Lesson Module Status
- Slides – draft
- Flash cards – draft
- Properties – done
- Page numbers - done
- 1st minute quiz – done
- Web Calendar summary – done
- Web book pages - done
- Commands – done
- Lab tested – done

- enlightenment script tested - done

- CCC Confer wall paper / quiz - done
- Check that headset is charged – done
- Backup headset charged - done
- Backup slides, CCC info, handouts on flash drive - done

Email me (risimms@cabrillo.edu) a relatively current photo of your face for 3 points extra credit

First Minute Quiz

Please close your books, notes, lesson materials, forum and answer these questions **in the order** shown:

email answers to: risimms@cabrillo.edu

[ ] Has the phone bridge been added?

[ ] Is recording on?

[ ] Does the phone bridge have the mike?

[ ] Share slides, putty (rsimms, simmsben, roddyduk), Chrome

[ ] Disable spelling on PowerPoint

The UNIX/Linux File System

Objectives	Agenda
• Become familiar with the UNIX file hierarchy. • Be able to navigate the hierarchy using cd, ls and pwd commands. • Understand the key elements of a file. • Be able to distinguish the different UNIX files types. • Learn appropriate commands to view file contents.	• Quiz • Questions • The UNIX Directory Hierarchy • Navigating the file system • File types • Viewing files • Exercise: Enlightenment • Wrap up

Previous material and assignment

1. Questions on previous material?

2. Lab 3 questions?

   - I'll use check3 for grading
   - bash shell vs mail "shell"
   - clean up duplicates before last submittal
   - mail $(ls /home/cis90ol)
   - mail -f, mail -f mbox, mail -f uhistory

Lab 2 Results

1) show shell	(0)
2) type commands	xxxxx (5)
3) echo variables	x (1)
4) set TERM	xxx (3)
5) upper/lower case	(0)
6) who –g	xx (2)
7) number of arguments	xxxxxxxxxx (10)
8) CR and quotes	xxxxxxxx (8)
9) ; to separate commands	xxxxxx (6)
10) change password	(0)
11) uname options	xxxxxxxxxx xxxx (14)
12) banner	(0)
13) finger	xx (2)
14) id	x (1)
15) man	(0)
16) whatis vs man –f	xxxxx (5)
17) Tryme	xxxxxxxxxxx (11)
18) who –q	xxxxxxxx (8)
19) man –k vs apropos	xxxxxxxxxx (9)
20) info bash	(0)
21) Google	(0)
22) sqrt	xx (2)
Q1 – input from cmd line	x (1)
Q2 – input from keyboard	xxx (3)
Q3 – input from OS	xx (2)

Lab 2 Results – Q2

2. Use the following commands as arguments to the type command, to find out where each of the commands resides.

cmd argument
type man
type uname
type tryme
type echo
type type

Lab 2 Results – Q2

```
/home/cis90ol/simmsben $ type man
man is /usr/bin/man
```

*The **man** command is in the /usr/bin/ directory*

*Use the **type** command to find where on the path a command is located*

```
/home/cis90ol/simmsben $ type uname
uname is /bin/uname
```

*The **uname** command is in the /bin/ directory*

```
/home/cis90ol/simmsben $ type tryme
tryme is /home/cis90ol/simmsben/bin/tryme
```

*The **tryme** command is in the bin/ directory of our home directory*

```
/home/cis90ol/simmsben $ type echo
echo is a shell builtin

/home/cis90ol/simmsben $ type type
type is a shell builtin
```

*The **echo** and **type** commands are built into the bash shell*

Lab 2 Results – Q7

7. How many arguments do each of the following command lines have?

```
echo one     two                threefour
echo "My TERM type is " $TERM
echo one.two.three
```

Lab 2 Results – Q7

```
/home/cis90ol/simmsben $ echo one      two            threefour
one two threefour
```
(3 arguments)

```
/home/cis90ol/simmsben $ echo "My TERM type is " $TERM
My TERM type is  xterm
```
(2 arguments)

```
/home/cis90ol/simmsben $ echo one.two.three
one.two.three
```
(1 argument)

Lab 2 Results – Q8

8. What is the difference in output between the following two commands? Note, the $ and > are part of the prompt, you don't need to type them.

```
$ echo red 'white
> and blue'
```

and

```
$ echo red white \
> and blue
```

Note: the [enter] key is pressed immediately after the last character of each line

Lab 2 Results – Q8

Pressing the Enter (or Return on Macs) key generates an invisible <newline> metacharacter. This signals the shell to stop prompting and process the command line.

```
/home/cis90ol/simmsben $ echo red 'white <newline>
> and blue'
red white
and blue
```

The unclosed single quote prevents the <newline> from signaling the end of the command. Instead the shell continues to prompt and the <newline> gets passed to the echo command.

```
/home/cis90ol/simmsben $ echo red white \<newline>
> and blue
red white and blue
```

The <newline> is escaped in this example. The shell ignores it and continues to prompt the user for the rest of the command. The escaped <newline> and is never passed to the echo command.

Lab 2 Results – Q8

Note: Primary prompt is determined by the value of PS1

```
/home/cis90ol/simmsben $ echo $PS1
$PWD $
```

```
/home/cis90ol/simmsben $ echo red 'white
> and blue'
red white
and blue
```

Note: Secondary prompt is determined by the value of PS2

```
/home/cis90ol/simmsben $ echo $PS2
>
```

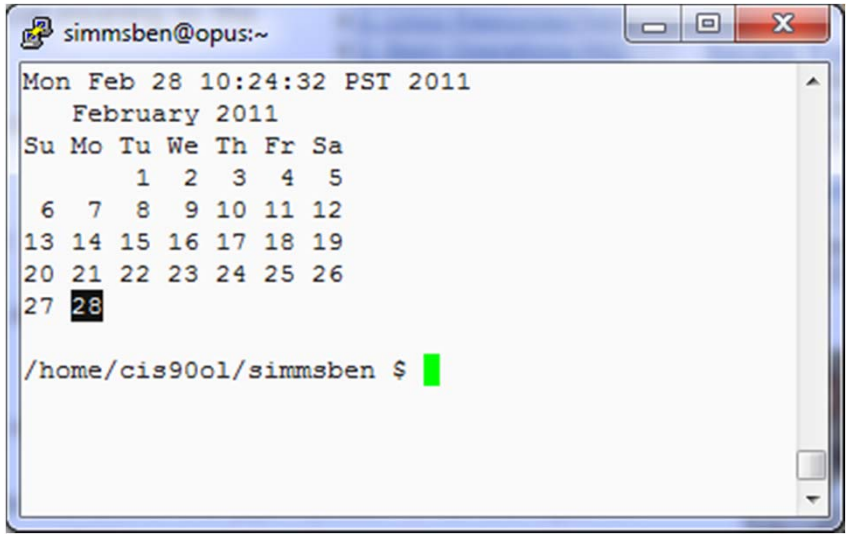
Lab 2 Results – Q9

9. Use the shell metacharacter ";" to write out a one line command that will clear the screen, print out the date and the current month's calendar.

$ _____

Lab 2 Results – Q9

```
/home/cis90ol/simmsben $ clear;date;cal
```



The ; metacharacter allows multiple commands on one line

Lab 2 Results – Q11

11. Using the **uname** command what options would you use to display just the operating system, it's kernel release numbers and the machine's network node hostname?

(Hint: Use the **man uname** command)

Lab 2 Results – Q11

```
-a, --all
       print all information, in the  following  order,  ex
       omit -p and -i if unknown:

-s, --kernel-name
       print the kernel name

-n, --nodename
       print the network node hostname

-r, --kernel-release
       print the kernel release

-v, --kernel-version
       print the kernel version

-m, --machine
       print the machine hardware nam

-p, --processor
       print the processor type or "u

-i, --hardware-platform
       print the hardware platform or

-o, --operating-system
       print the operating system

--help display this help and exit
```

Use the man page to determine the options to show just the operating system, it's kernel release numbers and the machine's network node hostname

```
/home/cis90ol/simmsben $ man uname

/home/cis90ol/simmsben $ uname -orn
opus.cabrillo.edu 2.6.18-164.el5 GNU/Linux
```

or

```
/home/cis90ol/simmsben $ uname -o -r -n
opus.cabrillo.edu 2.6.18-164.el5 GNU/Linux
```

Use q to quit the man page

Free Software = Freedom to view and modify the source code

Richard Stallman started the GNU project in 1983 to create a free UNIX-like OS. He Founded the Free Software Foundation in 1985. In 1989 he wrote the first version of the GNU General Public License

```
/home/cis90ol/simmsben $ uname -orn
opus.cabrillo.edu 2.6.18-164.el5 GNU/Linux
```

node hostname *kernel release* *OS*

*Dan M. didn't like the order the **uname** command printed the information so he downloaded the source code, modified it, recompiled it. He now has his own version of the **uname** command!*

```
cis90@eko-04:~/dan/coreutils-7.4/src$ ./uname -orn
GNU/Linux 2.6.32-27-generic eko-04
```

OS *kernel release* *node hostname*

See forum post topic "Lab #2...even though 'info uname' output states". This is one of the really cool things about Linux and the GNU General Public License … if you don't like something about it you can change it!

Lab 2 Results – Q16

16. What is the **whatis** command? Use the command with the argument, bc

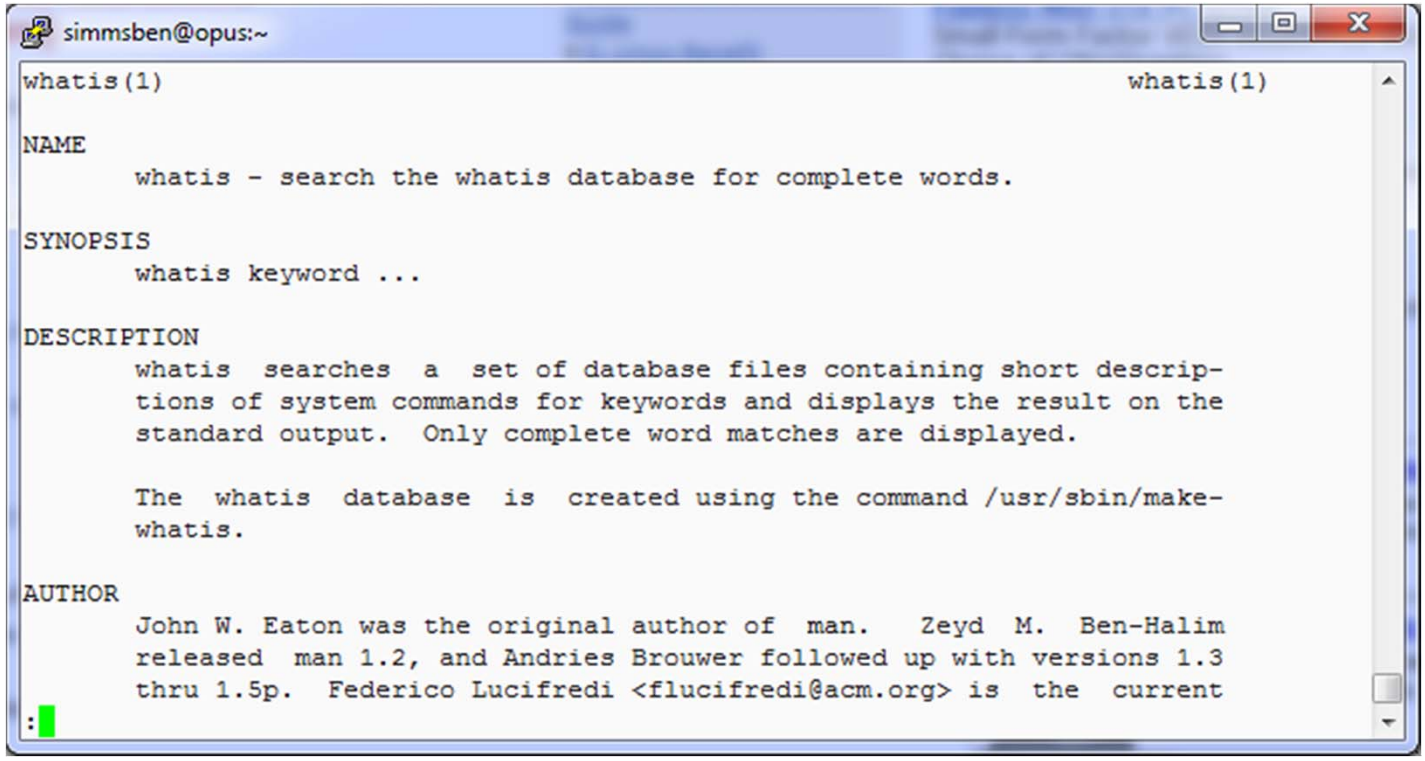
How does this compare to using the man command with -f option?

man -f bc

Lab 2 Results – Q16

*Use the **whatis** or **man** command to determine what the **whatis** command does.*

```
/home/cis90ol/simmsben $ whatis whatis
whatis                (1)  - search the whatis database for complete words

/home/cis90ol/simmsben $ man whatis
```

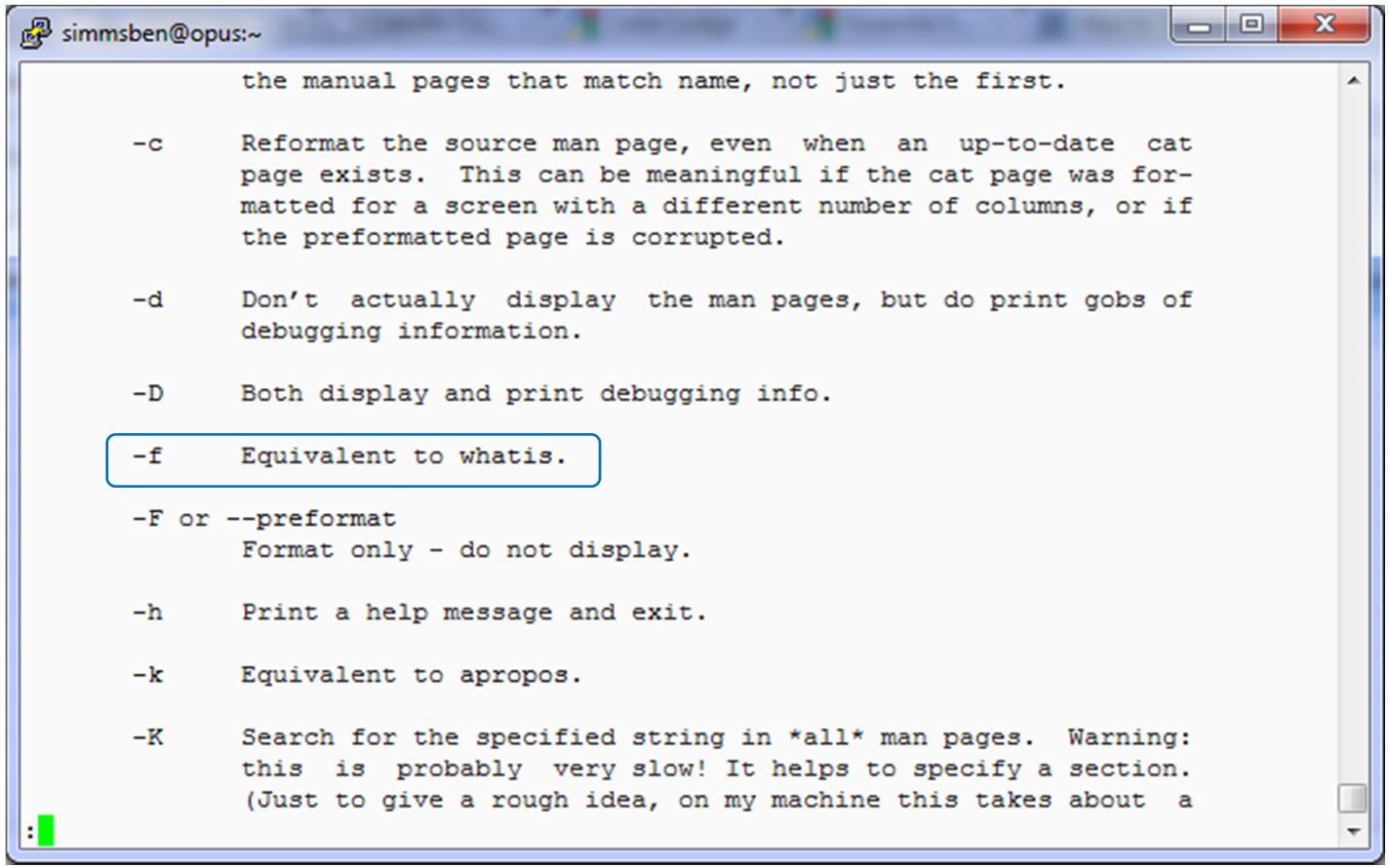


Lab 2 Results – Q16

*The **whatis** command is the same as the **man –f** command*

```
/home/cis90ol/simmsben $ whatis bc
bc                    (1)  - An arbitrary precision calculator language
bc                    (1p)  - arbitrary-precision arithmetic language
bc                   (rpm) - GNU's bc (a numeric processing language)
and dc (a calculator).


/home/cis90ol/simmsben $ man -f bc
bc                    (1)  - An arbitrary precision calculator language
bc                    (1p)  - arbitrary-precision arithmetic language
bc                   (rpm) - GNU's bc (a numeric processing language)
and dc (a calculator).
/home/cis90ol/simmsben $
```

Lab 2 Results – Q16



man man *will display the manual page for the man command and its documented there that the –f option is "Equivalent to whatis"*

Lab 2 Results – Q17

17. Is tryme a UNIX command? How do you know?

Lab 2 Results – Q17

```
/home/cis90ol/simmsben $ tryme
My name is "tryme"
I am pleased to make your acquaintance, Benji Simms
/tmp

/home/cis90ol/simmsben $ whatis tryme
tryme: nothing appropriate

/home/cis90ol/simmsben $ man tryme
No manual entry for tryme
```

UNIX commands are documented with man pages and have entries in the whatis database. ***tryme*** *does not appear in either one so is not a UNIX command*

Lab 2 Results – Q17

```
/home/cis90ol/simmsben $ type tryme
tryme is /home/cis90ol/simmsben/bin/tryme
```

type *shows* ***tryme*** *resides in the bin/ directory of my home directory*

```
/home/cis90ol/simmsben $ file /home/cis90ol/simmsben/bin/tryme
/home/cis90ol/simmsben/bin/tryme: Bourne-Again shell script text executable
```

file *shows* ***tryme*** *is a bash shell script*

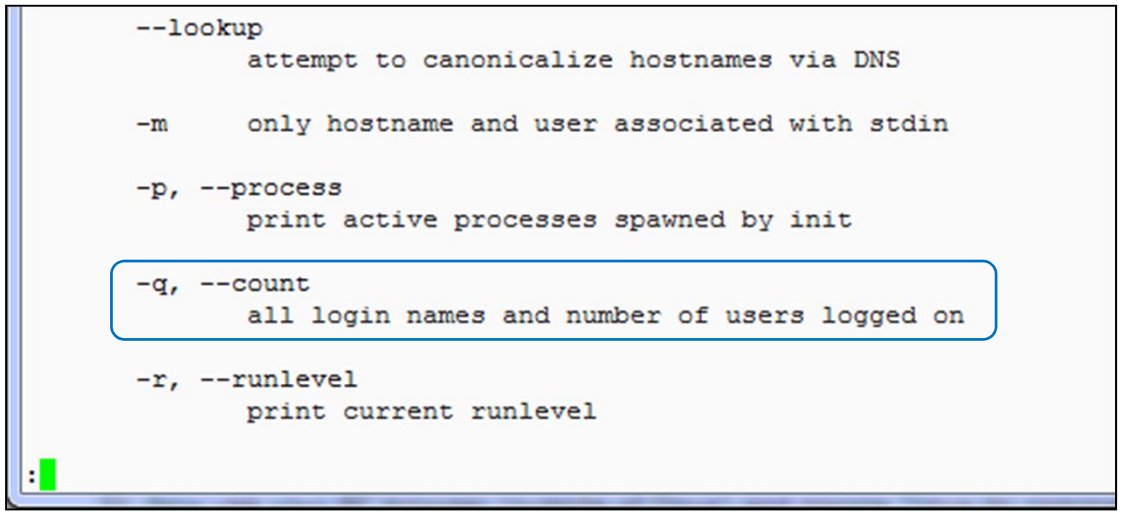
```
/home/cis90ol/simmsben $ cat  /home/cis90ol/simmsben/bin/tryme
#!/bin/bash

hello()
{
        cd /tmp
}
PATH=/bin
echo My name is \"`basename $0`\"
IFS=:
set `grep $LOGNAME /etc/passwd`
echo I am pleased to make your acquaintance, $5
hello
pwd
```

cat *shows the actual* ***tryme*** *script itself*

Lab 2 Results – Q18

18. Use the manual pages, and the **who** command, to find out the number of users logged on.

Lab 2 Results – Q18



```
       --lookup
              attempt to canonicalize hostnames via DNS

       -m     only hostname and user associated with stdin

       -p, --process
              print active processes spawned by init

       -q, --count
              all login names and number of users logged on

       -r, --runlevel
              print current runlevel

:
```

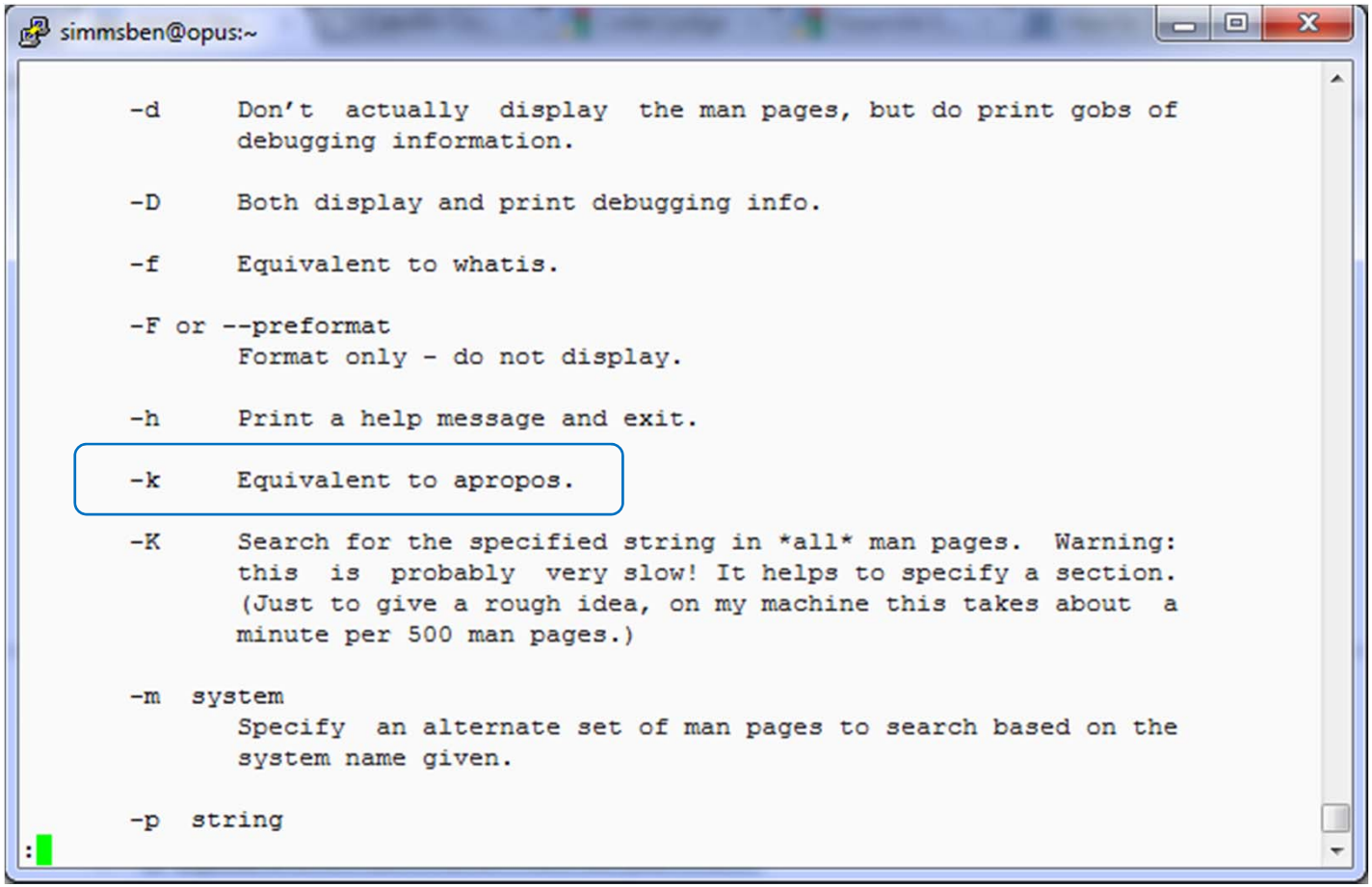
*The man page for **who** shows the q option will count the users logged in*

```
/home/cis90ol/simmsben $ who -q
arnsdtha rsimms alvesdes simmsben salinjac wingejas
pirkllau pirkllau wingejas vasqucar
# users=10
/home/cis90ol/simmsben $
```

Lab 2 Results – Q19

19. Run the command: **man -k boot** Use the manual pages to find out what the -k option does. What command is **man -k** equivalent to? Run the equivalent command and verify.

Lab 2 Results – Q19



*Use **man man** to read the manual page for the **man** command*

*the **apropos** command is equivalent to the **man –k** command*

Lab 2 Results – Q19

simmsben@opus:~

```
/home/cis90ol/simmsben $ apropos boot
ExtUtils::Mkbootstrap (3pm)  - make a bootstrap file for use by DynaLoader
boot-scripts [boot]   (7)  - General description of boot sequence
bootparam             (7)  - Introduction to boot time parameters of the Linux kernel
firstboot           (rpm) - Initial system configuration utility
firstboot-tui       (rp
grub                (rp
initrd               (4
kexec                (8
mbchk                (1
mkbootdisk           (8
mkbootdisk          (rp
perlboot             (1
pxeboot              (8
pxeos                (8
ty
reboot               (2
reboot [halt]        (8
rhgb                (rp
sys-unconfig         (8
syslinux            (rp
system-config-netboot (
system-config-netboot (
system-config-netboot-c
/home/cis90ol/simmsben
```

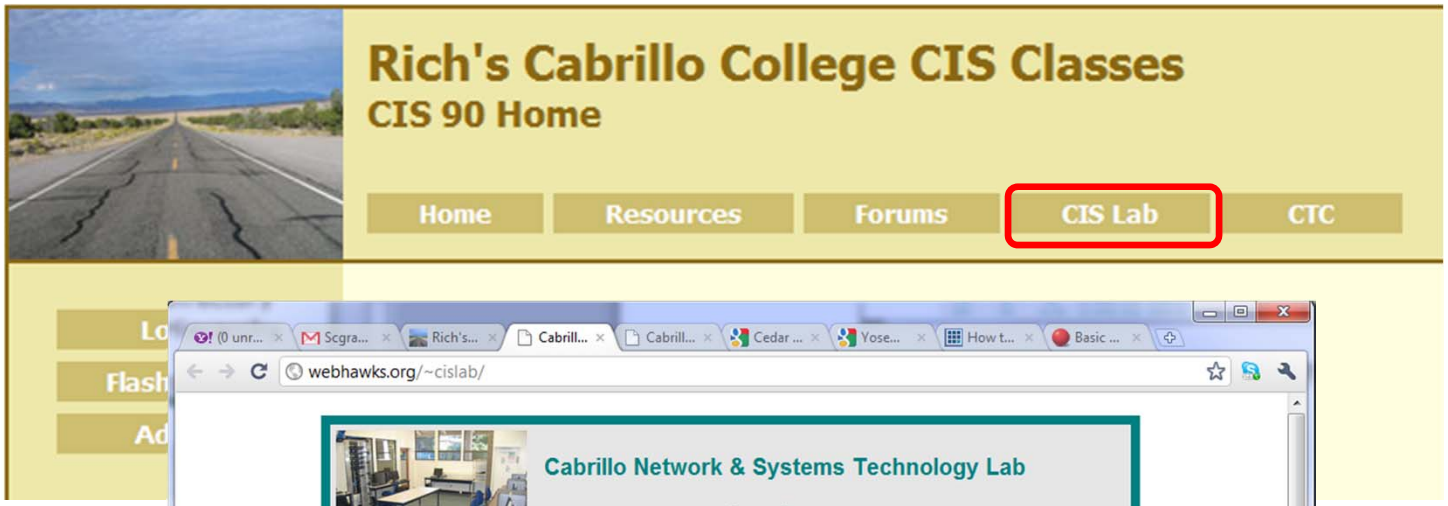
simmsben@opus:~

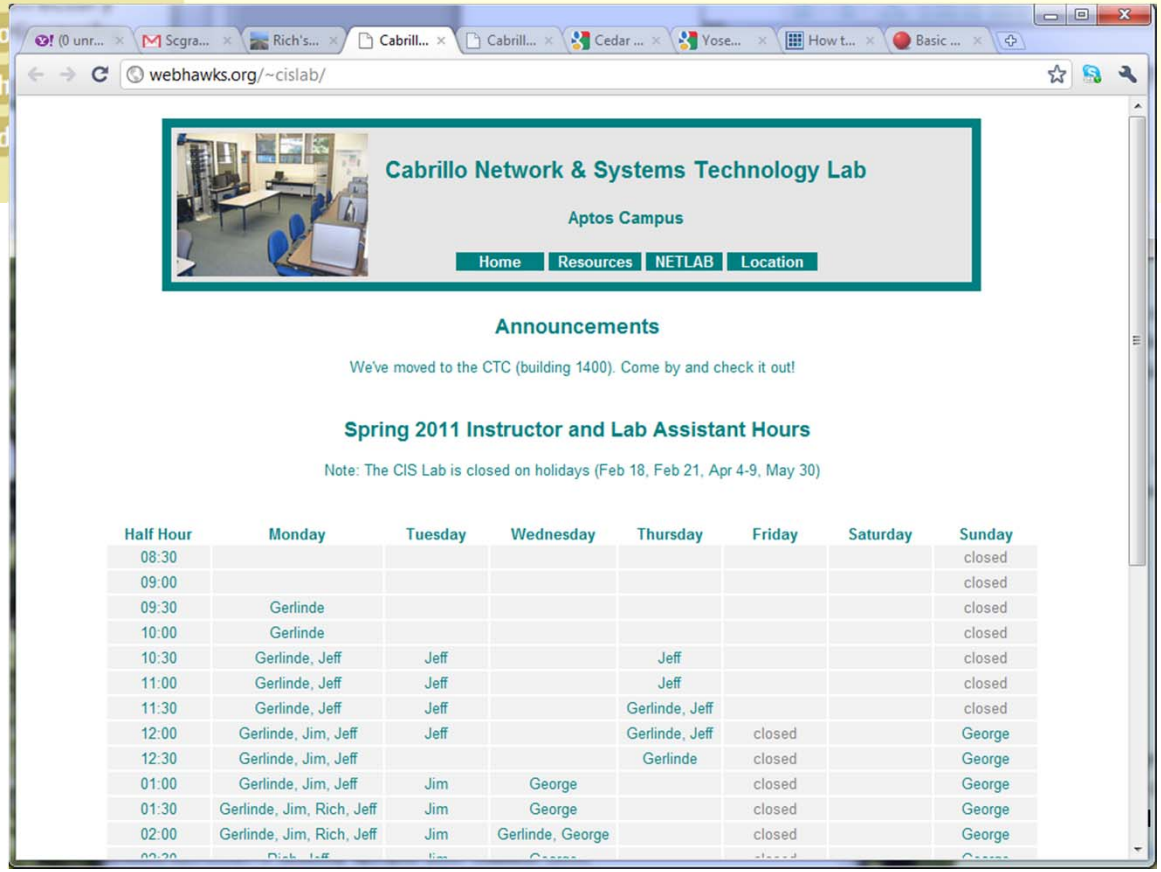
```
/home/cis90ol/simmsben $ man -k boot
ExtUtils::Mkbootstrap (3pm)  - make a bootstrap file for use by DynaLoader
boot-scripts [boot]   (7)  - General description of boot sequence
bootparam             (7)  - Introduction to boot time parameters of the Linux kernel
firstboot           (rpm) - Initial system configuration utility
firstboot-tui       (rpm) - A text interface for firstboot
grub                (rpm) - GRUB - the Grand Unified Boot Loader.
initrd               (4)  - boot loader initialized RAM disk
kexec                (8)  - directly boot into a new kernel
mbchk                (1)  - check the format of a Multiboot kernel
mkbootdisk           (8)  - creates a stand-alone boot floppy for the running system
mkbootdisk          (rpm) - Creates a boot floppy disk for booting a system.
perlboot             (1)  - Beginner(aqs Object-Oriented Tutorial
pxeboot              (8)  - Network Booting Operating Systems Configuration Utility
pxeos                (8)  - PXEBoot Operating System description Configuration Utili
ty
reboot               (2)  - reboot or enable/disable Ctrl-Alt-Del
reboot [halt]        (8)  - stop the system
rhgb                (rpm) - Red Hat Graphical Boot
sys-unconfig         (8)  - shell script to reconfigure the system upon next boot
syslinux            (rpm) - Simple kernel loader which boots from a FAT filesystem
system-config-netboot (8)  - Network Booting Configuration Utility
system-config-netboot (rpm) - network booting/install configuration utility (GUI)
system-config-netboot-cmd (rpm) - network booting/install configuration utility
/home/cis90ol/simmsben $
```

