



Interacting with the UNIX File System

COMP 364 - Lecture #2
January 6, 2010, updated 2012
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Announcements

- TA : Javier Sanchez Galan (javier.sanchezgalan@mail.mcgill.ca)
- Office hours are now
 - Mondays 11AM - 12PM
 - > Trottier 3130 (My office)
 - Thursdays 10AM - 11AM
 - > Outside Trottier 3130 (common area)
 - > Look for Javier
- Information updated on the website

Last class

- Structure of a command:

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

- Example of commands that we saw?

The file system: the digital universe

- **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

We will discuss these in detail and learn commands for viewing and changing them.

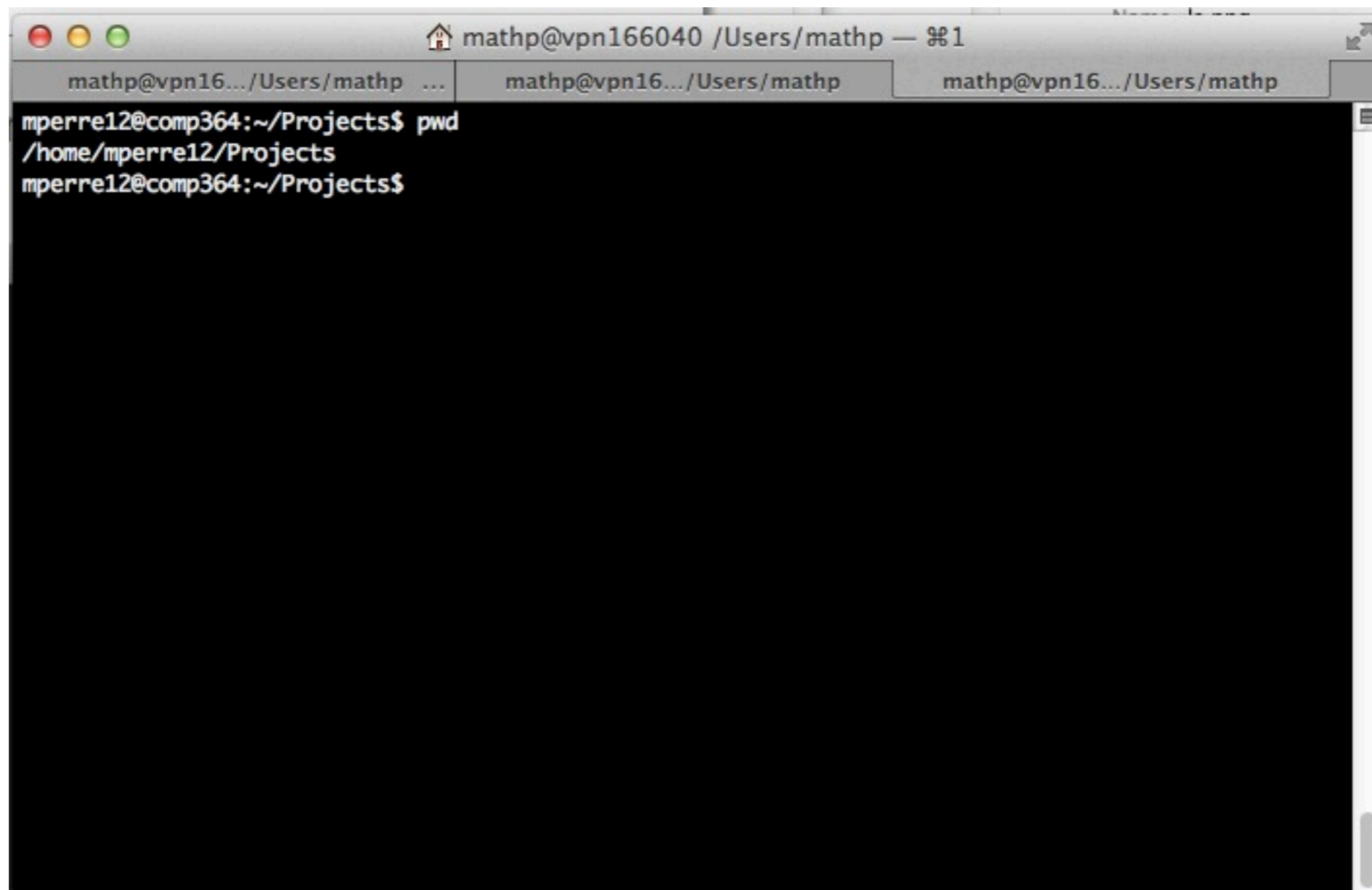
How does the file system look?

