Lesson Module Checklist

- Slides
- WB pre-generated

- Flash cards
- Page numbers
- 1st minute quiz
- Web Calendar summary
- Web book pages
- Commands

- Lab tested
- Submit clock set
- Enlightenment script tested

- 9V backup battery for microphone
- Backup slides, CCC info, handouts on flash drive

Student Learner Outcomes

1. Navigate and manage the UNIX/Linux file system by viewing, copying, moving, renaming, creating, and removing files and directories.
2. Use the UNIX features of file redirection and pipelines to control the flow of data to and from various commands.
3. With the aid of online manual pages, execute UNIX system commands from either a keyboard or a shell script using correct command syntax.

Introductions and Credits

Jim Griffin
- Created this Linux course
- Created Opus and the CIS VLab
- Jim's site: http://cabrillo.edu/~jgriffin/

Rich Simms
- HP Alumnus
- Started teaching this course in 2008 when Jim went on sabbatical
- Rich's site: http://simms-teach.com

And thanks to:
- John Govsky for many teaching best practices: e.g. the First Minute quizzes, the online forum, and the point grading system (http://teacherjohn.com/)

Student checklist
(How to attend from home or in the classroom)

1) Browse to the CIS 90 website Calendar page
   - http://simms-teach.com
   - Click CIS 90 link on left panel
   - Click Calendar link near top of content area
   - Locate today's lesson on the Calendar

2) Download the presentation slides for today's lesson for easier viewing

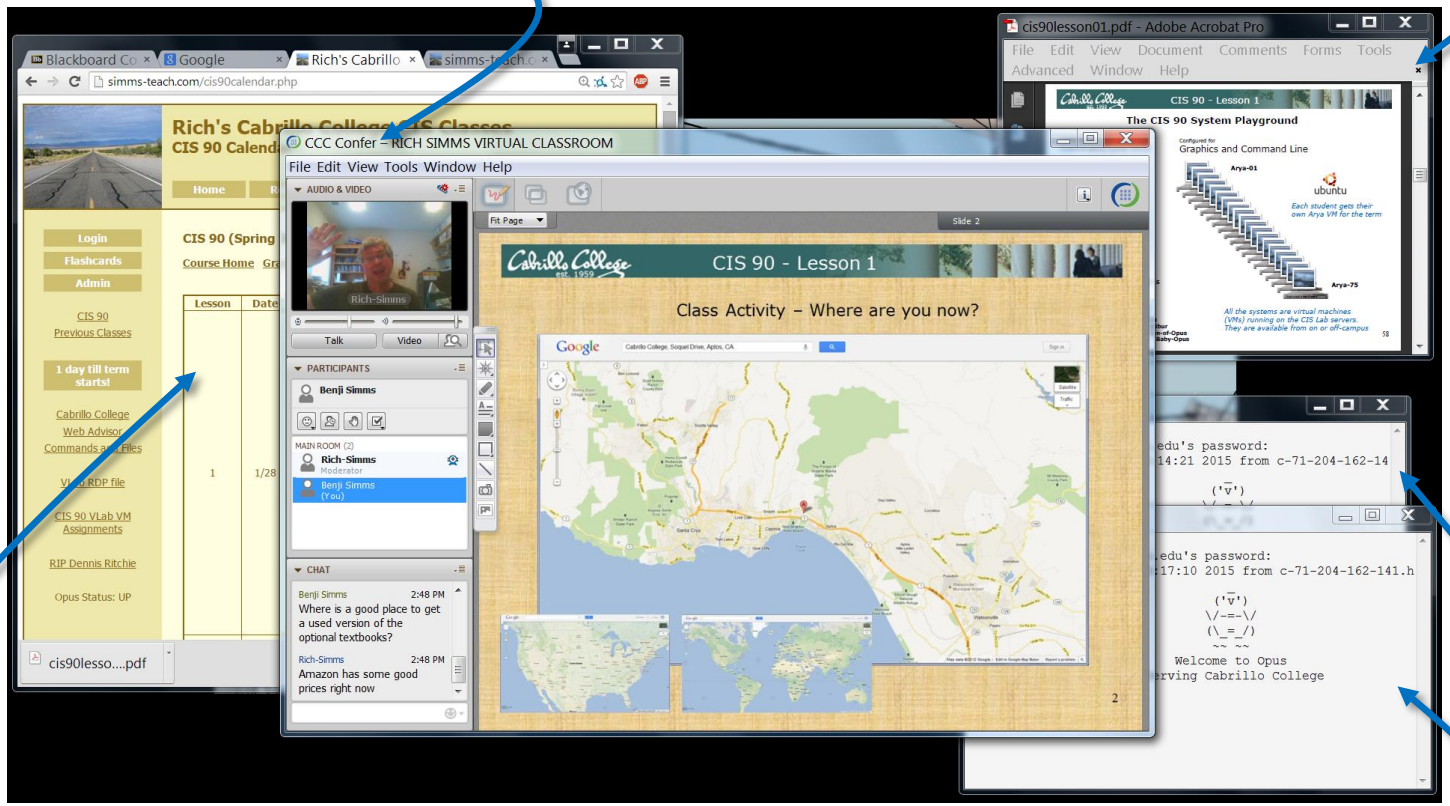
3) Click Enter virtual classroom to join CCC Confer session

4) Connect to Opus using Putty or ssh command

Student checklist
(How to layout your screen when attending class)

CCC Confer

Downloaded PDF of Lesson Slides

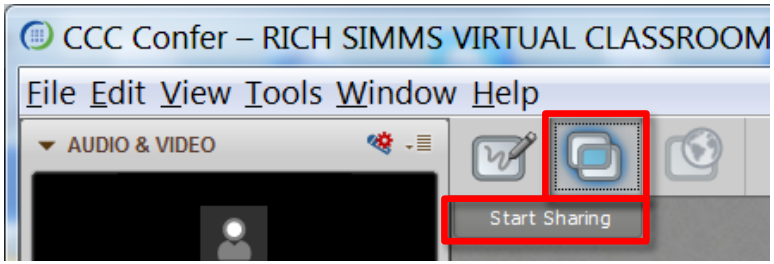


CIS 90 website Calendar page

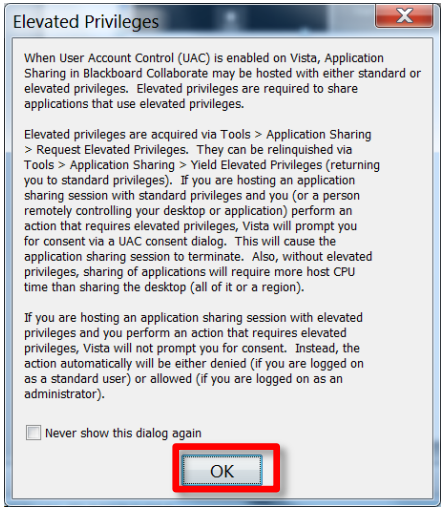
One or more login sessions to Opus

Student checklist
(To share your desktop with the class)

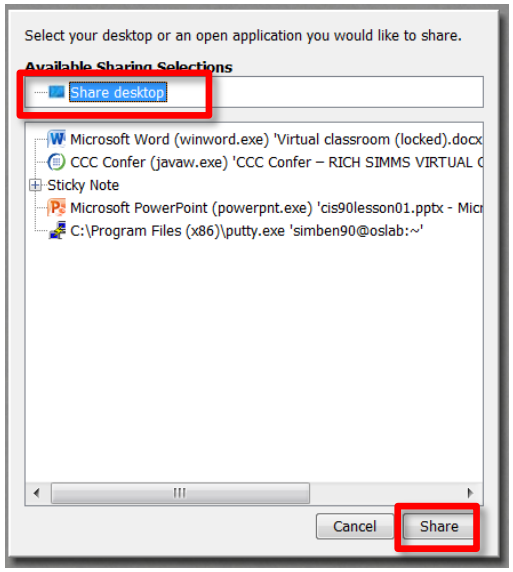
1) Instructor gives you sharing privileges



2) Click overlapping rectangles icon. If white "Start Sharing" text is present then click it as well.



3) Click OK button.



4) Select "Share desktop" and click Share button.