*the **apropos** command is equivalent to the **man –k** command*

Housekeeping

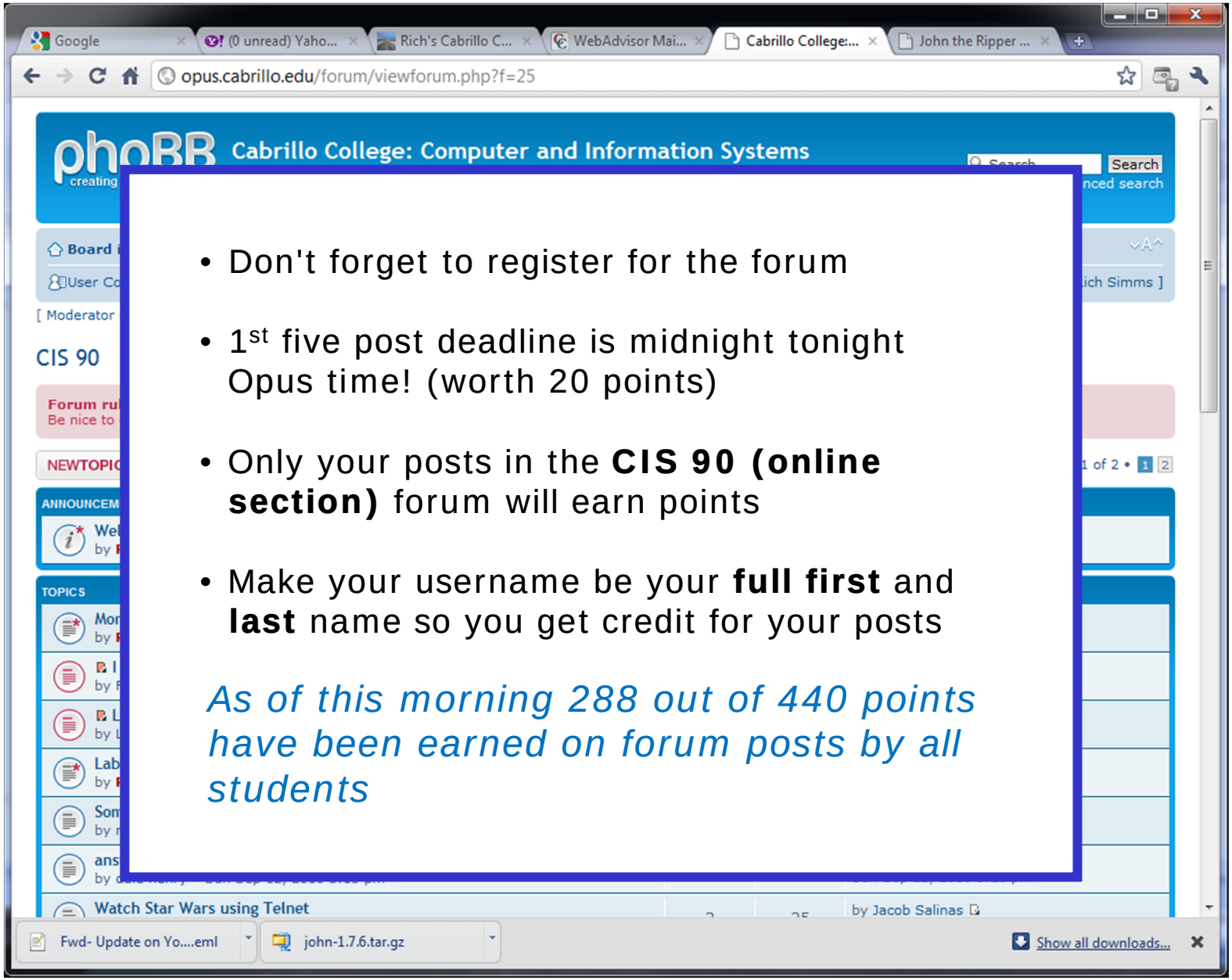
- MSDN AA - is it working?
- Graded labs placed in your home directory
- Answers to labs in /home/cis90ol/answers/ directory
- Lab 3 and five forum posts due tonight





Half Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
08:30							closed
09:00							closed
09:30	Gerlinde						closed
10:00	Gerlinde						closed
10:30	Gerlinde, Jeff	Jeff		Jeff			closed
11:00	Gerlinde, Jeff	Jeff		Jeff			closed
11:30	Gerlinde, Jeff	Jeff		Gerlinde, Jeff			closed
12:00	Gerlinde, Jim, Jeff	Jeff		Gerlinde, Jeff	closed		George
12:30	Gerlinde, Jim, Jeff			Gerlinde	closed		George
01:00	Gerlinde, Jim, Jeff	Jim	George		closed		George
01:30	Gerlinde, Jim, Rich, Jeff	Jim	George		closed		George
02:00	Gerlinde, Jim, Rich, Jeff	Jim	Gerlinde, George		closed		George

Note: CIS Lab hours have been updated with the latest instructor and lab assistant hours



- Don't forget to register for the forum
- 1st five post deadline is midnight tonight Opus time! (worth 20 points)
- Only your posts in the **CIS 90 (online section)** forum will earn points
- Make your username be your **full first** and **last** name so you get credit for your posts

As of this morning 288 out of 440 points have been earned on forum posts by all students

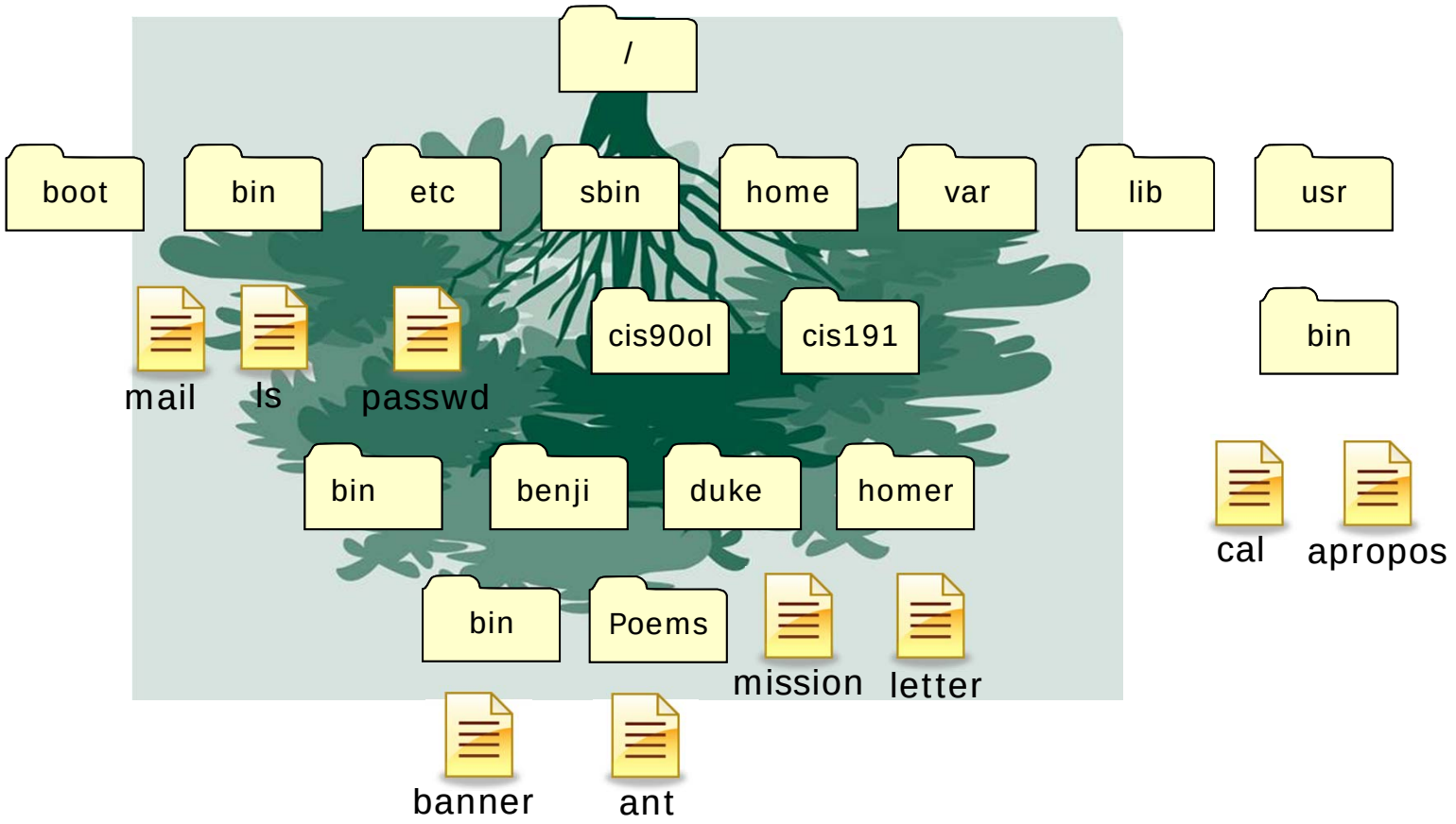
The UNIX Directory Hierarchy

UNIX File Tree

/ = root of the tree

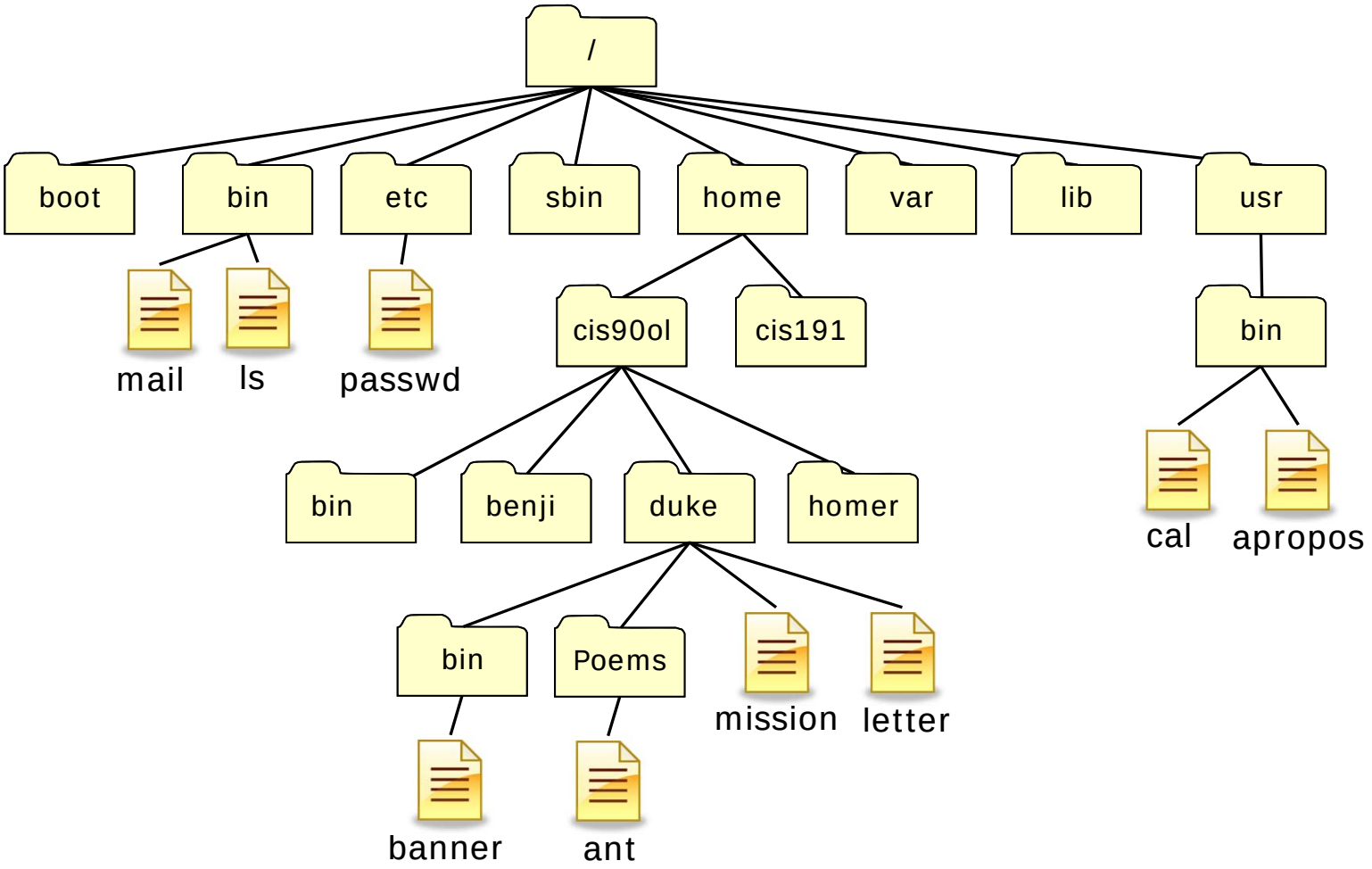
UNIX File Tree

/ = root of the tree



UNIX File Tree

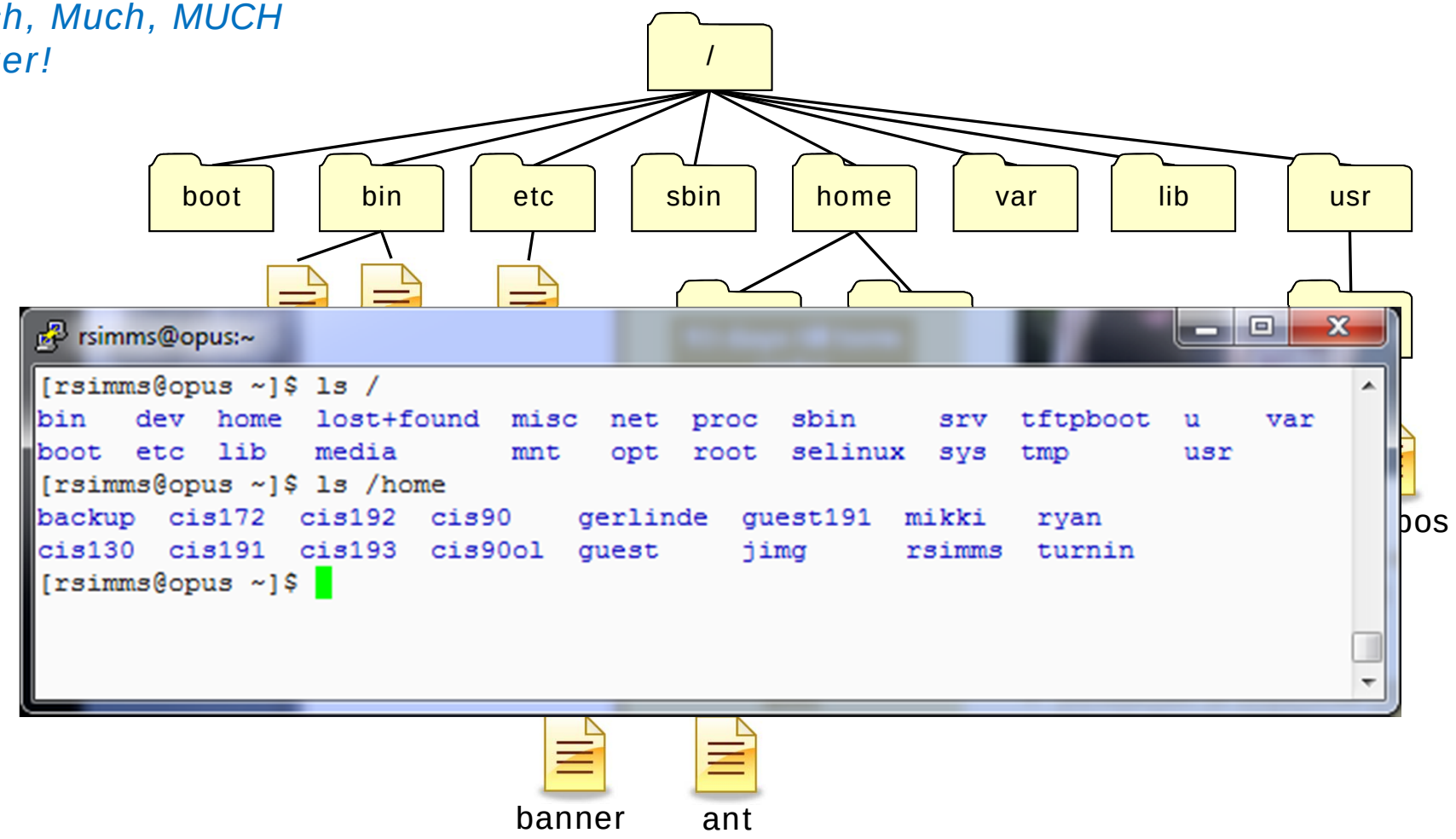
/ = root of the tree



UNIX File Tree

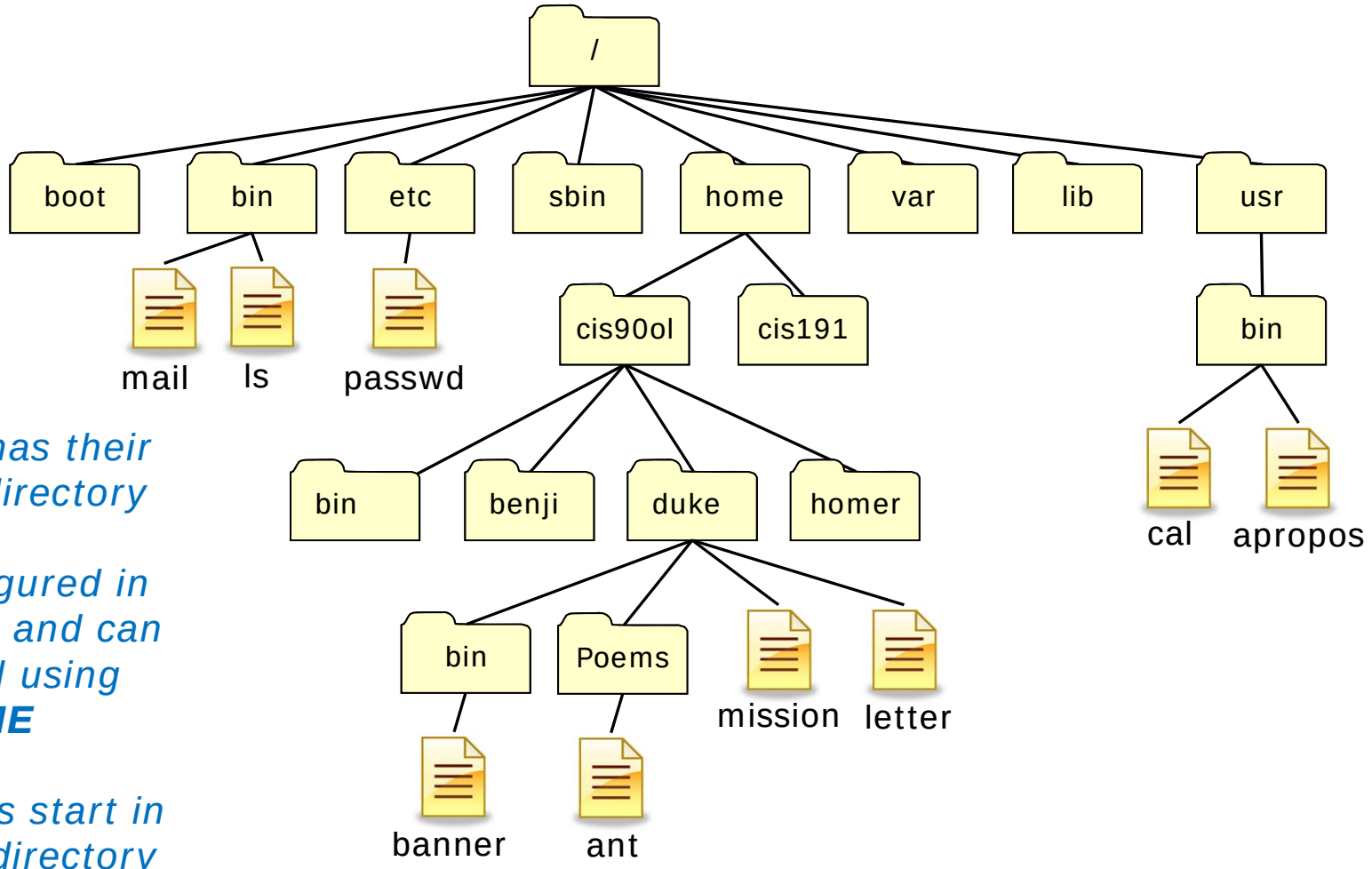
/ = root of the tree

Note, the actual file tree on Opus is much, Much, MUCH bigger!



UNIX File Tree

/ = root of the tree



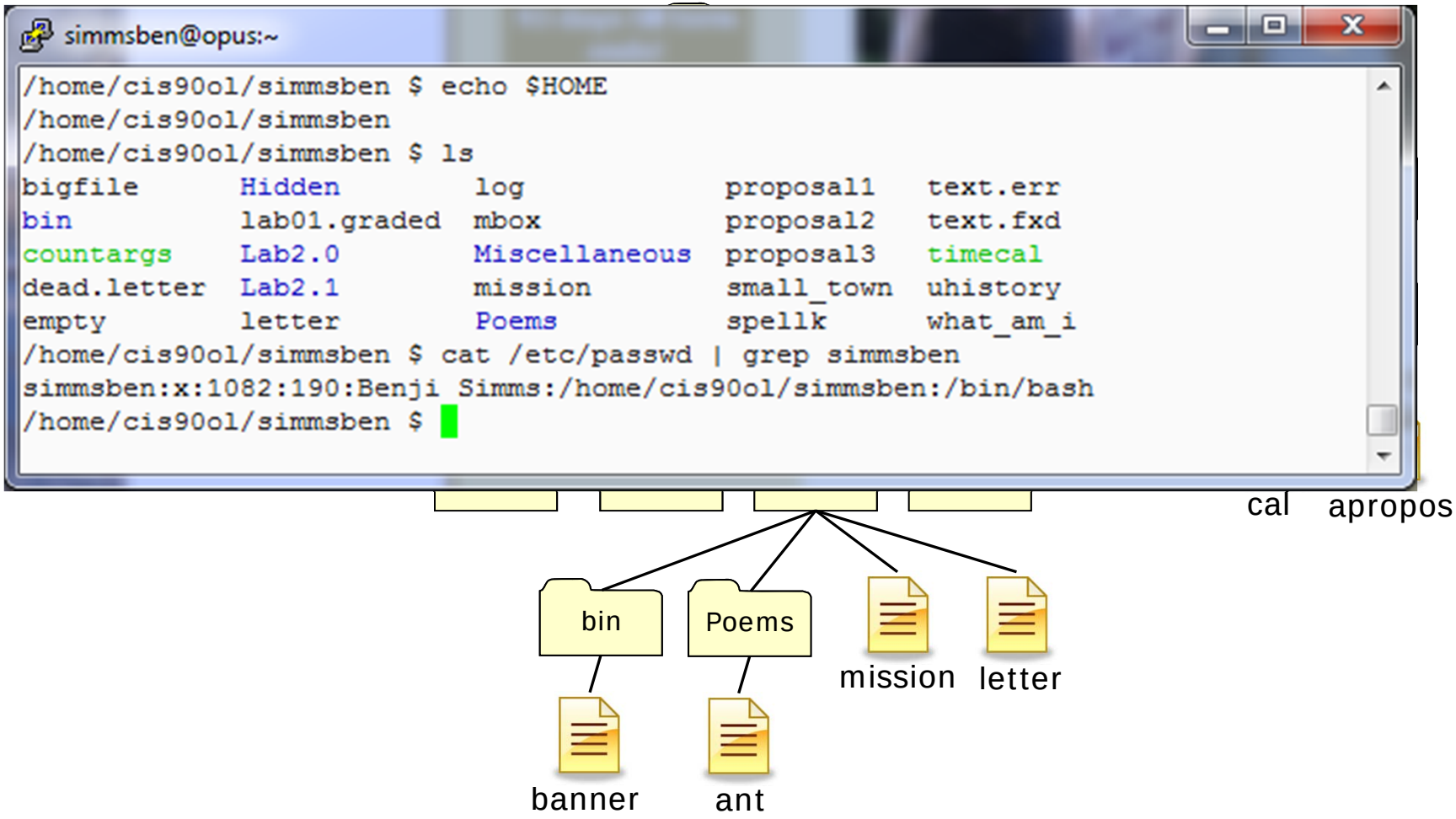
Every user has their own home directory

This is configured in /etc/passwd and can be displayed using ***echo $HOME***

Users always start in their home directory when they login

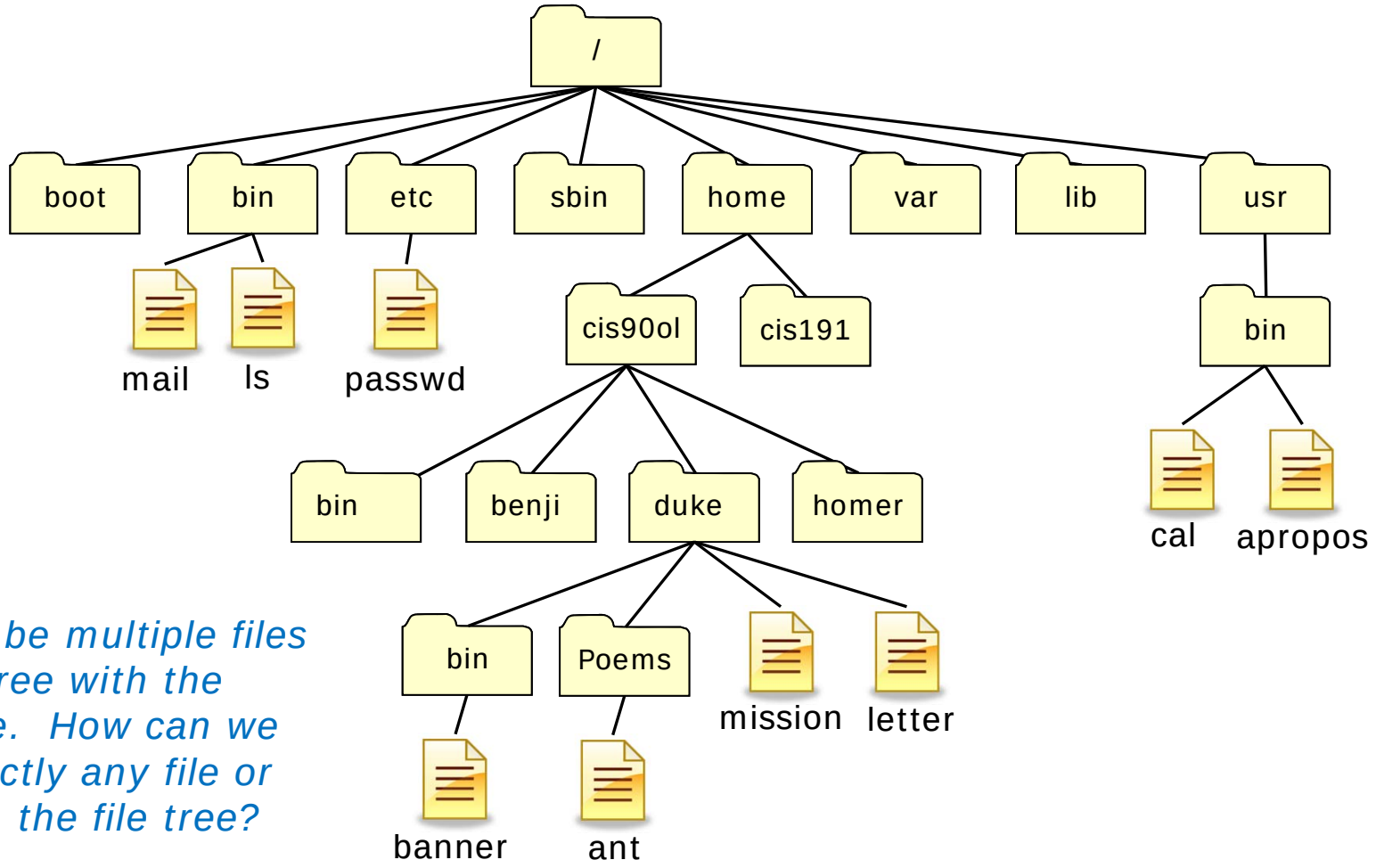
UNIX File Tree

/ = root of the tree



UNIX File Tree

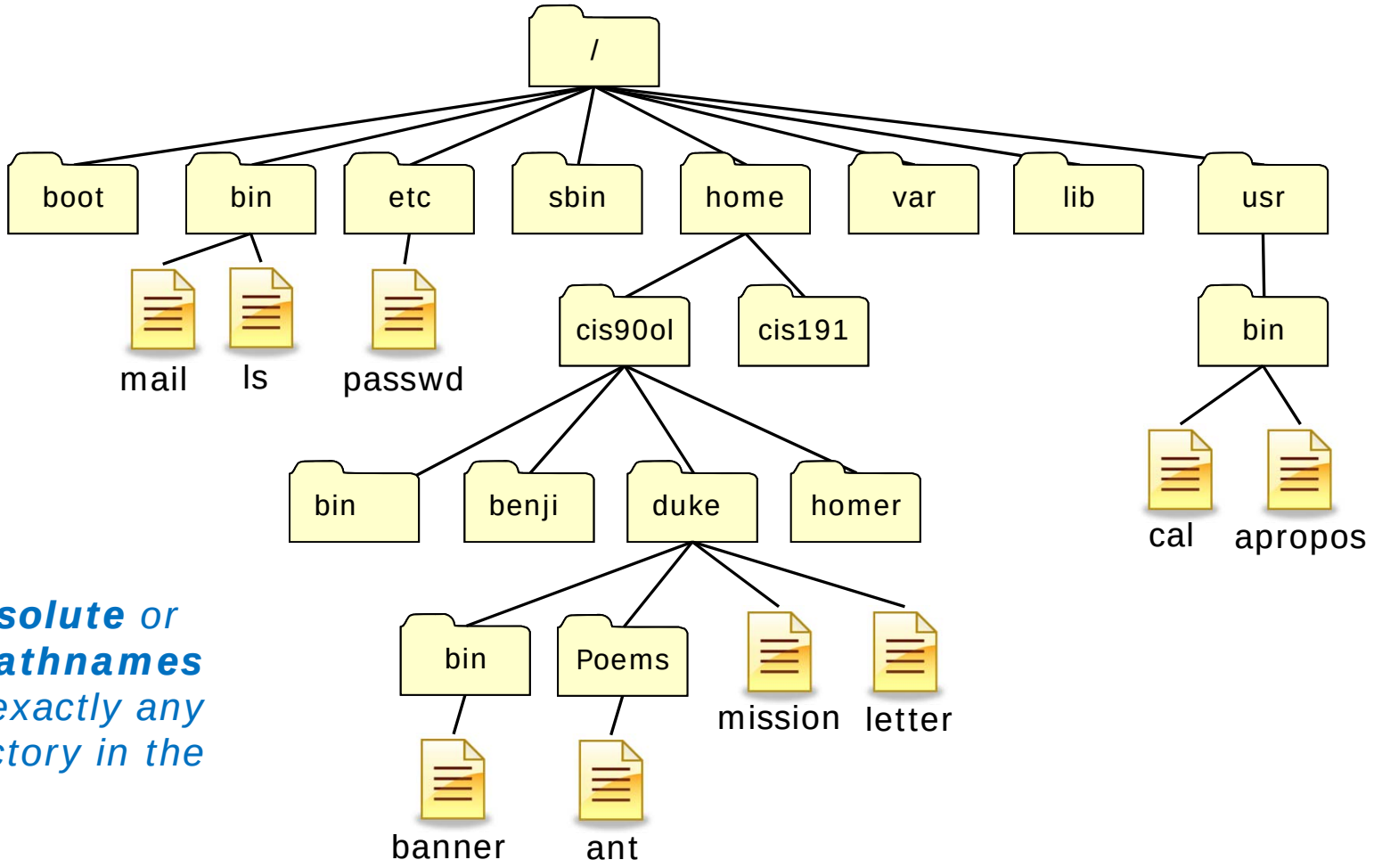
/ = root of the tree



There may be multiple files in the file tree with the same name. How can we specify exactly any file or directory in the file tree?

UNIX File Tree

/ = root of the tree



*We use **absolute** or **relative pathnames** to specify exactly any file or directory in the tree.*

Pathnames

What the heck are they?

A pathname is a precise way to specify any file or directory in the file tree.

- An **absolute pathname** specifies the path from the top of the tree to the target directory or file.
- A **relative pathname** specifies the path from your current location to the target directory or file.

Understanding pathnames is critical because they are used as arguments to all commands that deal with files and directories.

