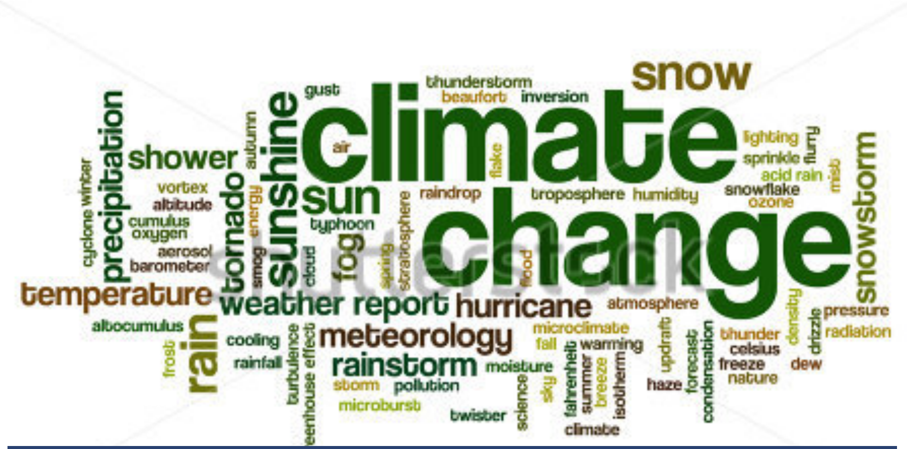
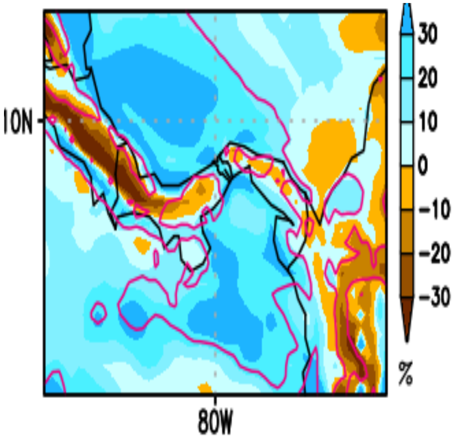


01010100 01101000 01101001 01110011
00100000 01101001 01110011 00100000
01110100 01101000 01100101 00100000
01110100 01110101 01110100 01101111
01110010 01101001 01100001 01101100
00100000 01110100 01101111 00100000
01101100 01100101 01100001 01110010
01101110 00100000 01100010 01101001
01101110 01100001 01110010 01111001
00101110 00100000 01001001 00100000
01101000 01101111 01110000 01100101
00100000 01111001 01101111 01110101
00100000 01100101 01101110 01101010
01101111 01111001 00100000 01101001
01110100 00100001



Tutorial de UNIX

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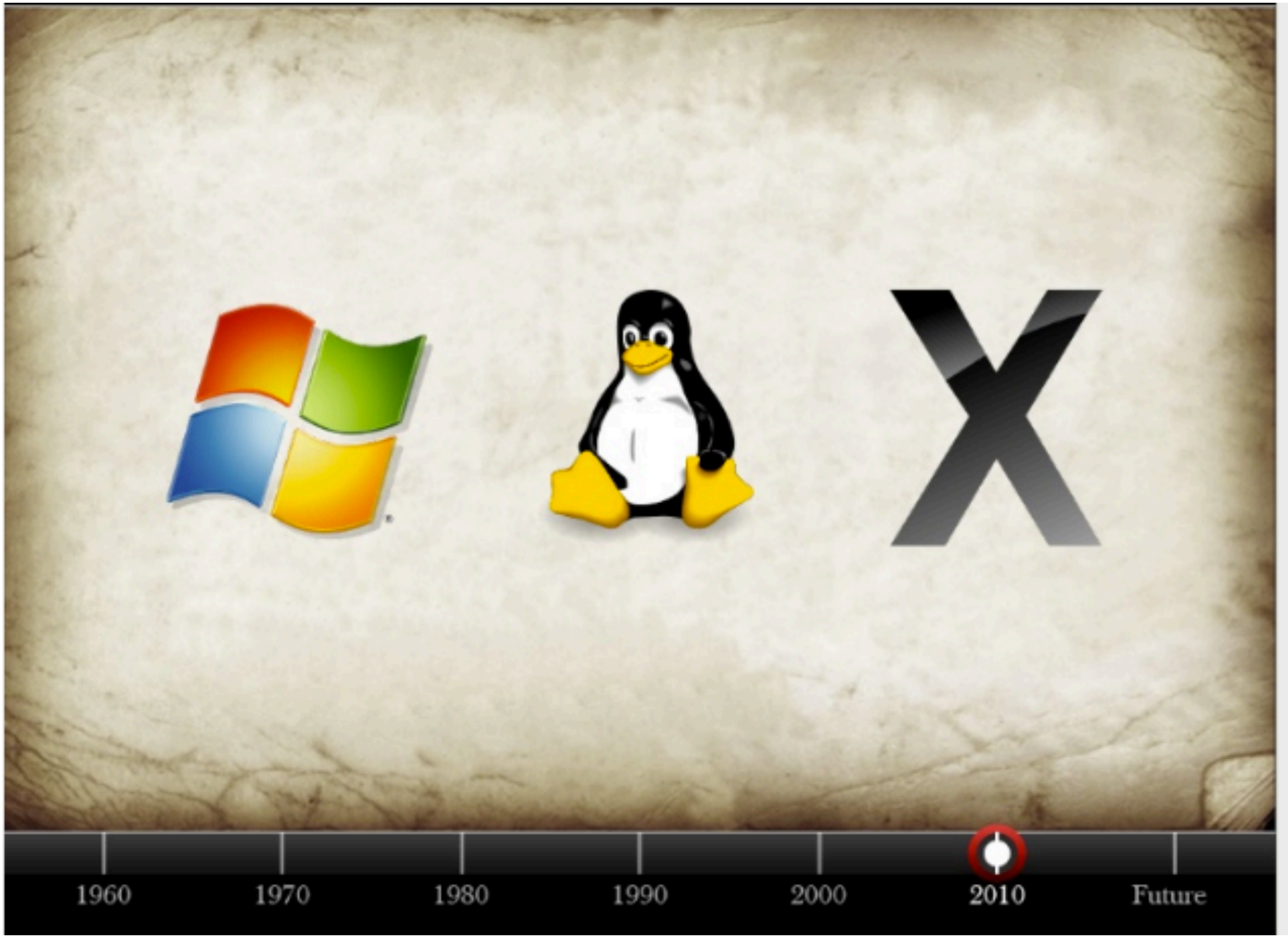
Historia de los Sistemas Operativos



Sistemas Operativos

Linea de Comandos de Unix

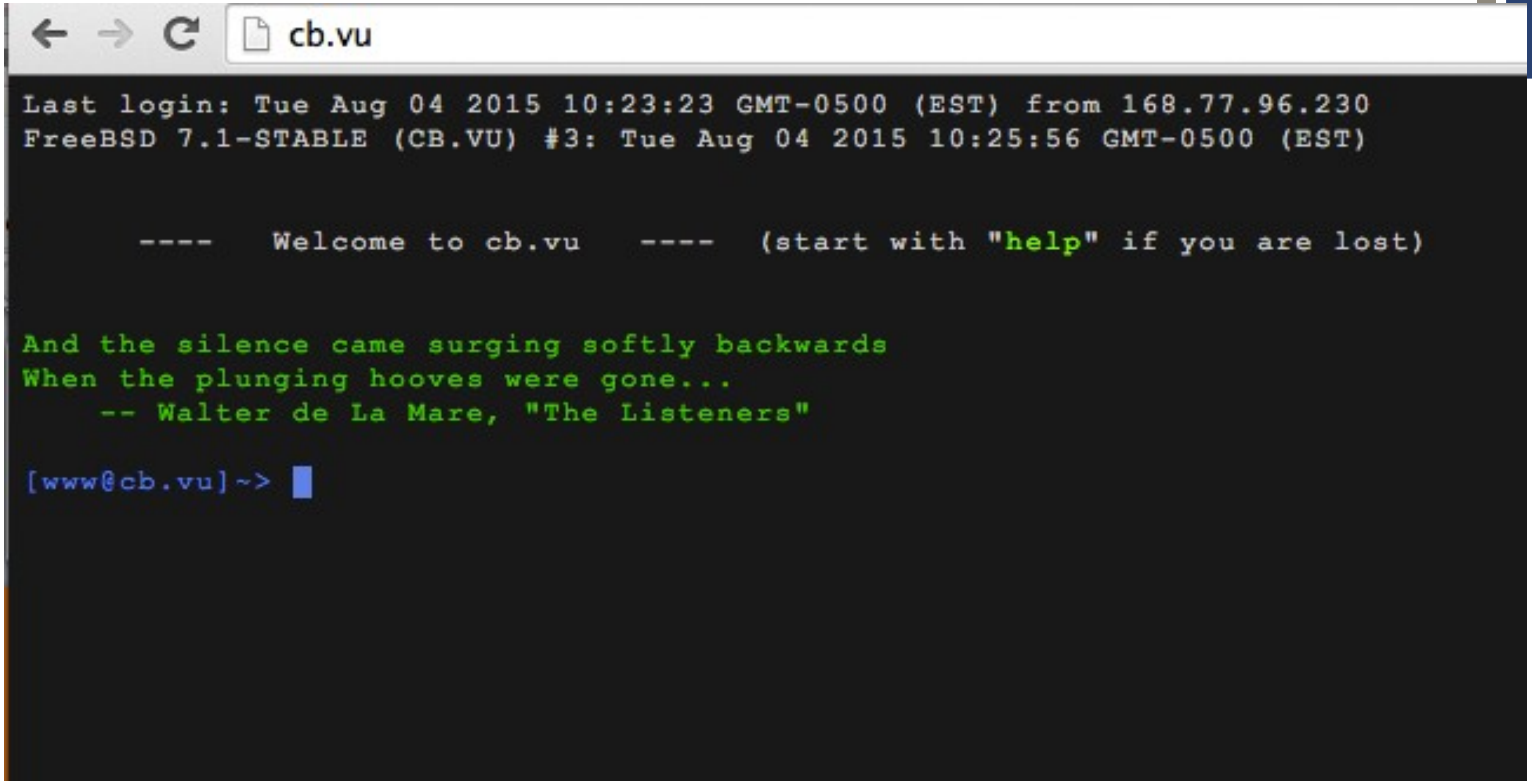
The Command Line

Every communication is a task (command)