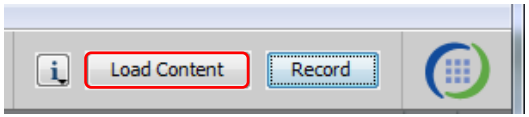
Instructor: **Rich Simms**
Dial-in: **888-886-3951**
Passcode: **136690**

Al	Tim	Emilio	Chris	Eddie	Clara	Ryan	Ethan	Monte	Cameron
Tanner	Tess	Ahmad	Mike F.	Mario	Roberto	Diego	John	Efrain	Ivers
Django	Ian	Abraham C.	Benji	Abraham N.	Mateo	Melissa	Sean		

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

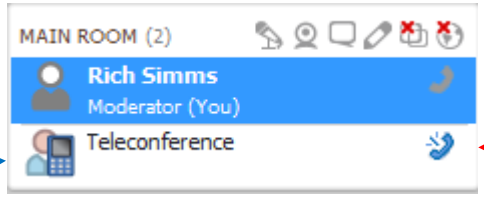
Rich's CCC Confer checklist - setup

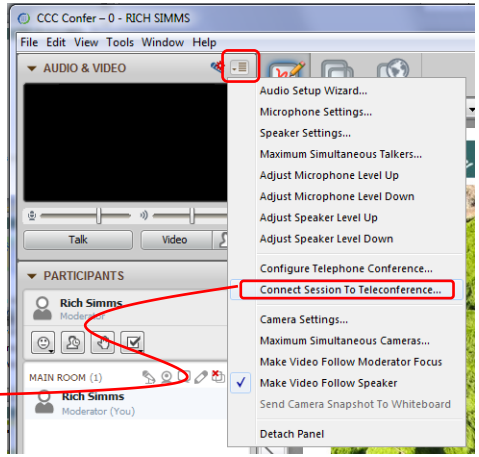
[ ] Preload White Board



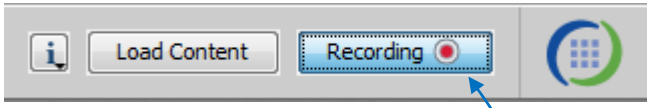
[ ] Connect session to Teleconference

Session now connected to teleconference





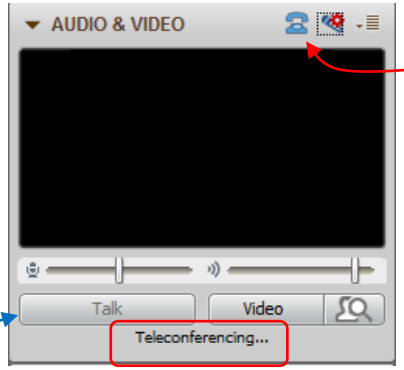
[ ] Is recording on?



Red dot means recording

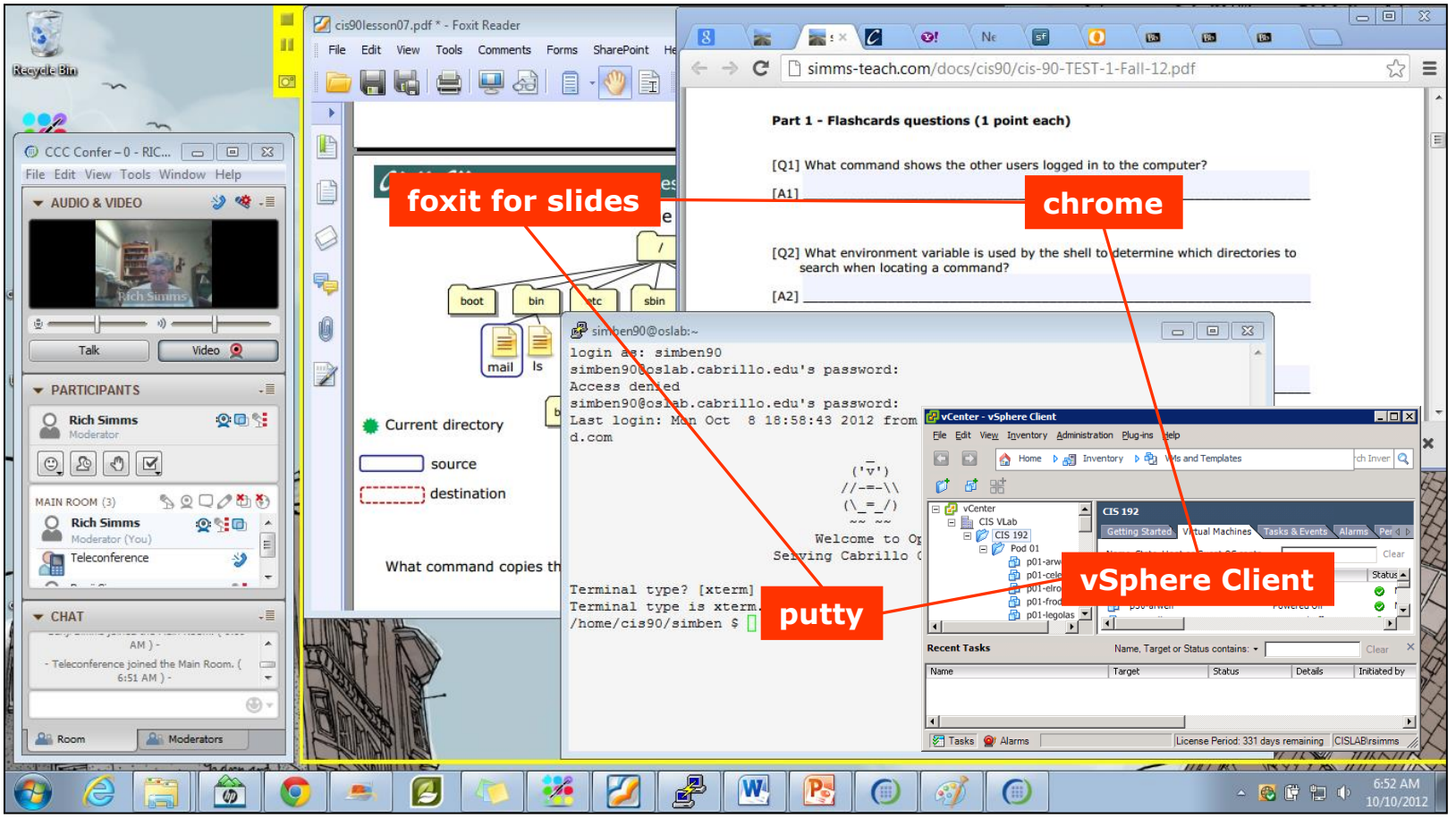
[ ] Use teleconferencing, not mic

Should be greyed out



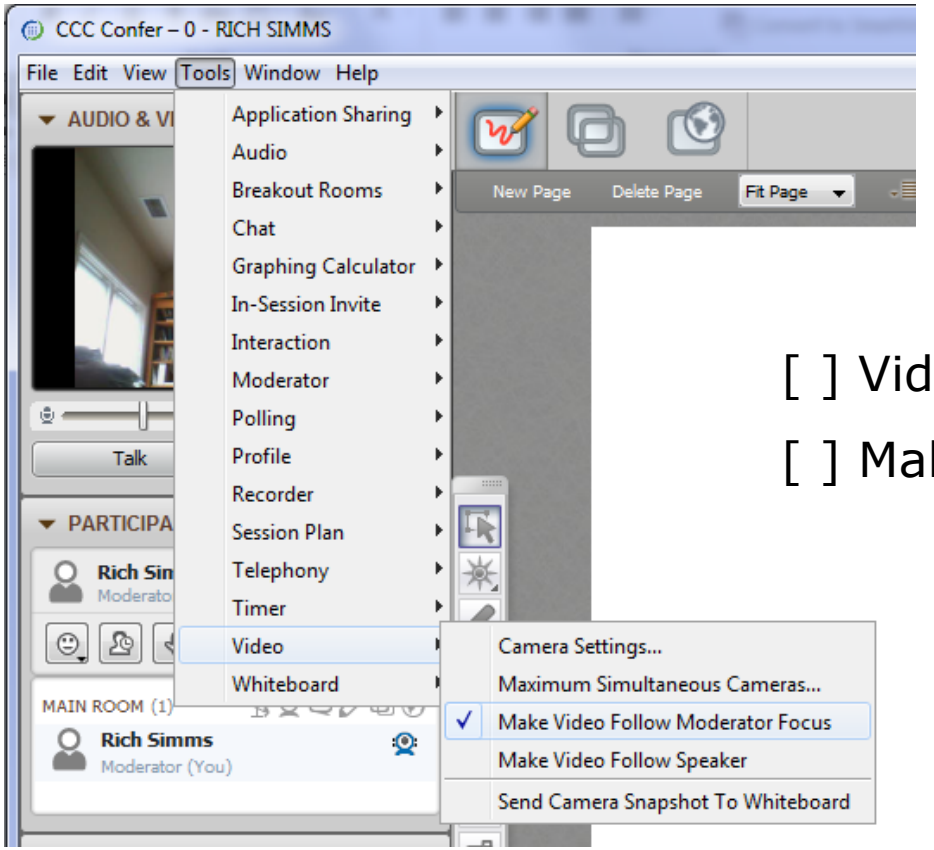
Should show as this live "off hook" telephone handset icon and the Teleconferencing … message displayed