Absolute Pathnames

*An **absolute pathname** specifies the path from the top of the tree to the target directory or file.*

Examples:

/home/cis90ol/duke/Poems/ant	*(file)*
/boot	*(directory)*
/usr/bin/cal	*(file)*
/home/cis90ol/bin/	*(directory)*
/bin/mail	*(file)*

Notice they all start with the /

Absolute Pathnames

Using absolute pathnames as command arguments

*An **absolute pathname** specifies the path from the top of the tree to the target directory or file.*

Examples of absolute pathnames used as command arguments:

ls /bin /sbin /usr/bin /usr/sbin

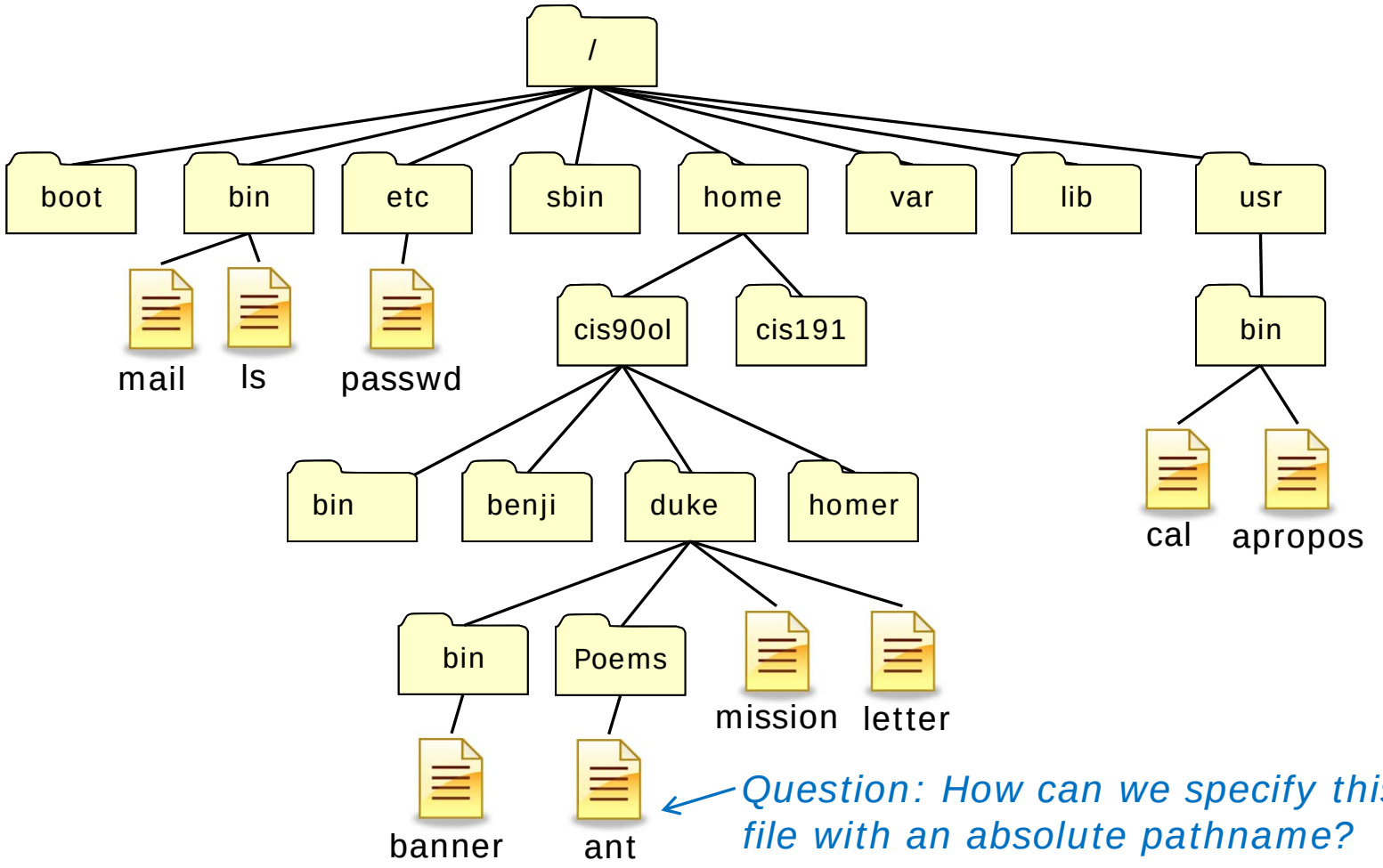
file /usr/bin/cal

cd /home/cis90ol/Poems/Shakespeare

ls -l /bin/mail

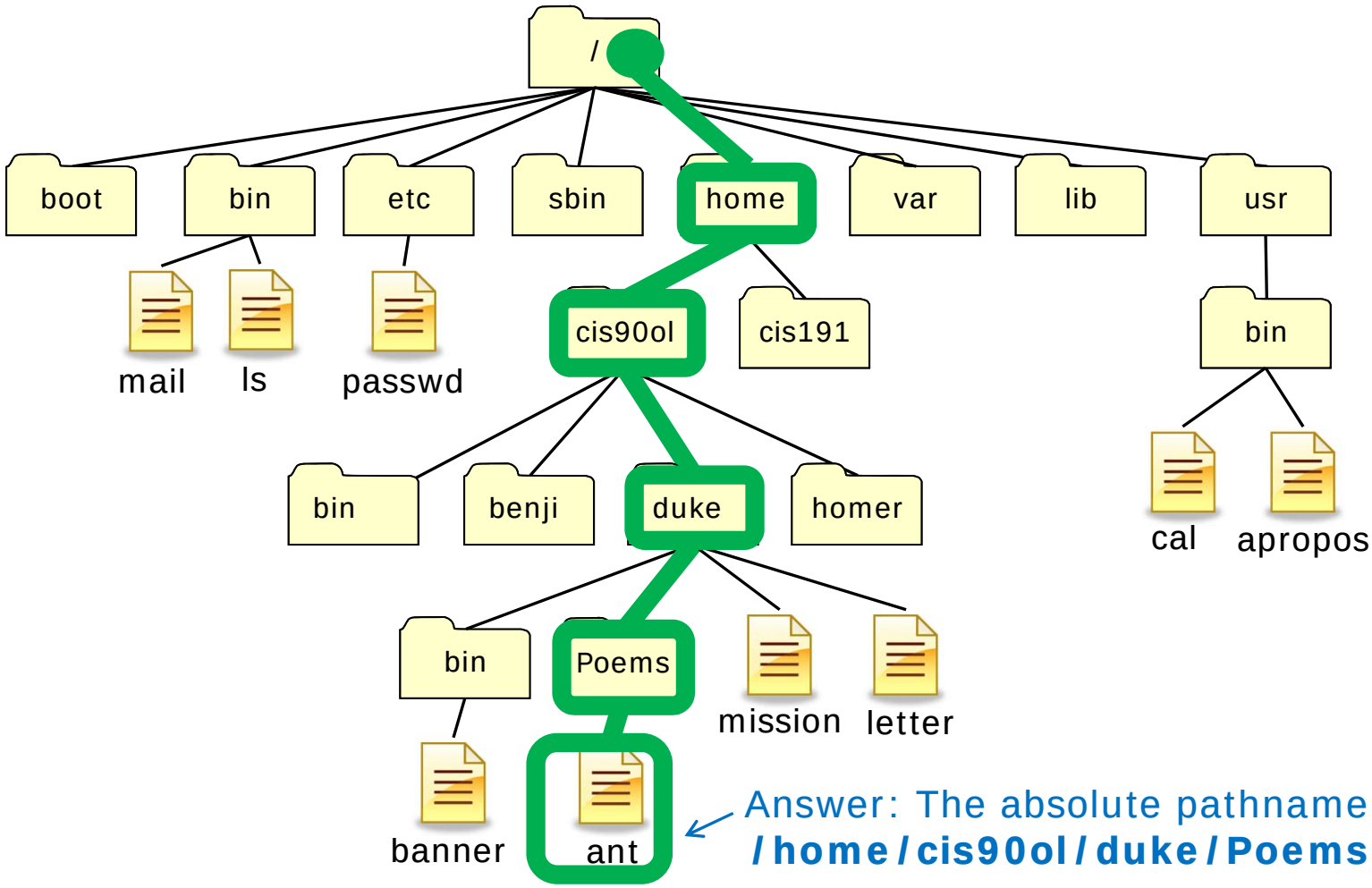
cp /etc/passwd /home/cis90ol/simmsben/misc

An **absolute pathname** specifies the path from the top of the tree to the target directory or file



Question: How can we specify this file with an absolute pathname?

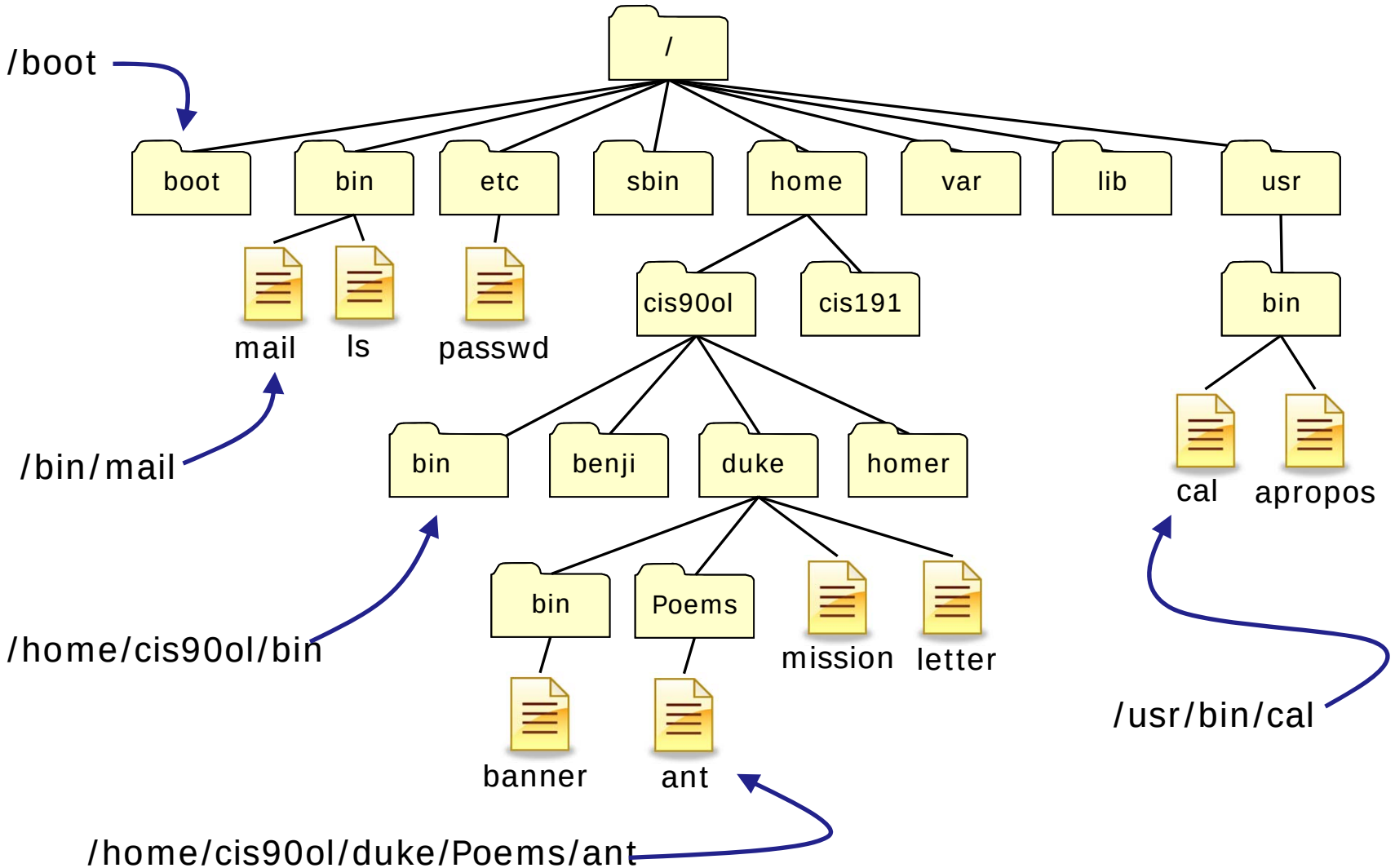
An **absolute pathname** specifies the path from the top of the tree to the target directory or file



Answer: The absolute pathname is **/home/cis90ol/duke/Poems/ant**

Absolute Pathnames

These are all absolute pathname examples



Relative Pathnames

*A **relative pathname** specifies the path from your current location to the target directory or file.*

Examples:

ant	*(file)*
Poems/Shakespeare/sonnet5	*(file)*
../mission	*(file)*
../bin/	*(directory)*
../../../boot/vmlinuz-2.6.18-164.el5	*(file)*

Relative Pathnames

Using relative pathnames as command arguments

*A **relative pathname** specifies the path from your current location to the target directory or file.*

Examples of using releative pathnames as command arguments:

ls -l ant

file ../../../../bin/mail

cd Poems/Blake

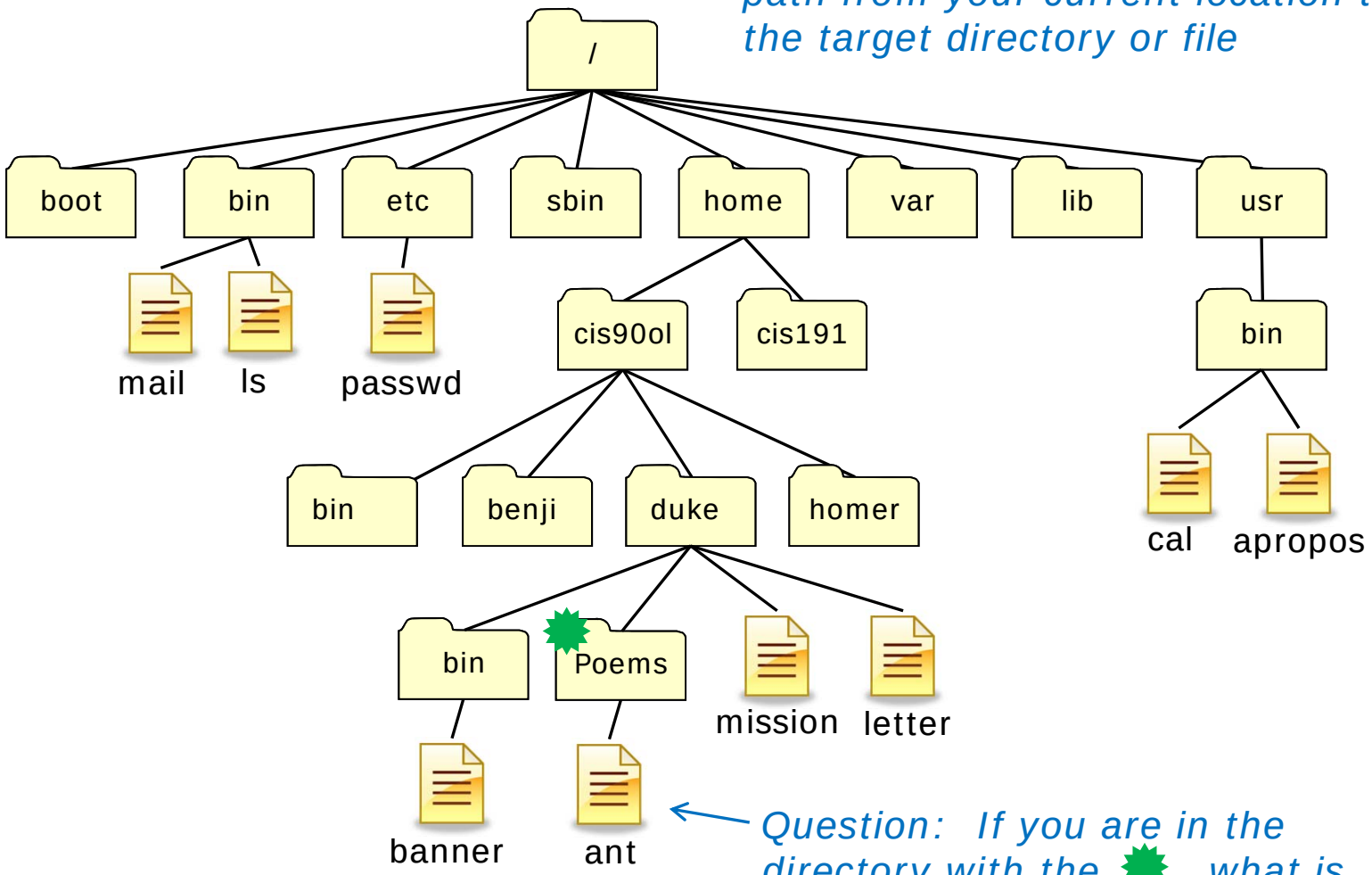
ls -l ../bin/check3

file Poems/Shakespeare/sonnet4

cd Poems/Shakespeare

Relative Pathname Example

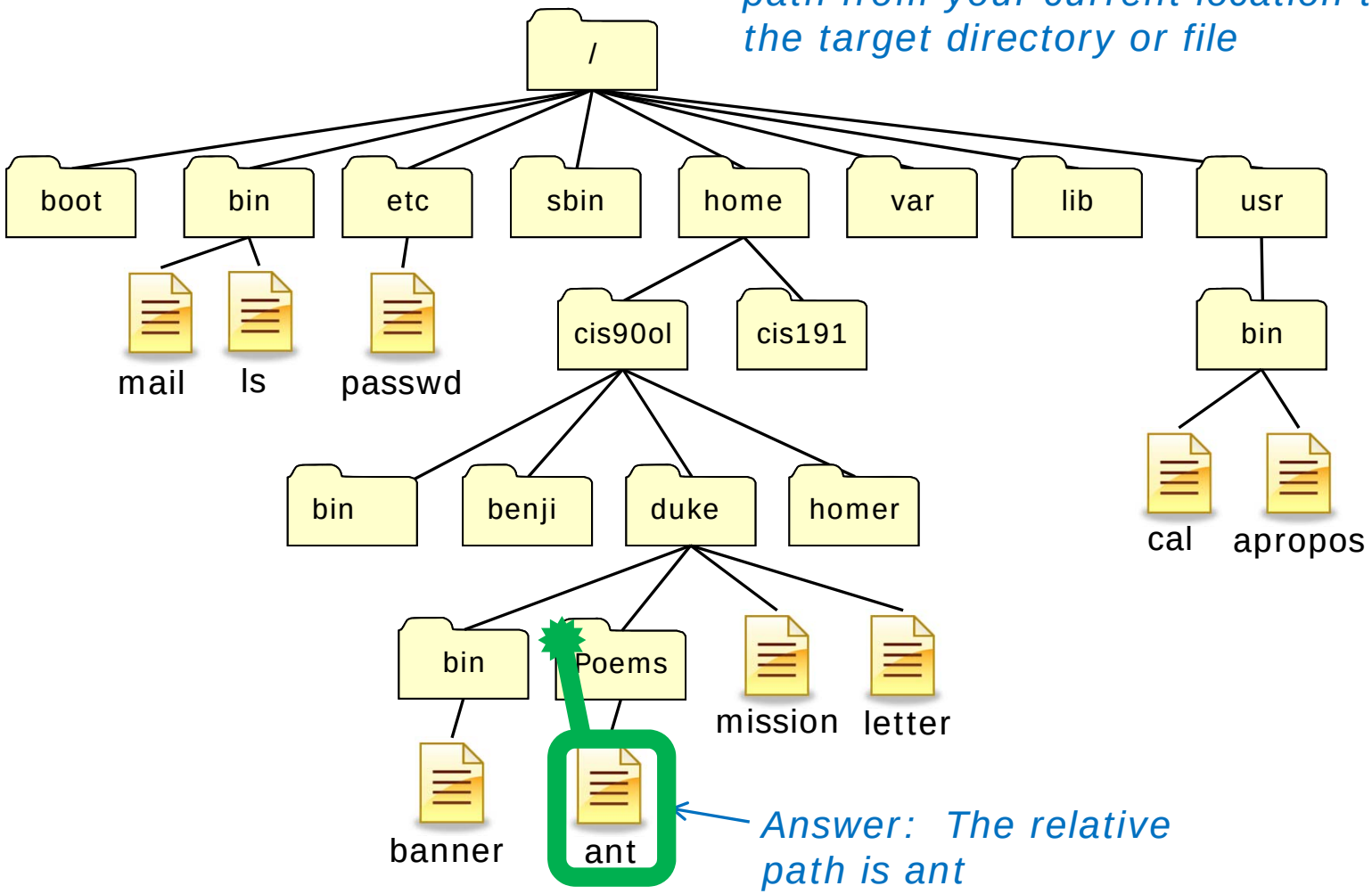
*A **relative pathname** specifies the path from your current location to the target directory or file*



Question: If you are in the directory with the , what is the relative path to this file?

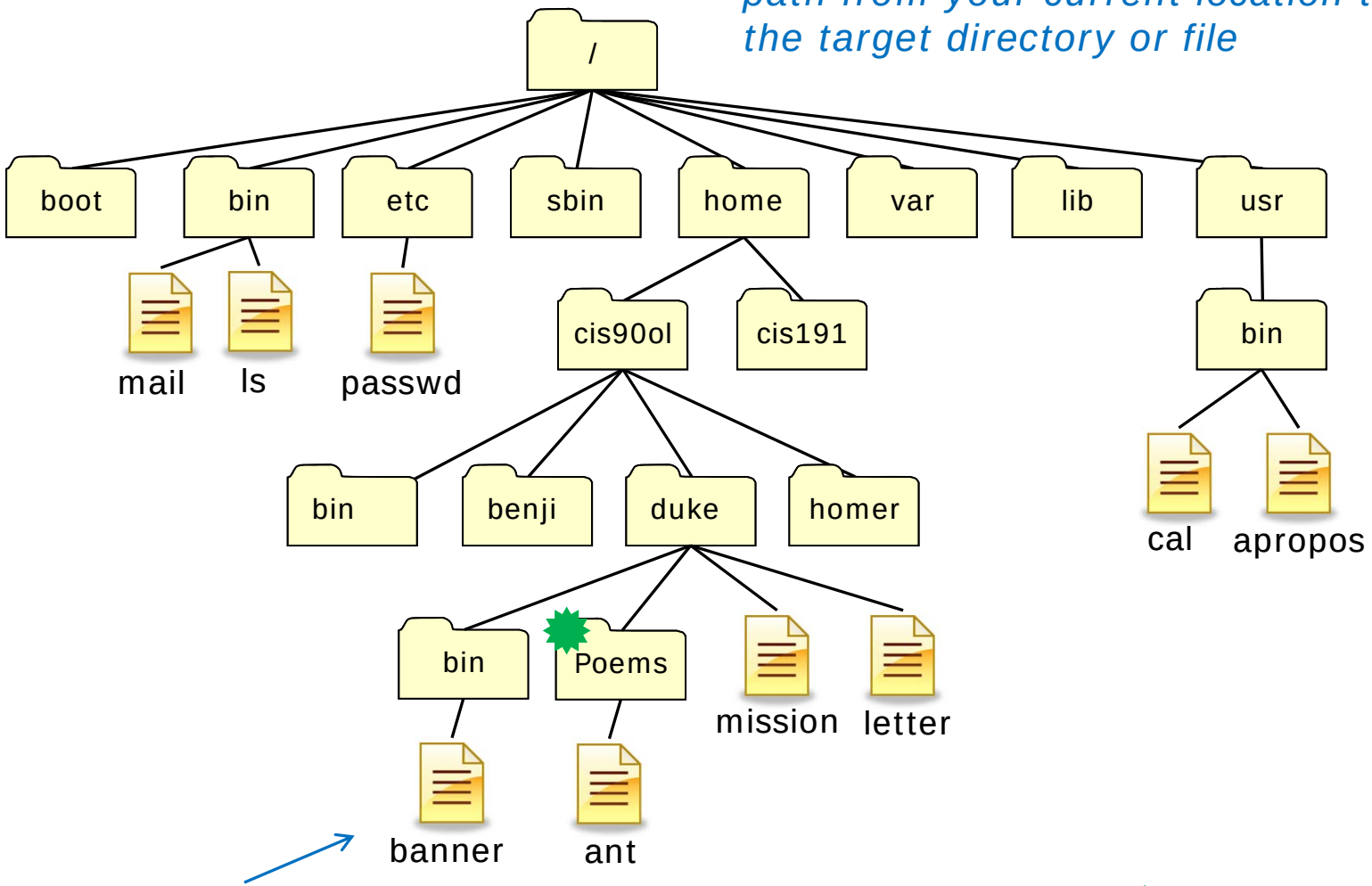
Relative Pathname Example

*A **relative pathname** specifies the path from your current location to the target directory or file*



Relative Pathname Example

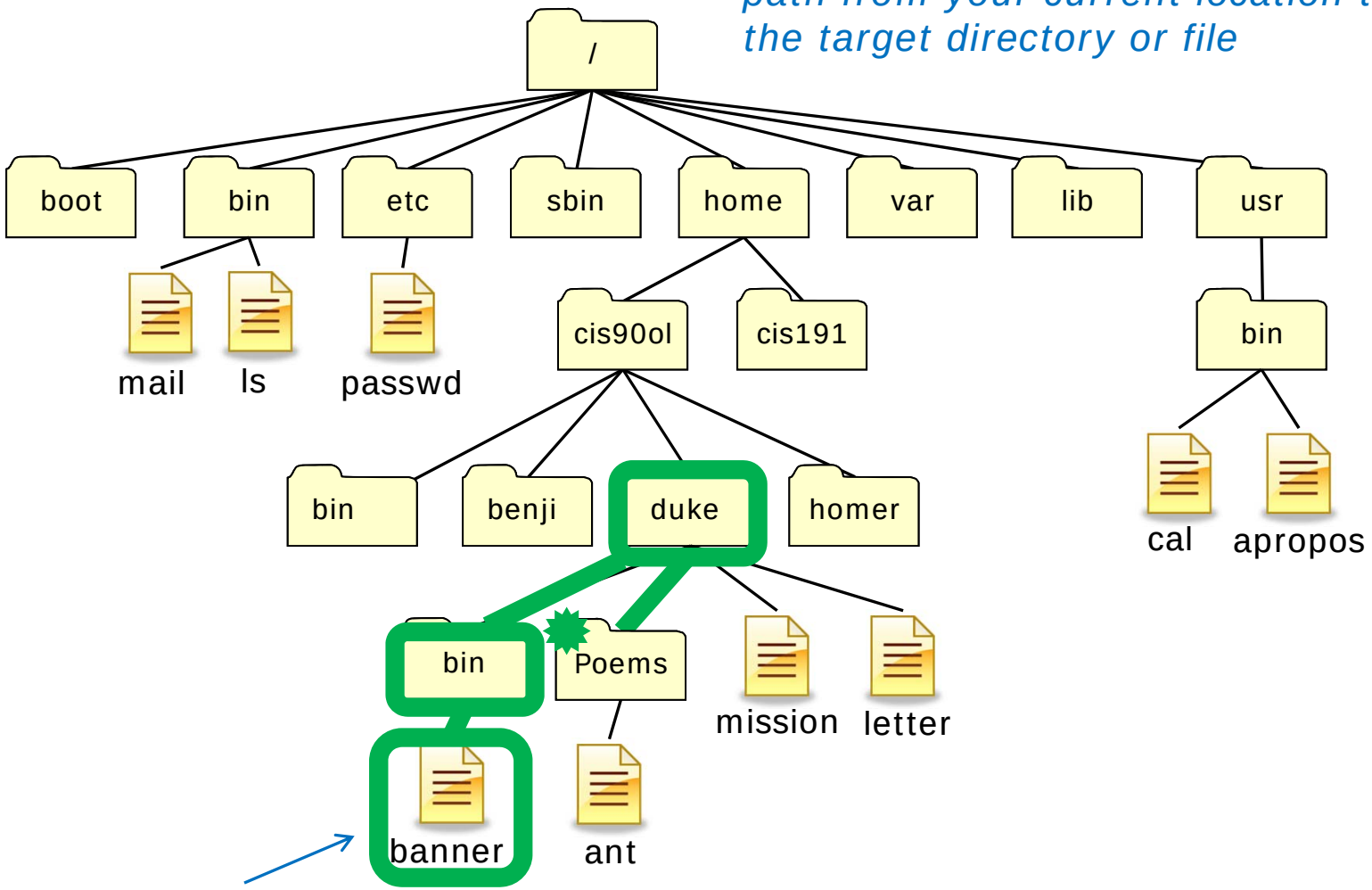
*A **relative pathname** specifies the path from your current location to the target directory or file*



Question: If you are in the directory with the ✹, what is the relative path to this file?

Relative Pathname Example

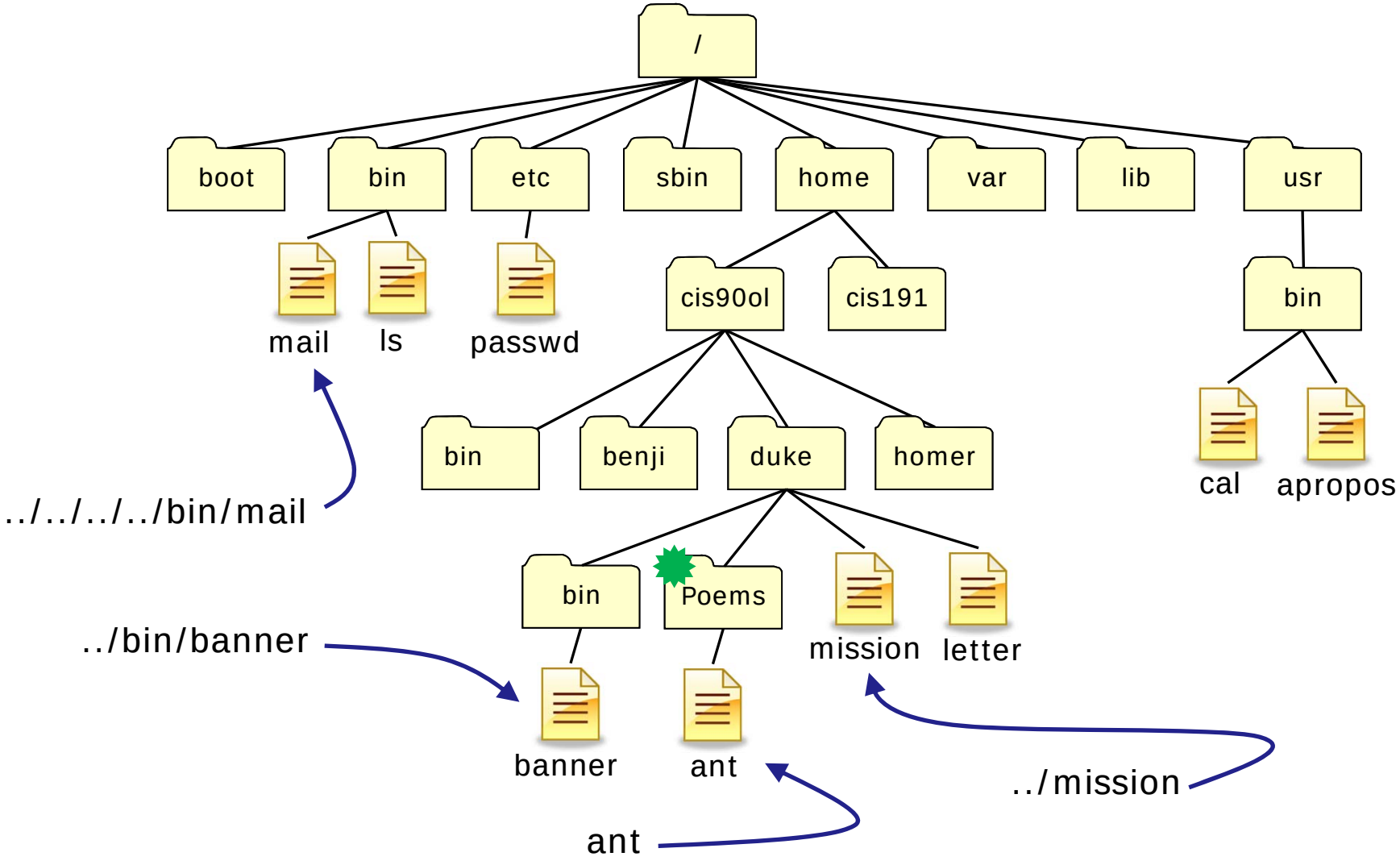
*A **relative pathname** specifies the path from your current location to the target directory or file*



Answer: The relative path to this file is ../bin/banner

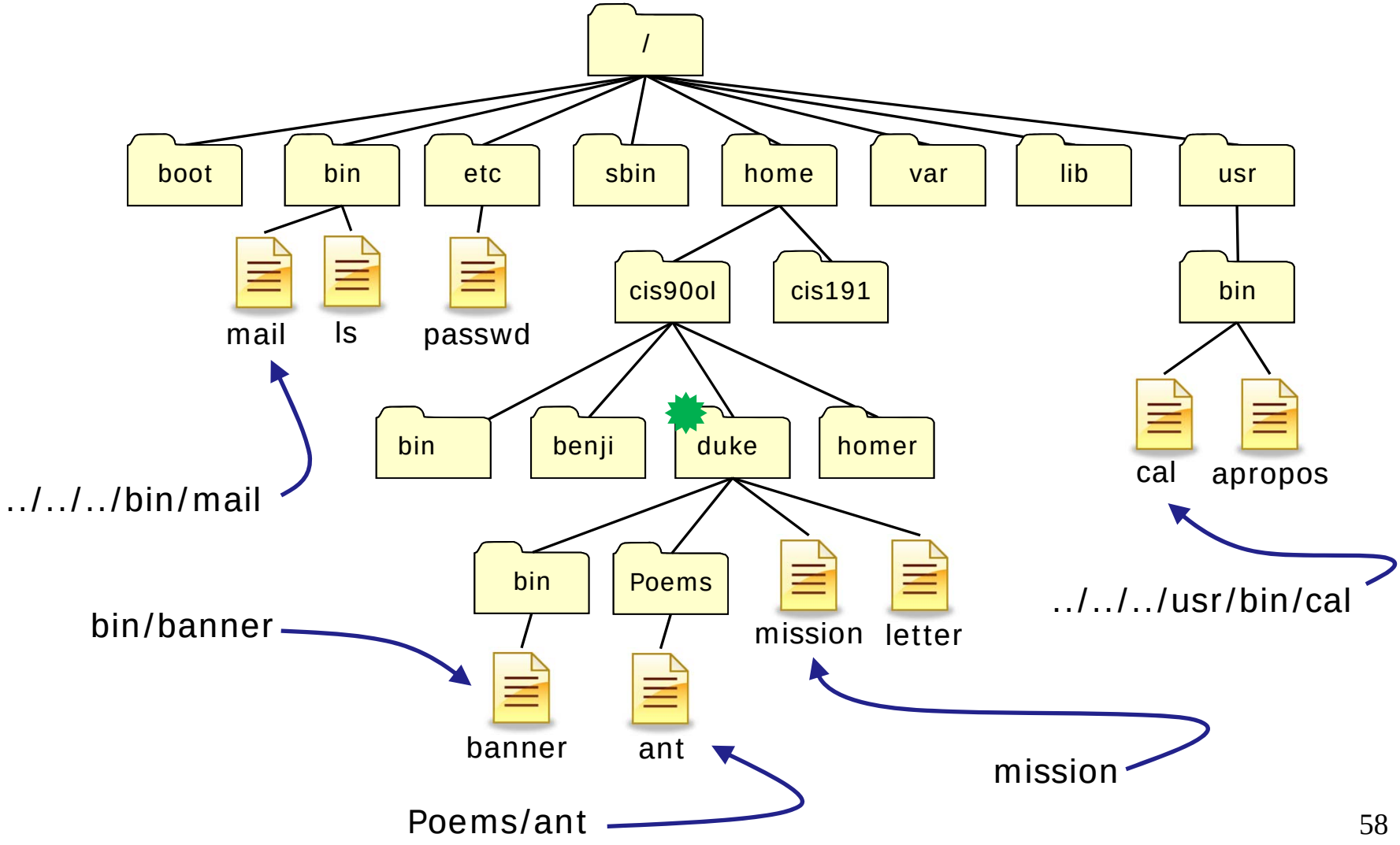
Relative Pathnames

Names that start relative to the current working directory (✹)



Relative Pathnames

Names that start relative to the current working directory (✹)



Class Exercise

From your home directory:

- List the /etc/passwd/ file using a relative pathname

  ls ../../../etc/passwd

- List the /etc/passwd file using a absolute pathname

  ls /etc/passwd

- List the letter file using a relative pathname

  ls letter

- List the letter file using an absolute pathname

  ls /home/cis90ol/simmsben/letter

user your home directory instead

Heads up on a future test question

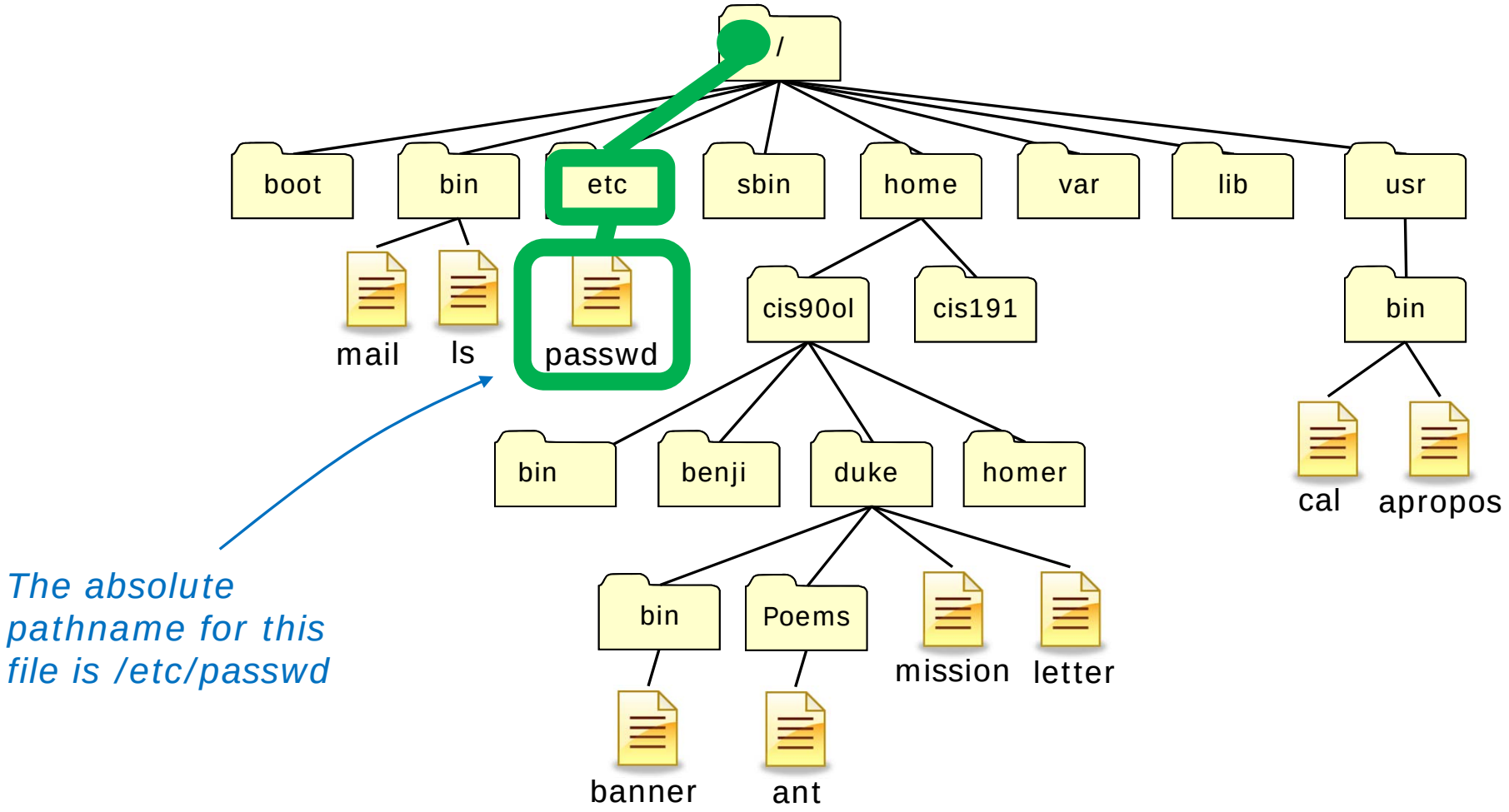
Question: What is the absolute pathname of /etc/passwd?