Question: what is the size of a file?
Command: *Count the number of bytes in a file*

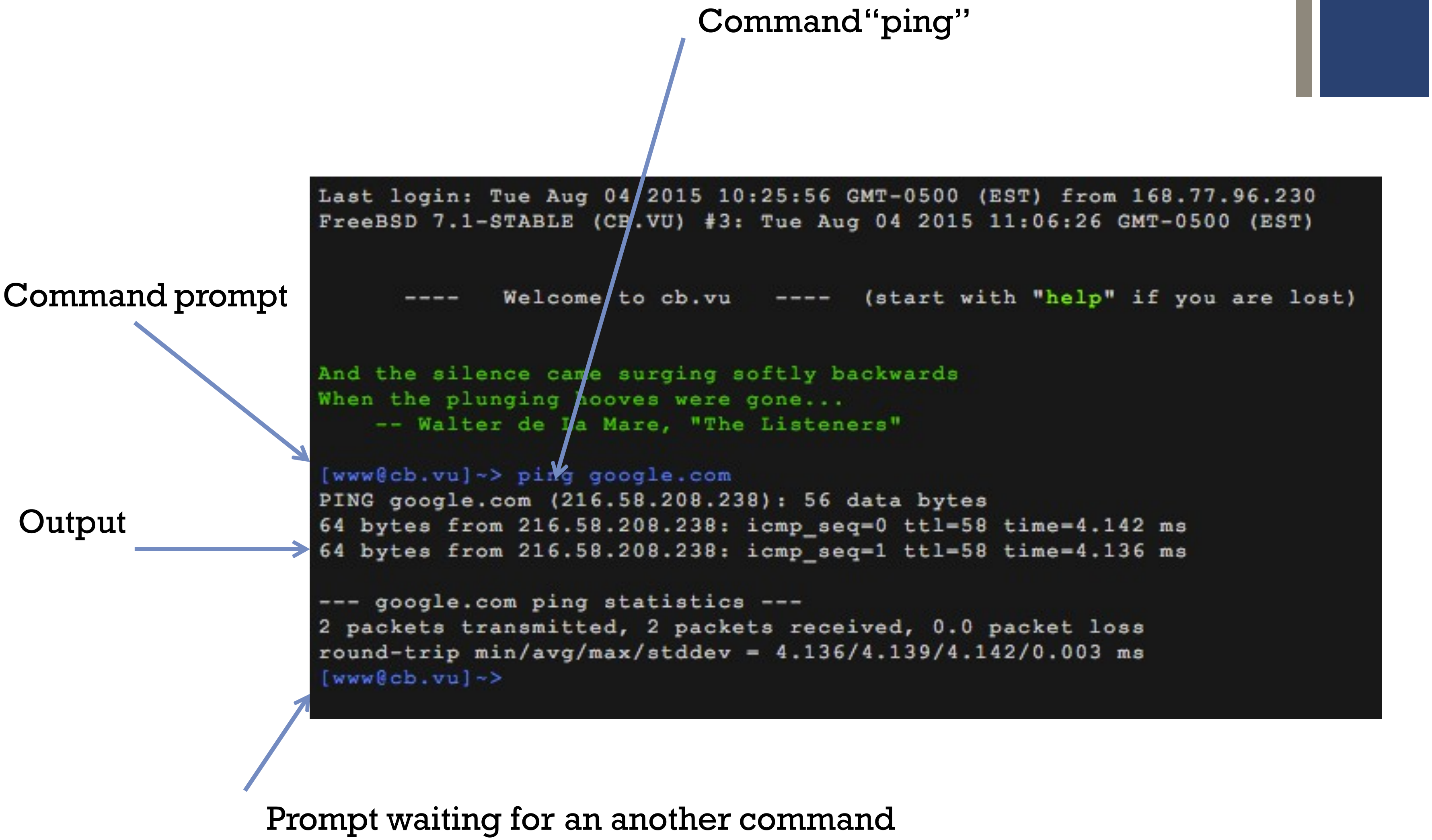
Question: How many words are in a document
Command: *Count the number of words in a document*

Anatomy of The Command Line



```
Last login: Tue Aug 04 2015 10:23:23 GMT-0500 (EST) from 168.77.96.230
FreeBSD 7.1-STABLE (CB.VU) #3: Tue Aug 04 2015 10:25:56 GMT-0500 (EST)


      ----   Welcome to cb.vu   ----  (start with "help" if you are lost)


And the silence came surging softly backwards
When the plunging hooves were gone...
    -- Walter de La Mare, "The Listeners"

[www@cb.vu]~> 
```

Anatomy of The Command Line



Command“ping”

Command prompt

Output

Prompt waiting for an another command

```
Last login: Tue Aug 04 2015 10:25:56 GMT-0500 (EST) from 168.77.96.230
FreeBSD 7.1-STABLE (CB.VU) #3: Tue Aug 04 2015 11:06:26 GMT-0500 (EST)


      ----   Welcome to cb.vu   ----  (start with "help" if you are lost)


And the silence came surging softly backwards
When the plunging hooves were gone...
    -- Walter de la Mare, "The Listeners"

[www@cb.vu]~> ping google.com
PING google.com (216.58.208.238): 56 data bytes
64 bytes from 216.58.208.238: icmp_seq=0 ttl=58 time=4.142 ms
64 bytes from 216.58.208.238: icmp_seq=1 ttl=58 time=4.136 ms

--- google.com ping statistics ---
2 packets transmitted, 2 packets received, 0.0 packet loss
round-trip min/avg/max/stddev = 4.136/4.139/4.142/0.003 ms
[www@cb.vu]~>
```

Translating commands to the command line

Question: what is the size of a file?
Command: *Count the number of bytes in a file*

```
ls -l foo.txt
```

Question: How many words are in a document
Command: *Count the number of words in a document*

```
wc -w foo.txt
```

Rename file foo.txt to bar.txt

```
mv foo.txt bar.txt
```

How many times is “E. coli” mentioned in foo.txt? Or Count the number of times “E. coli” is mentioned in foo.txt

```
grep -c “E. coli” foo.txt
```

The structure of commands

```
$<command>     <options/flags>     <arguments>

ls -l foo.txt

wc -w foo.txt

mv foo.txt bar.txt

grep -c "E.coli" foo.txt
```

Options/Flags

Always preceded by “-”

```
ls -l foo.txt
```

```
wc -w foo.txt
```

An option can take one or more arguments

```
head -n 3 foo.txt
```

```
grep -c “E. coli” foo.txt
```

One Line Commands

One line commands can achieve a lot:

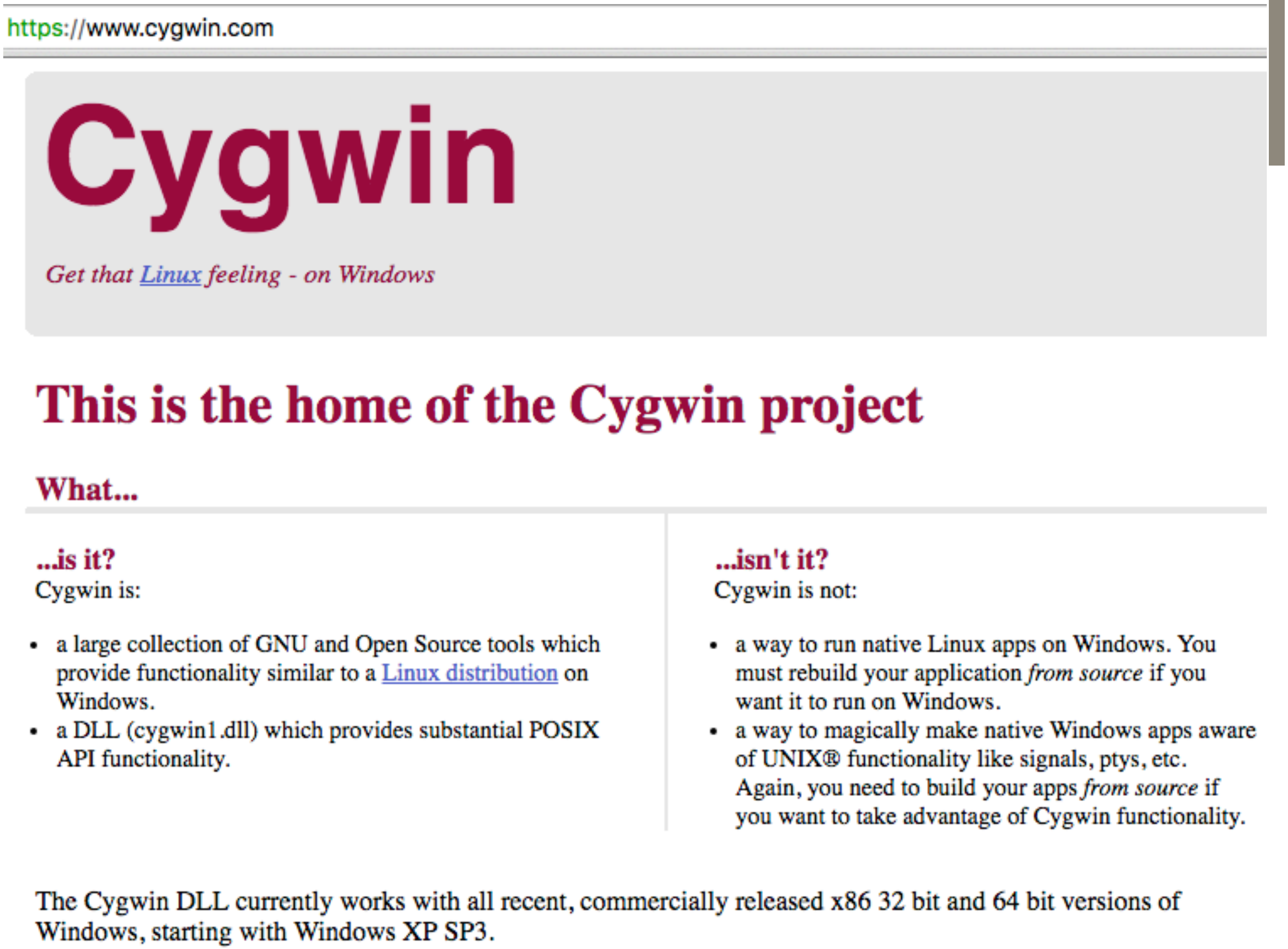
```
perl -pe 's/\r\n|\n|\r/\n/g' toknow.txt > toknow1.txt
```

```
./getTFname.sh ~/Desktop/toknow1.txt
```

```
rm -rf
```