Rich's CCC Confer checklist - app layout



[ ] layout and share apps

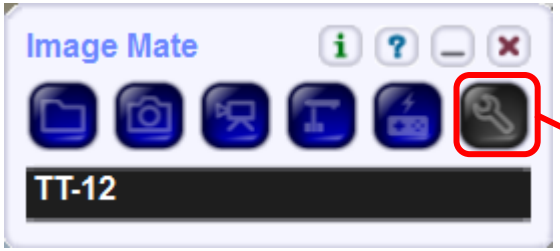
Rich's CCC Confer checklist - video

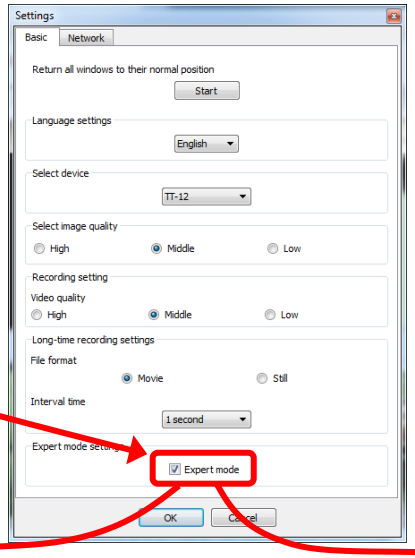


[ ] Video (webcam)

[ ] Make Video Follow Moderator Focus

Rich's CCC Confer checklist - Elmo



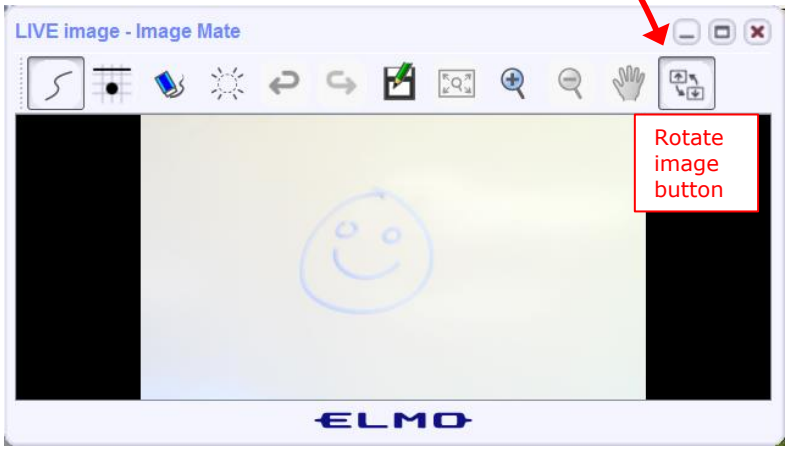


The "rotate image" button is necessary if you use both the side table and the white board.

Quite interesting that they consider you to be an "expert" in order to use this button!

Elmo rotated down to view side table

Elmo rotated up to view white board

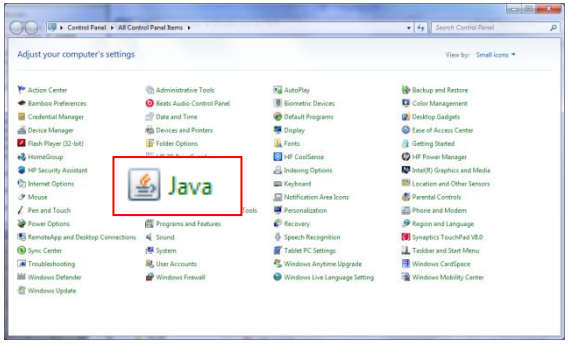


Run and share the Image Mate program just as you would any other app with CCC Confer

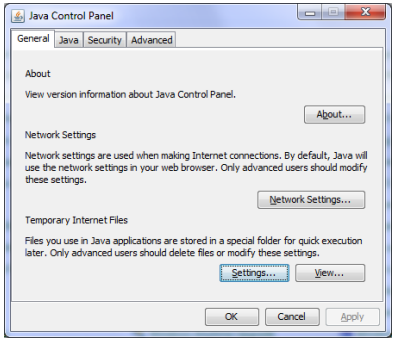
Rich's CCC Confer checklist - universal fix

Universal Fix for CCC Confer:
1) Shrink (500 MB) and delete Java cache
2) Uninstall and reinstall latest Java runtime

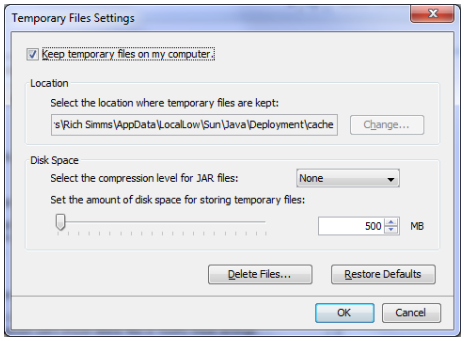
Control Panel (small icons)



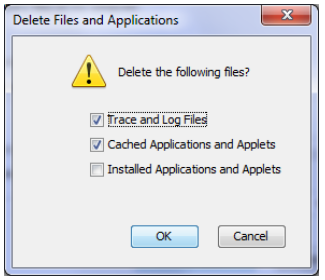
General Tab > Settings…



500MB cache size



Delete these



Google Java download

Quiz

Please answer these questions **in the order** shown:

See electronic white board

email answers to: risimms@cabrillo.edu

(answers must be emailed within the first few minutes of class for credit)

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 • Housekeeping • The UNIX file tree • Navigating the file system • Unix files and filename conventions • Viewing text and binary files • File system and content types • Absolute and relative pathnames • / . .. and ~ directories • More on cd, pwd and ls commands • Home directories • Filename expansion with * • Exercise: Enlightenment • Wrap up

Questions on previous material

Questions?

Lesson material?

Labs? Tests?

How this course works?

- Graded work in home directories
- Answers in /home/cis90/answers

Who questions much, shall learn much, and retain much.
- Francis Bacon

If you don't ask, you don't get.
- Mahatma Gandhi

Chinese Proverb	他問一個問題，五分鐘是個傻子，他不問一個問題仍然是一個傻瓜永遠。 *He who asks a question is a fool for five minutes; he who does not ask a question remains a fool forever.*

Lab 2
Post Mortem

Lab Steps

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

Lab 2 Results

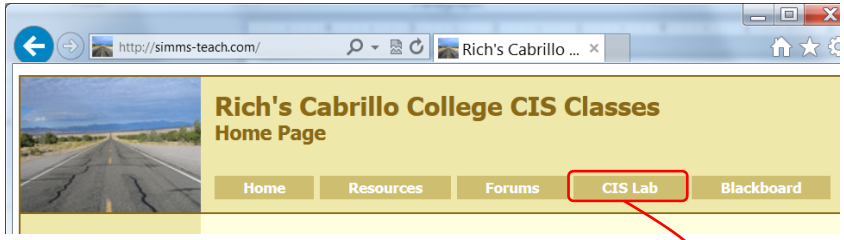
- Graded work in home directories
  `more lab02.graded`
  (tap spacebar to scroll down)

- Answers in /home/cis90/answers
  `more ../answers/lab02`
  (tap spacebar to scroll down)

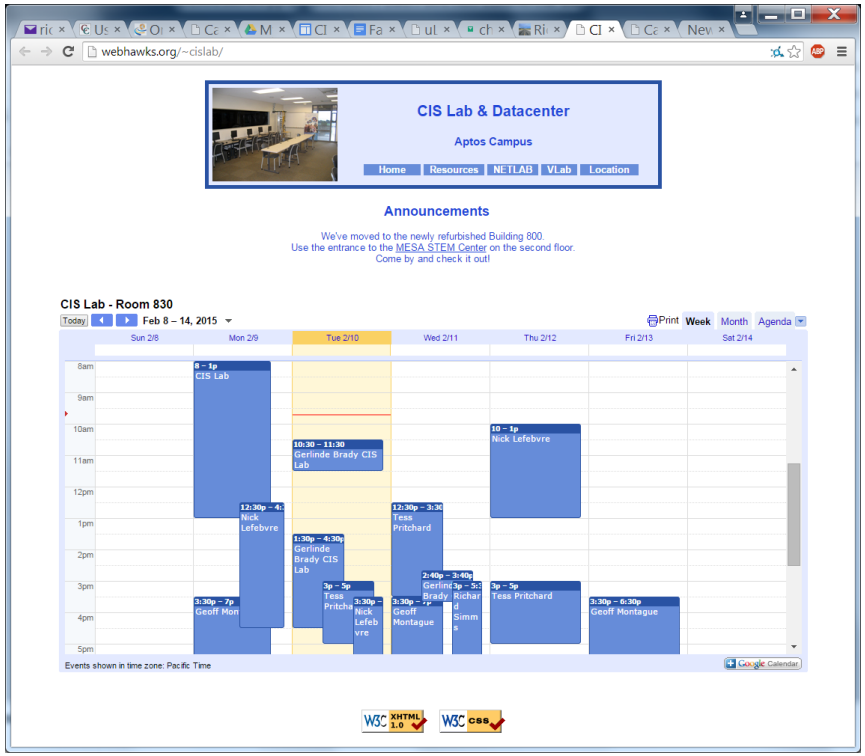
24 labs submitted

4 labs not submitted

Got stuck or having trouble getting started in this course?