Answer: /etc/passwd

What is the color of Washington's white horse?

UNIX File Tree

/ = root of the tree



/

. and ..

~

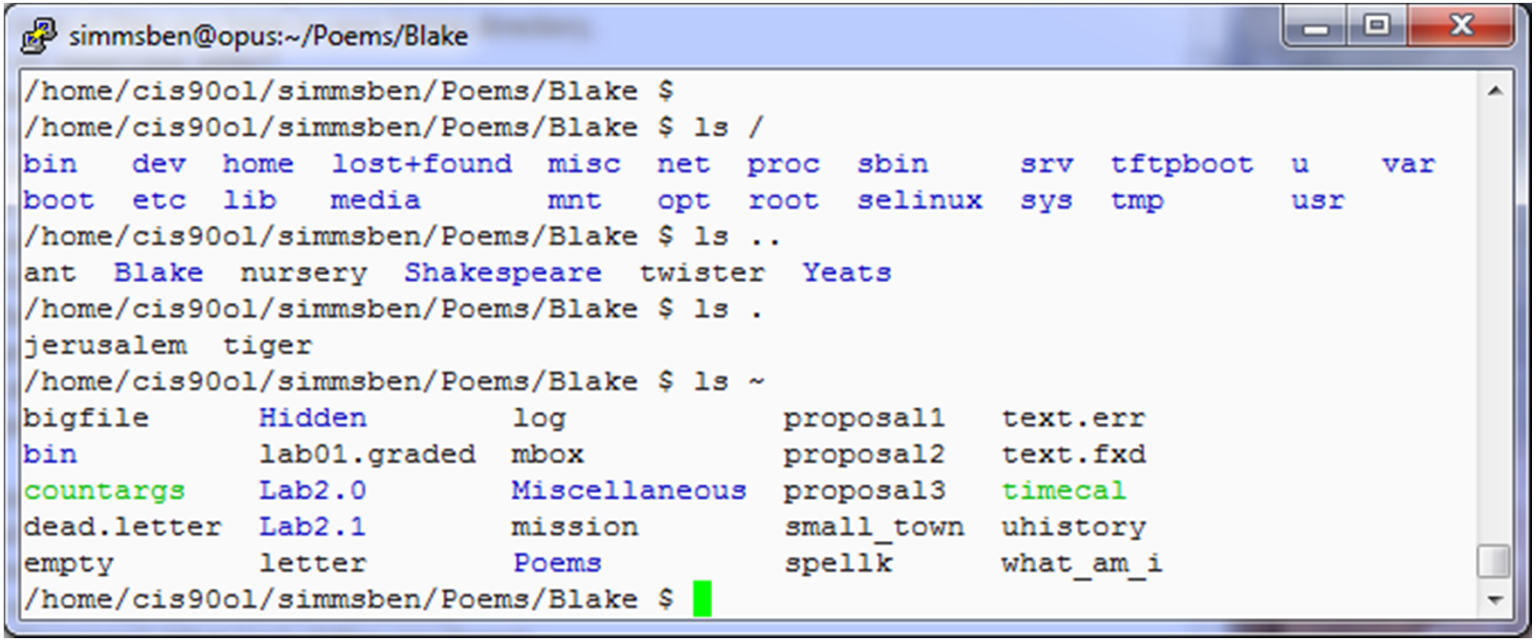
More on Directories

/ is always used for the root directory of the tree

.. is shorthand for the current parent directory

. is shorthand for the absolute path to your current directory -- "here"

~ is shorthand for the absolute path to your home directory



. and .. are hidden files, more on hidden files later …

UNIX File Hierarchy

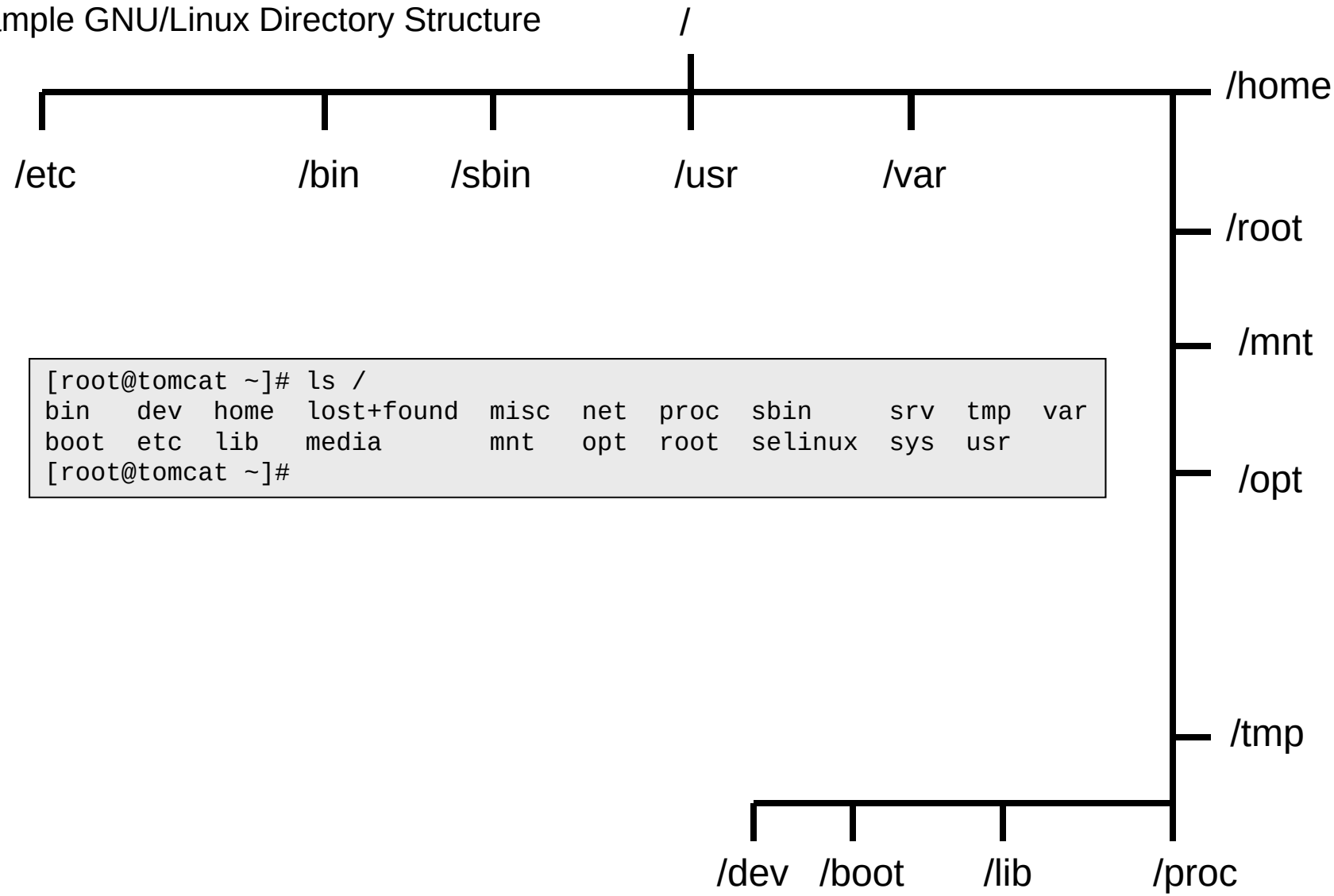
/
/bin
/boot
/dev
/etc
/home
/lib
/lost+found
/mnt
/opt
/proc
/root
/sbin
/tmp
/usr

The UNIX/Linux File System Hierarchy

There are standard top level directories in every version of UNIX/Linux

Directory	Contents
/bin	binary files forming the commands and shells used by the system administrator and users
/boot	files used during the initial boot-up process including the kernel
/dev	device files for connected hardware
/etc	system configuration files
/home	individual directories owned by each user
/lib	shared libraries needed to boot the system and run the commands in the root filesystem (i.e. commands in /bin and /sbin)
/lost+found	recovered files that were corrupted by power failures or system crashes
/mnt	mount points for floppies, cds, or other file systems
/opt	add-on software packages and/or commercial applications
/proc	kernel level process information
/root	home directory for the root user
/sbin	system administration commands reserved for the superuser (root)
/tmp	temporary files that are deleted when the system is rebooted or started
/usr	program files and related files for use by all users
/var	log files, print spool files, and mail queues

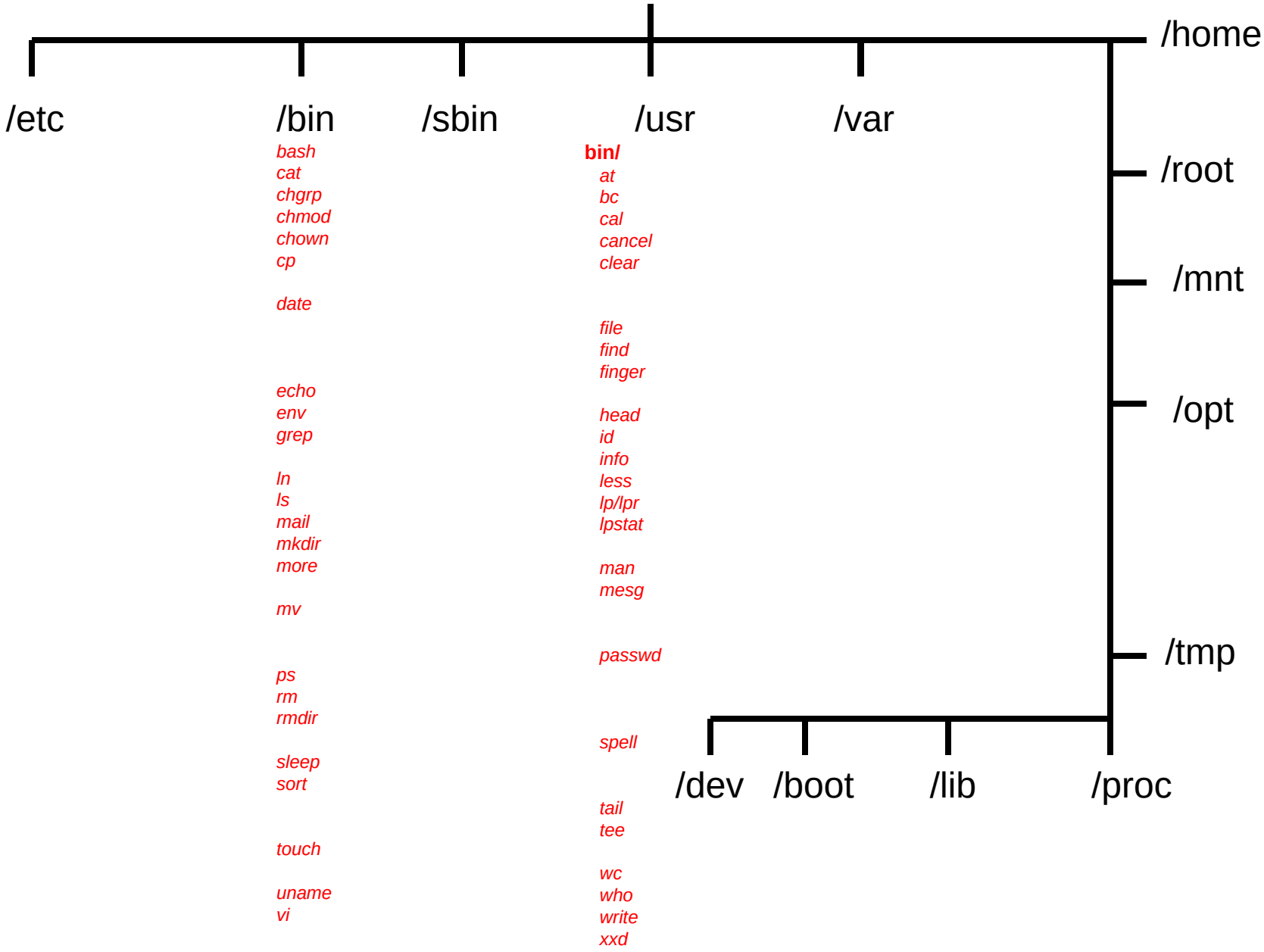
Example GNU/Linux Directory Structure




```
[root@tomcat ~]# ls /
bin   dev  home  lost+found  misc  net  proc  sbin     srv  tmp  var
boot  etc  lib   media       mnt   opt  root  selinux  sys  usr
[root@tomcat ~]#
```

Example GNU/Linux Directory Structure

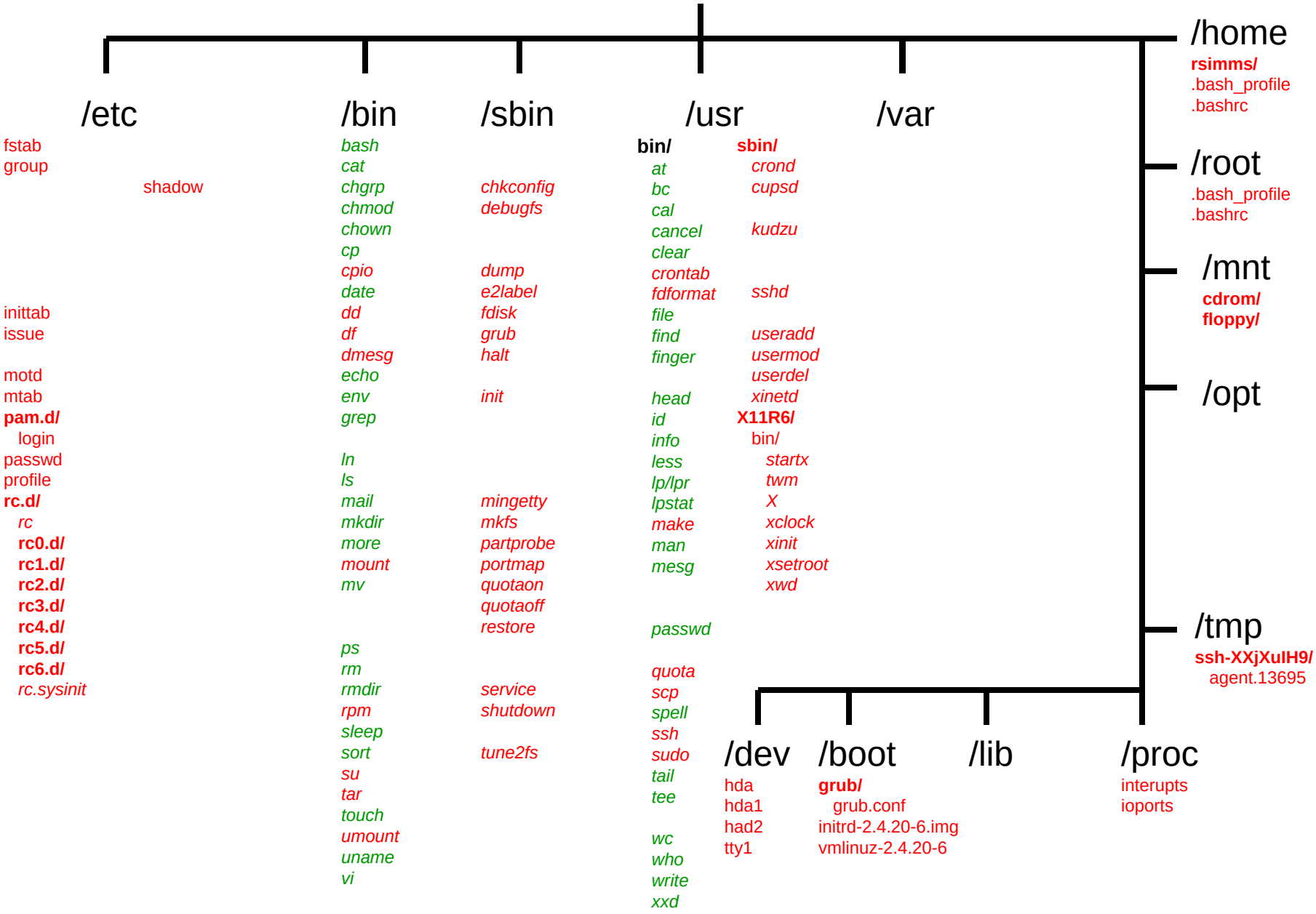
CIS 90 files, directories, commands



Note: shell builtins = cd, echo, exit, export, history, jobs, kill, pwd, set, type, umask, unset

Example GNU/Linux Directory Structure

/ CIS 191 files, directories, commands

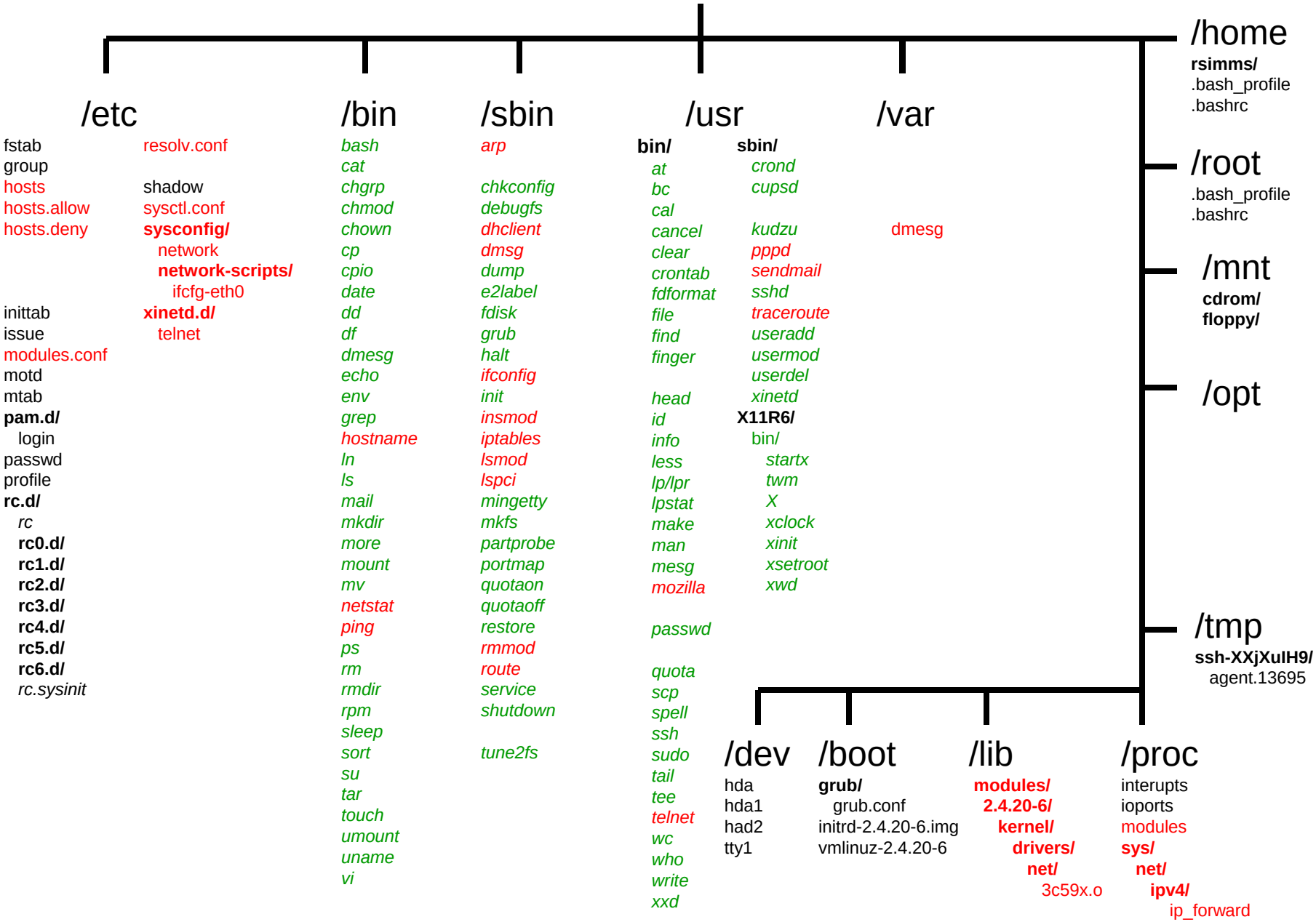


Note: shell builtins = cd, echo, exit, export, history, jobs, kill, pwd, set, type, umask, unset

Example GNU/Linux Directory Structure

/

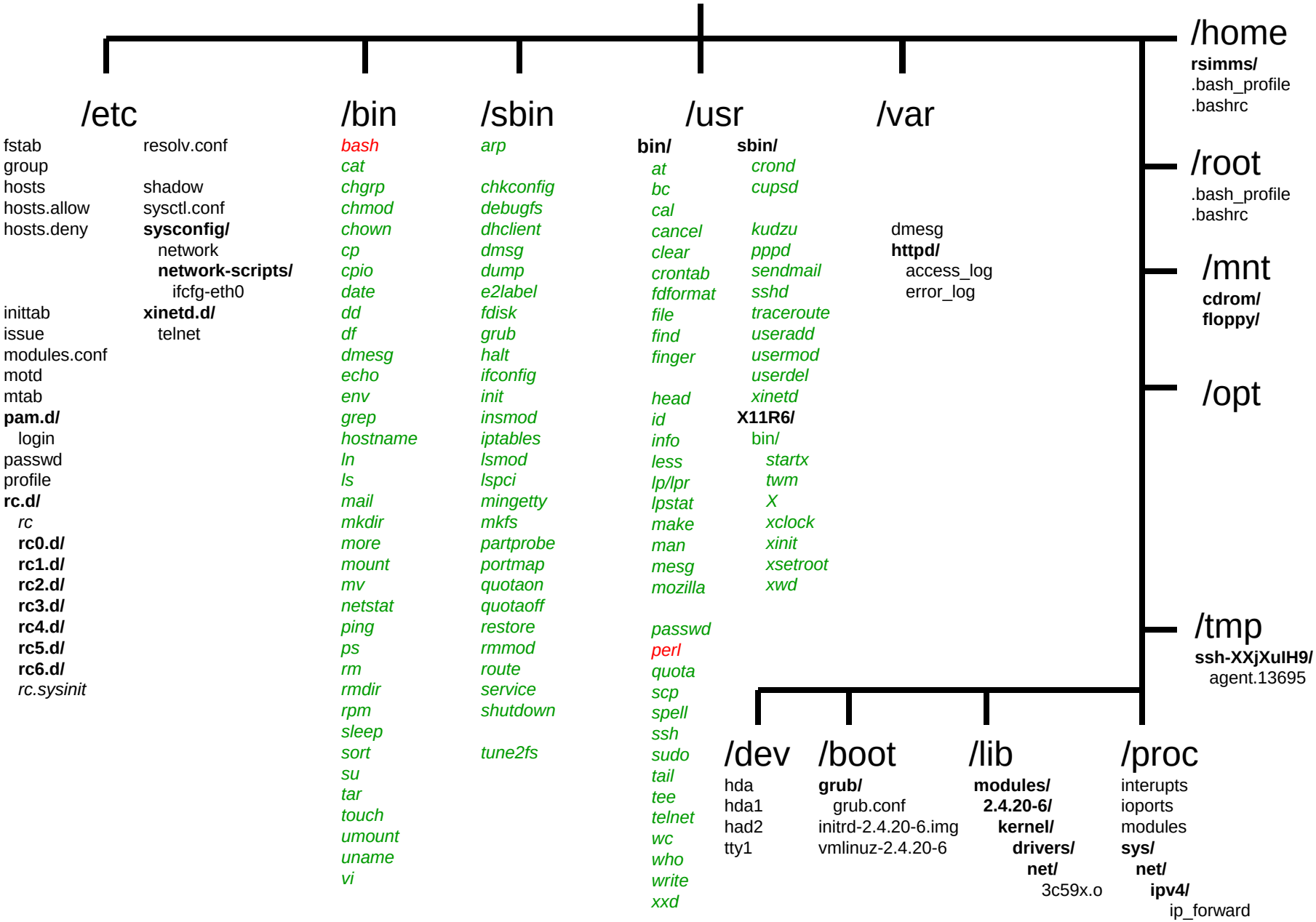
CIS 192 files, directories, commands



Note: shell builtins = cd, echo, exit, export, history, jobs, kill, pwd, set, type, umask, unset

Example GNU/Linux Directory Structure

/ CIS 130 files, directories, commands

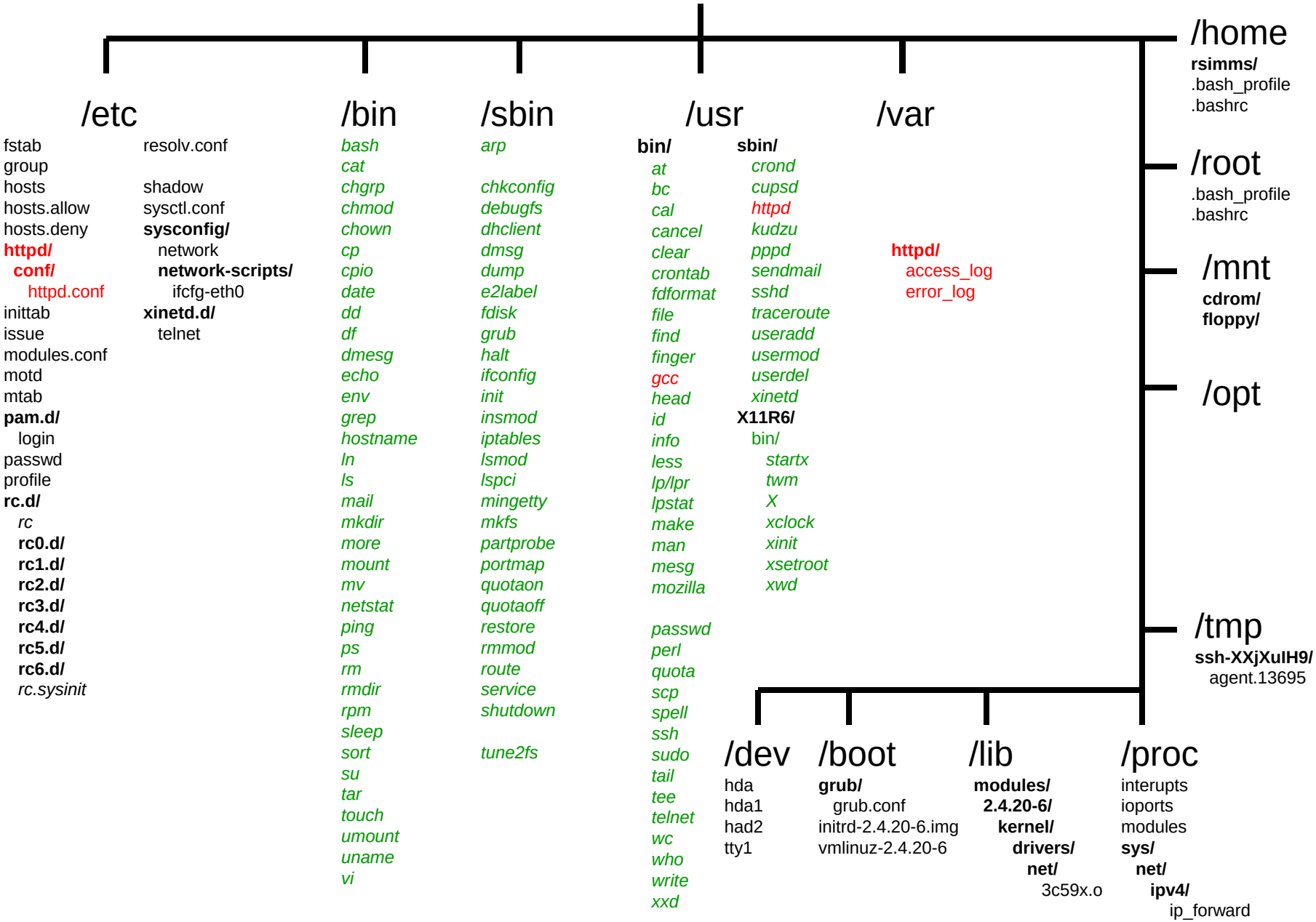


Note: shell builtins = cd, echo, exit, export, history, jobs, kill, pwd, set, type, umask, unset shell keywords = if, then, else, case, for, while

Example GNU/Linux Directory Structure

/

CIS 164 files, directories, commands

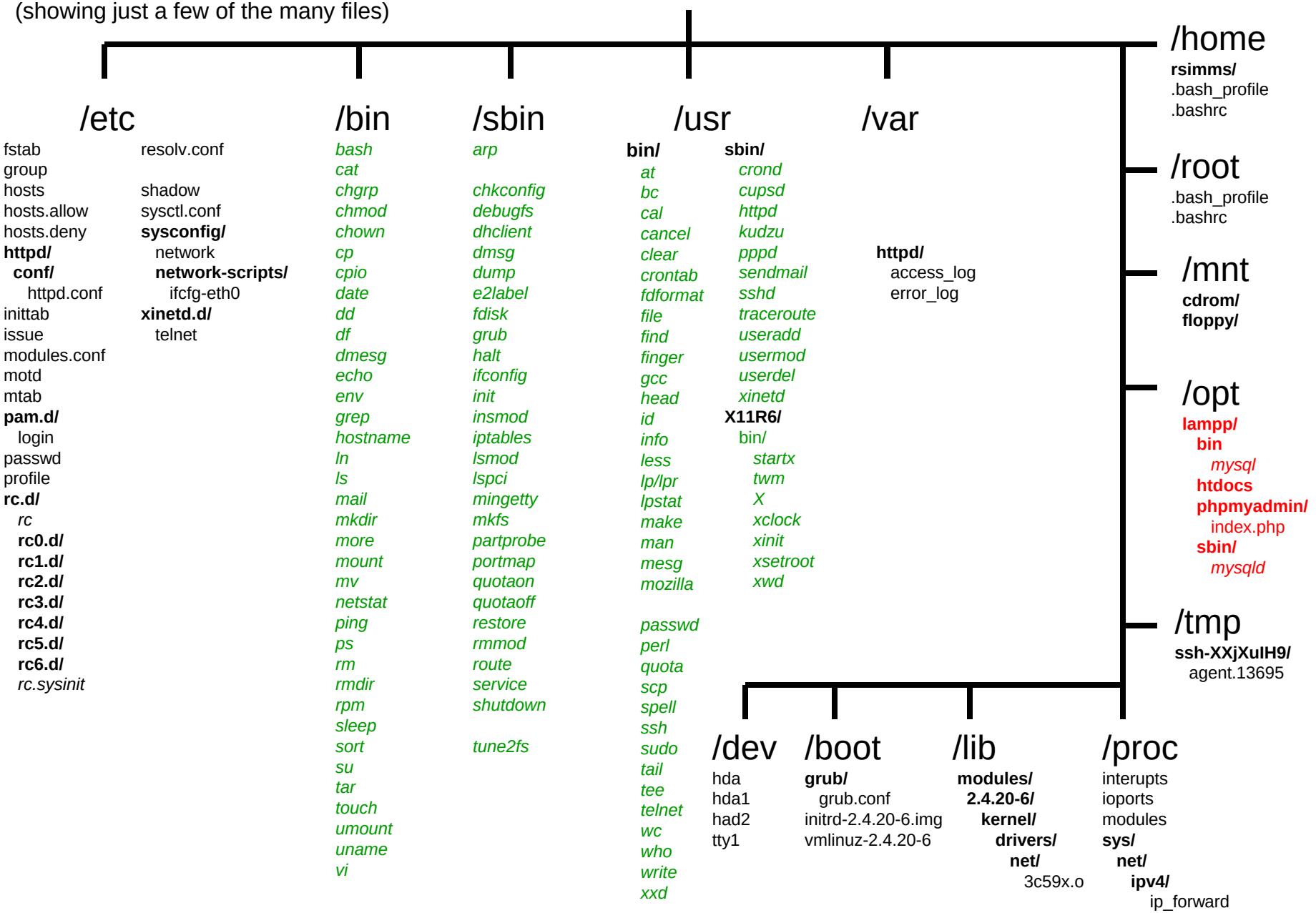


Note: shell builtins = cd, echo, exit, export, history, jobs, kill, pwd, set, type, umask, unset shell keywords = if, then, else, case, for, while

Example GNU/Linux Directory Structure

(showing just a few of the many files)

