuntu
~
Data




```
genomics@harvard_ami:~$ mkdir Data
genomics@harvard_ami:~$ cd Data
genomics@harvard_ami:~/Data$ pwd
/home/genomics/Data
genomics@harvard_ami:~/Data$
```

Now let’s create some directories and files

Make an empty file

```
$ touch rags
```

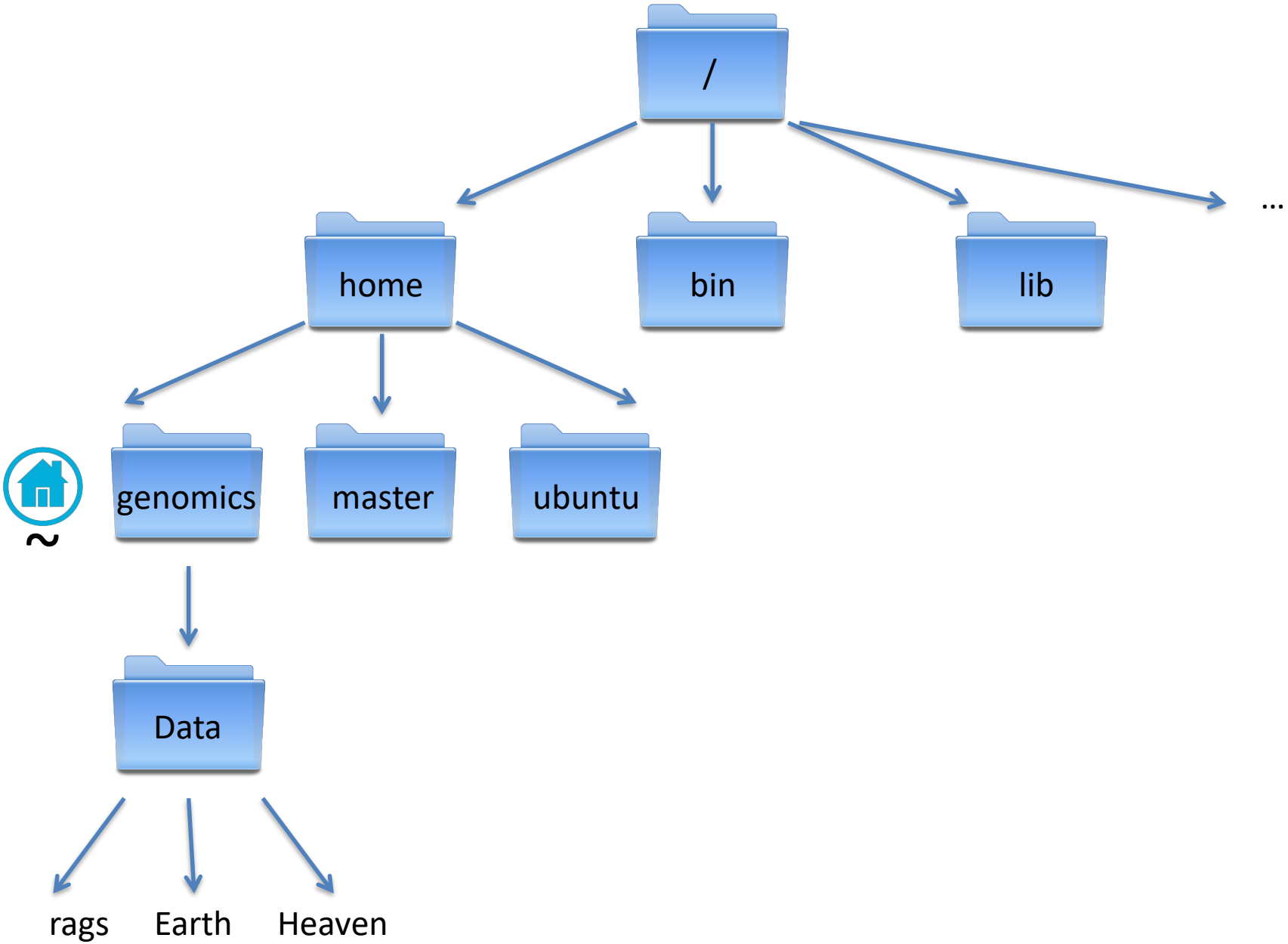
And another two