If you would like some additional come over to the CIS Lab. There are student lab assistants and instructors there to help you.



Nick and Geoff are both CIS 90 Alumni.

Tess is in our class!

Michael is the other Linux instructor.

I'm in there Wednesdays 3:00-5:30pm.

CIS 90 Tutoring Available

http://www.cabrillo.edu/services/tutorials/

Matt Smithey

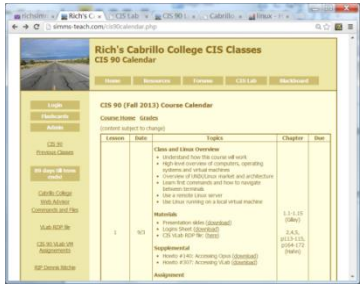
All students interested in tutoring in CIS 90, 172, and 81 classes need to come directly to the Tutorials Center to schedule, register and fill out some paperwork. This is just a one-time visit.

The tutoring will take place at the STEM center and they will log in and log out on a computer you have designated (I will figure out exactly what that means).

Don't wait too long to sign up! Tutoring hours are limited!

Housekeeping

- Lab 3 due tonight at 11:59PM (Opus time)
  - Use **mail -f uhistory** and **check3** to review your collection
  - Clean up duplicates before last submittal
  - I'll grade using a variation of **check3** script
  - Don't forget to use **submit** to turn in your work!
- Five forum posts due tonight at 11:59PM (Opus time)
- Reminder - all quizzes, all tests, all due dates for all work is on the website Calendar page



Linux Certifications

Red Hat / Linux Professional Institute (LPI) / Linux Foundation

Linux Professional Institute (LPI) certifications

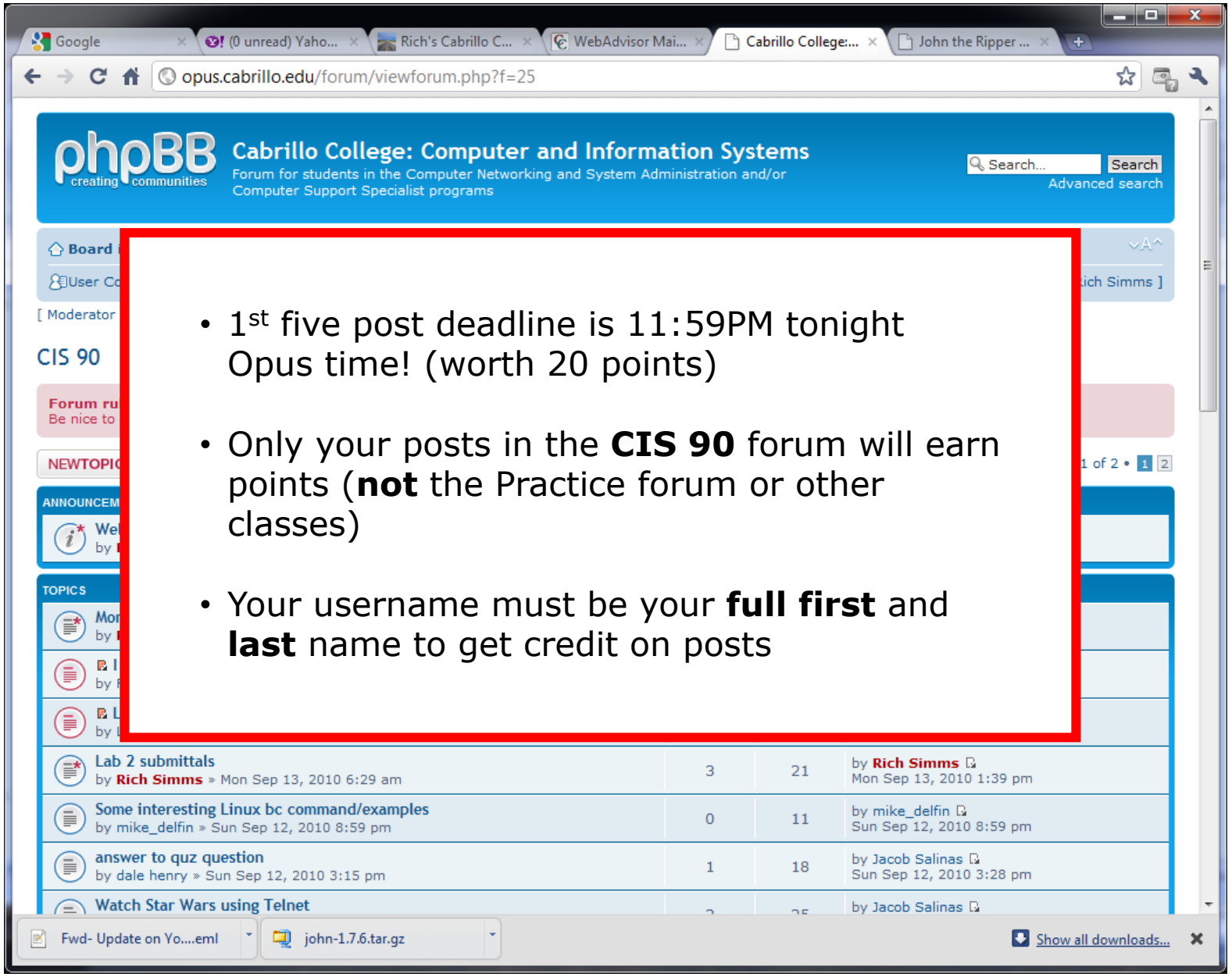
- **Linux Essentials** The Linux Essentials Professional Development Certificate (PDC) is a great way to show employers that you have the foundational skills required for your next job or promotion. It also serves as an ideal stepping-stone to the more advanced LPIC Professional Certification track for Linux Systems Administrators.
  - 60 minute exam at PearsonVue test center
- **LPIC-1** is a junior level certification for Linux administrators. You should be able to perform maintenance tasks with the command line, install & configure a workstation and be able to configure a basic network.
  - LX0-101 exam CompTIA Linux+ Powered by LPI
  - LX0-102 exam CompTIA Linux+ Powered by LPI
- **LPIC-2** is aimed at advanced Linux professionals. To be awarded LPIC level 2 you should be able administer small to medium sized mixed networks and provide suggestions to upper management.
  - LX0-103 exam CompTIA Linux+ Powered by LPI
  - LX0-104 exam CompTIA Linux+ Powered by LPI
- **LPIC-3** is designed for senior-level Linux professionals in an enterprise environment. You should be able to concept, architect, install and troubleshoot LDAP software and integrate with Active Directory.
- LPI Certification Mapping Matrix to Cabrillo College Linux classes

LPI Linux Essentials Certificate
www.lpi.org

Objective	# of Questions	Covered
Topic 1: The Linux Community and a Career in Open Source		
1.1 Linux Evolution and Popular Operating Systems	2	CIS90 Lesson 1
1.2 Major Open Source Applications	2	CIS90 Lesson 1
1.3 Understanding Open Source Software and Licensing	1	CIS90 Lesson 1
1.4 ICT Skills and Working in Linux	2	not covered
Topic 2: Finding Your Way on a Linux System		
2.1 Command Line Basics	2	CIS90 Lesson 2
2.2 Using the Command Line to Get Help	2	CIS90 Lesson 2
2.3 Using Directories and Listing Files	2	CIS 90 Lesson 4
2.4 Creating, Moving and Deleting Files	2	CIS90 Lesson 5
Topic 3: The Power of the Command Line		
3.1 Archiving Files on the Command Line	2	CIS 90 Lesson 14
3.2 Searching and Extracting Data from Files	4	CIS 90 Lesson 8
3.3 Turning Commands into a Script	4	CIS 90 Lesson 13 & 14
Topic 4: The Linux Operating System		
4.1 Choosing an Operating System	1	not covered
4.2 Understanding Computer Hardware	2	CIS 90 Lesson 1
4.3 Where Data is Stored	3	CIS 90 Lesson 1
4.4 Your Computer on the Network	2	CIS 192
Topic 5: Security and File Permissions		
5.1 Basic Security and Identifying User Types	2	CIS 191
5.2 Creating Users and Groups	2	CIS 191
5.3 Managing File Permissions and Ownership	2	CIS 90 Lesson 7
5.4 Special Directories and Files	1	CIS 90 Lesson 4