“/” separates the levels in a file system

- / (the “root” of the file system - your hard drive)
- /home
- /home/mperre12 (my home directory)
- /home/mperre12/Projects
- /home/mperre12/Test
- /home/mperre12/Test/bar.txt

pwd: where am I?

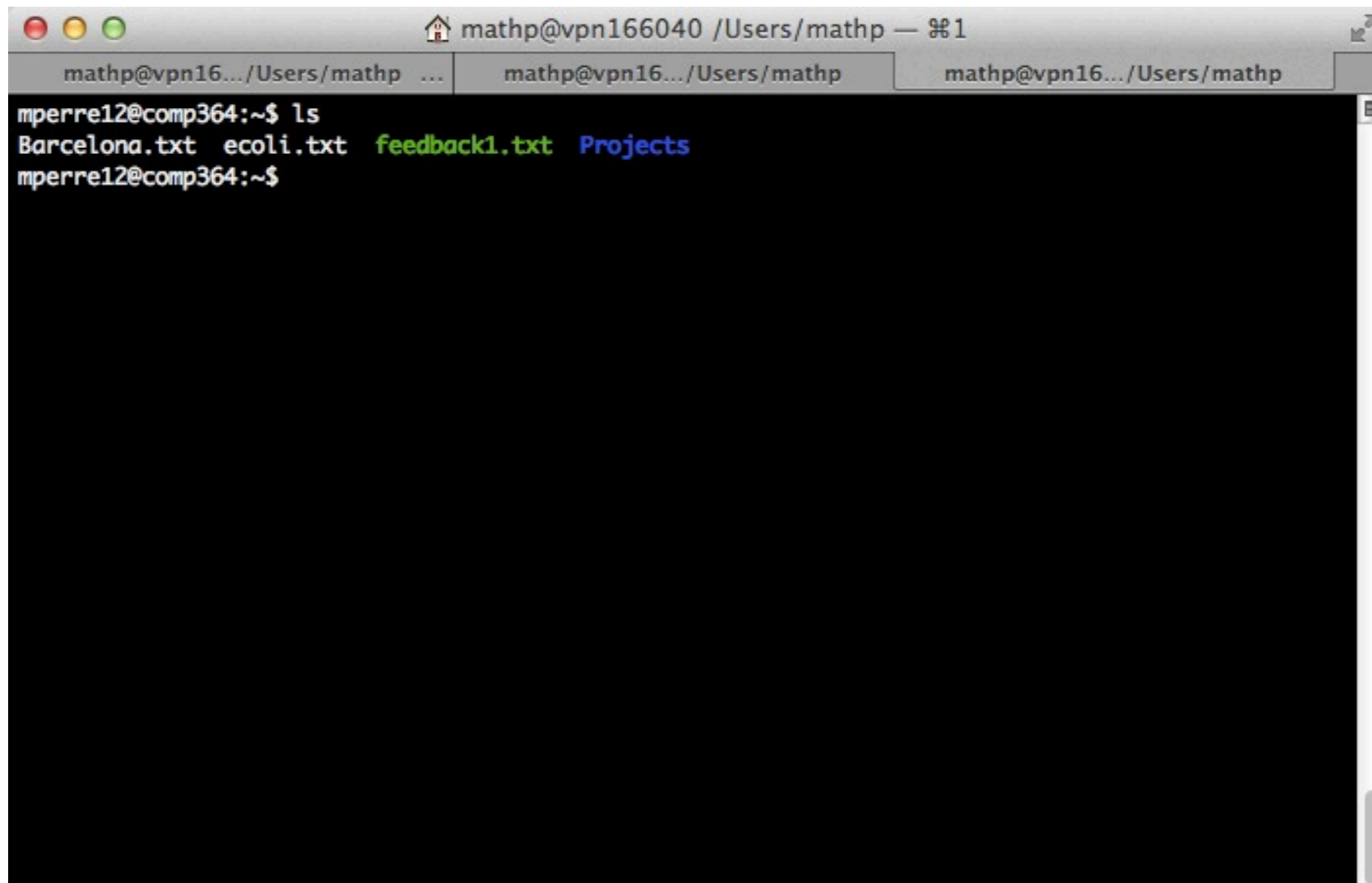
- *pwd* - prints the directory you are currently in (“print working directory”)



```
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