+ ¿Cómo obtengo una Linea de Comandos de Unix?

Linea de Comandos (Para instalar)



https://www.cygwin.com

Cygwin

Get that Linux feeling - on Windows

This is the home of the Cygwin project

What...

...is it?

Cygwin is:

- a large collection of GNU and Open Source tools which provide functionality similar to a Linux distribution on Windows.
- a DLL (cygwin1.dll) which provides substantial POSIX API functionality.

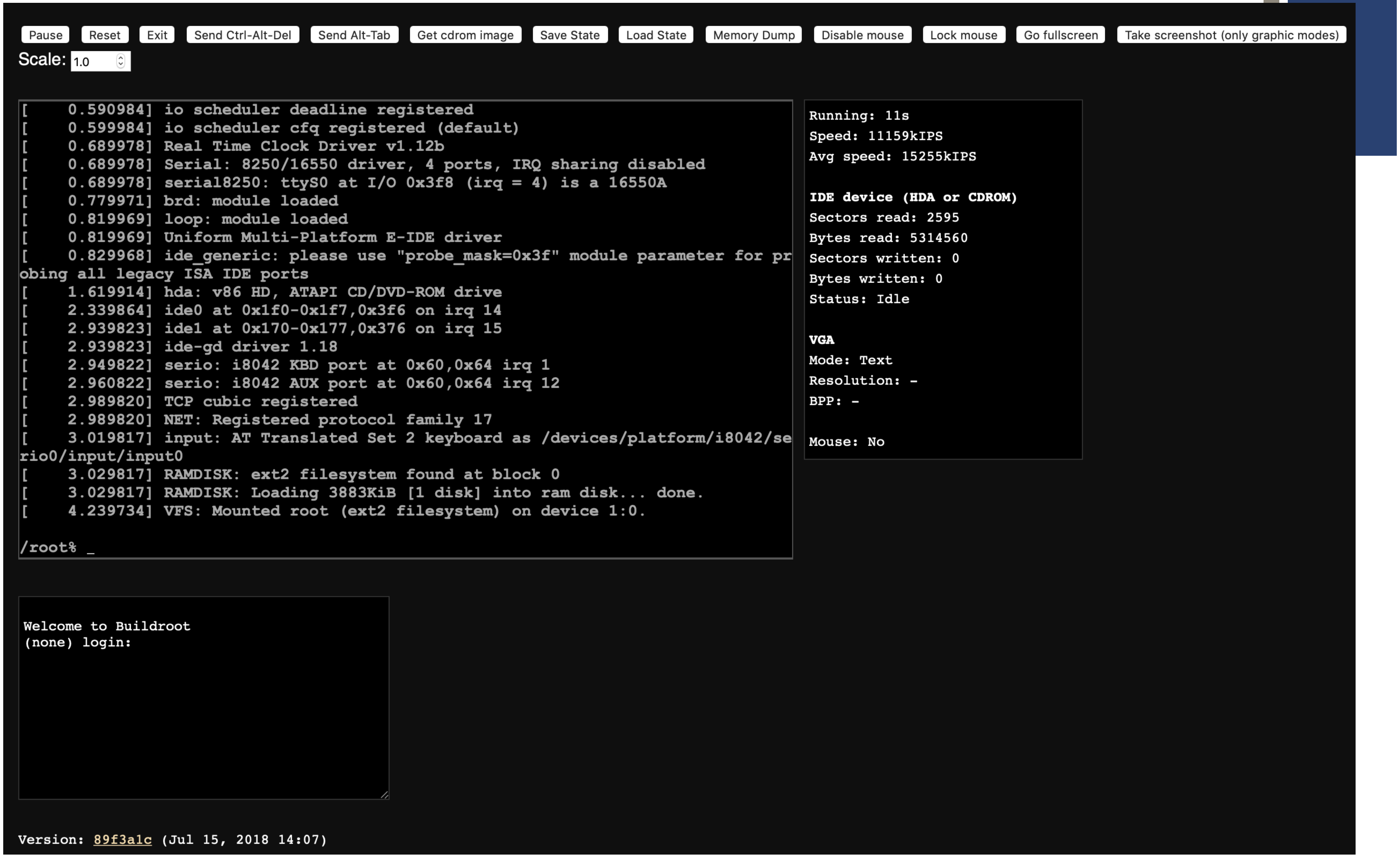
...isn't it?

Cygwin is not:

- a way to run native Linux apps on Windows. You must rebuild your application *from source* if you want it to run on Windows.
- a way to magically make native Windows apps aware of UNIX® functionality like signals, ptys, etc. Again, you need to build your apps *from source* if you want to take advantage of Cygwin functionality.

The Cygwin DLL currently works with all recent, commercially released x86 32 bit and 64 bit versions of Windows, starting with Windows XP SP3.

Linea de Comandos (Online)



Scale: 1.0

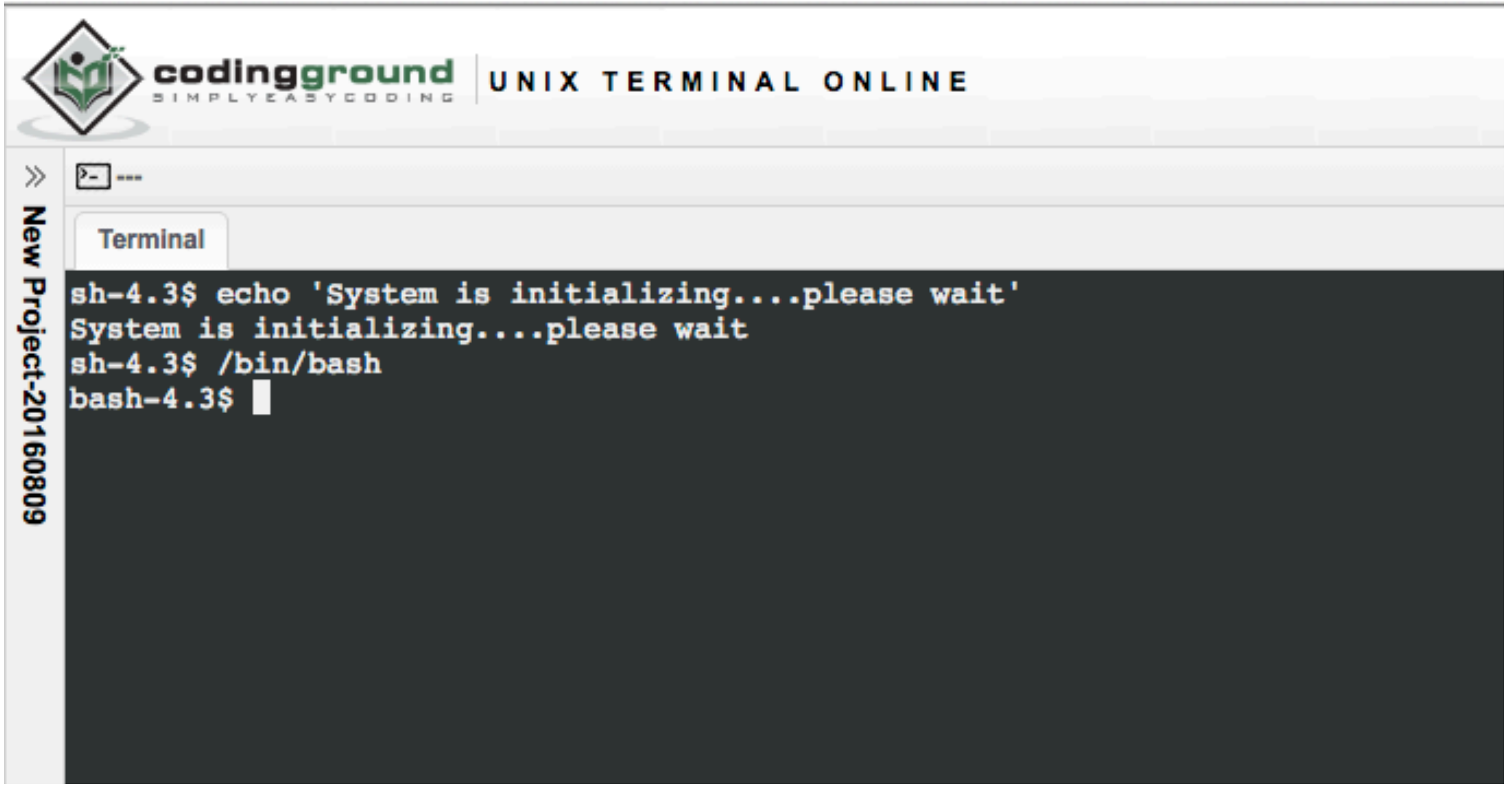
```
[    0.590984] io scheduler deadline registered
[    0.599984] io scheduler cfq registered (default)
[    0.689978] Real Time Clock Driver v1.12b
[    0.689978] Serial: 8250/16550 driver, 4 ports, IRQ sharing disabled
[    0.689978] serial8250: ttyS0 at I/O 0x3f8 (irq = 4) is a 16550A
[    0.779971] brd: module loaded
[    0.819969] loop: module loaded
[    0.819969] Uniform Multi-Platform E-IDE driver
[    0.829968] ide_generic: please use "probe_mask=0x3f" module parameter for pr
obing all legacy ISA IDE ports
[    1.619914] hda: v86 HD, ATAPI CD/DVD-ROM drive
[    2.339864] ide0 at 0x1f0-0x1f7,0x3f6 on irq 14
[    2.939823] ide1 at 0x170-0x177,0x376 on irq 15
[    2.939823] ide-gd driver 1.18
[    2.949822] serio: i8042 KBD port at 0x60,0x64 irq 1
[    2.960822] serio: i8042 AUX port at 0x60,0x64 irq 12
[    2.989820] TCP cubic registered
[    2.989820] NET: Registered protocol family 17
[    3.019817] input: AT Translated Set 2 keyboard as /devices/platform/i8042/se
rio0/input/input0
[    3.029817] RAMDISK: ext2 filesystem found at block 0
[    3.029817] RAMDISK: Loading 3883KiB [1 disk] into ram disk... done.
[    4.239734] VFS: Mounted root (ext2 filesystem) on device 1:0.

/root% _
```

```
Running: 11s
Speed: 11159kIPS
Avg speed: 15255kIPS

IDE device (HDA or CDROM)
Sectors read: 2595
Bytes read: 5314560
Sectors written: 0
Bytes written: 0
Status: Idle

VGA
Mode: Text
Resolution: -
BPP: -

Mouse: No
```

```
Welcome to Buildroot
(none) login:
```