CIS 165PH files, directories, commands

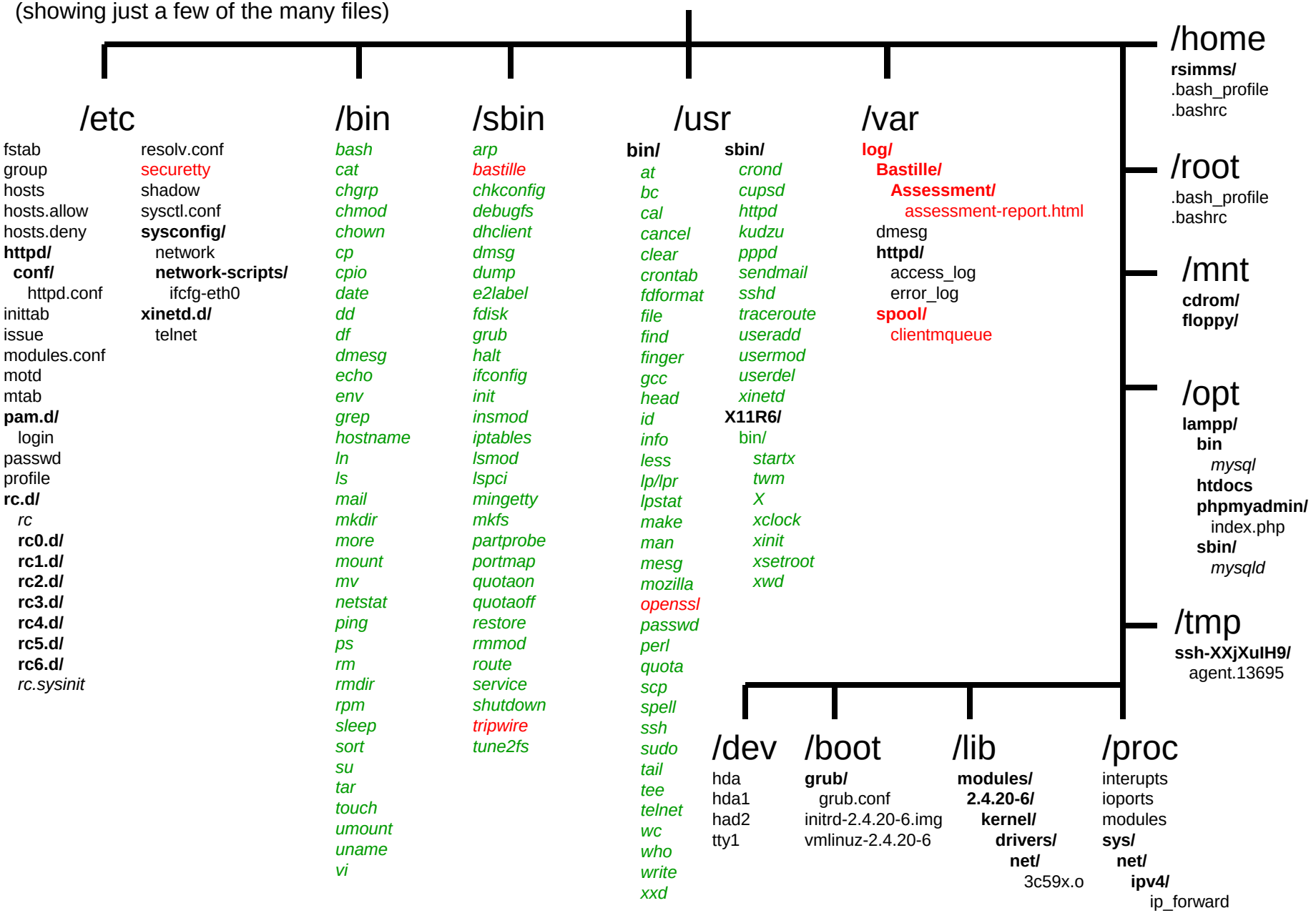


Note: shell builtins = cd, echo, exit, export, history, jobs, kill, pwd, set, type, umask, unset shell keywords = if, then, else, case, for, while

Example GNU/Linux Directory Structure

(showing just a few of the many files)

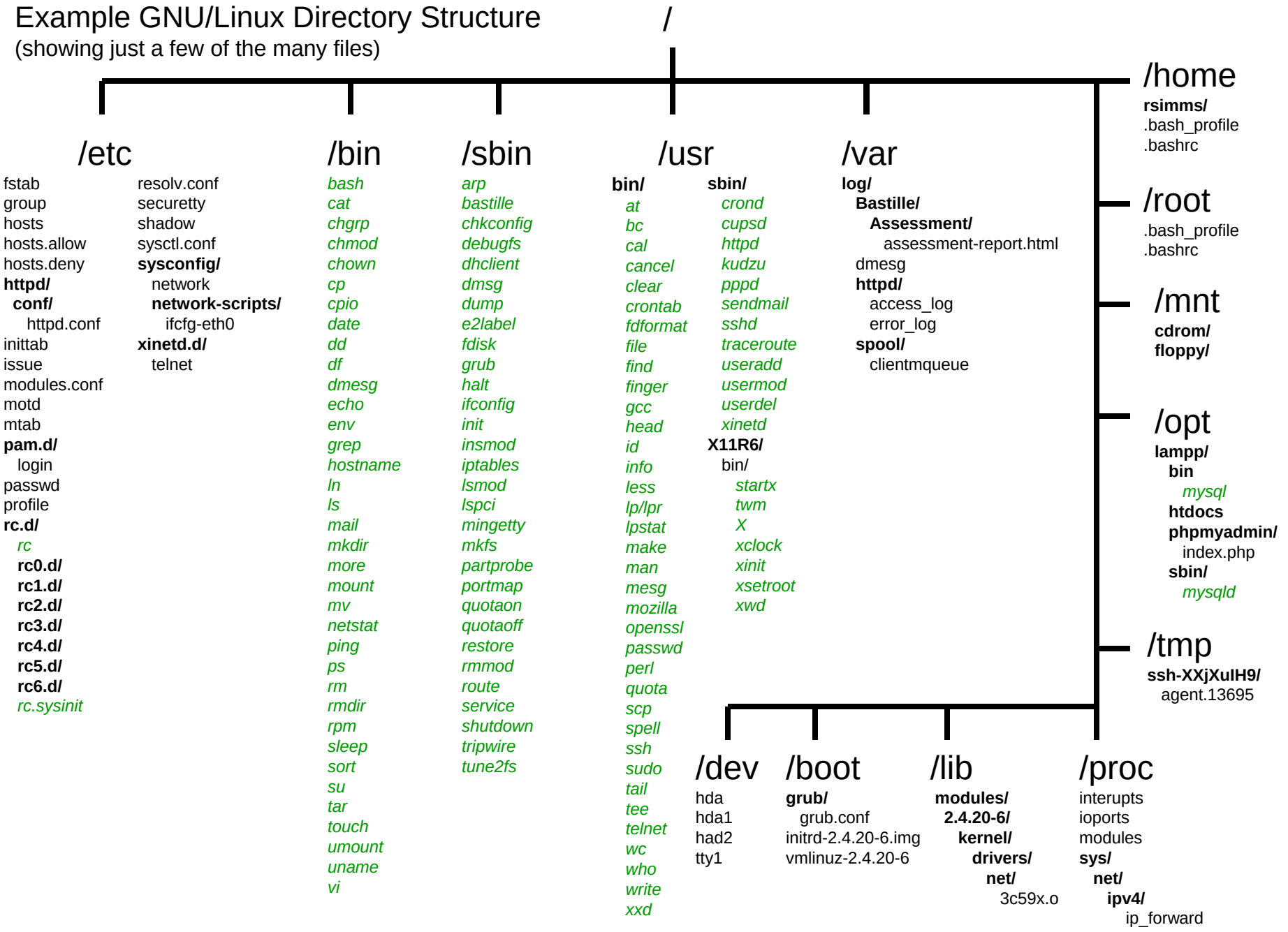
CIS 193 files, directories, commands



Note: shell builtins = cd, echo, exit, export, history, jobs, kill, pwd, set, type, umask, unset shell keywords = if, then, else, case, for, while

Example GNU/Linux Directory Structure

(showing just a few of the many files)



Note: shell builtins = cd, echo, exit, export, history, jobs, kill, pwd, set, type, umask, unset shell keywords = if, then, else, case, for, while

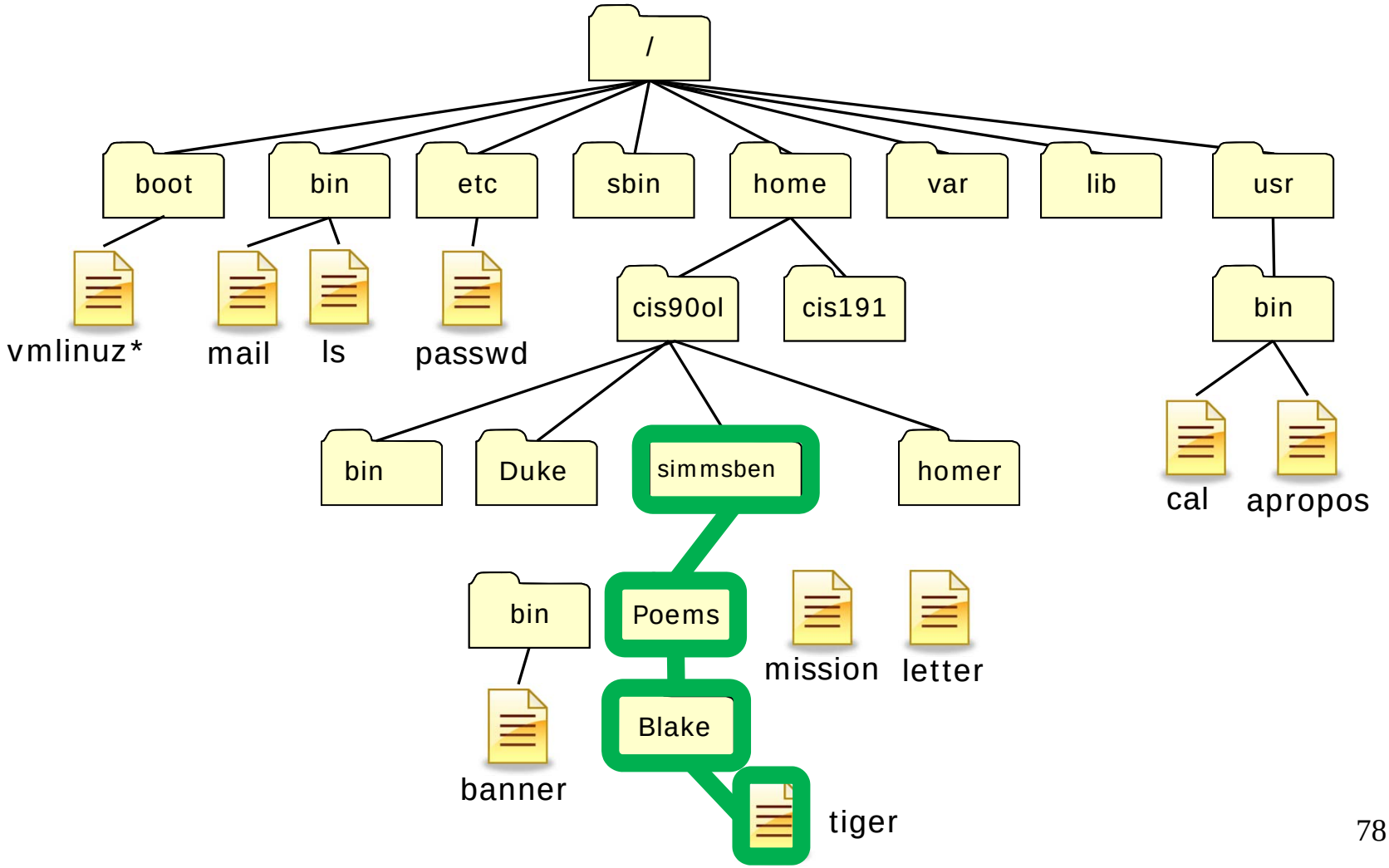
Navigating the UNIX file tree

Navigating the tree

- Use the **cd** command to change directories *(your legs)*
- Use the **ls** command to list files at your current location (your eyes)
- Use the **pwd** command to check where you are (your GPS)

*Note, as CIS 90 students your command prompt has been configured to show what you would normally get with the **pwd** command. As you move around the tree your command prompt will change to show your current location.*

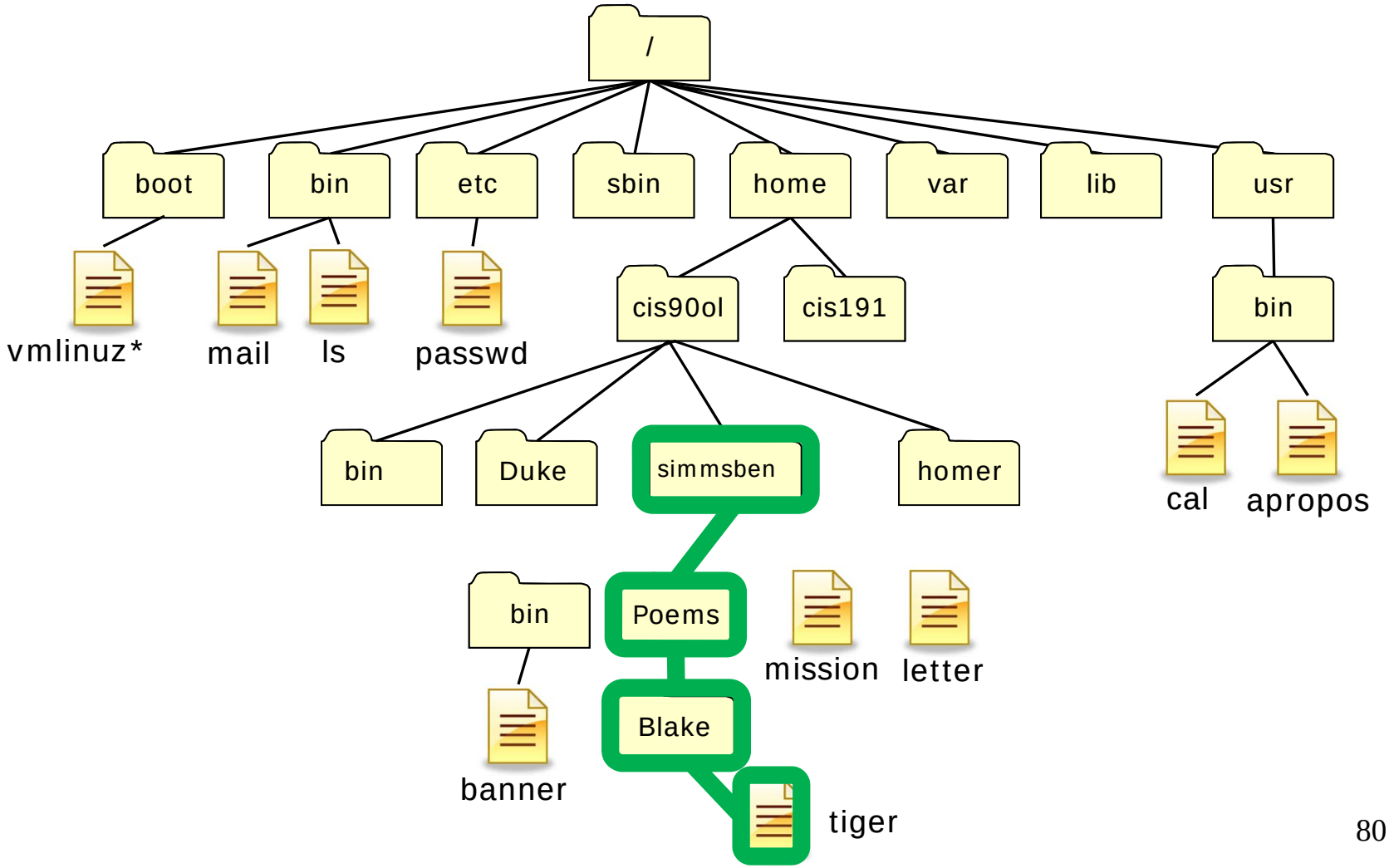
How do we walk the tree from our home directory to the directory containing the tiger file and print it?



Class Exercise

```
/home/cis90ol/simmsben $ cd        start in our home directory
/home/cis90ol/simmsben $ ls        see what's there
bigfile      Hidden         log            proposal1   text.err
bin          lab01.graded   mbox           proposal2   text.fxd
countargs    Lab2.0         Miscellaneous  proposal3   timecal
dead.letter  Lab2.1         mission        small_town  uhistory
empty        letter         Poems          spellk      what_am_i
/home/cis90ol/simmsben $ cd Poems/   go down into Poems directory
/home/cis90ol/simmsben/Poems $ ls    see what's there
ant  Blake  nursery  Shakespeare  twister  Yeats
/home/cis90ol/simmsben/Poems $ cd Blake/   go down into Blake directory
/home/cis90ol/simmsben/Poems/Blake $ ls    see what's there
jerusalem  tiger
/home/cis90ol/simmsben/Poems/Blake $ cat tiger   print tiger file
Tiger, Tiger burning bright
In the forest of the night,
What immortal hand or eye
Dare frame thy fearful symmetry?
```

Alternatively how could we print the tiger file from our home directory without navigating there first?

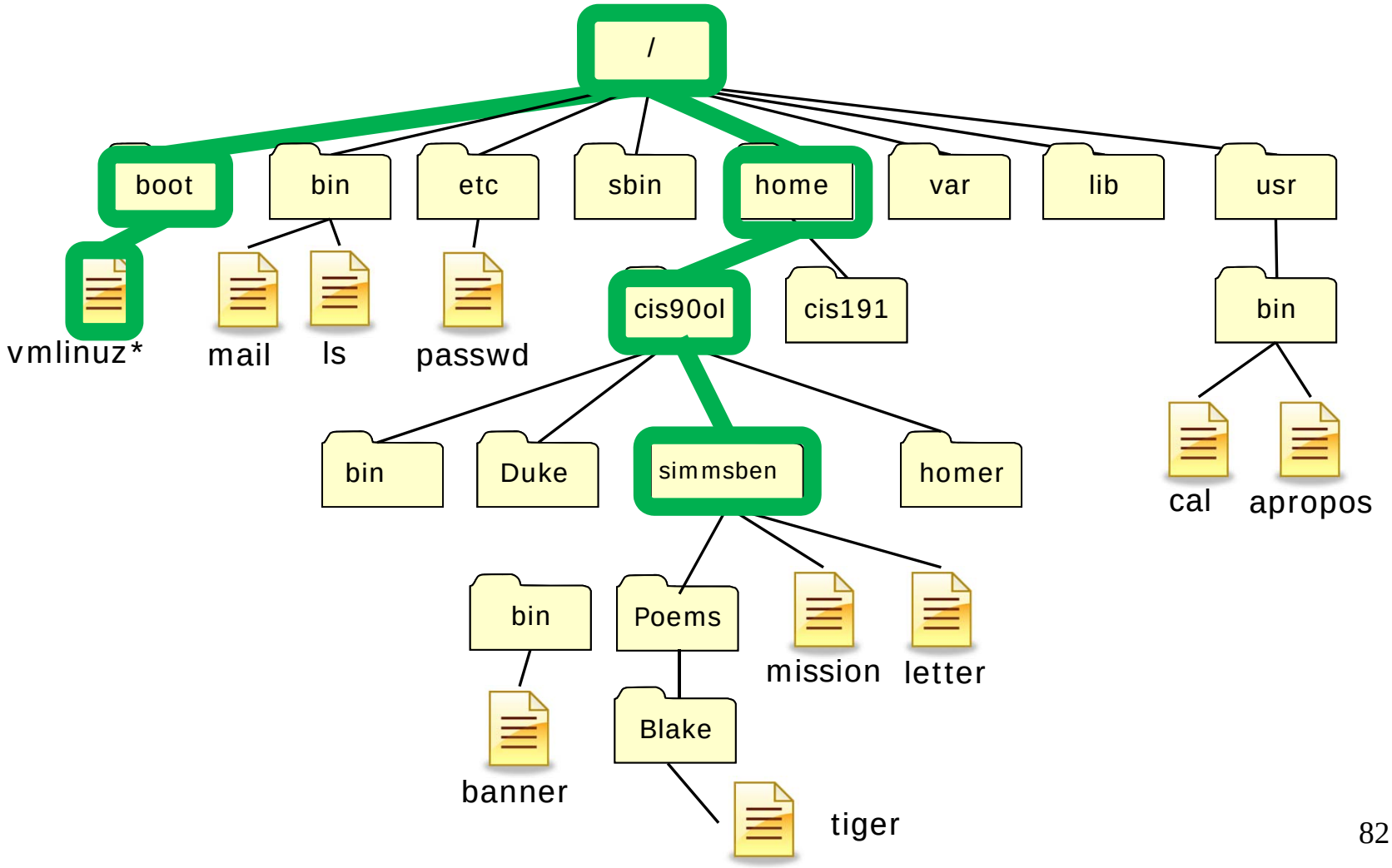


Class Exercise

```
/home/cis90ol/simmsben $ cd
/home/cis90ol/simmsben $ cat Poems/Blake/tiger
Tiger, Tiger burning bright
In the forest of the night,
What immortal hand or eye
Dare frame thy fearful symmetry?
/home/cis90ol/simmsben $
```

using a relative pathname

How do we walk the tree from our home directory to the directory containing the Linux kernel and do a long listing of it?



Class Exercise

```
/home/cis90ol/simmsben/Poems/Blake $ cd
```
start in your home directory

```
/home/cis90ol/simmsben $ cd ..
```
go up

```
/home/cis90ol $ ls
```
look around

```
answers   christan  dienequi  hillejef  lighttom  paytomar  sylvijos  willitaj
bin       cis90     elmenchr  hwangyuc  lynbeeri  roddyduk  vieyrleo  wilsodan
carvaema  clarkric  herodbob  keezeter  mcnamdan  simmsben  vistigab  wingejas
cheeken   depot     hextcra   lewisgre  montageo  stumbdav  warrejes
```
student home directories

```
/home/cis90ol $ cd ..
```
go up

```
/home $ ls
```
look around

```
backup  cis172  cis192  cis90    gerlinde  guest191  mikki   ryan
cis130  cis191  cis193  cis90ol  guest     jimg      rsimms  turnin
```
where labs are submitted

our class directory

my home directory

```
/home $ cd ..
```
go up

```
/ $ ls
```
look around

```
bin   dev  home  lost+found  misc  net  proc  sbin     srv  tftpboot  u    var
boot  etc  lib   media       mnt   opt  root  selinux  sys  tmp       usr
```

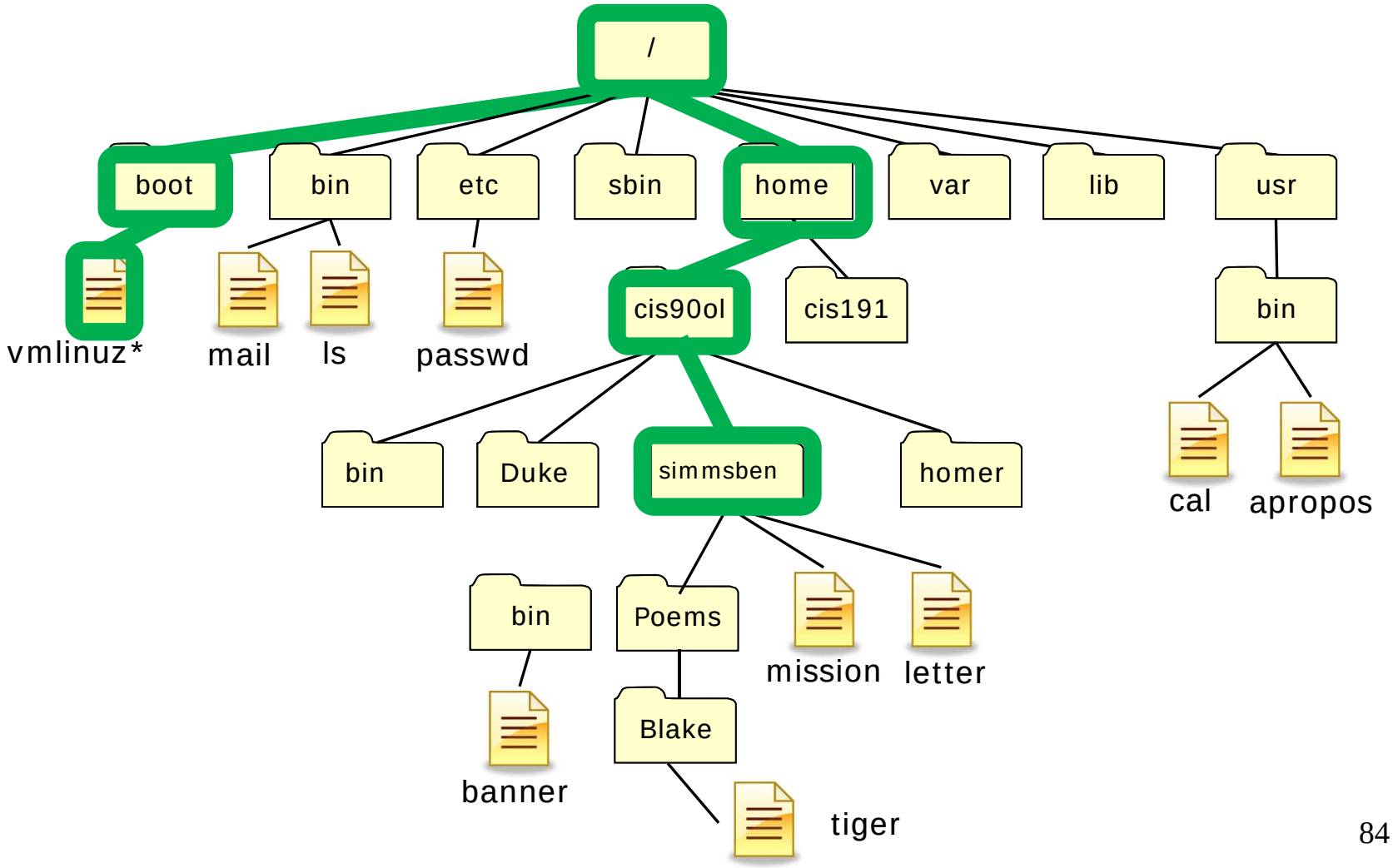
```
/ $ cd boot
```
go down into boot

```
/boot $ ls
```
look around

```
config-2.6.18-164.el5      lost+found                vmlinuz-2.6.18-164.el5
grub                       symvers-2.6.18-164.el5.gz
initrd-2.6.18-164.el5.img  System.map-2.6.18-164.el5
```
the Linux kernel

```
/boot $ ls -l vmlinuz-2.6.18-164.el5
-rw-r--r-- 1 root root 1855956 Aug 18  2009 vmlinuz-2.6.18-164.el5
```

Alternatively, how could we do the same thing without walking there first?



Class Exercise

```
/home/cis90ol/simmsben/Poems/Blake $ cd
/home/cis90ol/simmsben $ ls -l /boot/vmlinuz-2.6.18-164.el5
-rw-r--r-- 1 root root 1855956 Aug 18  2009 /boot/vmlinuz-2.6.18-164.el5
/home/cis90ol/simmsben $
```

start in your home directory

using an absolute pathname

the Linux kernel

Navigating

cd command

cd command

change directory

- Syntax: **cd [*directory*]**
- Changes the current working directory to the directory specified.
- Use **cd** with no arguments to return to your home directory.

  Note, users always start in their home directory after logging in.
  Every user's home directory is configured in the /etc/passwd file.

- The *directory* can be:
  An absolute pathname, e.g. **cd /home/cis90/duke/Poems/ant**
  A relative pathname, e.g. **cd Poems**
  A **..** for the parent of the current working directory, e.g. **cd ..**

- Note, **cd** is a Bash builtin command (part of the shell itself)
  /home/cis90/simmsben $ **type cd**
  cd is a shell builtin

More on .. and .

Any file that begins with a . is a hidden file.
There are two hidden files that are quite useful:

.. will always refer to the parent directory of the current directory

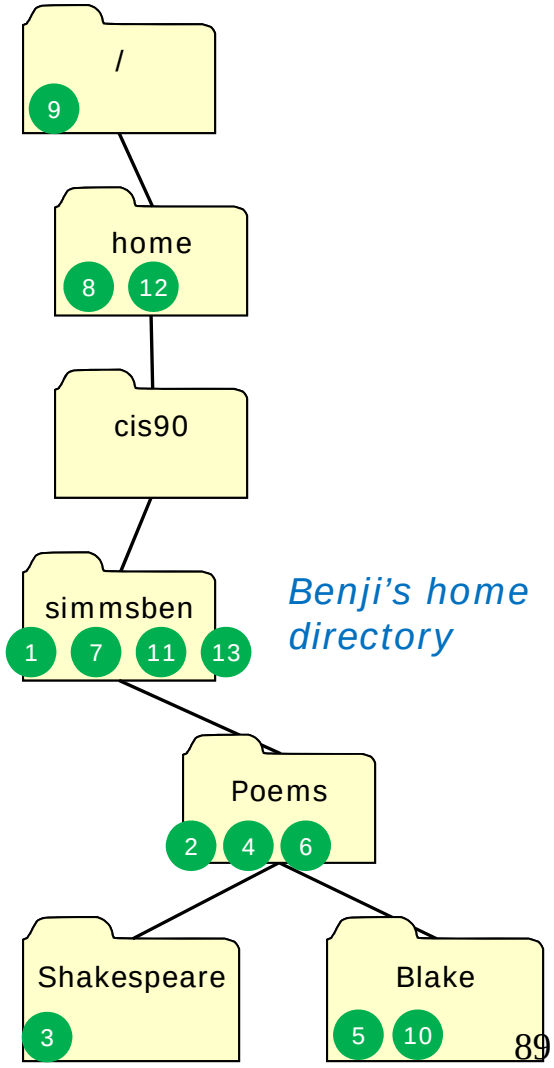
. will always refer to "here" or the current directory, it is shorthand for writing out the entire absolute path to your current directory

More on hidden files later …

cd command

change directory example

```
/home/cis90/simmsben $ echo $HOME
/home/cis90/simmsben
/home/cis90/simmsben $ echo $PS1
$PWD $
1  /home/cis90/simmsben $ cd Poems/
2  /home/cis90/simmsben/Poems $ cd Shakespeare/
3  /home/cis90/simmsben/Poems/Shakespeare $ cd ..
4  /home/cis90/simmsben/Poems $ cd Blake/
5  /home/cis90/simmsben/Poems/Blake $ cd ..
6  /home/cis90/simmsben/Poems $ cd ..
7  /home/cis90/simmsben $ cd /home
8  /home $ cd ..
9  / $ cd /home/cis90/simmsben/Poems/Blake/
10 /home/cis90/simmsben/Poems/Blake $ cd
11 /home/cis90/simmsben $ cd ../../
12 /home $ cd
13 /home/cis90/simmsben $
```



Navigating

pwd command

pwd command

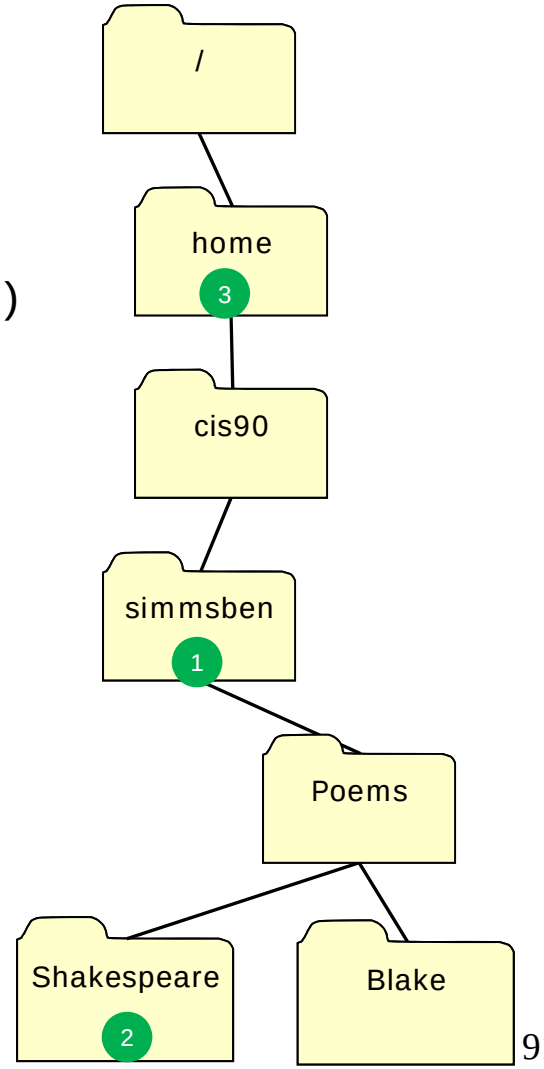
print working directory

Note: The shell prompt has been configured for CIS 90 students to always show the current working directory. This example shows the pwd command with a more typical prompt.

- Syntax: **pwd**
- Prints the current working directory.
- pwd is a BASH builtin command (part of the shell itself)

```
/home/cis90/simmsben $ type pwd
pwd is a shell builtin
```

```
/home/cis90/simmsben $ PS1='[\u@\h \W]\$'
1 [simmsben@opus ~]$ pwd
/home/cis90/simmsben
[simmsben@opus ~]$ cd Poems/Shakespeare/
2 [simmsben@opus Shakespeare]$ pwd
/home/cis90/simmsben/Poems/Shakespeare
[simmsben@opus Shakespeare]$ cd /home/
3 [simmsben@opus home]$ pwd
/home
/home/cis90/simmsben $ PS1='$PWD $ '
/home/cis90/simmsben $
```



Navigating

ls command

ls command

lists files

- Syntax: **ls [-a –i –d –l –F -S -R] [*directory*]...**

Option	Description
-a	Show all files, even the hidden ones with names starting with "."
-i	Show inode numbers
-d	Show the directory itself rather than the contents of the directory
-l	Long listing (lots of inode information)
-F	Show file types (directory/, program*, link@, socket=)
-S	Sort by size
-R	Recursive (show all sub-directories)

- The *directory* can be:
  An absolute pathname, e.g. **cd /home/cis90/duke/Poems/**
  A relative pathname, e.g. **cd /Poems**
  If no directory is specified, the current working directory is used.
  Can also be a filename e.g. **ls –l /etc/passwd** to show permissions
  More than one directory can be specified

- Use **man ls** to see more information.

ls command example

is used to list file and directory information

FYI ...

- **ls** is in /bin and has been aliased to use color on tty's (not pipes)

```
[simmsben@opus ~]$type -a ls
ls is aliased to `ls --color=tty'
ls is /bin/ls
```

- Note: the `–color=tty` added by the alias is what enables the color classifications

We will learn about aliases later in the course

ls command example

no options

Regular files in black

```
/home/cis90/simmsben $ ls
bigfile  Hidden   letter          Poems      proposal3   text.err  what_am_i
bin      Lab2.0   Miscellaneous   proposal1  small_town  text.fxd
empty    Lab2.1   mission         proposal2  spellk      timecal
```

Directories in blue

Executables (programs or scripts) in green

Typing the ls command in your home directory displays the files and directories using colors for different file types

ls command example

use the -F option to show file types with symbols

Regular files

```
/home/cis90/simmsben $ ls -F
bigfile  Hidden/  letter          Poems/     proposal3   text.err  what_am_i
bin/     Lab2.0/  Miscellaneous/  proposal1  small_town  text.fxd
empty    Lab2.1/  mission         proposal2  spellk      timecal*
```

Directories end with /

*Executables (programs or scripts) end with **

*Showing file types with colors doesn't work if you are color blind. Use **ls** with the **–F** option to show file types with symbols*

ls command example

use the -a option to show hidden files

```
/home/cis90/simmsben $ cd
```

***cd** with no arguments takes you to your home directory*

```
/home/cis90/simmsben $ ls -a
.                .bashrc     Hidden      Miscellaneous  proposal1   text.err
..               bigfile     Lab2.0      mission        proposal2   text.fxd
.bash_history    bin         Lab2.1      .mozilla       proposal3   timecal
.bash_logout     .emacs      .lesshst    .plan          small_town  what_am_i
.bash_profile    empty       letter      Poems          spellk      .zshrc
/home/cis90/simmsben $
```

Note, all hidden files begin with a .