Some supplemental study options to prepare for this certificate:

- http://www.theurbanpenguin.com/lpi/le.html (free)
- NDG Linux Essentials course on Cisco Networking Academy (free)

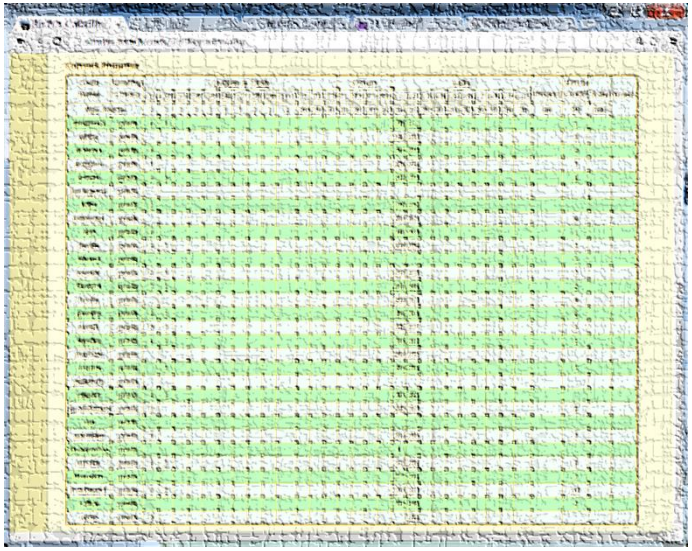


- 1st five post deadline is 11:59PM tonight Opus time! (worth 20 points)
- Only your posts in the **CIS 90** forum will earn points (**not** the Practice forum or other classes)
- Your username must be your **full first** and **last** name to get credit on posts

Where to find your grades

Send me your survey to get your LOR code name.

The CIS 90 website

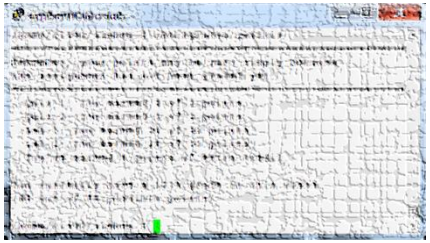


http://simms-teach.com/cis90grades.php

On Opus

`checkgrades` *`codename`*

(where codename is your LOR codename)



The checkgrades script was written by Jessie a past CIS 90 Alumnus

Percentage	Total Points	Letter Grade	Pass/No Pass
90% or higher	504 or higher	A	Pass
80% to 89.9%	448 to 503	B	Pass
70% to 79.9%	392 to 447	C	Pass
60% to 69.9%	336 to 391	D	No pass
0% to 59.9%	0 to 335	F	No pass

At the end of the term I'll add up all your points and assign you a grade using this table

Graded work is copied to your home directories

ls

```
simben90@oslab:~
/home/cis90/simben $ ls
archives     empty         Lab2.0  Miscellaneous  proposal2   text.err  uhistory.bak
bigfile      Hidden        Lab2.1  mission        proposal3   text.fxd  what_am_i
bin          lab01.graded  letter  Poems          small_town  timecal
dead.letter  lab02.graded  log     proposal1      spellk      uhistory
/home/cis90/simben $
```

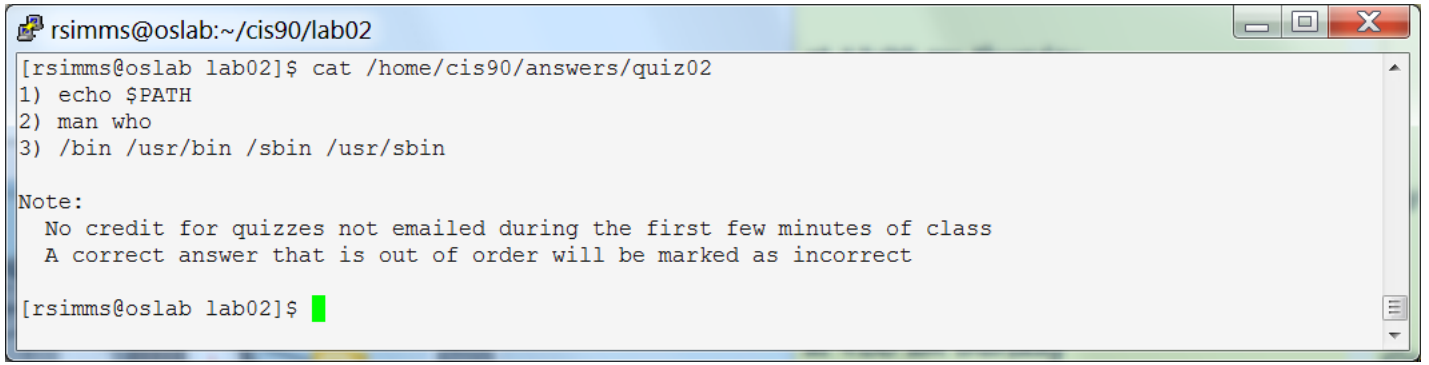
*Log in to Opus and use the **ls, cat,** or **more** commands to see your graded work*

cat lab02.graded

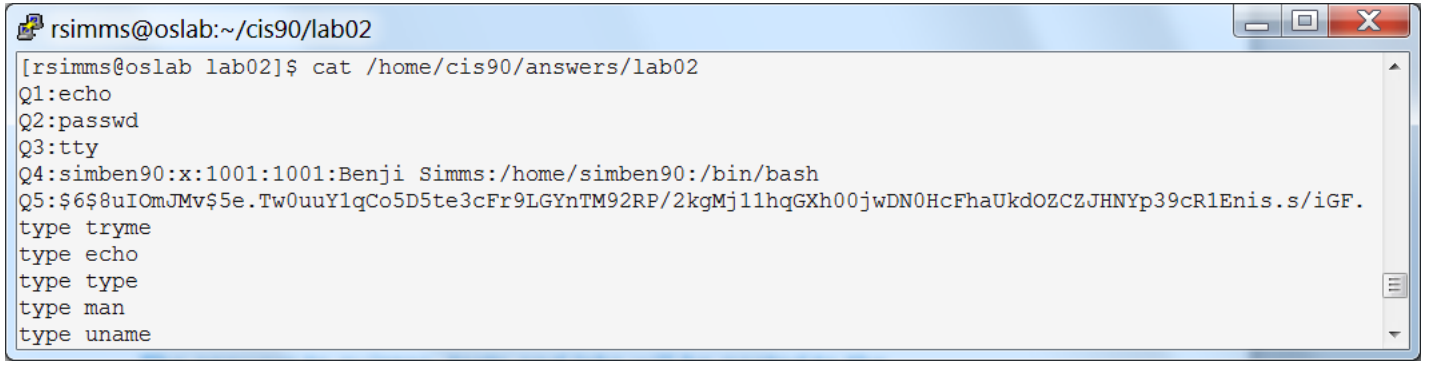
```
simben90@oslab:~
/home/cis90/simben $ cat lab02.graded

GRADING RUBRIC (30 points total)
27 points  for entering the commands on Opus necessary to do
           each step of Lab 2. The instructor will scan
           the commands in your user account's history file
           and take off a point for any missing commands.

 3 points  for correct answers to the three questions asked by
           the submit script (1 point each)

+1 Q4 extra credit answer correct
+1 Q5 extra credit answer correct
```