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

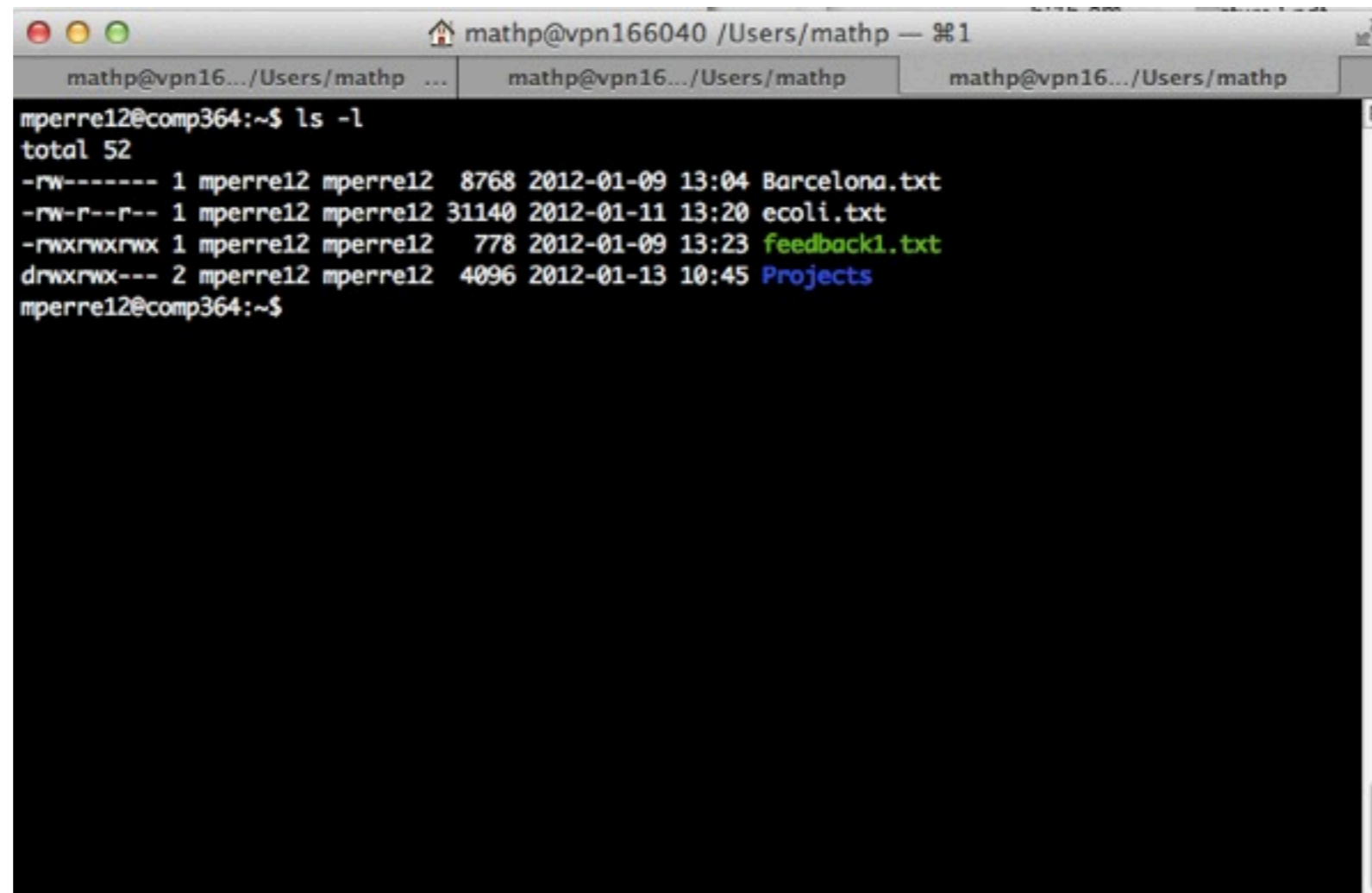


A screenshot of a terminal window. The window title is "mathp@vpn166040 /Users/mathp — 1". The terminal shows the command "ls" being executed, resulting in the output: "Barcelona.txt", "ecoli.txt", "feedback1.txt", and "Projects". The prompt "mperre12@comp364:~\$" is visible before and after the command.