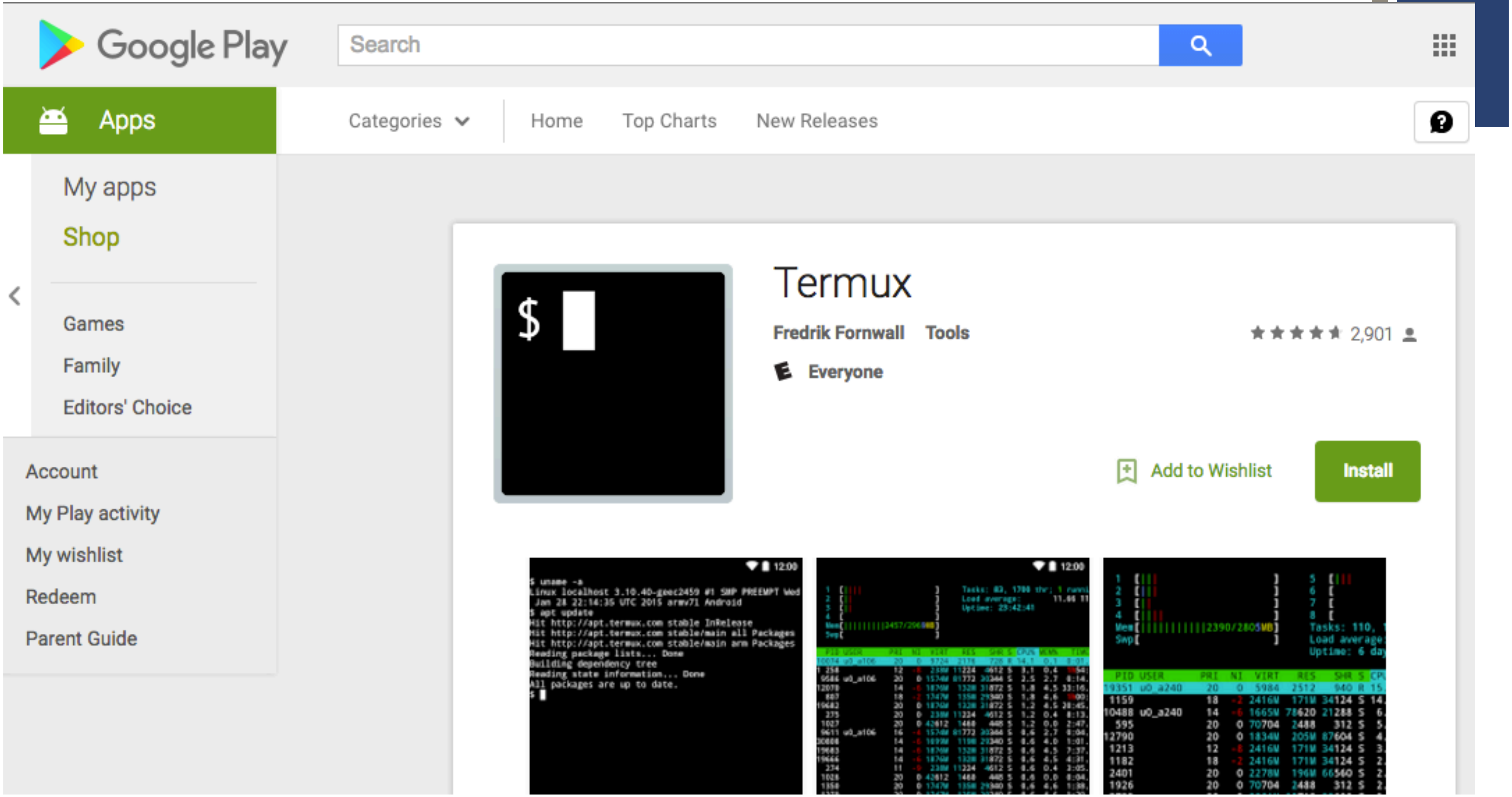
Version: 89f3a1c (Jul 15, 2018 14:07)

Linea de Comandos (Online)



```
sh-4.3$ echo 'System is initializing....please wait'
System is initializing....please wait
sh-4.3$ /bin/bash
bash-4.3$
```

Linea de Comandos (Android)



```
$ uname -a
Linux localhost 3.10.40-geec2459 #1 SMP PREEMPT Wed
 Jan 28 22:14:35 UTC 2015 armv7l Android
$ apt update
Hit http://apt.termux.com stable InRelease
Hit http://apt.termux.com stable/main all Packages
Hit http://apt.termux.com stable/main arm Packages
Reading package lists... Done
Building dependency tree
Reading state information... Done
All packages are up to date.
$
```

+ Sistema de Archivos de Unix

The Universe Inside your PC

- **File system:** the low-level software that manages and enforces access to files and directories. Defines the "world" of objects that exist on the computer.

- **File**: entities that have content

- **Directory**: entities that contain other files and directories

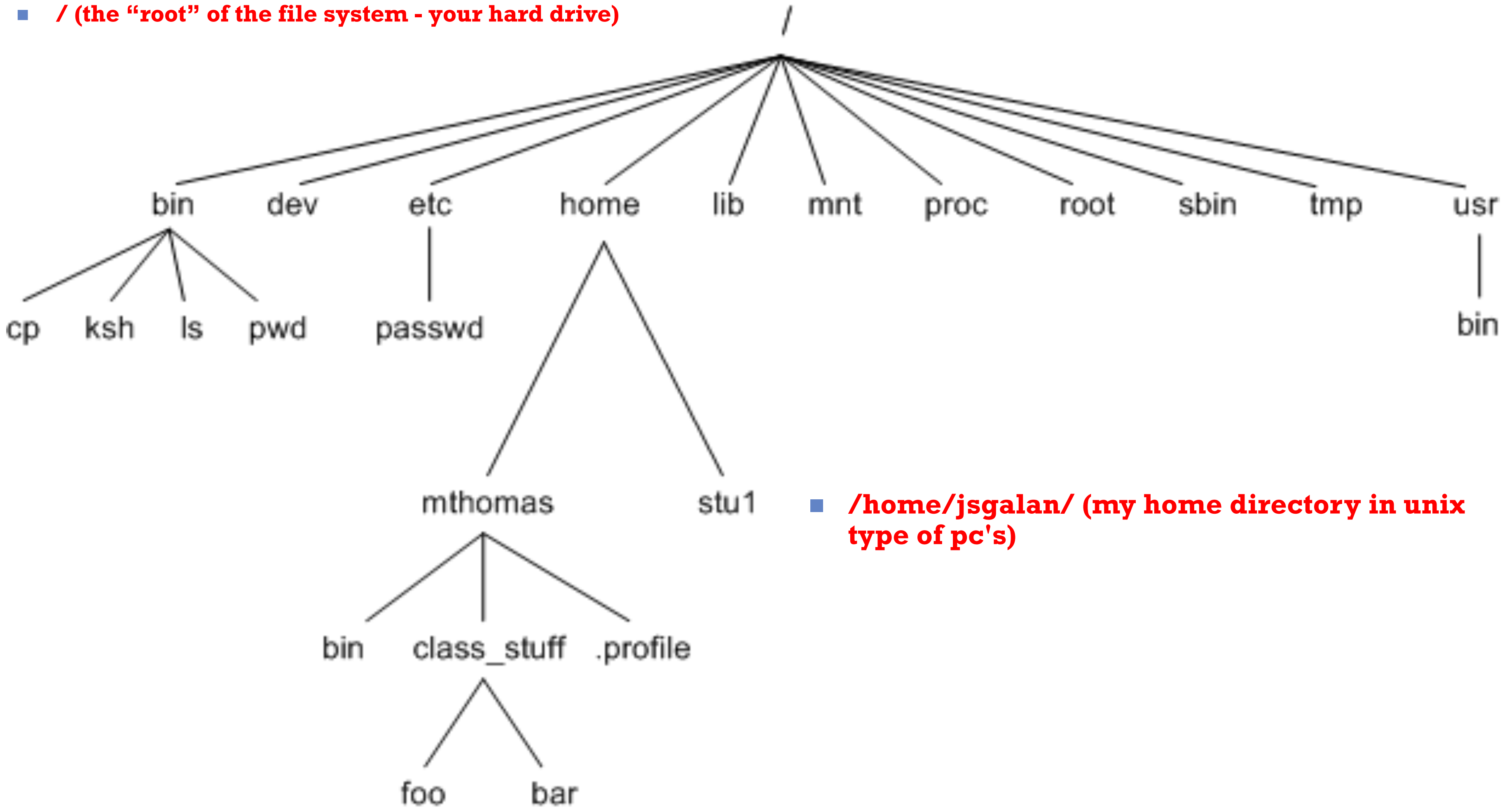
- **Permissions**: rules indicating what actions a user may perform on a file or directory