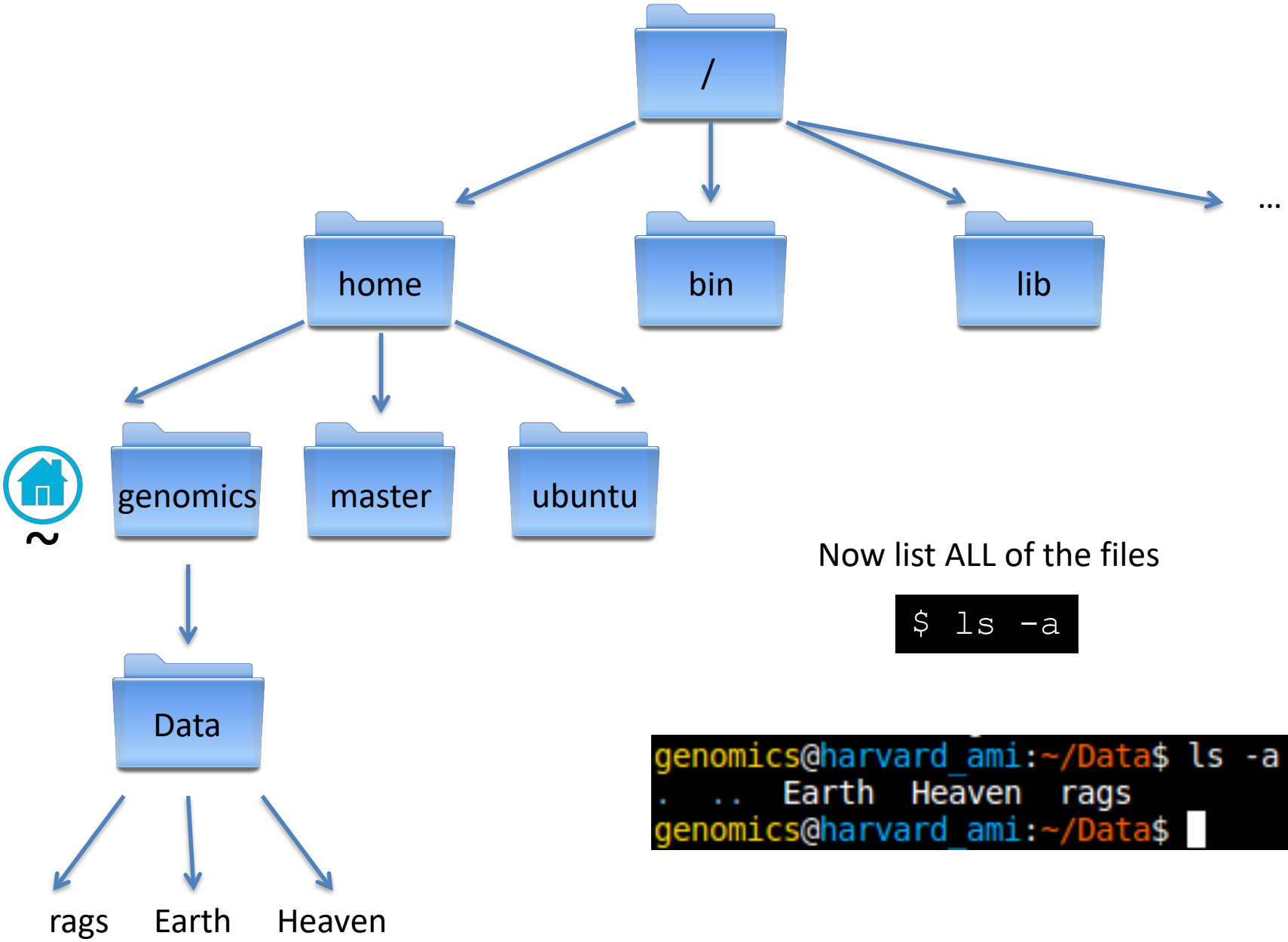
```
$ touch Earth Heaven
```

Now let’s list the contents of the current directory (Data)

```
$ ls
```

```
genomics@harvard_ami:~/Data$ touch rags
genomics@harvard_ami:~/Data$ touch Earth Heaven
genomics@harvard_ami:~/Data$ ls
Earth  Heaven  rags
genomics@harvard_ami:~/Data$
```