```
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@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:~$
```

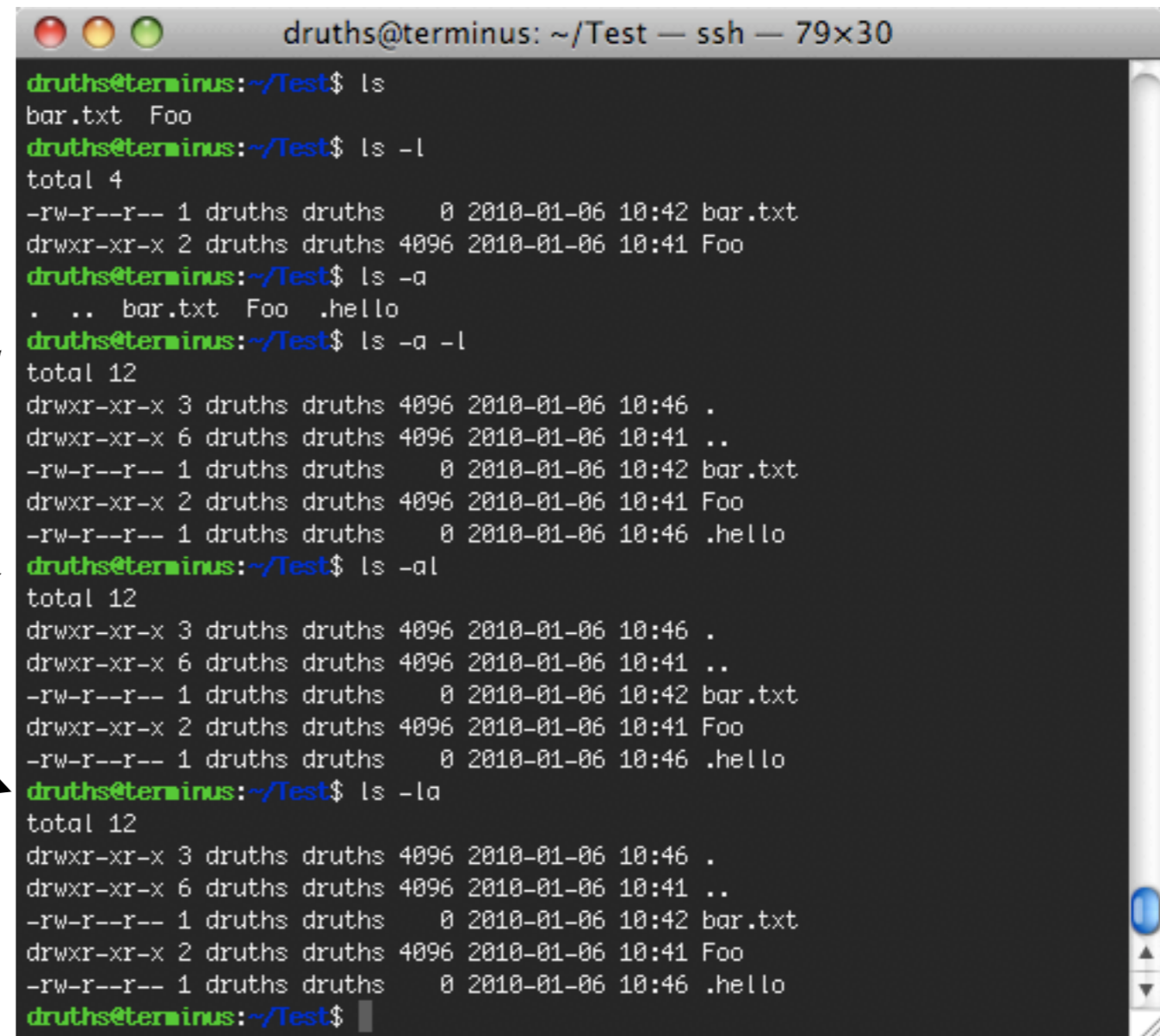
<file mode> <# links> <owner> <group> <size> <date last modified> <name>

↑
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

3 different ways
to write it



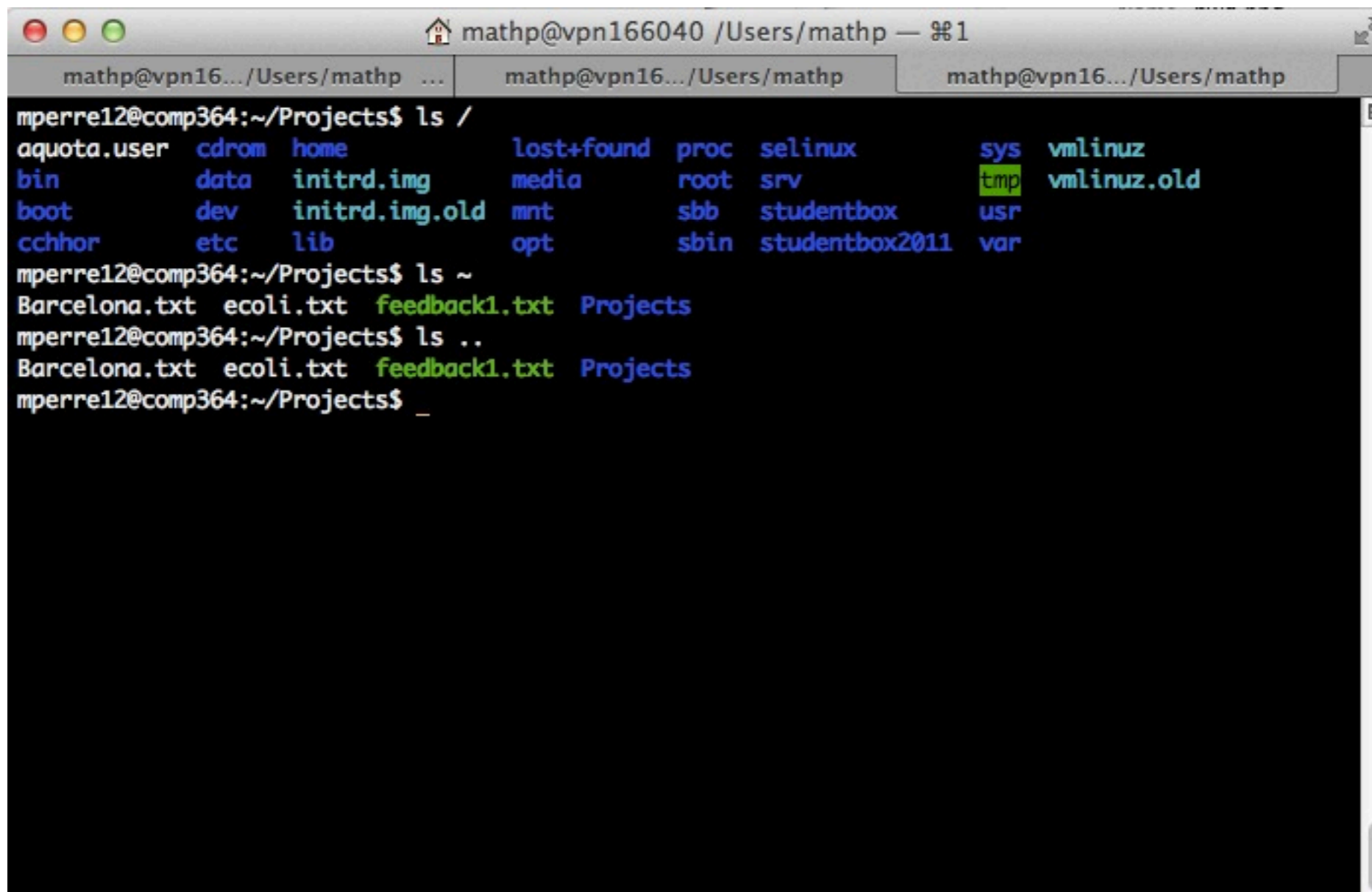
```
druths@terminus: ~/Test — ssh — 79x30
druths@terminus:~/Test$ ls
bar.txt  Foo
druths@terminus:~/Test$ ls -l
total 4
-rw-r--r-- 1 druths druths  0 2010-01-06 10:42 bar.txt
drwxr-xr-x 2 druths druths 4096 2010-01-06 10:41 Foo
druths@terminus:~/Test$ ls -a
.  ..  bar.txt  Foo  .hello
druths@terminus:~/Test$ 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$
```

Special directories: . and .. (but not ...)

- Some special directories:
 - / = the root of the file system
 - . = the current directory
 - .. = the directory containing the current directory (one level “up”)
 - ~ = your home directory

ls <dir>: inspecting specific directories

- `ls <dir>`: lists the contents of the directory <dir>