The answers/ directory on Opus

cat /home/cis90/answers/quiz02

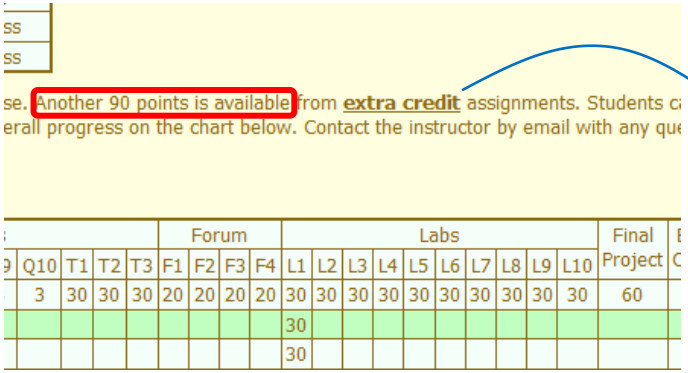


cat /home/cis90/answers/lab02

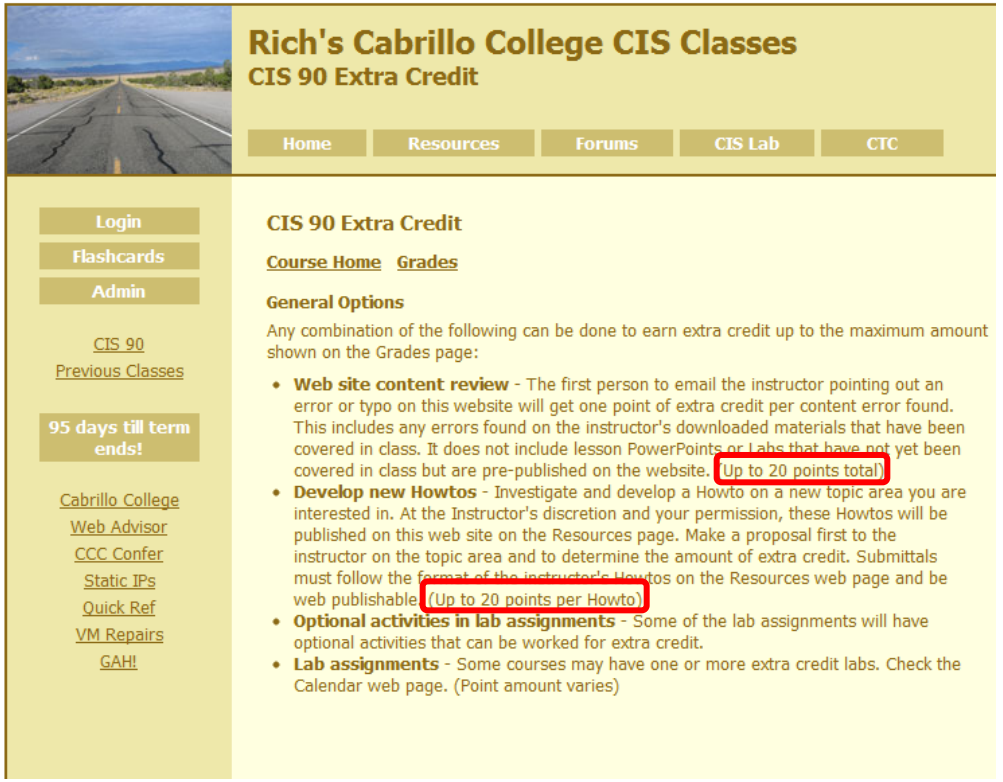


The answers to quizzes, tests and labs will be posted to the /home/cis90/answers/ directory after the due date has passed.

Extra Credit



Note the caps on extra credit.