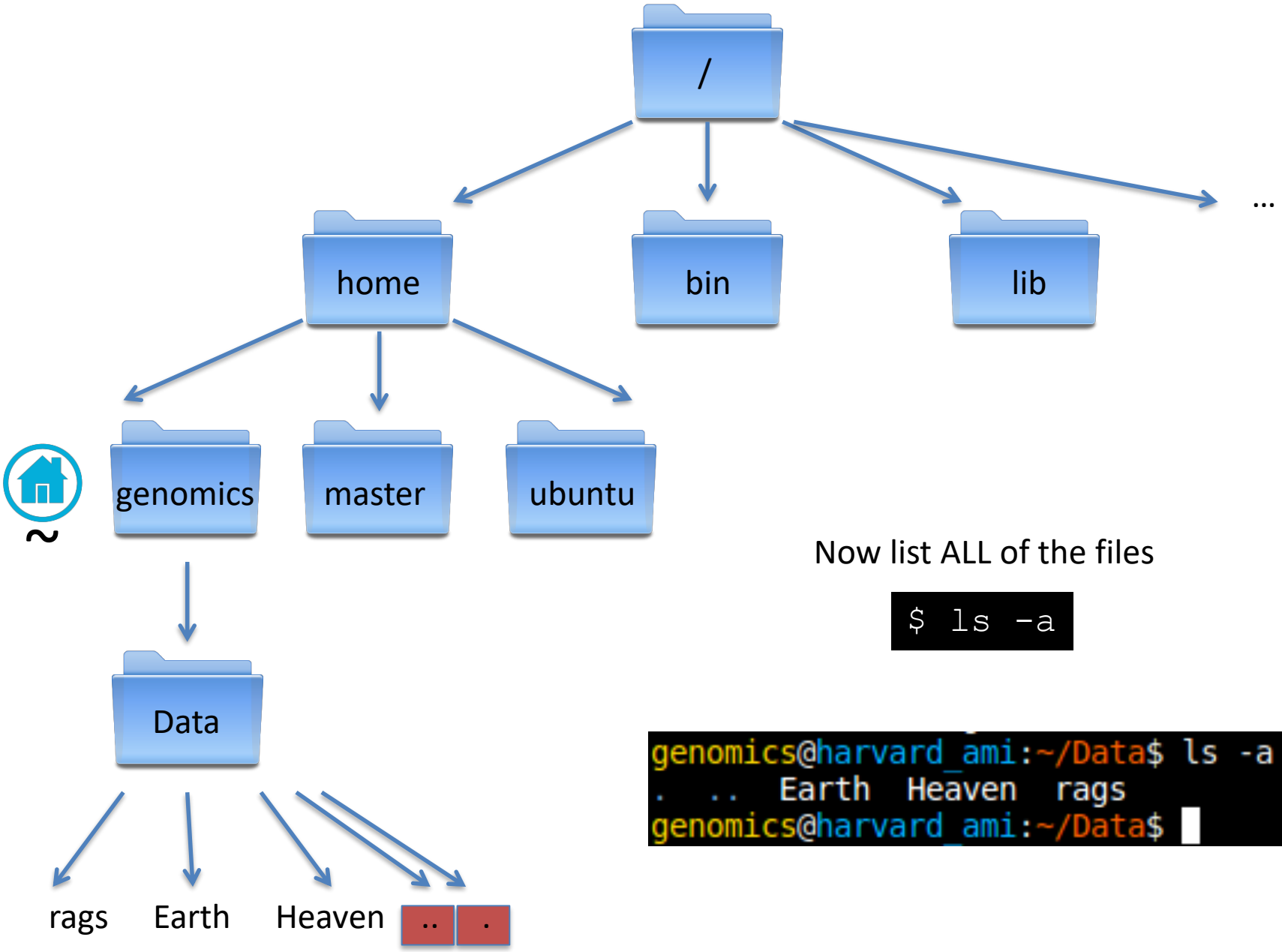

/
home
bin
lib
...
genomics
master
ubuntu
~
Data
rags
Earth
Heaven



Now list ALL of the files

```
$ ls -a
```

```
genomics@harvard_ami:~/Data$ ls -a
.  ..  Earth  Heaven  rags
genomics@harvard_ami:~/Data$
```