```
mathp@vpn166040 /Users/mathp — %1
mathp@vpn16.../Users/mathp ... mathp@vpn16.../Users/mathp mathp@vpn16.../Users/mathp
mperre12@comp364:~/Projects$ ls /
aquota.user  cdrom  home      lost+found  proc  selinux  sys  vmlinuz
bin          data   initrd.img media        root  srv      tmp  vmlinuz.old
boot        dev    initrd.img.old mnt          sbb   studentbox  usr
cchhor      etc    lib        opt          sbin  studentbox2011 var
mperre12@comp364:~/Projects$ ls ~
Barcelona.txt  ecoli.txt  feedback1.txt  Projects
mperre12@comp364:~/Projects$ ls ..
Barcelona.txt  ecoli.txt  feedback1.txt  Projects
mperre12@comp364:~/Projects$ _
```

man: when you need help

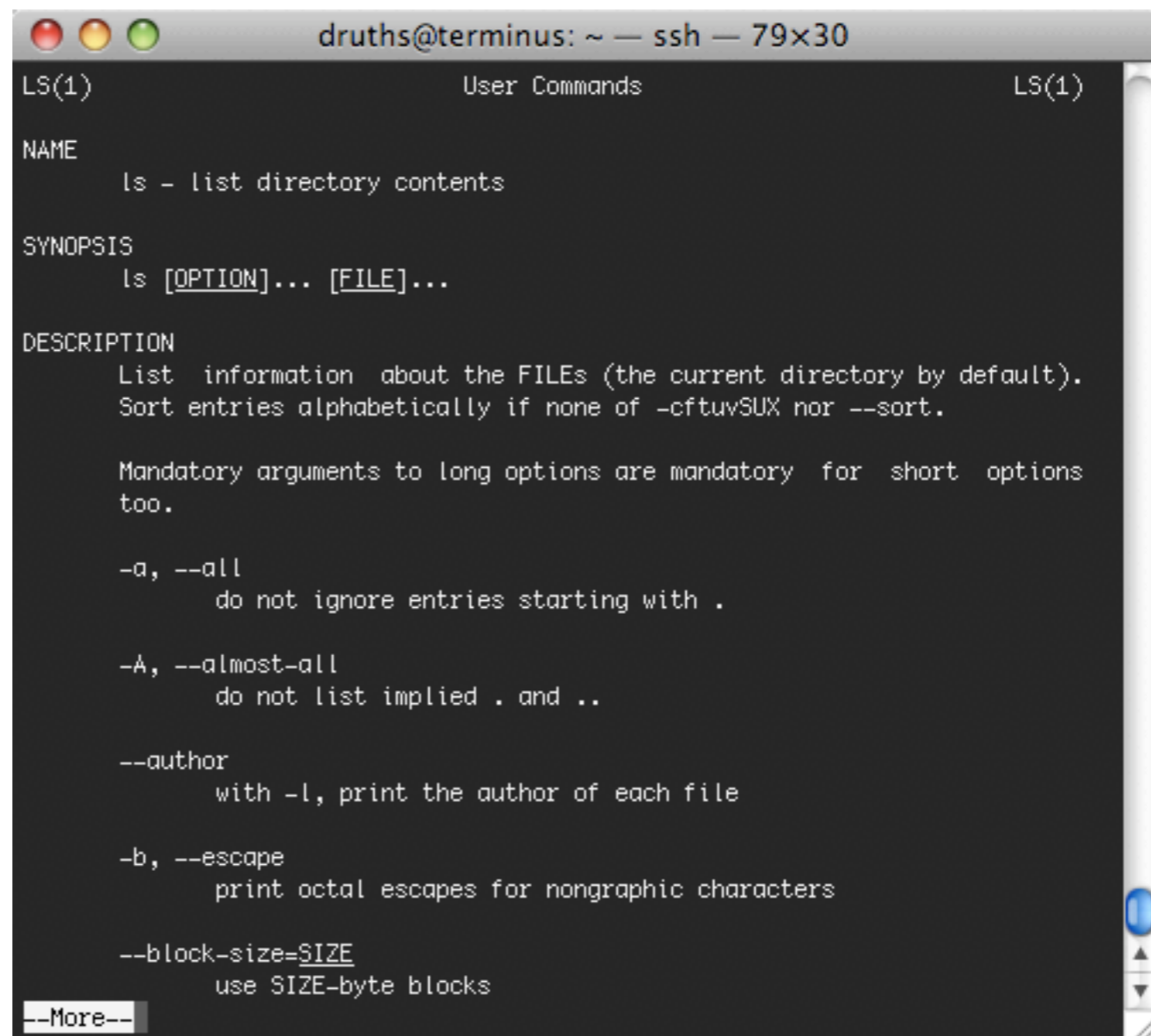
- *man*: pulls up the manual entry for a given command

- *man ls*

- *man chmod*

- *man pwd*

- *man grep*



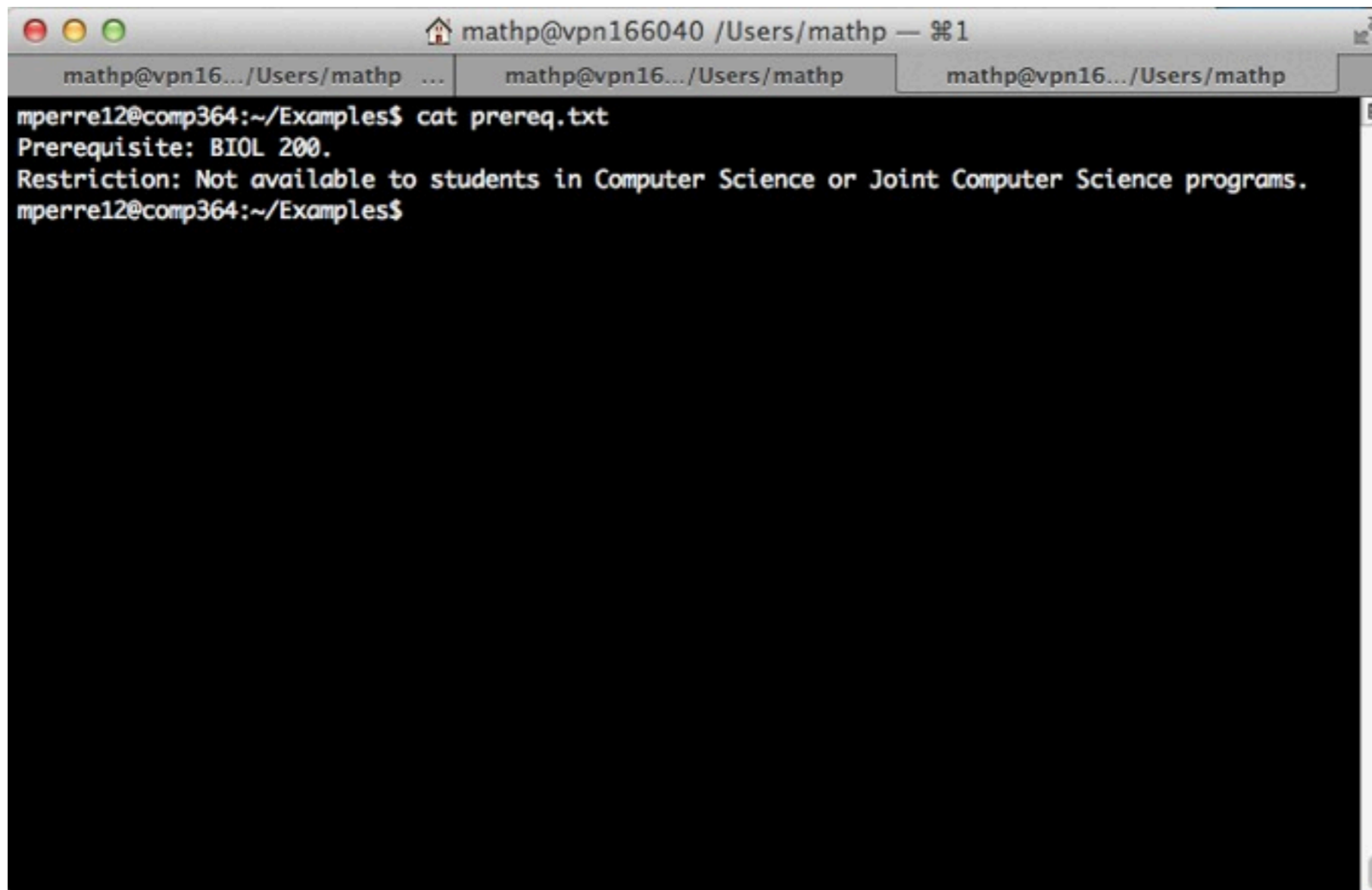
```
druths@terminus: ~ — ssh — 79x30
LS(1) User Commands LS(1)
NAME
  ls - list directory contents
SYNOPSIS
  ls [OPTION]... [FILE]...
DESCRIPTION
  List information about the FILES (the current directory by default).
  Sort entries alphabetically if none of -cftuvSUX nor --sort.