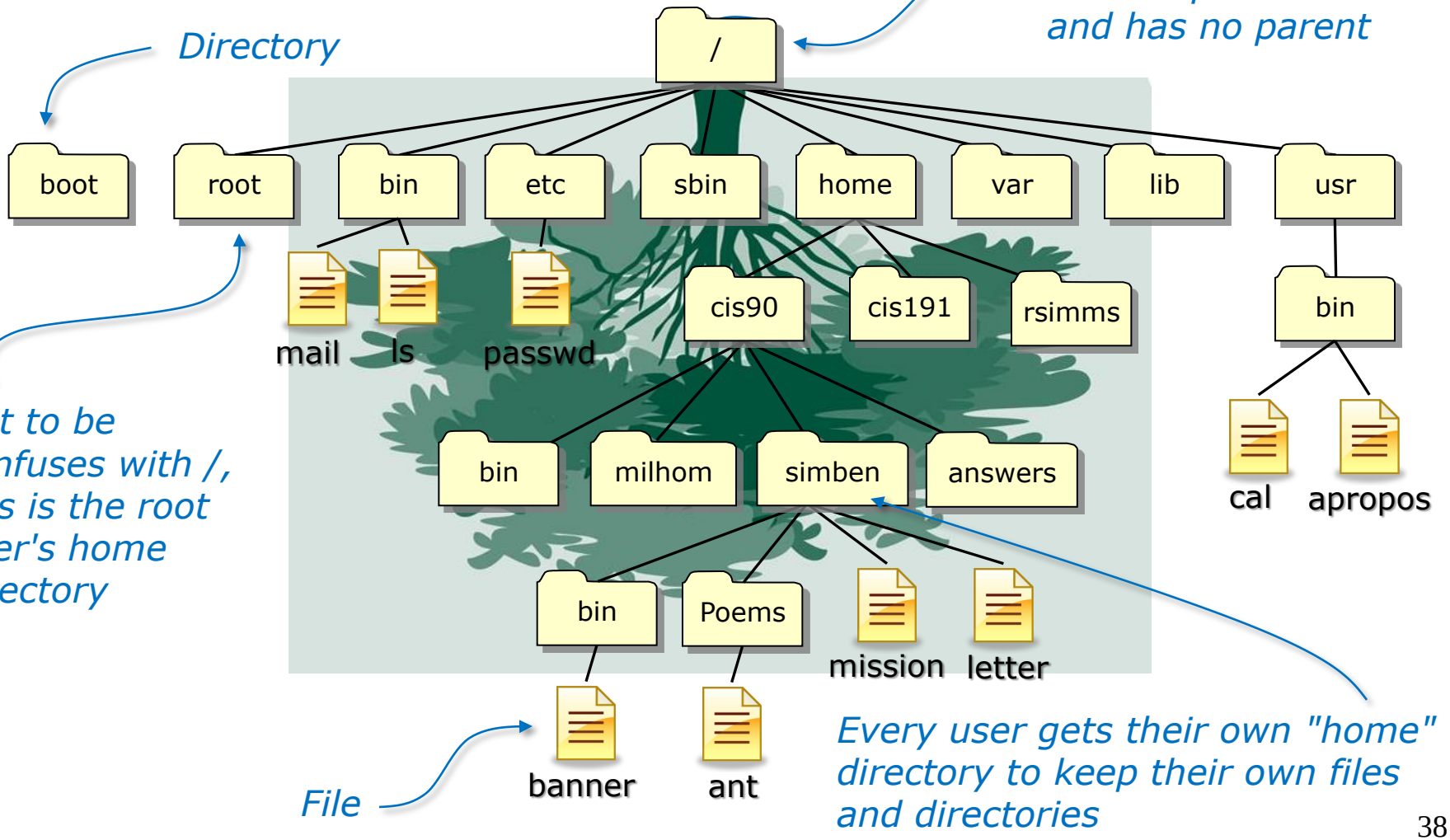
The UNIX File Tree

UNIX File Tree

/ = root of the tree

UNIX File Tree

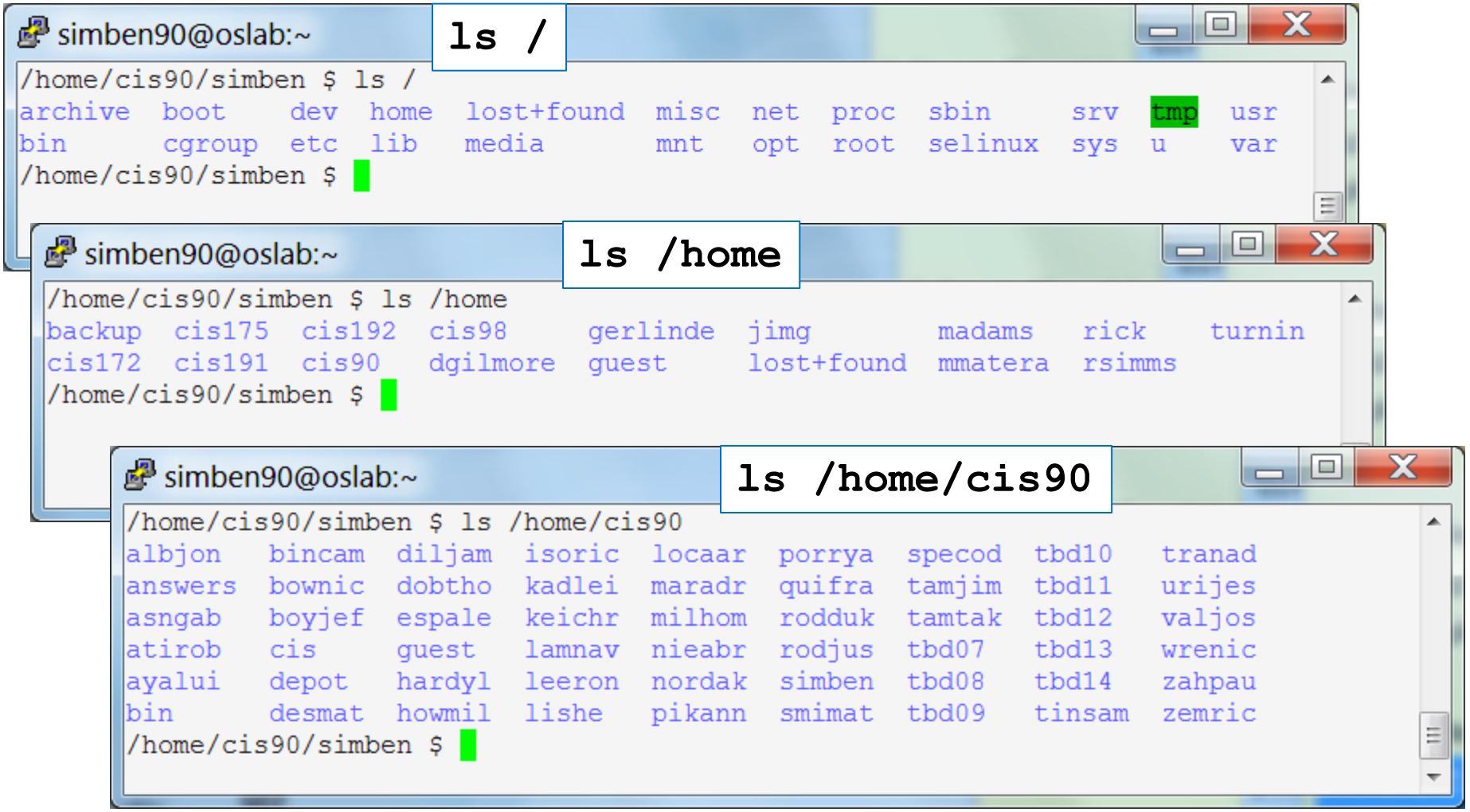
/ = root of the tree



The UNIX/Linux File System Hierarchy

Top-Level Directory	Contents
/bin	binary files forming the commands and shells used by the system administrator and users
/boot	files used during the initial bootup process including the kernel
/dev	device files, like terminals and drives 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

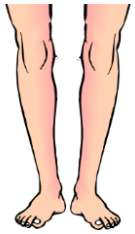
The CIS 90 student home directories



Do you see your home directory in the /home/cis90 directory?

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)

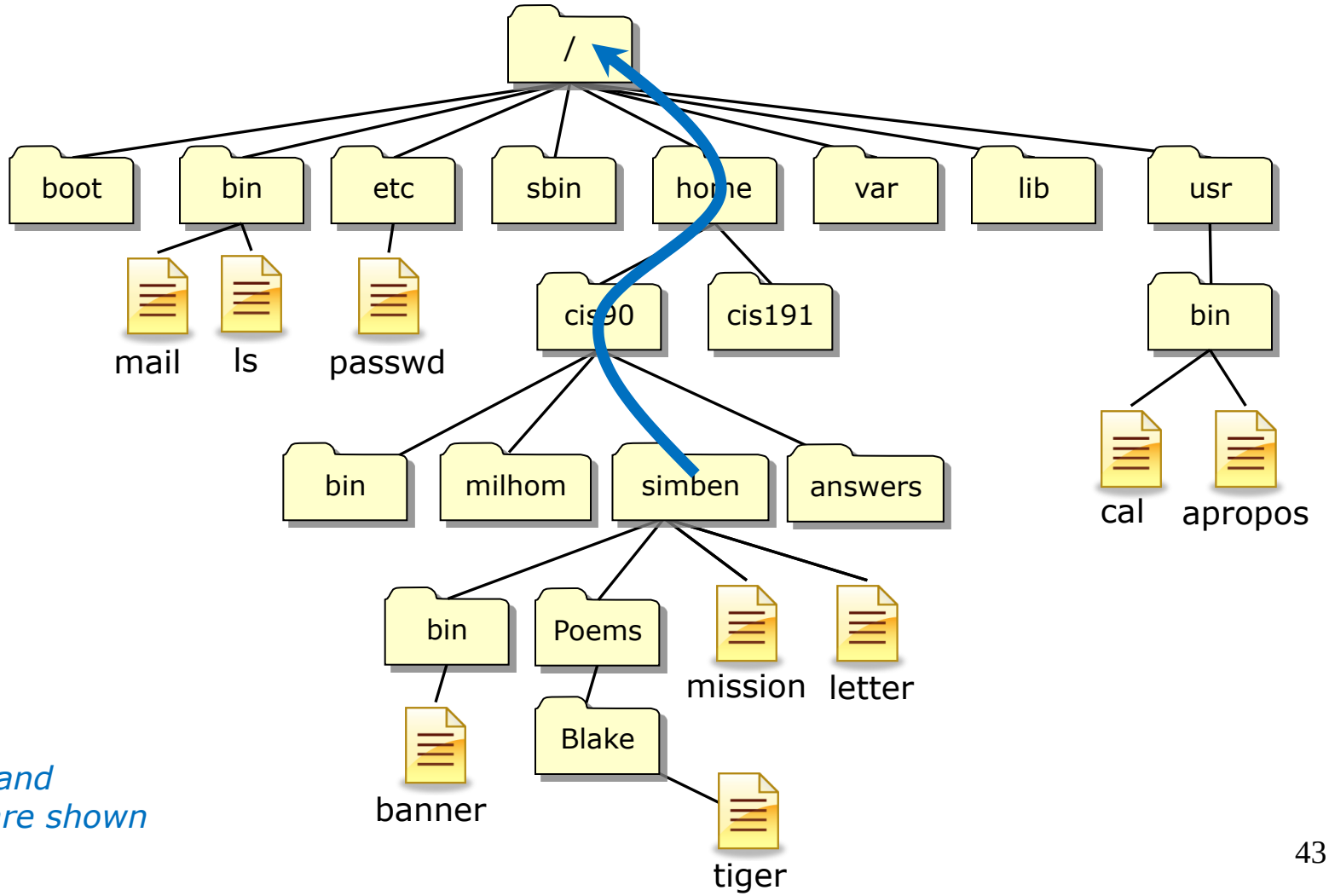
- Use the **`pwd`** command to show your location (your GPS)

Note, as CIS 90 students your shell prompt uses the PWD variable. As you move around the tree your command prompt will change to show your current location.

To see why compare the output of the commands: ***`pwd`*** *and* ***`echo $PWD`***