How does the file system look?

In UNIX "/" separates the levels in a file system.

For a windows machine we would use a backslash "\".

- / (the "root" of the file system - your hard drive)



- /home/jsgalan/ (my home directory in unix type of pc's)

Special directories

Some special directories:

- **/** = the root of the file system
- **.** = the current directory
- **..** = the directory containing the current directory (one level "up")
- **~** = your home directory

- Hidden files and directories have names that start with "**.**",

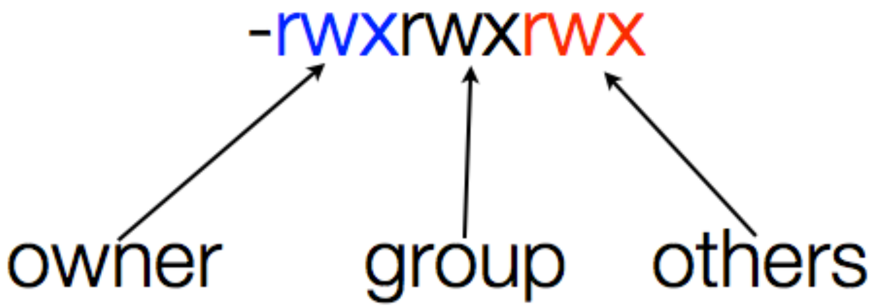
a.e: .**logs** and **configuration files** are hidden files

Permissions (Unix)

The three main actions a user may perform on a file/directory: read (r), write/modify (w), execute (x)

- The file system enforces permissions on every file and directory: permissions indicate whether a user may perform each of these actions

- A separate rule exists for the owner of the object (u), the group owning the object (g), and everybody else (o).

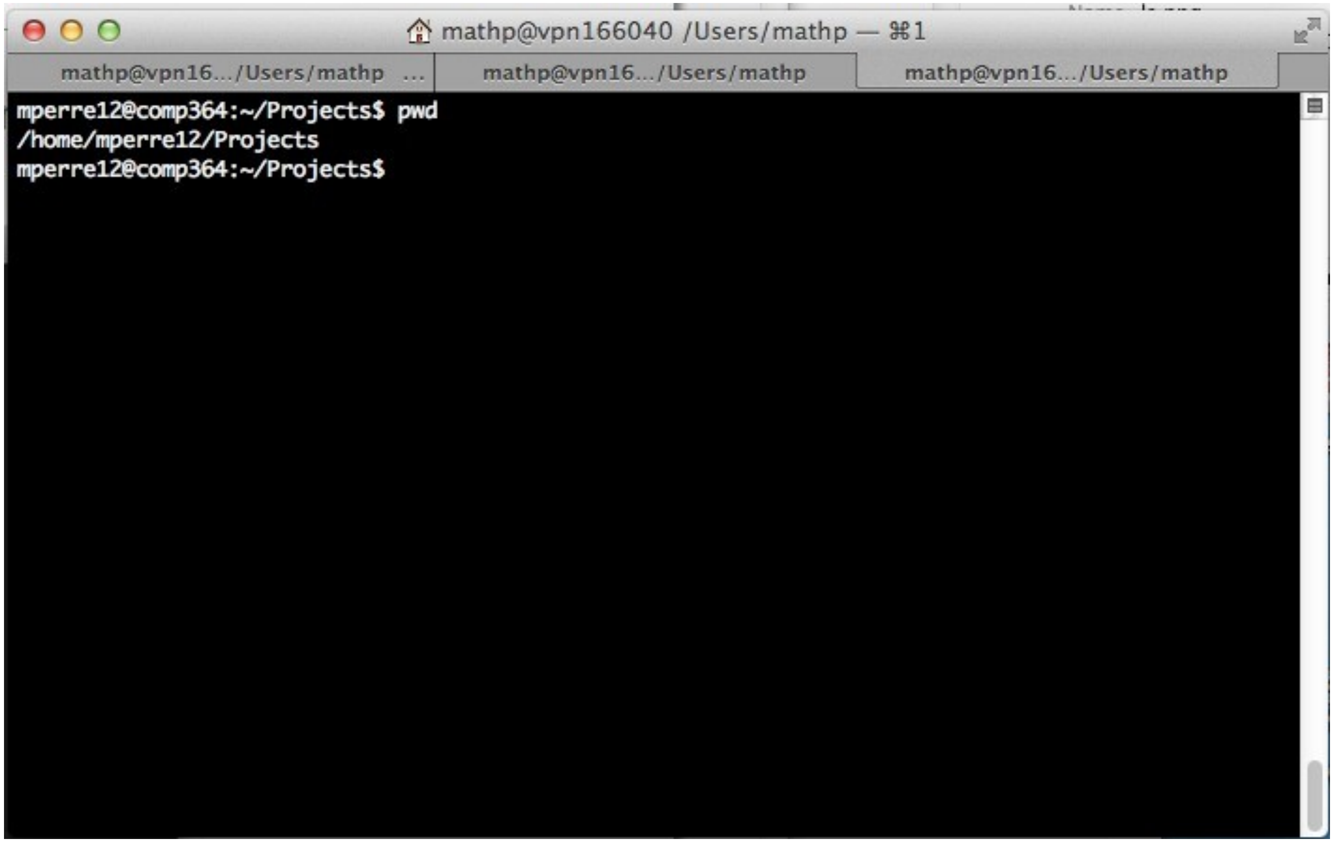


Comandos Basicos

(Reciben un Solo Parametro)

pwd: where am I?

- *pwd* - prints the directory you are currently in (“print working directory”)