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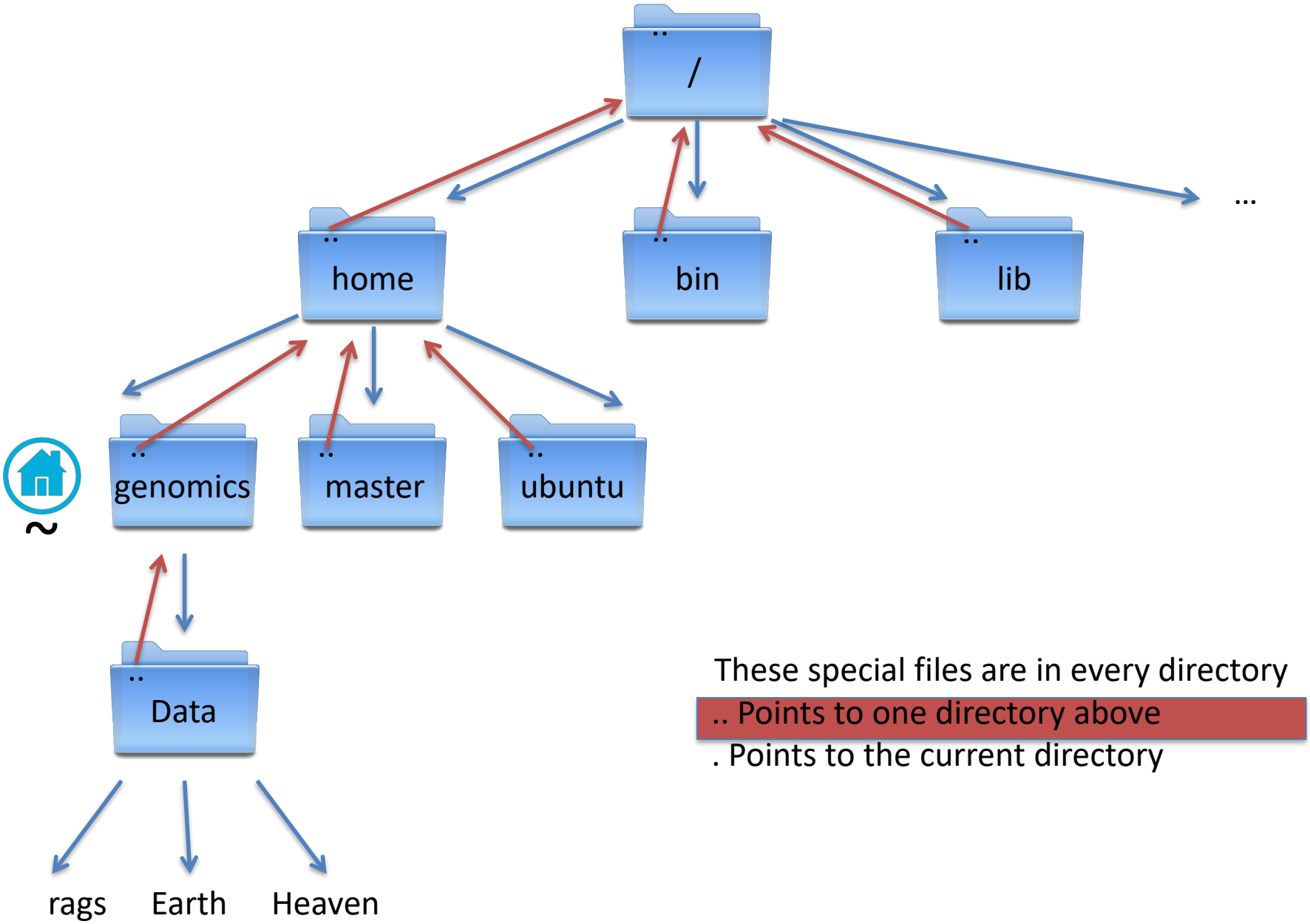
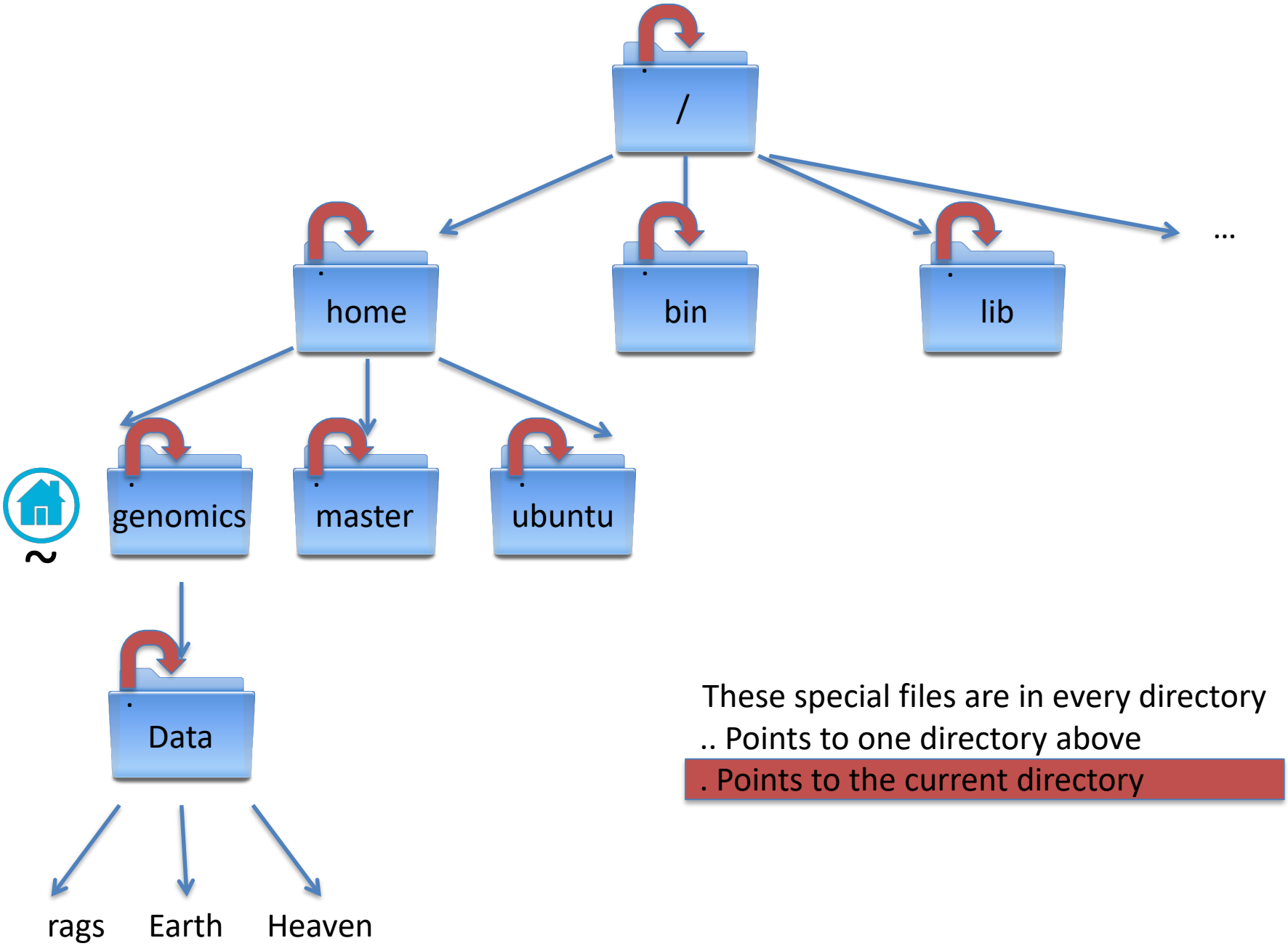
genomics@harvard_ami:~/Data$ ls -a
.  ..  Earth  Heaven  rags
genomics@harvard_ami:~/Data$
```



These special files are in every directory

.. Points to one directory above

. Points to the current directory



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