  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--
```

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$
```

cd: moving around the file system (“change directory”)

- *cd <directory>*
 - *cd /*
 - *cd ~*
 - *cd .*
 - *cd ..*
 - *cd /home/mperre12*

Paths: locating and navigating the file system

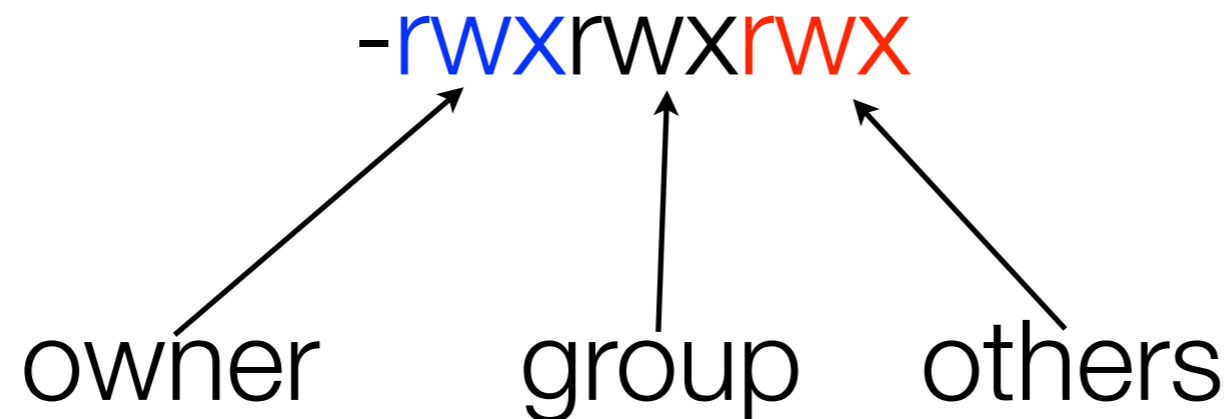
- **Path:** the chain of directories specifying the location of an object (file/directory)
 - *Absolute path:* the chain of directories from the file system root (“/”) to the object of interest
 - /home/mperre12/Test/bar.txt
 - /bin/lis
 - *Relative path:* the chain of directories from the current directory to the object of interest
 - ../Projects
 - ../../../../bin/lis
 - mperre12/feedback1.txt (when in /studentbox, for example)

Paths work wherever a file/directory is accepted

- *ls ~ = ls /home/mperre12*
- *ls /usr/bin*
- *ls /home/mperre12/Projects*
- *cd ~ = cd /home/mperre12*
- *cd /usr/bin*
- *cd /home/mperre12/Projects*
- *cat /home/mperre12/Test/bar.txt*

Permissions (on 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).
- *Can only change permissions if you are the owner of the file!*



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`