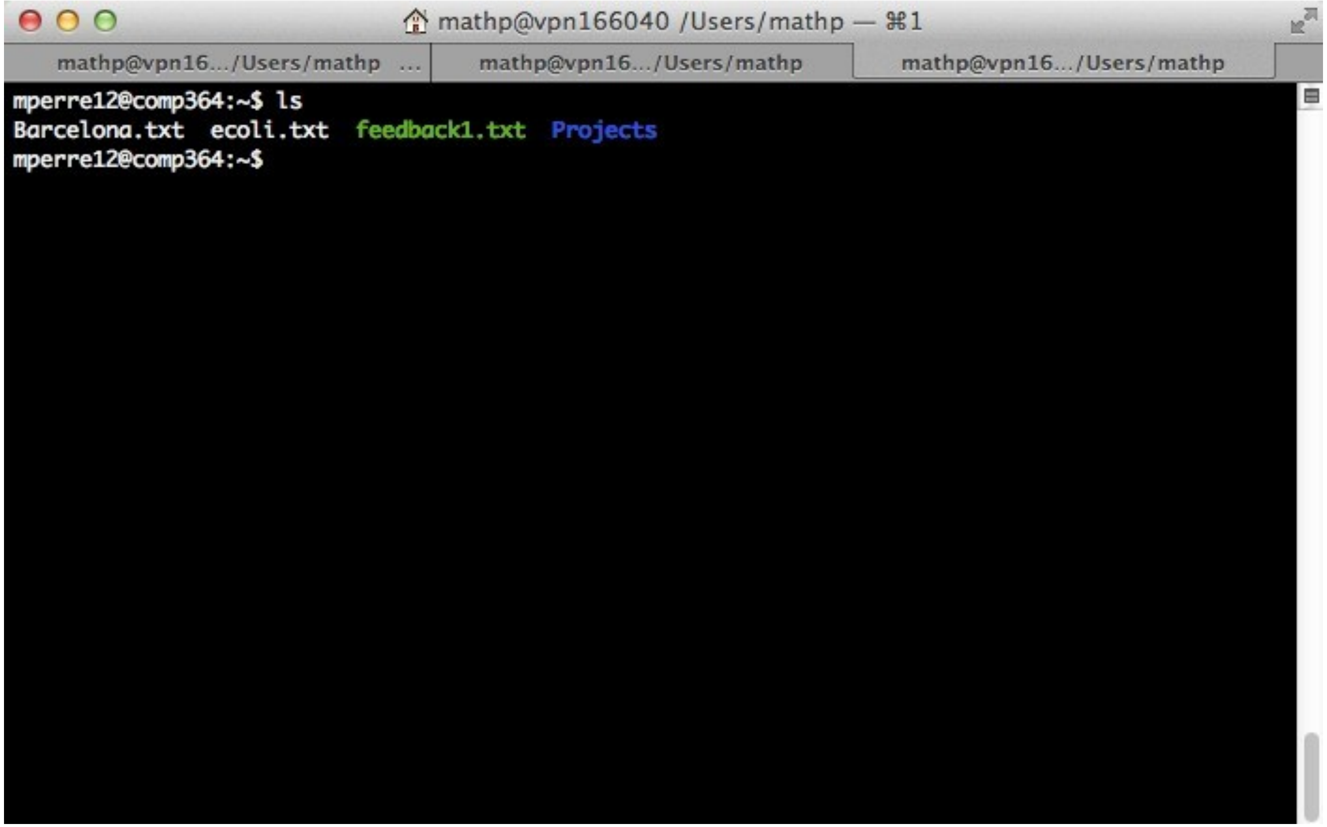


mathp@vpn166040 /Users/mathp — ⌘1
mathp@vpn16.../Users/mathp …
mathp@vpn16.../Users/mathp
mathp@vpn16.../Users/mathp

```
mperre12@comp364:~/Projects$ pwd
/home/mperre12/Projects
mperre12@comp364:~/Projects$
```

ls: viewing the file system

- ls: Lists the contents of the directory you are “in”

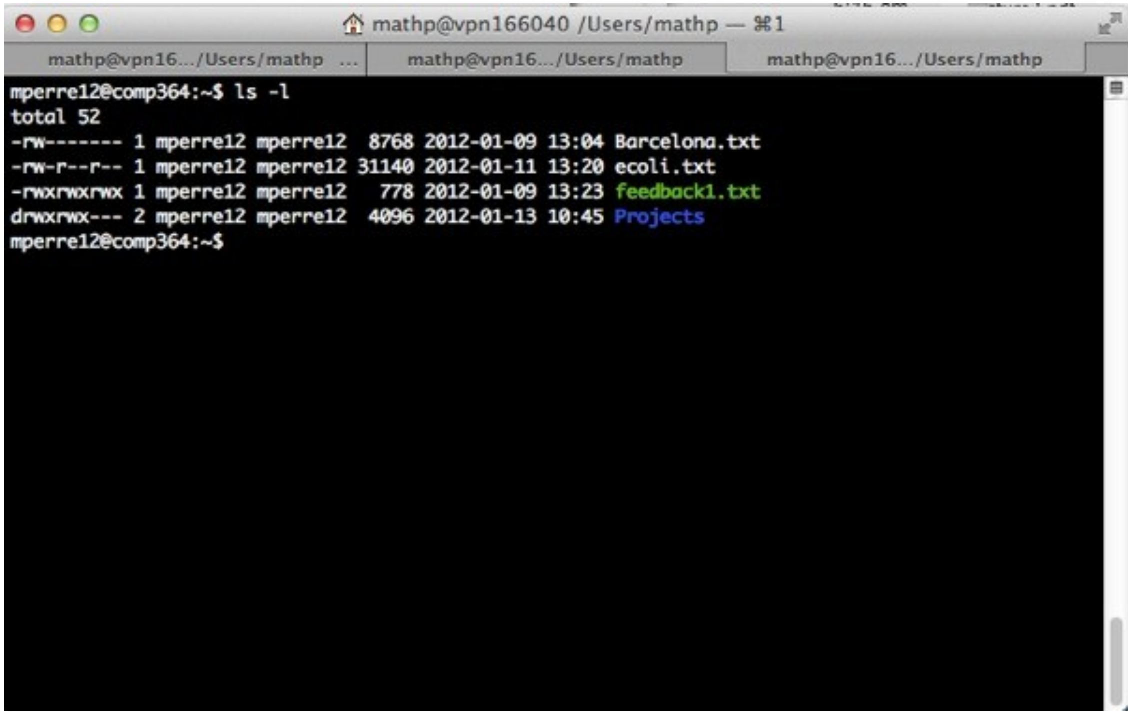


mathp@vpn166040 /Users/mathp — ⌘1
mathp@vpn16.../Users/mathp …
mathp@vpn16.../Users/mathp
mathp@vpn16.../Users/mathp

```
mperre12@comp364:~$ ls
Barcelona.txt  ecoli.txt  feedback1.txt  Projects
mperre12@comp364:~$
```

ls -l: the detailed list option

- ls -l shows details about each object in the directory


mathp@vpn166040 /Users/mathp — ⌘1
mathp@vpn16.../Users/mathp …
mathp@vpn16.../Users/mathp
mathp@vpn16.../Users/mathp

```
mperre12@comp364:~$ ls -l
total 52
-rw------- 1 mperre12 mperre12  8768 2012-01-09 13:04 Barcelona.txt
-rw-r--r-- 1 mperre12 mperre12 31140 2012-01-11 13:20 ecoli.txt
-rwxrwxrwx 1 mperre12 mperre12   778 2012-01-09 13:23 feedback1.txt
drwxrwx--- 2 mperre12 mperre12  4096 2012-01-13 10:45 Projects
mperre12@comp364:~$
```

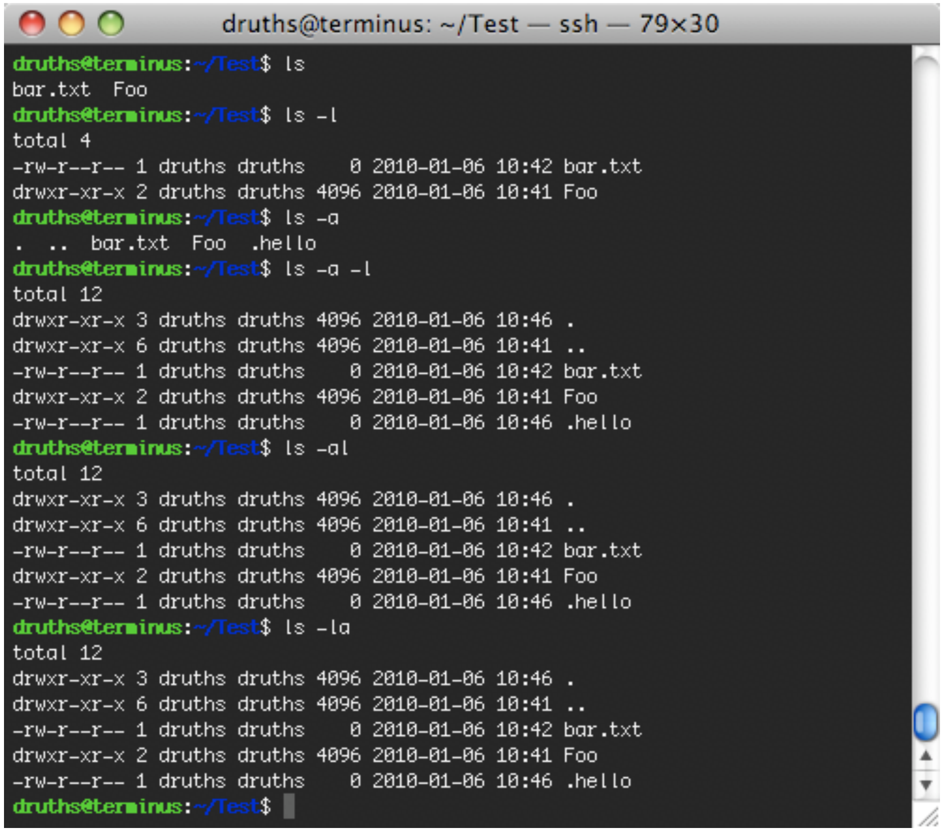
<file mode> <# links> <owner> <group> <size> <date last modified> <name>

If your username isn't here, the file isn't yours!

ls -a: showing all contents

- Hidden files and directories have names that start with “.”