***..** is the parent directory and is hidden*

***.** is "this directory" or "here" and is hidden*

ls command example

use the -i option to show inode numbers

```
/home/cis90/simmsben $ cd
```

***cd** with no arguments take you to your home directory*

```
/home/cis90/simmsben $ ls -i
105056 bigfile   102566 Lab2.1          102608 proposal1   102613 text.err
102542 bin       102576 letter          102609 proposal2   102614 text.fxd
102551 empty     102577 Miscellaneous   102610 proposal3   102615 timecal
102552 Hidden    102582 mission         102611 small_town  102616 what_am_i
102555 Lab2.0    102584 Poems           102612 spellk
```

***ls** with –i option shows inode numbers*

More on inode numbers later …

Class Exercise

- **cd** *(takes you home)*
- Use the ls command with different option combinations

ls	*(simple listing)*
ls –l	*(long listing)*
ls –a	*(include hidden files in list)*
ls –i	*(show inode numbers for each file)*
ls –F	*(use symbols instead of color to show types)*
ls –aiF	*(use multiple options at once)*

Practice test questions

Which program generated the error message?

ls command gave this error

```
/home/cis90ol/simmsben $ ls -3
ls: invalid option -- 3
Try `ls --help' for more information.
```

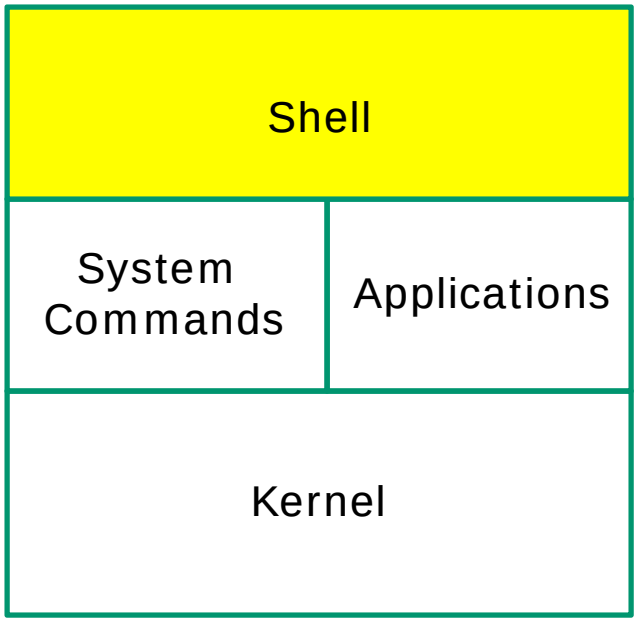
bash shell gave this error

```
/home/cis90ol/simmsben $ lx
-bash: lx: command not found
```

Navigating

* metacharacter

Life of the Shell



1) Prompt

2) Parse

3) Search

4) Execute

5) Nap

6) Repeat

*Metacharacters, like the *, are processed during the Parse step (before the selected command is even run)*

Metacharacters

* (filename expansion character)

Matches:

- all non-hidden files in the current directory when used alone
- zero or more characters when used as **prefix**, infix or postfix

```
/home/cis90/simmsben $ ls
bigfile  Lab2.0          mission    proposal3   text.fxd
bin      Lab2.1          Poems      small_town  timecal
empty    letter          proposal1  spellk      what_am_i
Hidden   Miscellaneous   proposal2  text.err

/home/cis90/simmsben $ ls *.err
text.err
```

***.err** matches all file names ending with ".err"*

*Shell operation question: Does the **ls** command see the "*" typed by the user?*

Metacharacters

* (filename expansion character)

Matches:

- all non-hidden files in the current directory when used alone
- zero or more characters when used as prefix, **infix** or postfix

```
/home/cis90/simmsben $ ls
bigfile  Lab2.0          mission    proposal3   text.fxd
bin      Lab2.1          Poems      small_town  timecal
empty    letter          proposal1  spellk      what_am_i
Hidden   Miscellaneous   proposal2  text.err

/home/cis90/simmsben $ ls *am*
what_am_i
```

am matches all file names containing "am"*

Answer to the question on pervious slide: NO! The shell replaced the ".err" with the string "text.err" and that's what the **ls** command received as an argument.*

Metacharacters

* (filename expansion character)

Matches:

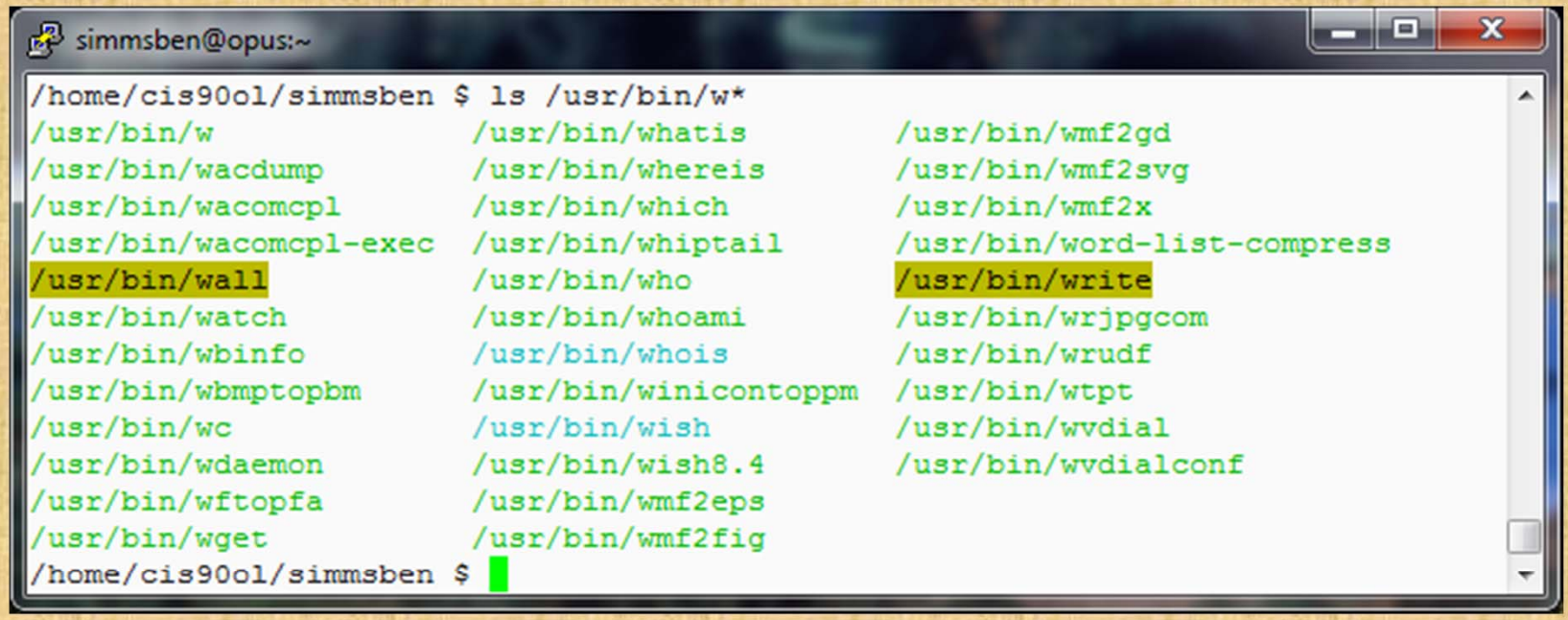
- all non-hidden files in the current directory when used alone
- zero or more characters when used as prefix, infix or **postfix**

```
/home/cis90/simmsben $ ls
bigfile  Lab2.0         mission    proposal3   text.fxd
bin      Lab2.1         Poems      small_town  timecal
empty    letter         proposal1  spellk      what_am_i
Hidden   Miscellaneous  proposal2  text.err

/home/cis90/simmsben $ ls p*
proposal1  proposal2  proposal3
```

p* *matches all file names starting with a "p"*

Activity

What commands in the /usr/bin directory starts with the letter w?



Navigating

More on ls command

ls command

Using files and directories as arguments

With no arguments specified, ls will show current directory contents

```
/home/cis90/simmsben $ ls
bigfile  Lab2.0          mission    proposal3   text.fxd
bin      Lab2.1          Poems      small_town  timecal
empty    letter          proposal1  spellk      what_am_i
Hidden   Miscellaneous   proposal2  text.err
```

With a filename specified as an argument, the file will be displayed (if it exists)

```
/home/cis90/simmsben $ ls bigfile
bigfile
```

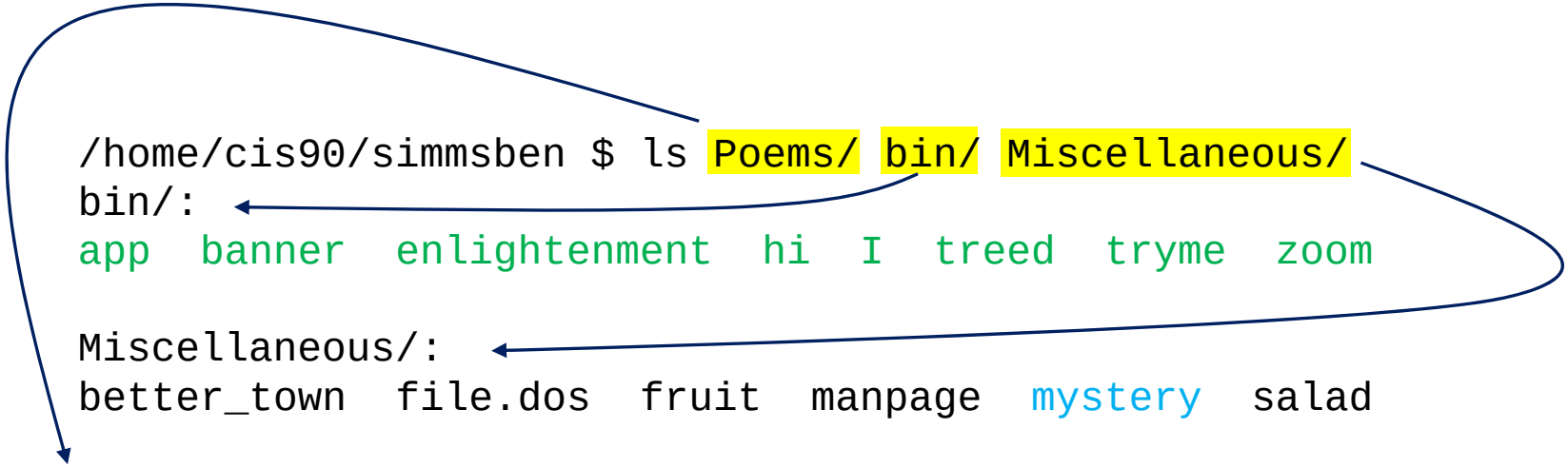
```
/home/cis90/simmsben $ ls Poems/
ant  Blake  nursery  Shakespeare  twister  Yeats
```

With a directory specified as an argument, the contents of the directory will be displayed (if it exists)

ls command

specifying multiple directories

The ls command can take more than one argument



*Note the mystery file is **light blue** ... it is a symbolic link to another file*

ls command example

*The * is expanded by the shell and replaced with the names of all files and directories in the current directory*

```
/home/cis90/simmsben $ ls *
bigfile  letter   proposal1  proposal3   spellk    text.fxd  what_am_i
empty    mission  proposal2  small_town  text.err  timecal

bin:
app  banner  enlightenment  hi  I  treed  tryme  zoom
ls: Hidden: Permission denied

Lab2.0:
386    A_long_name    file.9        README     this_years_annual_report
afile  annual report  junk.old.bak  sTrAnGeNeSs

Lab2.1:
1.1  filename  junk  letter  more  old  Proposal3  Proposal.old  xyz

Miscellaneous:
better_town  file.dos  fruit  manpage  mystery  salad

Poems:
ant  Blake  nursery  Shakespeare  twister  Yeats
```

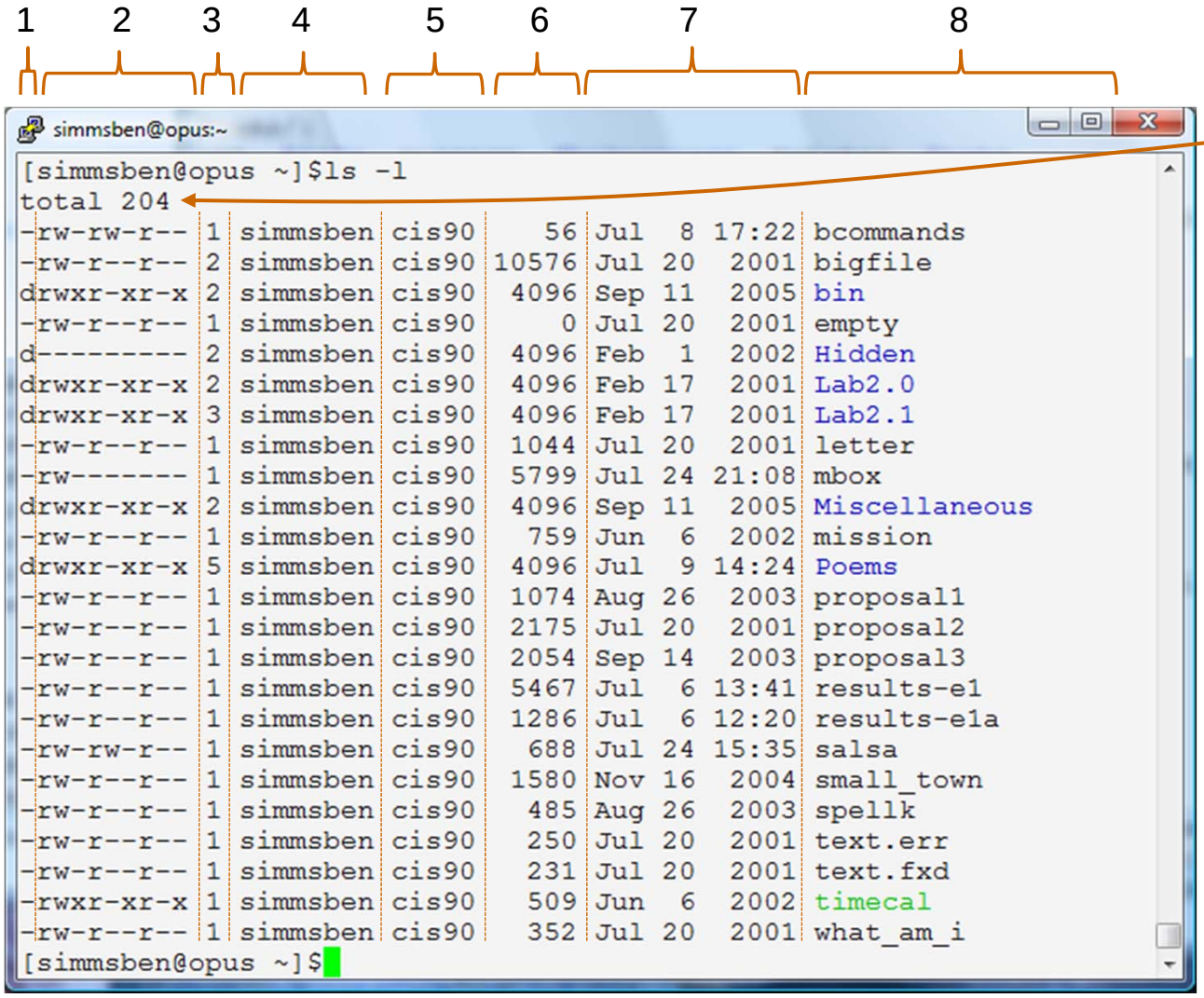
Files listed first

*Followed by each directory **expanded** to show that directory's files*

Do you see the error message? Which directory in the home directory could not be listed?

ls command

Use the –l option for a "long listing"



total size of all files in blocks

1. file type
   - = regular
   d = directory
   l = link
2. permissions
3. Number of hard links
4. owner
5. group
6. size (in bytes)
7. last modified
8. file name

ls command example

simmsben@opus:~

```
[simmsben@opus ~]$ls -lS
total 204
-rw-r--r-- 2 simmsben cis90 10576 Jul 20  2001 bigfile
-rw------- 1 simmsben cis90  5799 Jul 24 21:08 mbox
-rw-r--r-- 1 simmsben cis90  5467 Jul  6 13:41 results-e1
drwxr-xr-x 2 simmsben cis90  4096 Sep 11  2005 bin
d--------- 2 simmsben cis90  4096 Feb  1  2002 Hidden
drwxr-xr-x 2 simmsben cis90  4096 Feb 17  2001 Lab2.0
drwxr-xr-x 3 simmsben cis90  4096 Feb 17  2001 Lab2.1
drwxr-xr-x 2 simmsben cis90  4096 Sep 11  2005 Miscellaneous
drwxr-xr-x 5 simmsben cis90  4096 Jul  9 14:24 Poems
-rw-r--r-- 1 simmsben cis90  2175 Jul 20  2001 proposal2
-rw-r--r-- 1 simmsben cis90  2054 Sep 14  2003 proposal3
-rw-r--r-- 1 simmsben cis90  1580 Nov 16  2004 small_town
-rw-r--r-- 1 simmsben cis90  1286 Jul  6 12:20 results-e1a
-rw-r--r-- 1 simmsben cis90  1074 Aug 26  2003 proposal1
-rw-r--r-- 1 simmsben cis90  1044 Jul 20  2001 letter
-rw-r--r-- 1 simmsben cis90   759 Jun  6  2002 mission
-rw-rw-r-- 1 simmsben cis90   688 Jul 24 15:35 salsa
-rwxr-xr-x 1 simmsben cis90   509 Jun  6  2002 timecal
-rw-r--r-- 1 simmsben cis90   485 Aug 26  2003 spellk
-rw-r--r-- 1 simmsben cis90   352 Jul 20  2001 what_am_i
-rw-r--r-- 1 simmsben cis90   250 Jul 20  2001 text.err
-rw-r--r-- 1 simmsben cis90   231 Jul 20  2001 text.fxd
-rw-rw-r-- 1 simmsben cis90    56 Jul  8 17:22 bcommands
-rw-r--r-- 1 simmsben cis90     0 Jul 20  2001 empty
[simmsben@opus ~]$
```

Long listing (-l) sorted by file size (-S) of home directory

ls command

the directory or the contents of a directory

```
/home/cis90ol/simmsben $ ls bin
app  banner  enlightenment  hi  I  treed  tryme  zoom
```

The contents of the directory are shown

```
/home/cis90ol/simmsben $ ls -d bin
bin
```

The directory itself is shown with the -d option

*Use the **d** option to list the directory itself. Without the **d** the directory contents are listed instead.*

ls command

the directory or the contents of a directory

The contents of the directory are shown

```
/home/cis90/simmsben $ ls -l bin
total 68
-rwxr-xr-x 1 simmsben cis90  220 Apr 22  2004 app
-rwxr-xr-x 1 simmsben cis90 6160 Aug 28  2003 banner
-rwxr-xr-x 1 simmsben cis90 3388 Sep 11  2005 enlightenment
-rwxr-xr-x 1 simmsben cis90  107 Jul 20  2001 hi
-rwxr-x--x 1 simmsben cis90  375 Oct 20  2003 I
-rwxr-xr-x 1 simmsben cis90  190 Jul 20  2001 treed
-rwxr-xr-x 1 simmsben cis90  174 Mar  4  2004 tryme
-rwxr-xr-x 1 simmsben cis90   74 Jul 20  2001 zoom
```

The directory itself is shown with the -d option

```
/home/cis90/simmsben $ ls -ld bin
drwxr-xr-x 2 simmsben cis90 4096 Sep 11  2005 bin
/home/cis90/simmsben $
```

*Use the **d** option to get long listing information about the directory itself. Without the **d** the directory contents are listed instead.*

What are some different ways to get the inode number of your home directory?

ls command

different ways to determine the inode number of your home directory

using an absolute pathname

```
/home/cis90ol/simmsben $ ls -id /home/cis90ol/simmsben
2329740 /home/cis90ol/simmsben
```

using contents of the parent directory

```
/home/cis90ol/simmsben $ ls -i /home/cis90ol
2523721 answers   2329975 dienequi  2330007 lighttom  2329935 sylvijos
2395395 bin       2329756 elmenchr  2329839 lynbeeri  2329951 vieyrleo
2329831 carvaema  2329748 herodbob  2329780 mcnamdan  2329847 vistigab
2329943 cheeken   2329764 hextcra   2329855 montageo  2329927 warrejes
2329991 christan  2329919 hillejef  2329967 paytomar  2329983 willitaj
1902656 cis90     2330015 hwangyuc  2329823 roddyduk  2329772 wilsodan
2329657 clarkric  2329999 keezeter  2329740 simmsben  2329911 wingejas
2524651 depot     2329871 lewisgre  2329811 stumbdav
```

. in this context is an absolute pathname to here.

```
/home/cis90ol/simmsben $ ls -id .
2329740 .
```

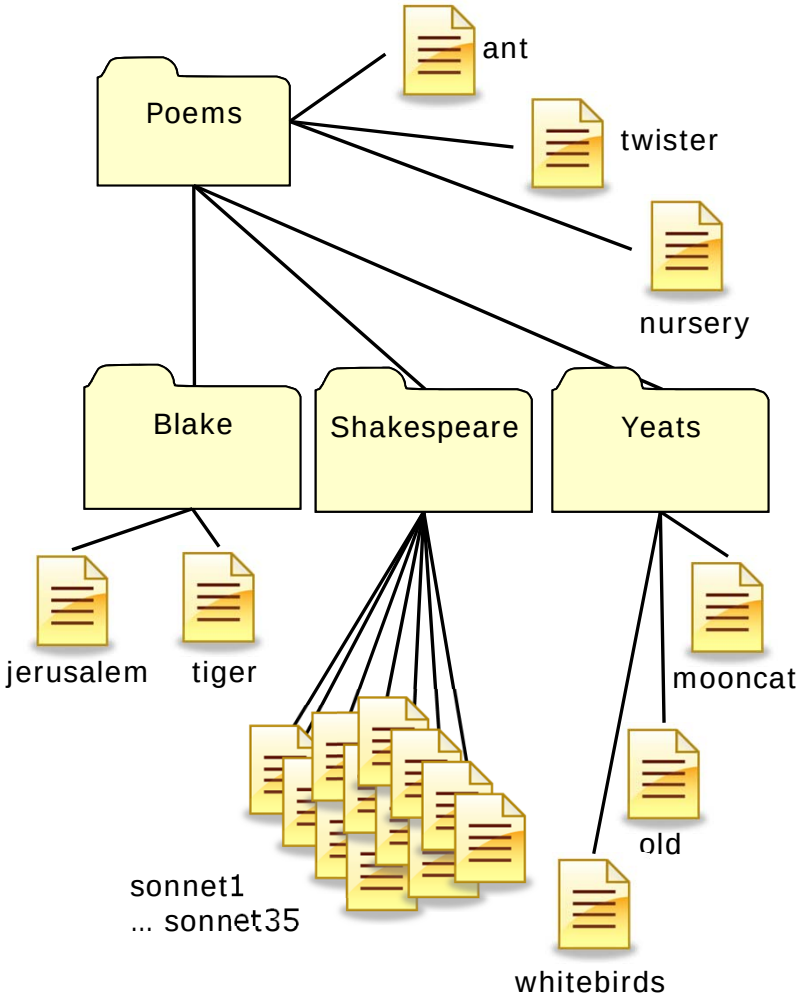
```
/home/cis90ol/simmsben $ ls -idl .
2329740 drwxr-xr-x 9 simmsben cis90ol 4096 Feb 28 09:25 .
```

ls command

long listing (-l), recursively list subdirectories (-R)

simmsben@opus:~/Poems

```
[simmsben@opus Poems]$ls -lR
.:
total 48
-rw-r--r-- 1 simmsben cis90  237 Aug 26  2003 ant
drwxr-xr-x 2 simmsben cis90 4096 Jul 20  2001 Blake
-rw-r--r-- 1 simmsben cis90  779 Oct 12  2003 nursery
drwxr-xr-x 2 simmsben cis90 4096 Oct 31  2004 Shakespeare
-rw-r--r-- 1 simmsben cis90  151 Jul 20  2001 twister
drwxr-xr-x 2 simmsben cis90 4096 Jul 20  2001 Yeats

./Blake:
total 16
-rw-r--r-- 1 simmsben cis90 582 Jul 20  2001 jerusalem
-rw-r--r-- 1 simmsben cis90 115 Jul 20  2001 tiger

./Shakespeare:
total 104
-rw-r--r-- 1 simmsben cis90 614 Jul 20  2001 sonnet1
-rw-r--r-- 1 simmsben cis90 620 Jul 20  2001 sonnet10
-rw-r--r-- 1 simmsben cis90 689 Oct 31  2004 sonnet11
-rw-r--r-- 1 simmsben cis90 618 Jul 20  2001 sonnet15
-rw-r--r-- 1 simmsben cis90 647 Jul 20  2001 sonnet17
-rw-r--r-- 1 simmsben cis90 631 Jul 20  2001 sonnet2
-rw-r--r-- 1 simmsben cis90 601 Jul 20  2001 sonnet26
-rw-r--r-- 1 simmsben cis90 615 Jul 20  2001 sonnet3
-rw-r--r-- 1 simmsben cis90 598 Jul 20  2001 sonnet35
-rw-r--r-- 1 simmsben cis90 588 Jul 20  2001 sonnet4
-rw-r--r-- 1 simmsben cis90 622 Jul 20  2001 sonnet5
-rw-r--r-- 1 simmsben cis90 581 Jul 20  2001 sonnet7
-rw-r--r-- 1 simmsben cis90 620 Jul 20  2001 sonnet9

./Yeats:
total 24
-rw-r--r-- 1 simmsben cis90 855 Jul 20  2001 mooncat
-rw-r--r-- 1 simmsben cis90 520 Jul 20  2001 old
-rw-r--r-- 1 simmsben cis90 863 Jul 20  2001 whitebirds
[simmsben@opus Poems]$
```



Class Exercise

- Go to your home directory, type: **cd**

- Use the **ls** command with different arguments:

- ls –lS *(sort by size)*
- ls –lSr *(sort by size in reverse order)*
- ls –id / *(get the idone number of the root directory)*
- ls .. *(list contents of parent directory)*
- ls –id .. *(get inode number of parent directory)*
- ls –id /home/cis90ol/ *(get inode number of parent directory)*
- ls bin Poems *(short listings of bin and Poems directories)*
- ls –R *(recursive simple listing of home directory)*
- ls –lR *(recursive long listing of home directory)*

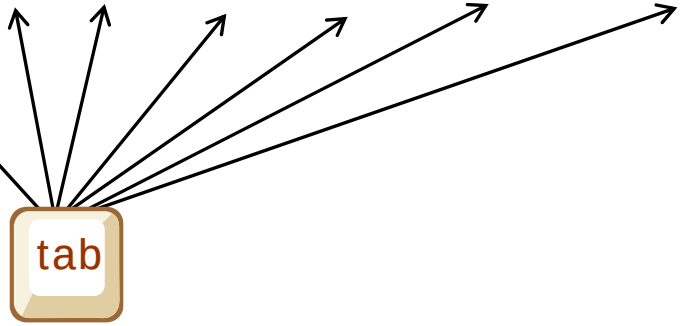
Shell tips

bash shell tip

tab completes

- It can be tedious typing in long pathnames.
- Since bash knows the names of the files you only have to type just enough characters to uniquely specify a name and then the tab key can be pressed to complete them.
- Example: the black characters were typed by the user, the green ones were typed by bash:

```
ls /home/cis90/simmsben/Poems/Shakespeare/
```

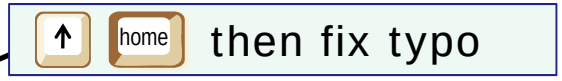


bash shell tip

command history and editing

- It can be tedious re-typing a long command to fix a typo.
- Since bash knows the commands you have previously entered, just use the up and down arrows to re-type a previous command.
- When the command you want appears, use the home, right or left arrow keys to go where you want to make the correction. New text can be inserted and old text deleted or backspaced over.
- Example: The ls command was mis-typed as la:

```
/home/cis90/simmsben $ la /home/cis90/simmsben/Poems/Shakespeare/
-bash: la: command not found
/home/cis90/simmsben $ ls /home/cis90/simmsben/Poems/Shakespeare/
sonnet1   sonnet11  sonnet17  sonnet26  sonnet35  sonnet5  sonnet9
sonnet10  sonnet15  sonnet2   sonnet3   sonnet4   sonnet7
/home/cis90/simmsben $
```



UNIX Files

File Systems
Linux

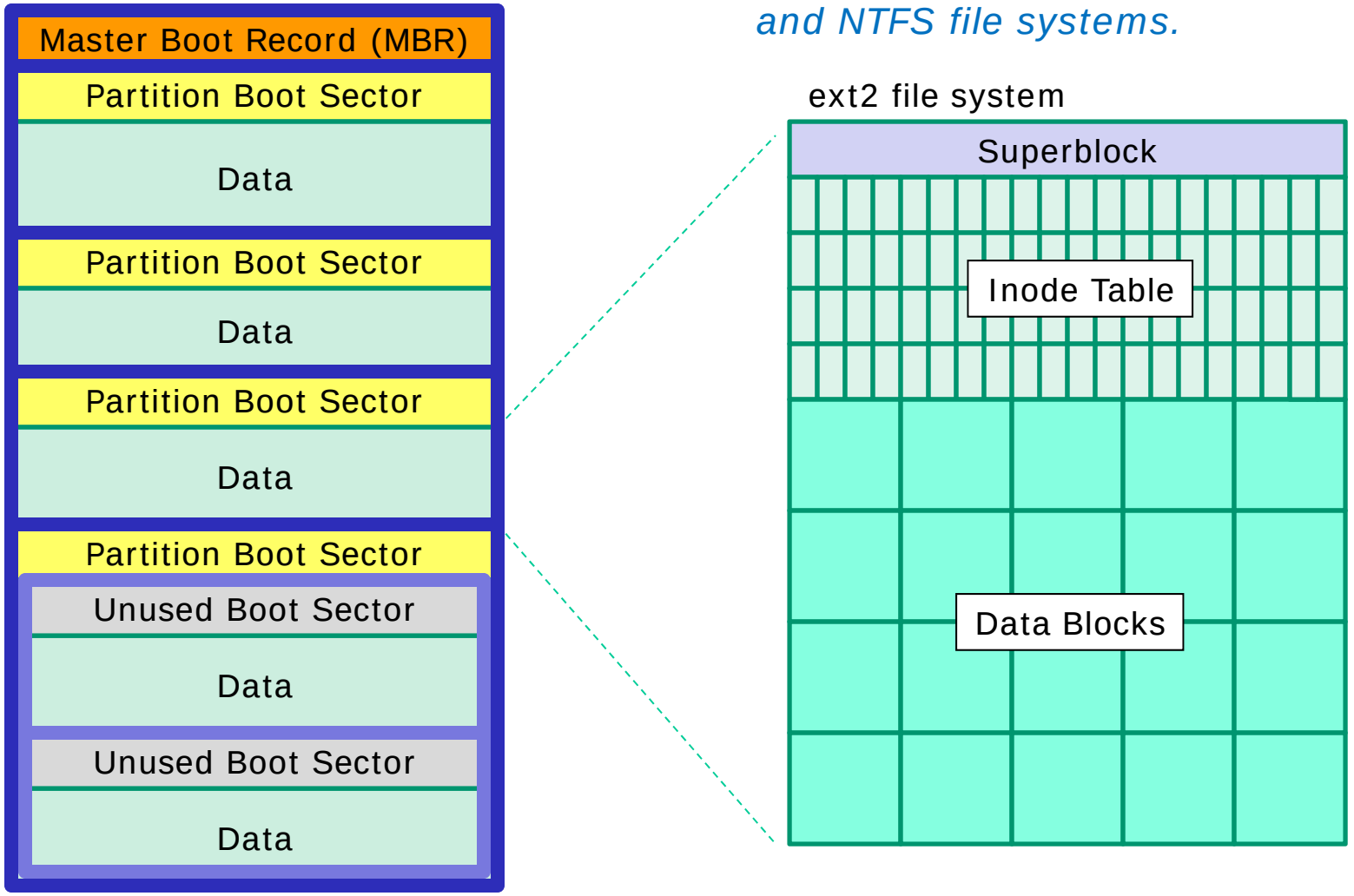
A typical hard drive

This is where your files actually reside

File Systems

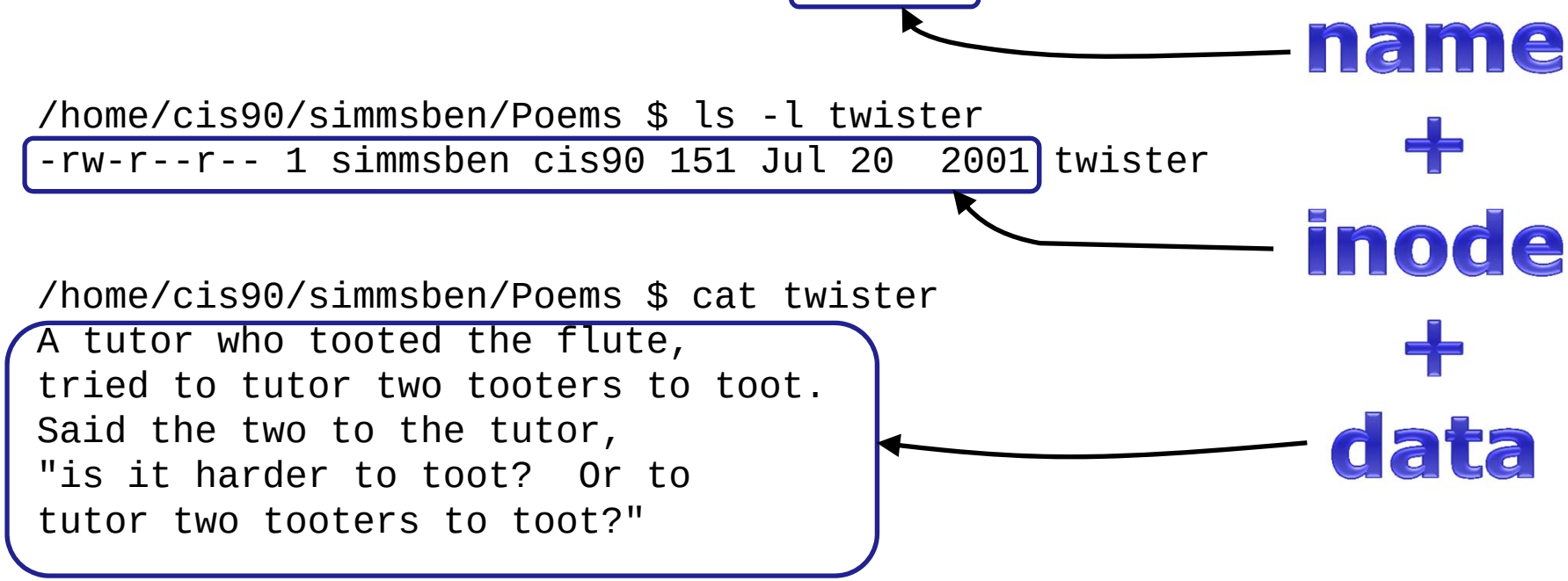
Linux

The hard drive is partitioned and the data areas can be formatted as a file system. Linux typically uses ext2 and ext3 file systems. Windows uses FAT32 and NTFS file systems.