- Many configuration files are hidden files

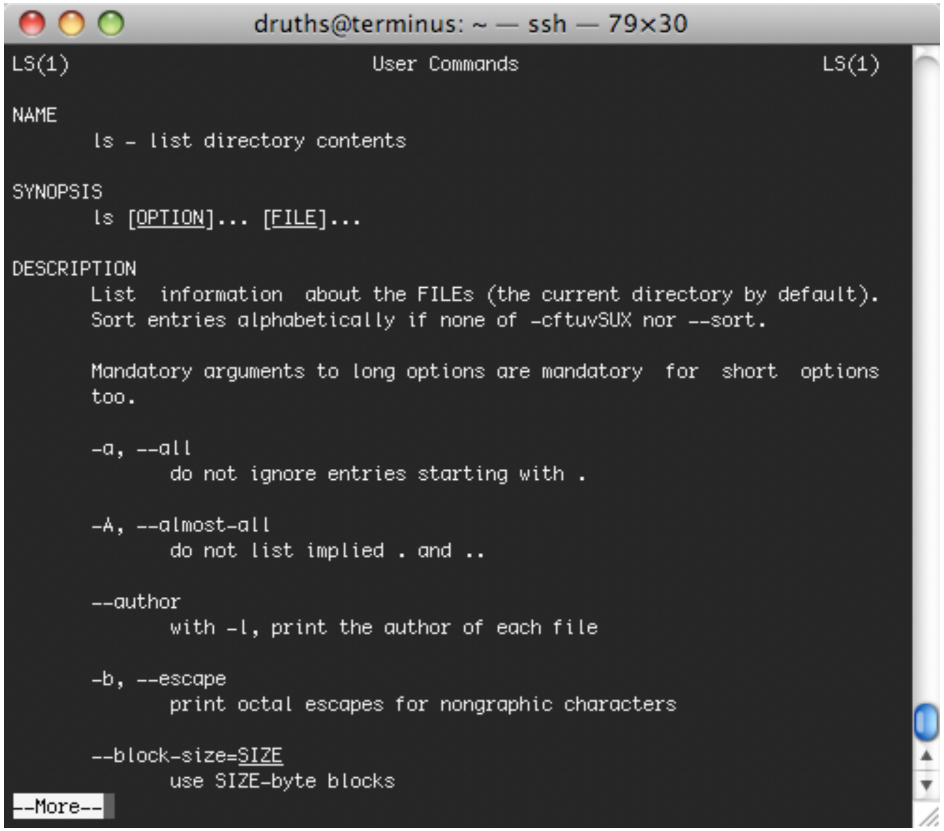


```
druths@terminus:~/Test$ ls
bar.txt  Foo
druths@terminus:~/Test$ ls -l
total 4
-rw-r--r-- 1 druths druths    0 2010-01-06 10:42 bar.txt
drwxr-xr-x 2 druths druths 4096 2010-01-06 10:41 Foo
druths@terminus:~/Test$ ls -a
.  ..  bar.txt  Foo  .hello
druths@terminus:~/Test$ ls -a -l
total 12
drwxr-xr-x 3 druths druths 4096 2010-01-06 10:46 .
drwxr-xr-x 6 druths druths 4096 2010-01-06 10:41 ..
-rw-r--r-- 1 druths druths    0 2010-01-06 10:42 bar.txt
drwxr-xr-x 2 druths druths 4096 2010-01-06 10:41 Foo
-rw-r--r-- 1 druths druths    0 2010-01-06 10:46 .hello
druths@terminus:~/Test$ ls -al
total 12
drwxr-xr-x 3 druths druths 4096 2010-01-06 10:46 .
drwxr-xr-x 6 druths druths 4096 2010-01-06 10:41 ..
-rw-r--r-- 1 druths druths    0 2010-01-06 10:42 bar.txt
drwxr-xr-x 2 druths druths 4096 2010-01-06 10:41 Foo
-rw-r--r-- 1 druths druths    0 2010-01-06 10:46 .hello
druths@terminus:~/Test$ ls -la
total 12
drwxr-xr-x 3 druths druths 4096 2010-01-06 10:46 .
drwxr-xr-x 6 druths druths 4096 2010-01-06 10:41 ..
-rw-r--r-- 1 druths druths    0 2010-01-06 10:42 bar.txt
drwxr-xr-x 2 druths druths 4096 2010-01-06 10:41 Foo
-rw-r--r-- 1 druths druths    0 2010-01-06 10:46 .hello
druths@terminus:~/Test$
```

3 different ways
to write it

man: when you need help

- *man*: pulls up the manual entry for a given command
  - *man ls*
  - *man chmod*
  - *man pwd*
  - *man grep*



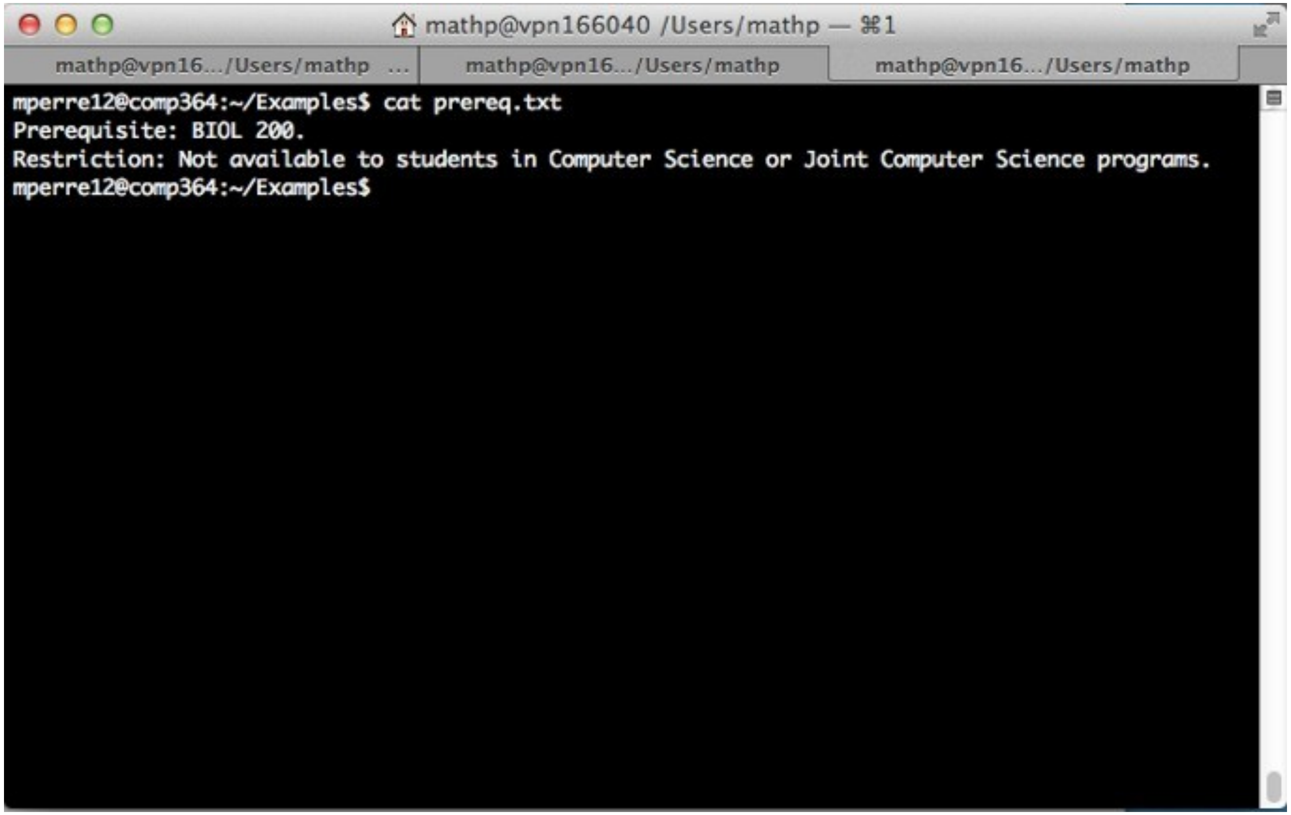
```
LS(1)                          User Commands                          LS(1)

NAME
       ls - list directory contents

SYNOPSIS
       ls [OPTION]... [FILE]...

DESCRIPTION
       List  information  about the FILEs (the current directory by default).
       Sort entries alphabetically if none of -cftuvSUX nor --sort.

       Mandatory arguments to long options are mandatory  for  short  options
       too.

       -a, --all
              do not ignore entries starting with .

       -A, --almost-all
              do not list implied . and ..

       --author
              with -l, print the author of each file

       -b, --escape
              print octal escapes for nongraphic characters

       --block-size=SIZE
              use SIZE-byte blocks
--More--
```

cd: moving around the file system ("change directory")

- *cd <directory>*
  - cd /
  - cd ~
  - cd .
  - cd ..
  - cd /home/jsgalan

cat: Display the contents of a file

- cat <path to file>
  - Will send the contents of the file to the output.



mathp@vpn166040 /Users/mathp — ⌘1
mathp@vpn16.../Users/mathp …
mathp@vpn16.../Users/mathp
mathp@vpn16.../Users/mathp

```
mperre12@comp364:~/Examples$ cat prereq.txt
Prerequisite: BIOL 200.
Restriction: Not available to students in Computer Science or Joint Computer Science programs.
mperre12@comp364:~/Examples$
```

Some Commands Accept a Directory Others a File

- *ls* ~ ***(ls /home/jsgalan)***
- *ls /usr/bin*
- *ls /home/jsgalan/Projects*
- *cd* ~ ***(cd /home/jsgalan)***
- *cd /usr/bin*
- *cd /home/jsgalan2/Projects*
- *cat /home/jsgalan/Test/bar.txt*

- *cat /home/jsgalan/Test/bar.txt*

+ Comandos Basicos

(Reciben un Solo Parametro)

mv: moving files and directories (Rename)

- *mv <source> <destination>*
  - *mv foo1 foo1.old* (renaming)
  - *mv foo1* .. (moving)

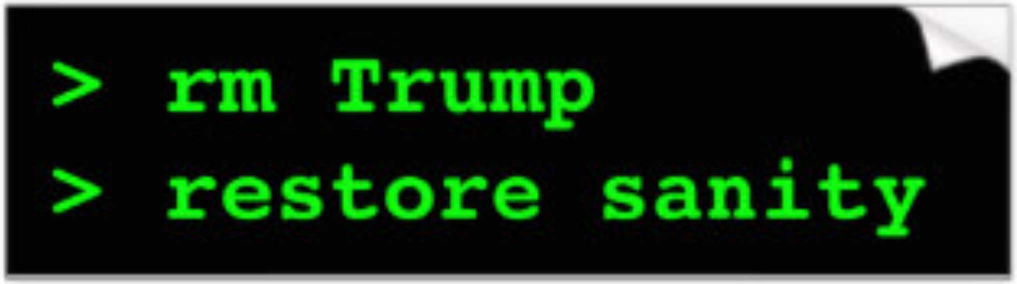
cp: copying file and directories

- cp <source> <destination>
  - *cp foo.txt ..*
  - *cp foo.txt ~/backup/foo.txt = cp foo.txt ~/backup*
  - cp -r: recursive copy
    - cp -r ~/projects /usr/backup

Deleting a directory

- rmdir: (“Remove Directory”) remove an empty directory
  - rmdir <directory name>
- rm -r: (“recursive delete”) remove a directory and everything in it (BE CAREFUL!)
  - rm -r <directory name>

Deleting a President



```
> rm Trump
> restore sanity
```

ln: creating symbolic links

- Like the “shortcut” feature in Windows and the “alias” feature in Mac

- Create a “link” object that refers to another file/directory (called the source). Most actions performed on this object are performed on the source.