UNIX Files
The three elements of a file

```
/home/cis90/simmsben/Poems $ ls
ant  Blake  nursery  Shakespeare  twister  Yeats

/home/cis90/simmsben/Poems $ ls -l twister
-rw-r--r-- 1 simmsben cis90 151 Jul 20  2001 twister

/home/cis90/simmsben/Poems $ cat twister
A tutor who tooted the flute,
tried to tutor two tooters to toot.
Said the two to the tutor,
"is it harder to toot?  Or to
tutor two tooters to toot?"
```



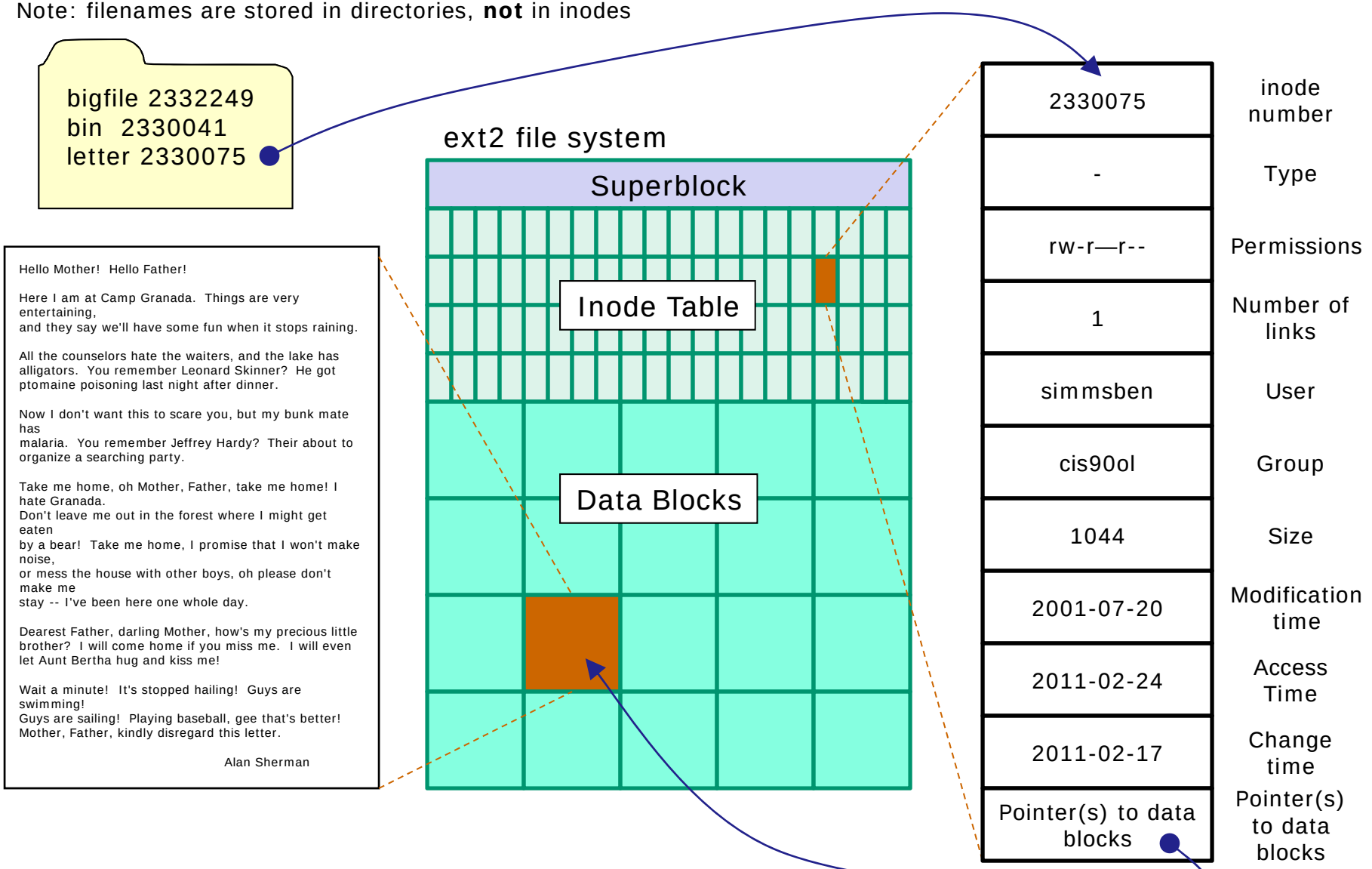
UNIX File names conventions

Any combination of the following:

- Upper and lower case letters: A-Z and a-z
- Numbers: 0-9
- Periods, underscores, hyphens: . _ -

Don't use metacharacters, blanks or /'s as part of your filenames because the shell will treat those characters differently!

Note: filenames are stored in directories, **not** in inodes




```
/home/cis90ol/simmsben $ ls -il letter
2330075 -rw-r--r-- 1 simmsben cis90ol 1044 Jul 20  2001 letter
```

File Types

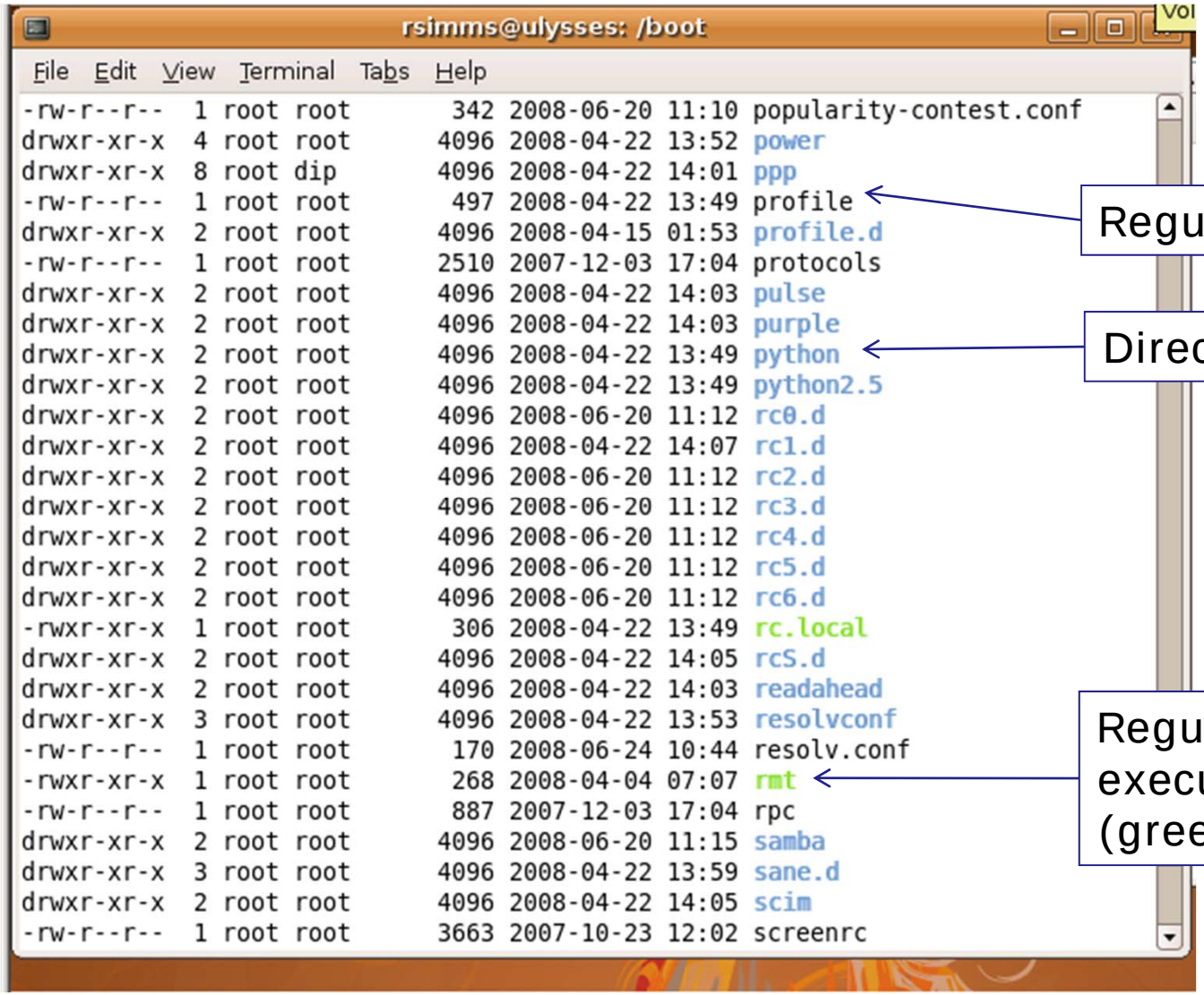
File Types and Commands

Long listing code (ls –l)	Type	How to make one
d	directory	mkdir
-	regular • Programs • Text • Data (binary)	touch
l	symbolic link	ln -s
c	character special device files	mknod
b	block special device files	mknod

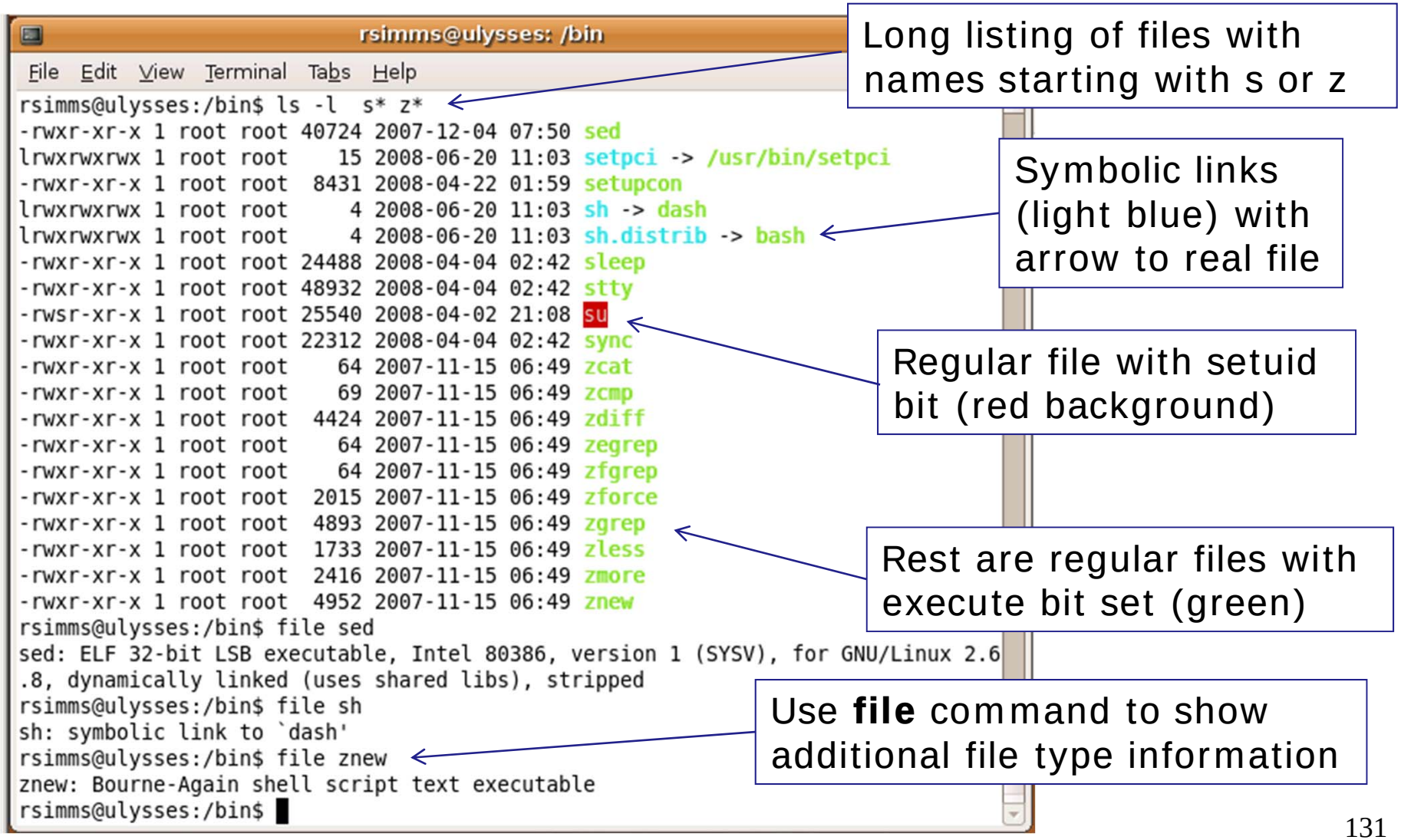
Note: Other files types includes sockets (s) and named pipes (p)

*Note: Use the **file** command to distinguish between text and date files*

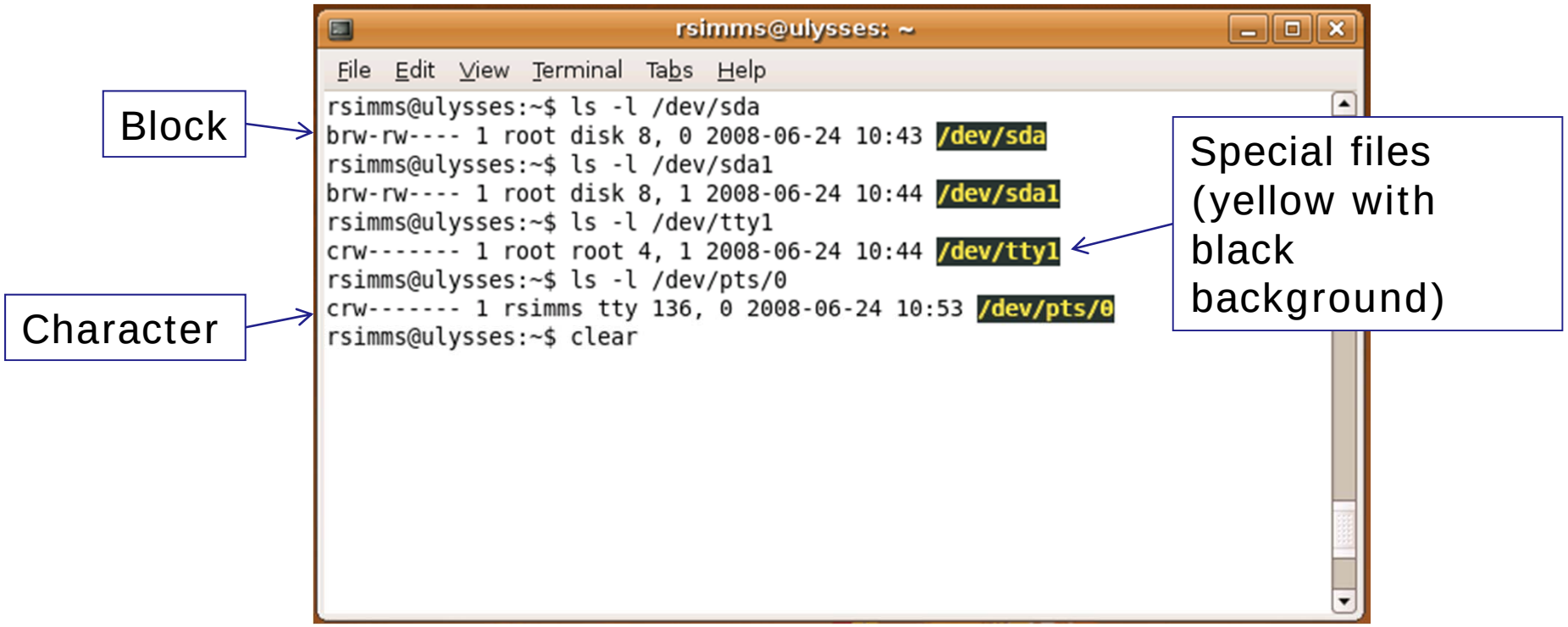
Various Types of Files (found in /etc)



Various Types of Files (found in /bin)

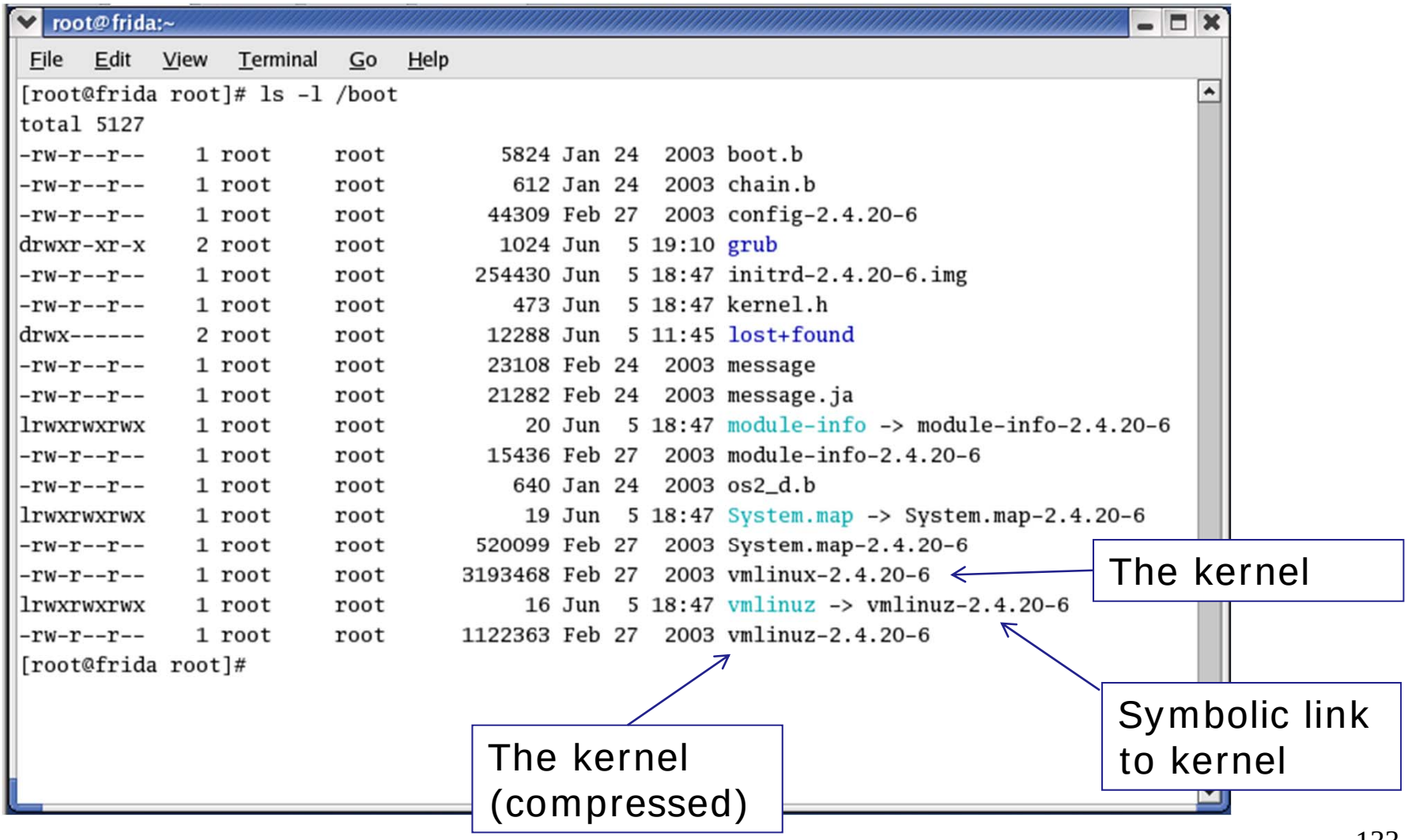


Various Types of Files (found in /dev)



Hard drives are block devices (data is transferred in large chunks for efficiency). Terminals are character devices where data is transferred one character at a time.

/boot (Red Hat 9)



Class Exercise

- Do a long listing of the /bin directory
  - *Who owns the vi command?*
  - *What size is the sleep command?*
  - *What file does the symbolic link tcptraceroute point to?*
  - *When was the file touch last modified?*
- Do a long listing of the /etc directory
  - *Is yum a directory or a file?*
  - *What are two ways you can tell if yum is a directory or a file?*

file command

Provides expanded information about files

- There are many different types of regular files:
  - Programs (binary)
  - Scripts (text)
  - Text files
  - Data files (binary)

- The **file** command attempts to classify files and give you more detailed information as to what type they are.

*Use the **file** command to determine is a file is a text file and can be viewed with **cat**, **more**, **less**, **tail** ... etc commands.*

file command
examples

The file command can take multiple arguments

```
/home/cis90ol/simmsben $ file Poems/ proposal2  timecal  empty
Poems/:    directory
proposal2: ASCII English text
timecal:   shell archive or script for antique kernel text
empty:     empty
/home/cis90ol/simmsben $
```

Note, this example is from Lab 4

file command

examples

```
rsimms@opus:~/work/examples/filetypes
[rsimms@opus filetypes]$ ls -l
total 156
-rw-r--r-- 1 rsimms cis191  8983 Aug  5 07:57 Adjective.frm
-rw-rw-rw- 1 rsimms cis191  5976 Aug  5 07:57 Adjective.MYD
-rw-rw-rw- 1 rsimms cis191  2048 Aug  5 07:57 Adjective.MYI
-rw-r--r-- 1 rsimms cis191 10240 Aug  4 18:13 backup.tar
-rw------- 1 rsimms users    191 Aug  5 08:10 bash_profile
crw-r--r-- 1 rsimms cis191  5, 1 Aug  5 08:03 console
-rwx------ 1 rsimms cis191  4846 Aug  4 18:08 cprog
lrwxrwxrwx 1 rsimms users      5 Aug  5 08:07 go-cprog -> cprog
-rw-r--r-- 1 rsimms cis191   119 Aug  4 17:55 letter
-rw------- 1 rsimms users   2968 Aug  5 08:08 mbox
-rw-r--r-- 1 rsimms cis191 34611 Aug  5 07:59 rich-260x216.jpg
-rwxr-xr-x 1 rsimms cis191   445 Aug  4 17:56 runit
brw-r--r-- 1 rsimms cis191  8, 0 Aug  5 08:04 sda
drwxr-xr-x 2 rsimms cis191  4096 Aug  4 17:57 travel
[rsimms@opus filetypes]$
```

Not all regular files are text files

*Use the **file** command to identify text files*

```
rsimms@opus:~/work/examples/filetypes
[rsimms@opus filetypes]$ file *
Adjective.frm:     MySQL table definition file Version 9
Adjective.MYD:     DBase 3 data file (33517822 records)
Adjective.MYI:     MySQL MISAM compressed data file Version 1
backup.tar:        POSIX tar archive
bash_profile:      ASCII English text
console:           character special (5/1)
cprog:             ELF 32-bit LSB executable, Intel 80386, version
 1 (SYSV), for GNU/Linux 2.2.5, dynamically linked (uses shared l
ibs), for GNU/Linux 2.2.5, not stripped
go-cprog:          symbolic link to `cprog'
letter:            ASCII English text
mbox:              ASCII mail text
rich-260x216.jpg: JPEG image data, JFIF standard 1.02
runit:             Bourne shell script text executable
sda:               block special (8/0)
travel:            directory
[rsimms@opus filetypes]$
```

wc command

count words, lines, and bytes

simmsben@opus:~/Poems/Blake

```
/home/cis90/simmsben/Poems/Blake $ cat tiger
Tiger, Tiger burning bright
In the forest of the night,
What immortal hand or eye
Dare frame thy fearful symmetry?
/home/cis90/simmsben/Poems/Blake $ wc -l tiger
4 tiger
/home/cis90/simmsben/Poems/Blake $ wc -w tiger
20 tiger
/home/cis90/simmsben/Poems/Blake $ wc tiger
  4  20 115 tiger
/home/cis90/simmsben/Poems/Blake $ ls -l tiger
-rw-r--r-- 1 simmsben cis90 115 Jul 20  2001 tiger
/home/cis90/simmsben/Poems/Blake $ wc -l *
 27 jerusalem
  4 tiger
 31 total
/home/cis90/simmsben/Poems/Blake $
```

Number of lines

Number of words

Number of lines, words, bytes

tiger file has 4 lines, 20 words and 115 bytes

Class Exercise

Navigate with cd, pwd, and ls

- Navigate to your Blake directory
- Use the file command on tiger: **file tiger**
  - *Is tiger a binary or ASCII text file?*
- Using one command only, with a relative path, get expanded type information on the sonnet files in your Shakespeare directory

  file ../Shakespeare/*
- Navigate to your Shakespeare directory
- Print the sonnet3 files with **cat sonnet3**

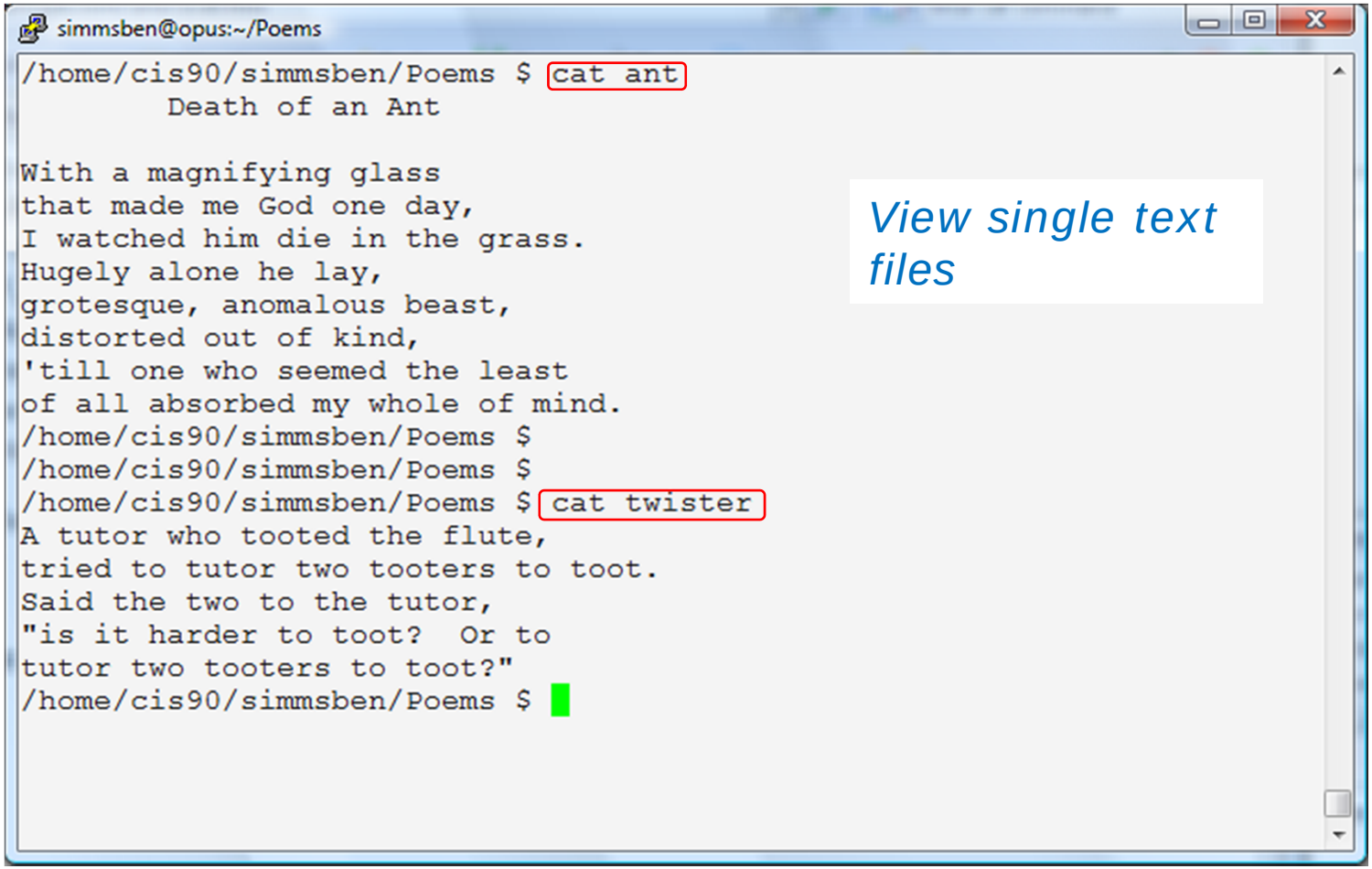
  *How many lines in the sonnet3 file? Hint: Use **wc –l sonnet3***

  How many words in the sonnet3 file?

Viewing Files

cat command

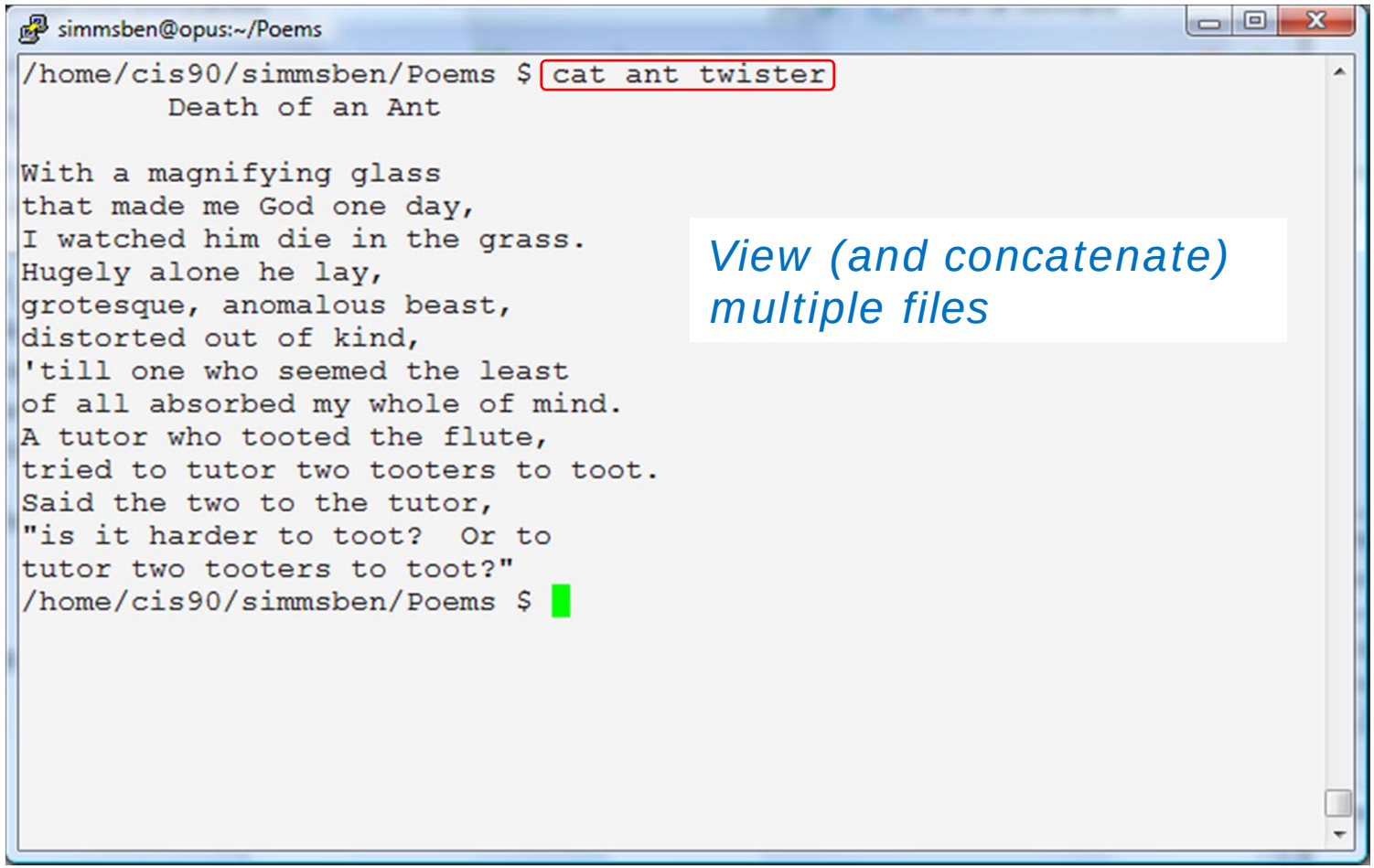
concatenate or view text files



View single text files

cat command

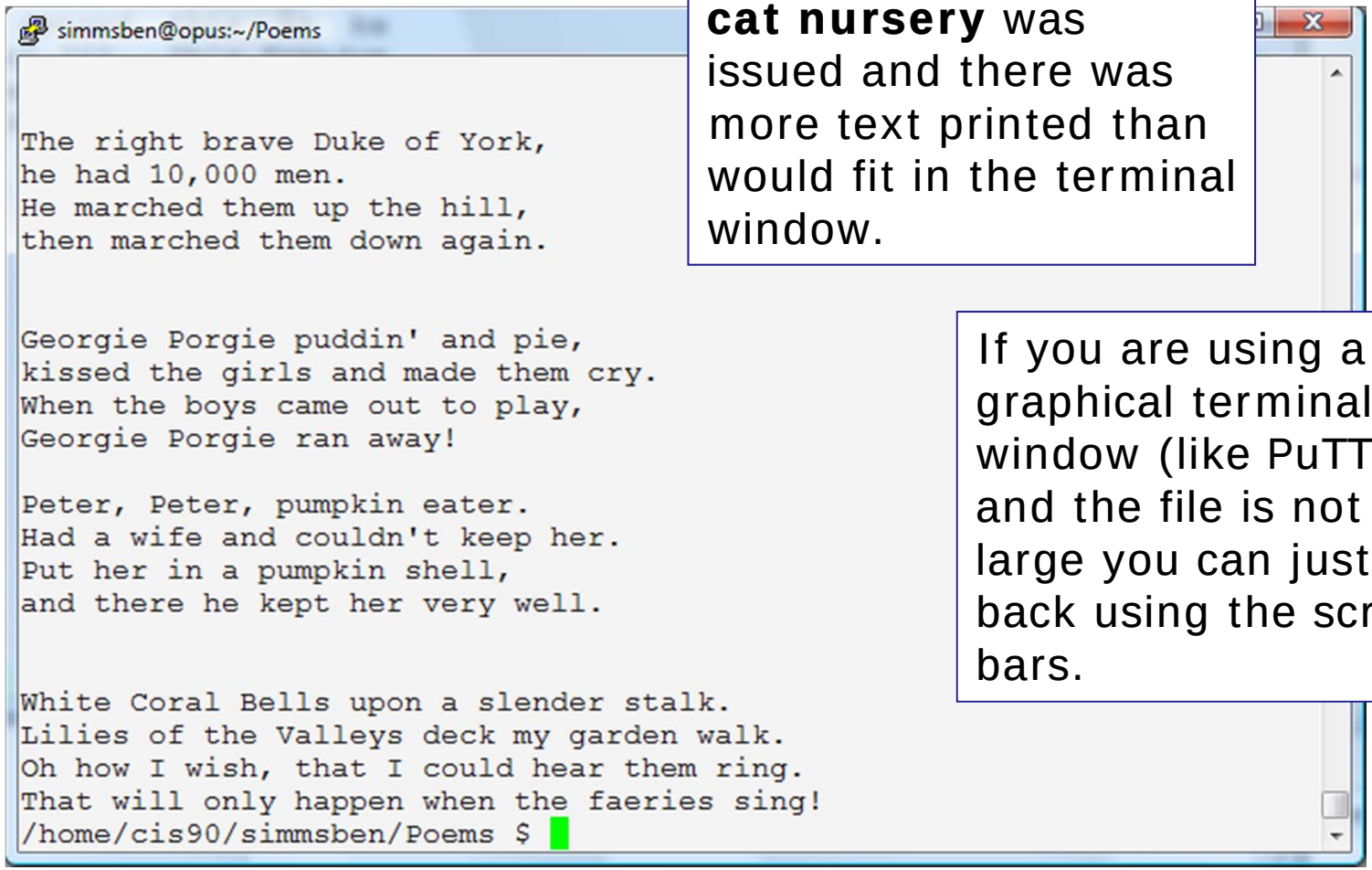
concatenate or view text files



View (and concatenate) multiple files

cat command

concatenate or view text files



cat nursery was issued and there was more text printed than would fit in the terminal window.