- ***ln -s <source>*** *- creates a link in the current directory that is identically named to the source*

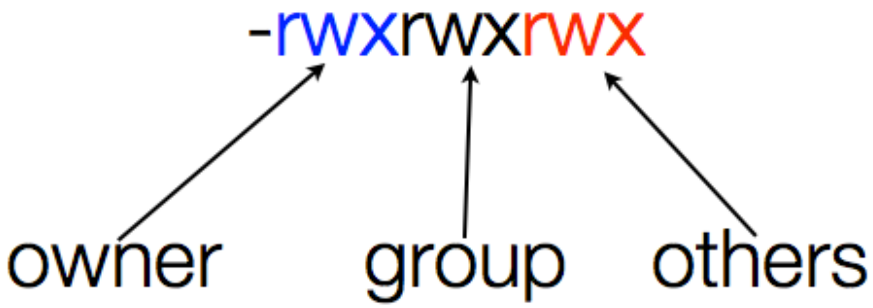
+

Permissions (Unix)

The three main actions a user may perform on a file/directory: read (r), write/modify (w), execute (x)

- The file system enforces permissions on every file and directory: permissions indicate whether a user may perform each of these actions

- A separate rule exists for the owner of the object (u), the group owning the object (g), and everybody else (o).



chmod: changing permissions

- *chmod <a/u/g/o><+/-><r/w/x> <file/directory name>*

- Adding a permission:
  - *chmod u+w foo.txt*
  - *chmod u+wx bar*
- Removing a permission:
  - *chmod o-r foo.txt*
  - *chmod o-rwx bar*

+ Rutas

Paths: locating and navigating the file system

Path: the chain of directories specifying the location of an object (file/ directory)

- **Absolute path:** the chain of directories from the file system root (“/”) to the object of interest

  /home/jsgalan/Test/a_text.txt

  /bin/ls

- **Relative path:** the chain of directories from the current directory to the object of interest

  ../Projects

  ../../../bin/ls

  jsgalan/feedback1.txt (when in /home, for example)

Wildcards

+

* and ?: the wildcards

Wildcards are powerful ways of referring to several objects at once without having to name each one.

- *** = zero or more of any characters**
- **? = exactly one character (it can be any character)**

Examples:

test**?**.py:

test1.py

test2.py

test3.py

test4.py

test40.py

test400.py

→

test1.py
test2.py
test3.py
test4.py

* and ?: the wildcards

test4*.py:

test1.py

test2.py

test3.py

test4.py

test40.py

test400.py

→

test4.py

test40.py

test400.py

foo*:

foo

foo.txt

foobar

fo1

foobar.txt

→

foo

foo.txt

foobar

fo1

foobar.txt

More wildcard examples

- What string (containing at least one wildcard) would you use for the bolded characters in each set?

- **hs001, hs002, hs003, hs004, hs009**, ec001
- hs001, hs002, hs003, hs004, hs009, **hs010,** hs011
- **hs01**.txt, **hs01**.csv, hs10.txt, hs10.csv

- In a directory that contains: foo.txt, foo.csv, bar.1, bar.2

- ls -l foo* ➠ ls -l foo.txt foo.csv
- rm foo* ➠ rm foo.txt foo.csv

Pipelines

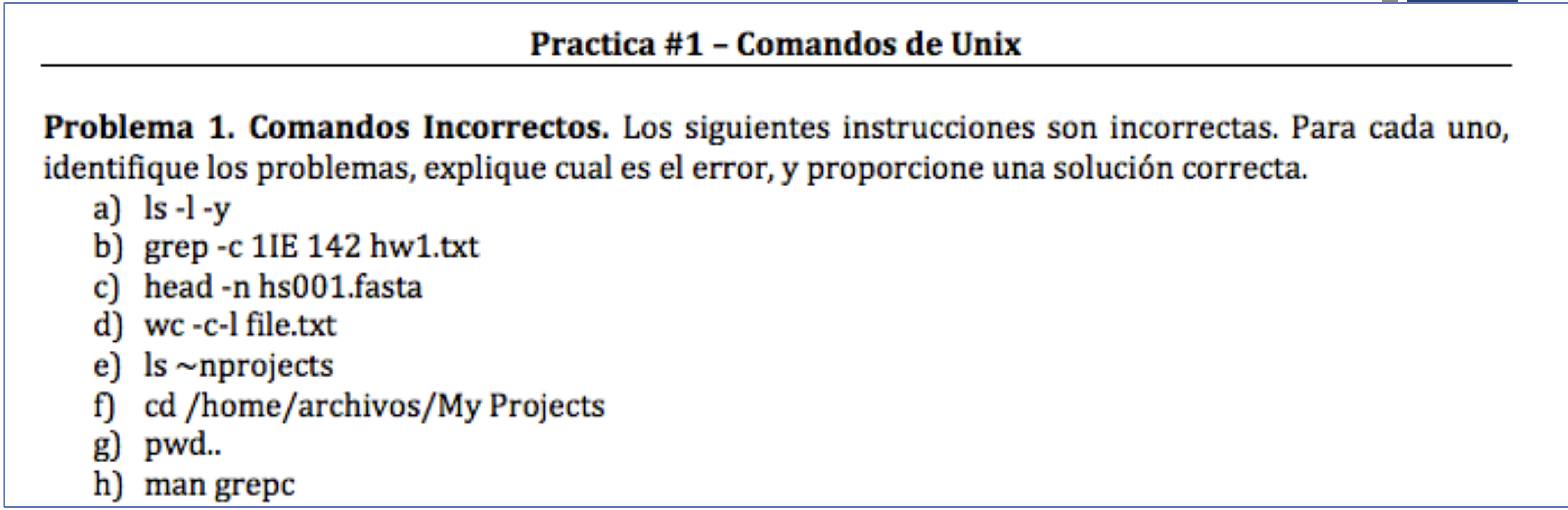
- The | operator will take the output of a command and send it to another command

- *curl http://en.wikipedia.org/wiki/Pipeline_(Unix)* | *head -n 10*
- cat /usr/share/dict/words | less
- cat *.fasta | grep AAA

- tail and head can be combined together with a pipeline!

+ Practica #1

Practica #1



Practica #1 – Comandos de Unix

Problema 1. Comandos Incorrectos. Los siguientes instrucciones son incorrectas. Para cada uno, identifique los problemas, explique cual es el error, y proporcione una solución correcta.

a) ls -l -y
b) grep -c 1IE 142 hw1.txt
c) head -n hs001.fasta
d) wc -c-l file.txt
e) ls ~nprojects
f) cd /home/archivos/My Projects
g) pwd..
h) man grepc

+ Comandos Encadenados

Putting Commands Together

- Output & input redirection
- Pipes
- Executing multiple commands in sequence
- Using the semicolon
- Batch files

Input & output on the command line

- **Standard out:** almost everything that is printed as a result of executing a command

- **Standard error:** the error text that is printed when something bad happens (or you did something wrong).

- **Standard in**: an opportunity to input text by hand into a command.

  - Standard in is often expected if you don't specify a file for a command that expects one. Type ctrl-D to indicate that you're done entering text.

Output redirection

- Redirection to a file:
  - ls -l ~/ > projects.list
  - egrep -o “^[[:space:]]*gene[[:space:]]+[[:digit:]]+\.\.[[:digit:]]+” **>** ~/Ecoli/genes.txt

Input redirection

- The “**<**“ operator feeds the contents of a file to a command via standard input
  - egrep “.*html” **<** files.txt

  (this egrep command operates on the contents of files.txt)

Pipeline

- "|" makes the output from one command the input for another. (Standard out is "piped" into standard input)
  - `ls -l | wc -l`

- Some Exercises:

1. How would you count the number of characters in the first 13 lines of file data.txt?
2. How would you store in genes.txt a list of all files in a directory that start with the word "gene", followed by a number between 200 and 300 (inclusive), and carries the extension ".fasta"?

Semi-colons: executing multiple commands

- A semi-colon acts like a return at the end of a line.

  - cp foo.txt bar.txt ; cat bar.txt

  (copies the file, then prints it out)

  - rm -rf backup/hsapiens ; cp -r hsapiens backup

Batch Files

- A file that executes a series of commands
- Can take arguments from the command line
- Good for:
  - Doing complex tasks
  - Capturing common tasks

Example batch files

```
#!/bin/sh
egrep “^[[:space:]]*gene[[:space:]]+[[:digit:]]+\.\.[[:digit:]]+$” $1 > $2
```

```
#!/bin/sh
egrep “^ORGANISM[[:space:]]+” $1 echo -n “File size: “
wc -c $1
echo -n “Number of genes: “
egrep -c “^[[:space:]]*gene[[:space:]]+[[:digit:]]+\.\.[[:digit:]]+$” $1
```

1.Note: you need to make a script executable with ***chmod***

2.Command to execute a script**: ./<script name>**

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