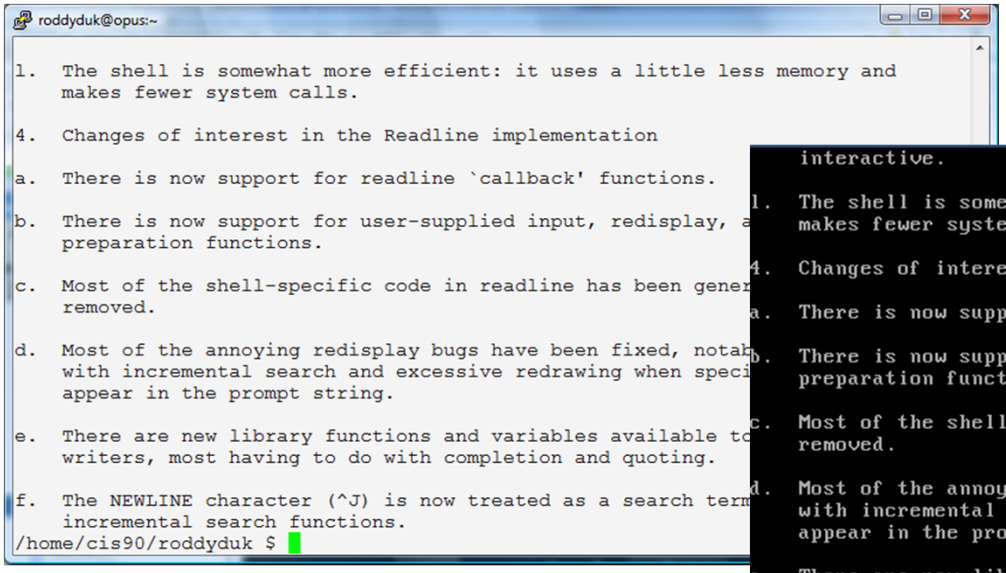
If you are using a graphical terminal window (like PuTTY) and the file is not too large you can just scroll back using the scroll bars.

cat command

concatenate or view text files

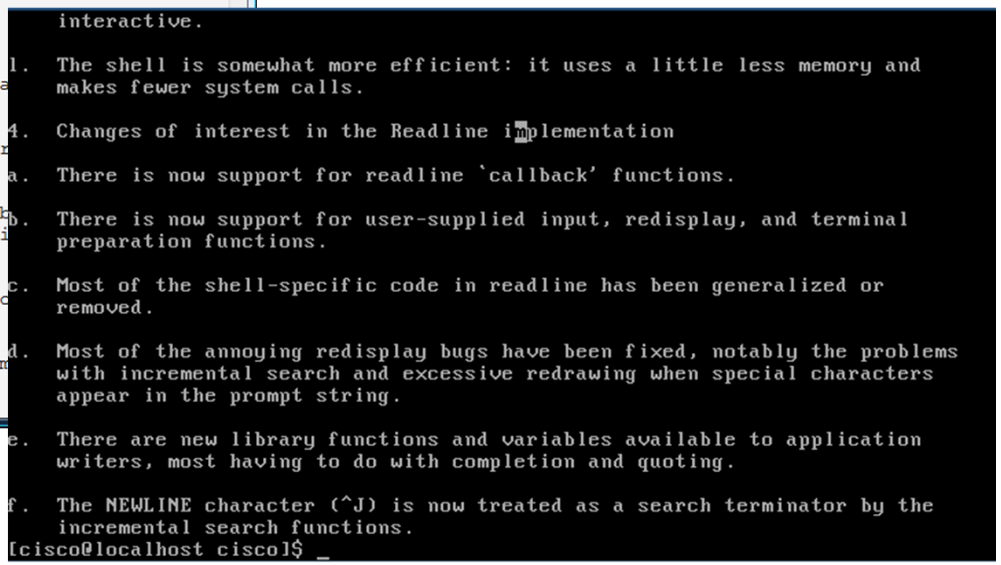
- Problem - if you **cat** really long files the text at the beginning is scrolled off and cannot be read.

- For example: **cat /usr/share/doc/bash-3.2/NEWS**



Terminal windows (like PuTTY) have scroll bars but the number of lines they buffer can be exceeded.

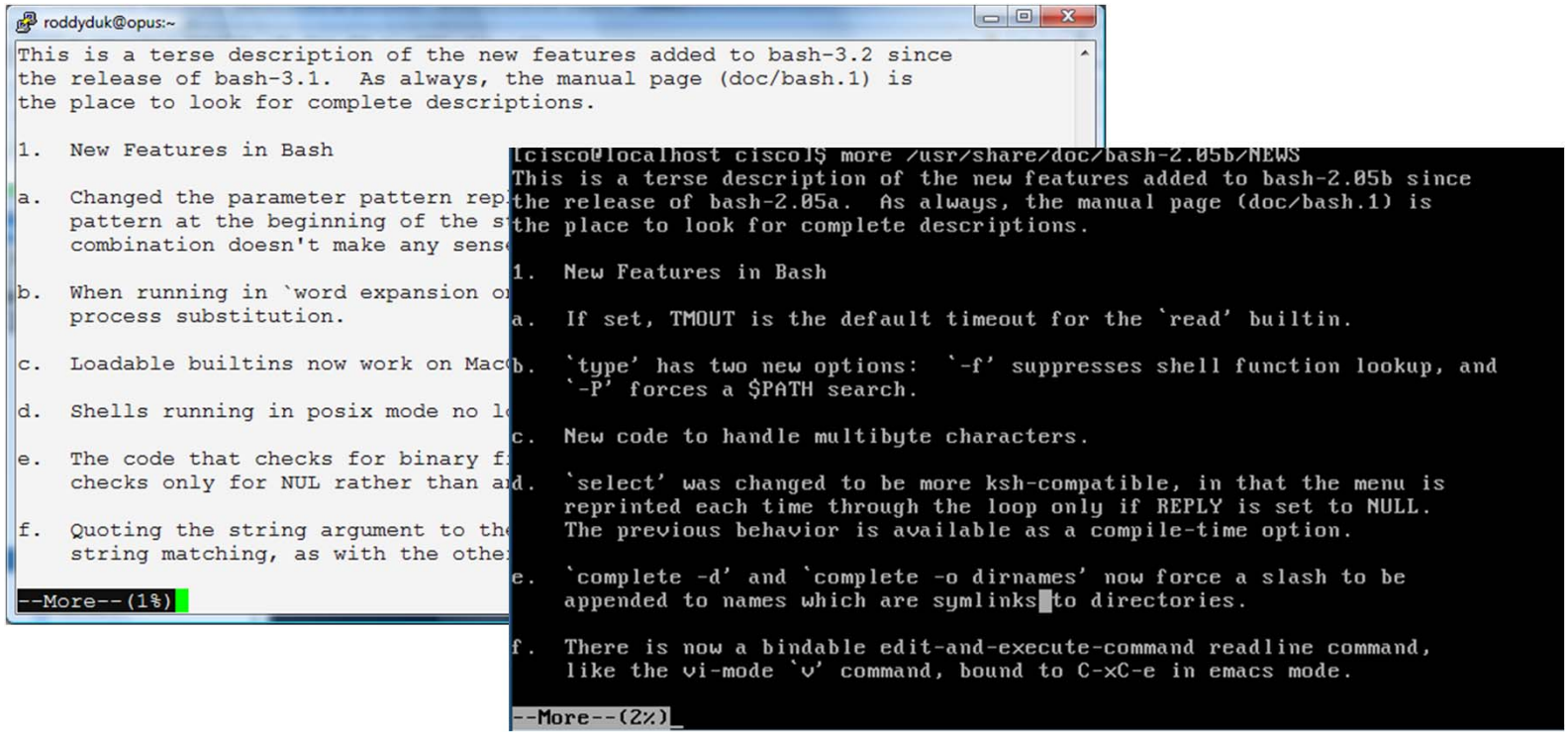
Virtual terminals have no scroll bars !



more command

For printing really big files

- Use the **more** command for paging through really long text files
- For example: **more /usr/share/doc/bash-3.2/NEWS**



Use the space key to page forward and q to quit

more command

Printing multiple files with one command

- Use the **more** command can take multiple arguments

```
/home/cis90ol/simmsben $ more Poems/Blake/tiger Poems/Blake/jerusalem
::::::::::::::
Poems/Blake/tiger
::::::::::::::
Tiger, Tiger burning bright
In the forest of the night,
What immortal hand or eye
Dare frame thy fearful symmetry?
::::::::::::::
Poems/Blake/jerusalem
::::::::::::::
        Jerusalem


And did those feet in ancient times,
Walk upon England's mountains green?
And was the holy lamb of God,
On England's pleasant pastures seen?


And did the countenance divine
Shine forth upon our darkened hills?
And was Jerusalem builded here,
< snipped >
```

Notice with multiple files as arguments, each file has a header to separate it from the other files

more command

*Printing multiple files using * metacharacter*

- Use the **more** command can take multiple arguments

```
/home/cis90ol/simmsben $ more Poems/Blake/*
::::::::::::::
Poems/Blake/jerusalem
::::::::::::::
        Jerusalem


And did those feet in ancient times,
Walk upon England's mountains green?
And was the holy lamb of God,
On England's pleasant pastures seen?


And did the countenance divine
Shine forth upon our darkened hills?
And was Jerusalem builded here,
Among these dark satanic mills.


Bring me my bow of burning gold.
Bring me my arrows of desire.
Bring me my spear, Oh clouds unfold!
Bring me my chariot of fire!


I will not cease from endless fight!
Nor shall my sword sleep in my hand,
'til we have built Jerusalem
On England's green and pleasant land.

                                        William Blake
::::::::::::::
Poems/Blake/tiger
::::::::::::::
< snipped >
```

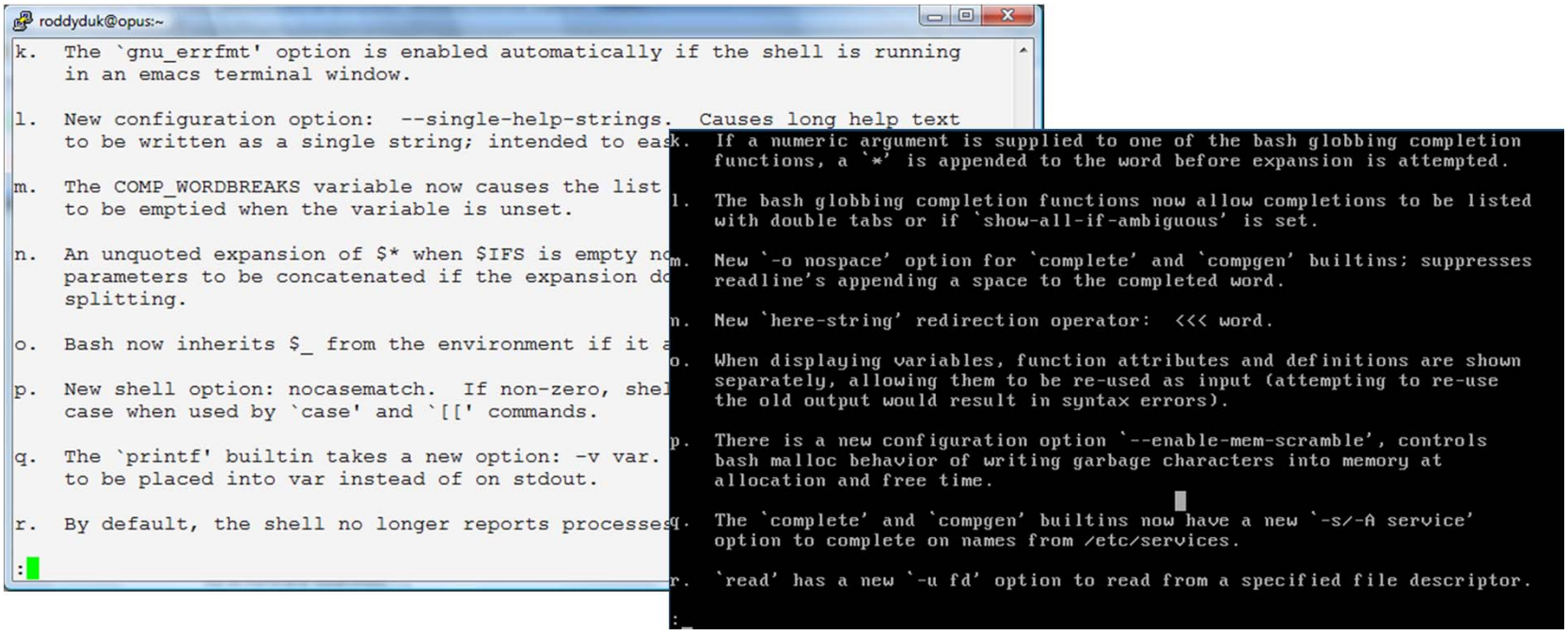
*The previous example using the * metacharacter instead*

less command

An alternative for printing really big files

- Use the **less** command to page forward and backward through really long text files. (just like the man command works)

- For example: **less /usr/share/doc/bash-3.2/NEWS**



*Use the pg up/dn and up/down arrows to move through text file. Use **q** to quit*
(See the man page for many more options like searching)

head command

print just the beginning of a text file

- Use the **head** command to show the first several lines of a file. Use the –number option to control the number of lines printed.

- For example:

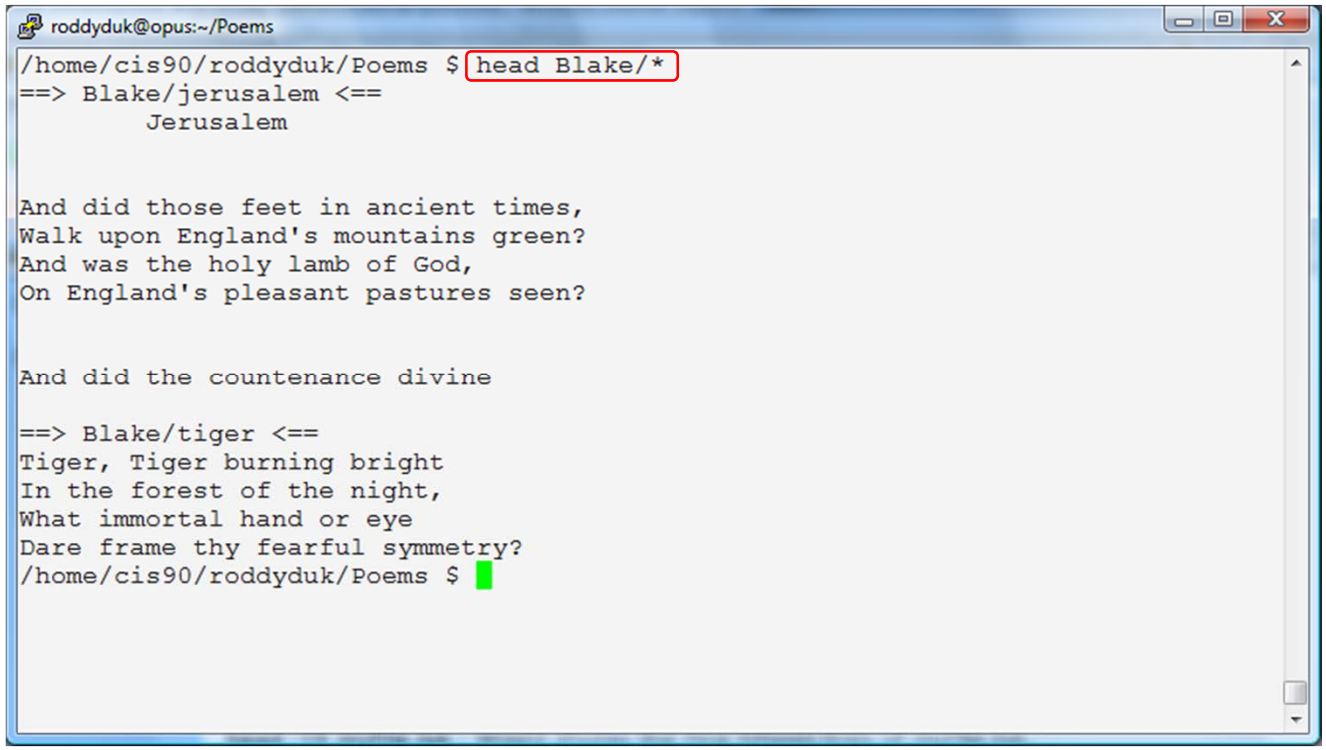
```
roddyduk@opus:~/Poems
/home/cis90/roddyduk/Poems $ ls
ant  Blake  nursery  Shakespeare  twister  Yeats
/home/cis90/roddyduk/Poems $ head twister
A tutor who tooted the flute,
tried to tutor two tooters to toot.
Said the two to the tutor,
"is it harder to toot?  Or to
tutor two tooters to toot?"
/home/cis90/roddyduk/Poems $ head -2 ant nursery twister
==> ant <==
        Death of an Ant


==> nursery <==
Jack and Jill went up the hill
to fetch a pail of water.

==> twister <==
A tutor who tooted the flute,
tried to tutor two tooters to toot.
/home/cis90/roddyduk/Poems $
```

This prints the first two lines in ant, nursery and twister files

head command

print just the beginning of multiple files

- Another example: **head Blake/*** to print headings of all the files in the Blake directory:

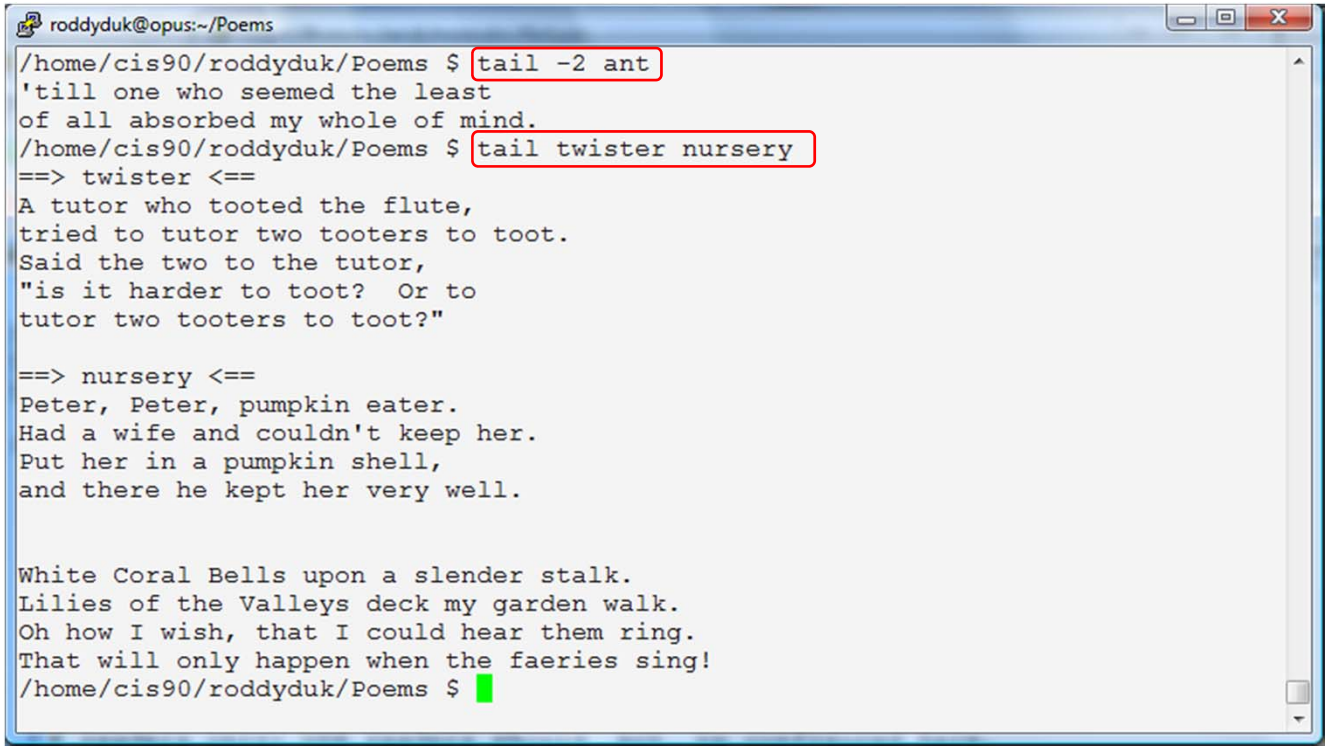


tail

print just the end of a text file

- Use the **tail** command to the print the last several lines of a file. Use the –number option to control the number of lines printed.

- For example:



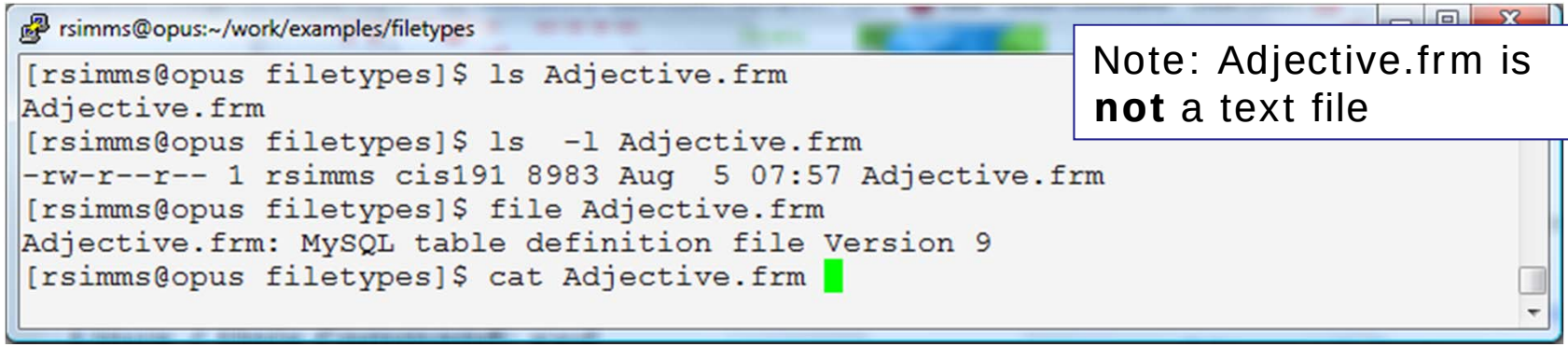
Class Exercise

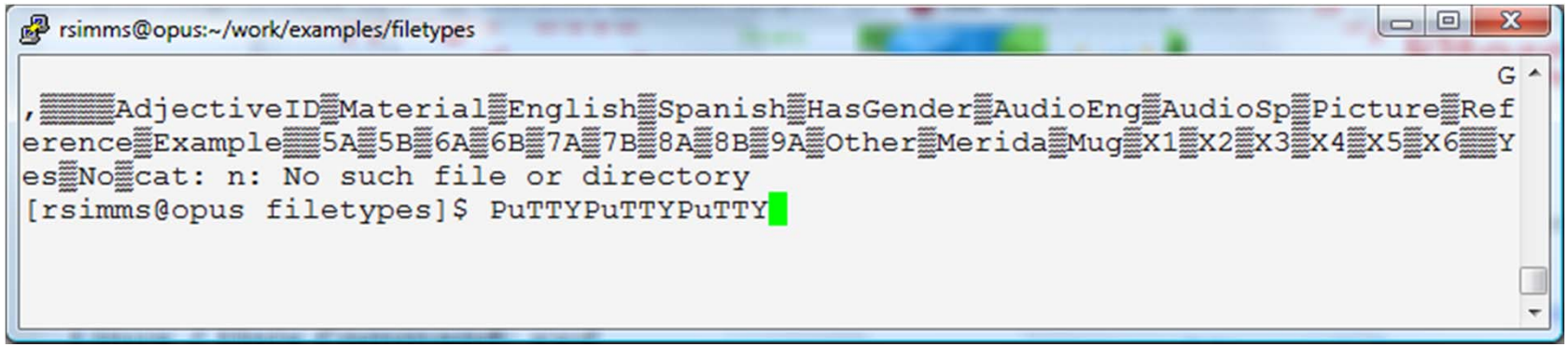
Navigate with cd, pwd, and ls

- Navigate to your Yeats directory
- Print the first line of the mooncat file with **head -1 mooncat**
- With one command print the first line of all files in the Yeats directory with **head -1 *** or **head –n 1 ***
- Use **tail -1 mooncat** to see the last line there
- Try **tail -1 *** to print the last lines in all Yeats poems. What happened?
- Try use **man tail**, review the n option, then try **tail –n 1 ***
- Navigate to your home directory use the **more** and **less** command to view bigfile

binary data files

cannot be viewed with cat, less, head, etc.





Tip: Use **reset** command to fix terminal if it gets really "sick"

xxd command

view hex dump of binary files

Example: **xxd Adjective.frm** (a MySql database schema file)

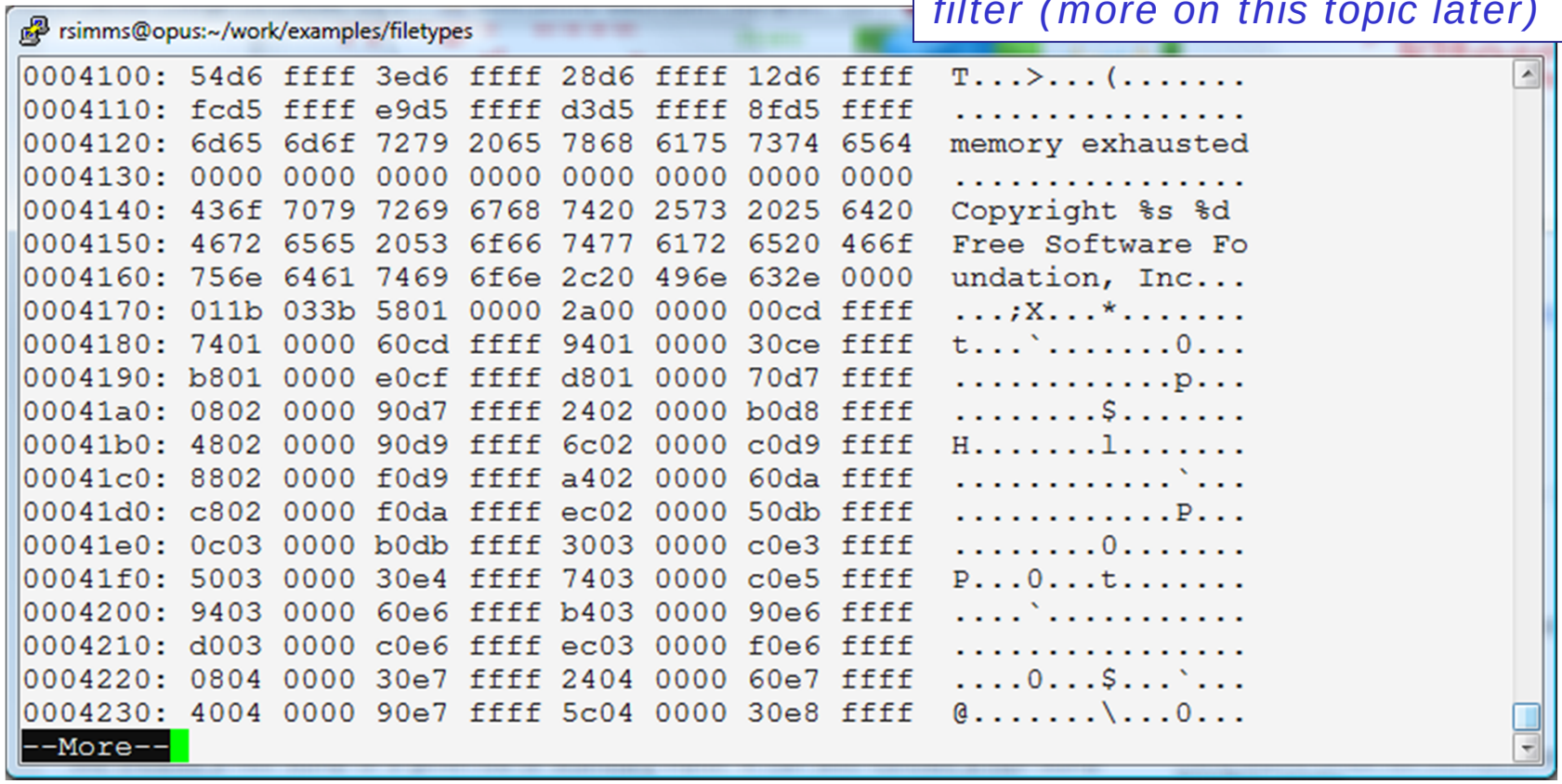
```
rsimms@opus:~/work/examples/filetypes
00021e0: 0008 8110 0001 f7c0 0000 0608 472c 0108  ............G,..
00021f0: 0000 0080 0000 00fd c000 0007 0847 2c01  .............G,.
0002200: 3401 0000 8000 0000 fdc0 0000 080a 0909  4...............
0002210: 0060 0200 0881 1000 02f7 c000 0009 0946  .`.............F
0002220: 2c01 6102 0000 8000 0000 fdc0 0000 0a08  ,.a.............
0002230: 472c 018d 0300 0080 0000 00fd c000 000b  G,..............
0002240: 0847 2c01 b904 0000 8000 0000 fdc0 0000  .G,.............
0002250: 0c0a 452c 01e5 0500 0080 0000 00fd c000  ..E,............
0002260: 000d 0847 2c01 1107 0000 8000 0000 fdc0  ...G,...........
0002270: 0000 ff41 646a 6563 7469 7665 4944 ff4d  ...AdjectiveID.M
0002280: 6174 6572 6961 6cff 456e 676c 6973 68ff  aterial.English.
0002290: 5370 616e 6973 68ff 4861 7347 656e 6465  Spanish.HasGende
00022a0: 72ff 4175 6469 6f45 6e67 ff41 7564 696f  r.AudioEng.Audio
00022b0: 5370 ff50 6963 7475 7265 ff52 6566 6572  Sp.Picture.Refer
00022c0: 656e 6365 ff45 7861 6d70 6c65 ff00 ff35  ence.Example...5
00022d0: 41ff 3542 ff36 41ff 3642 ff37 41ff 3742  A.5B.6A.6B.7A.7B
00022e0: ff38 41ff 3842 ff39 41ff 4f74 6865 72ff  .8A.8B.9A.Other.
00022f0: 4d65 7269 6461 ff4d 7567 ff58 31ff 5832  Merida.Mug.X1.X2
0002300: ff58 33ff 5834 ff58 35ff 5836 ff00 ff59  .X3.X4.X5.X6...Y
0002310: 6573 ff4e 6fff 00                        es.No..
[rsimms@opus filetypes]$
```

xxd command

view hex dump of binary files

Example: **xxd /bin/pwd | more**

For long files, the output of xxd can be "piped" into the more filter (more on this topic later)



Class Exercise

- **cd /home/cis90ol/depot/filetypes/**
- **xxd Adjective.frm**
- **xxd Adjective.frm | more**

Using xxd to dump contents of binary file

Class Exercise
Enlightenment

- **cd** to your home directory on Opus
- Run the enlightenment program: **enlightenment**
- Write down each magic word as you learn them.

Wrap up

Commands:

cat	Print a file on the screen
cd	Change directory
file	Classify a file
head	View first several lines of a file
less	Scroll up and down long files
ls	List files
more	Scroll down long files
pwd	Print working directory
reset	Use to reset terminal window
tail	View last several lines of a file
wc	Count the words, lines or characters in a file
xxd	Hex dump of a binary file

New Files and Directories:

/	Root of the file tree
/home	Opus home directories
/home/cis90	CIS 90 class home directories
/home/cis90/*username*	The home directory for CIS 90 student *username*

Next Class

Assignment: Check Calendar Page on web site to see what is due next week.

Lab 4

Quiz questions for next class:

1) What are two commands you can use to read through long text files?

2) How do you distinguish between relative and absolute paths?

3) What are the three elements of a UNIX file?

Backup

Lab 2 Results

4. Set the TERM environment variable to "dumb", and execute the **clear** command. What does it do? Use **echo $TERM** to see the new setting. Set TERM back to "vt100" or "ansi" What happens?

TERM="dumb"
TERM="ansi"

Set the TERM environment variable back to "xterm" which is what it was when you logged in.

Lab 2 Results

12. What is the difference in output between the following two commands?

banner I am fine
banner "I am fine"