UNIX File Tree

Navigate from your home directory up to the / directory



Not all files and directories are shown

Navigate from your home directory to the / directory

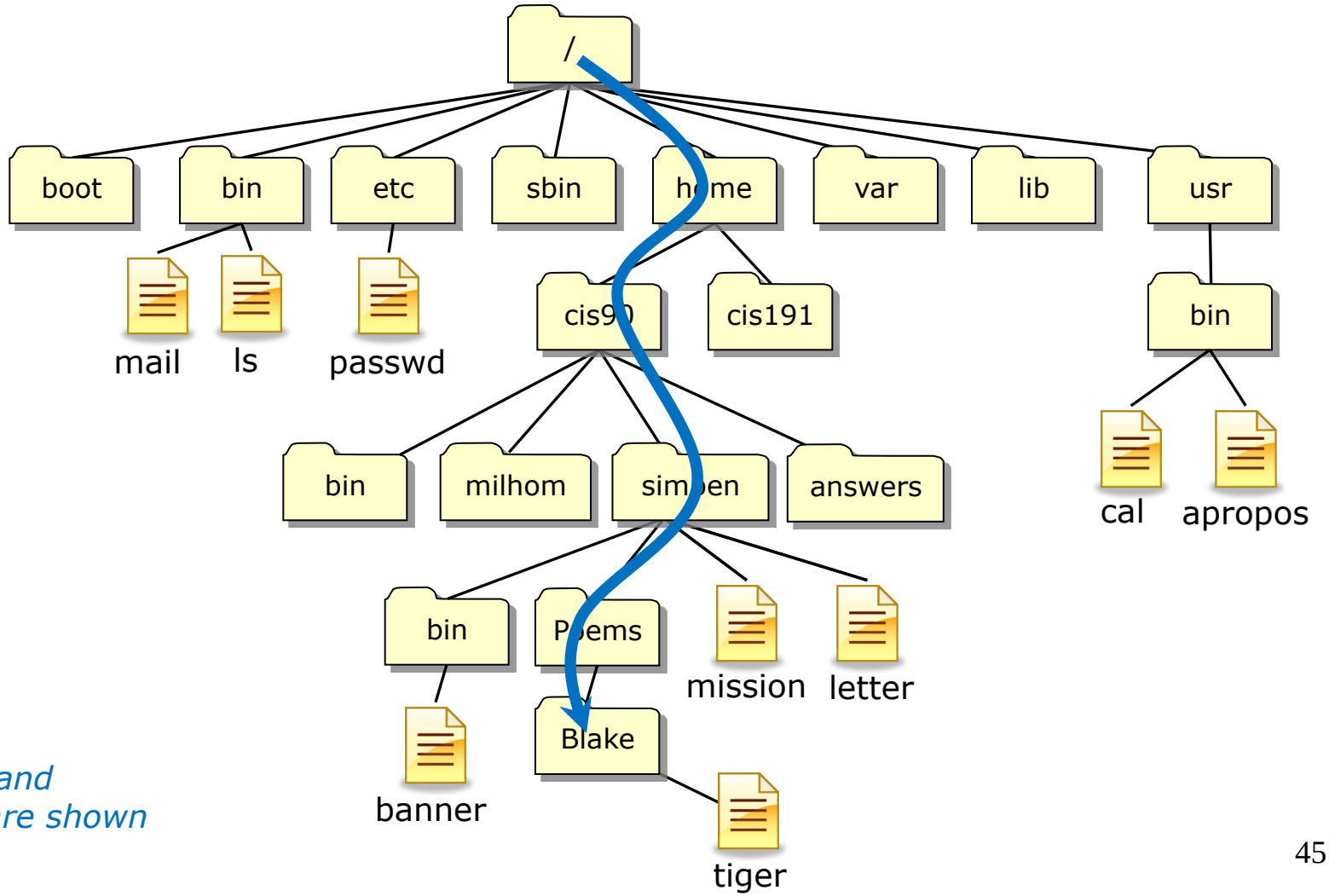
simben90@oslab:/

```
/home/cis90/simben $ ls
archives      Hidden            lab04-mydata  Miscellaneous  proposal3   text.fxd
bigfile       lab01-collection  Lab2.0        mission        small_town  timecal
bin           lab01.graded      Lab2.1        Poems          spellk      uhistory
dead.letter   lab02-collection  letter        proposal1      submit      what_am_i
empty         lab02.graded      log           proposal2      text.err
/home/cis90/simben $ cd ..
/home/cis90 $ ls
albjon   bin     depot   guest   keichr  maradr  porrya  smimat  tbd08  tbd13   valjos
answers  bincam  desmat  hardyl  lamnav  milhom  quifra  specod  tbd09  tbd14   wrenic
asngab   bownic  diljam  howmil  leeron  nieabr  rodduk  tamjim  tbd10  tinsam  zahpau
atirob   boyjef  dobtho  isoric  lishe   nordak  rodjus  tamtak  tbd11  tranad  zemric
ayalui   cis     espale  kadlei  locaar  pikann  simben  tbd07   tbd12  urijes
/home/cis90 $ cd ..
/home $ ls
backup  cis175  cis192  cis98     gerlinde  jimg        madams   rick    turnin
cis172  cis191  cis90   dgilmore  guest     lost+found  mmatera  rsimms
/home $ cd ..
/ $ ls
archive  boot    dev  home  lost+found  misc  net  proc  sbin     srv  tmp  usr
bin      cgroup  etc  lib   media       mnt   opt  root  selinux  sys  u    var
/ $
```

*Use **cd ..** to climb up to the parent directory and **ls** to view the directory contents as you go. Notice how the shell prompt reflects your current location in the tree.*

UNIX File Tree

Navigate from the / directory down to your Blake directory



Not all files and directories are shown

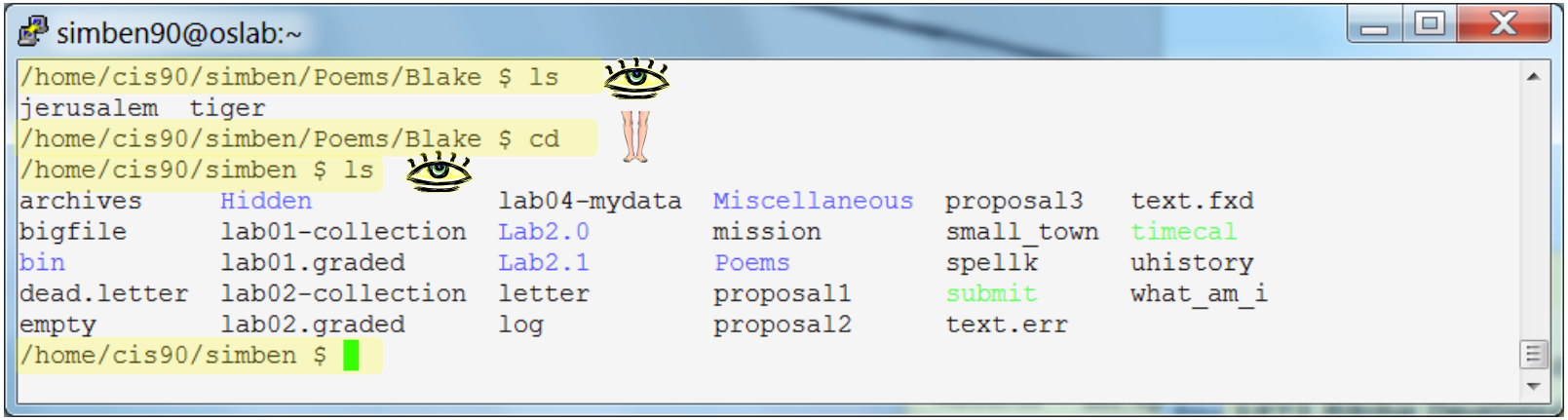
Navigate down to the directory of Blake's poems

simben90@oslab:~/Poems/Blake

```
/ $ ls
archive  boot    dev  home  lost+found  misc  net  proc  sbin     srv  tmp  usr
bin      cgroup  etc  lib   media       mnt   opt  root  selinux  sys  u    var
/ $ cd home
/home $ ls
backup  cis175  cis192  cis98     gerlinde  jimg        madams   rick    turnin
cis172  cis191  cis90   dgilmore  guest     lost+found  mmatera  rsimms
/home $ cd cis90
/home/cis90 $ ls
albjon   bin     depot   guest   keichr  maradr  porrya  smimat  tbd08  tbd13   valjos
answers  bincam  desmat  hardyl  lamnav  milhom  quifra  specod  tbd09  tbd14   wrenic
asngab   bownic  diljam  howmil  leeron  nieabr  rodduk  tamjim  tbd10  tinsam  zahpau
atirob   boyjef  dobtho  isoric  lishe   nordak  rodjus  tamtak  tbd11  tranad  zemric
ayalui   cis     espale  kadlei  locaar  pikann  simben  tbd07   tbd12  urijes
/home/cis90 $ cd simben/
/home/cis90/simben $ ls
archives     Hidden            lab04-mydata  Miscellaneous  proposal3   text.fxd
bigfile      lab01-collection  Lab2.0        mission        small_town  timecal
bin          lab01.graded      Lab2.1        Poems          spellk      uhistory
dead.letter  lab02-collection  letter        proposal1      submit      what_am_i
empty        lab02.graded      log           proposal2      text.err
/home/cis90/simben $ cd Poems/
/home/cis90/simben/Poems $ ls
Angelou  ant  Blake  Dickenson  Neruda  nursery  Shakespeare  twister  Yeats
/home/cis90/simben/Poems $ cd Blake/
/home/cis90/simben/Poems/Blake $ ls
jerusalem  tiger
/home/cis90/simben/Poems/Blake $
```

*Use **cd** <directory> to climb down directory by directory. Notice how the prompt changes to show your location in the Unix file tree*

Navigate back to your home directory



*You always have the power to go home. Just use the **cd** with no arguments to change back to your home directory*

http://vivandlarry.com/wp-content/uploads/2011/05/oz.jpg

Dorothy: Oh, will you help me? Can you help me?
Glinda: You don't need to be helped any longer. You've always had the power to go back to Kansas.
Dorothy: I have?
Scarecrow: Then why didn't you tell her before?
Glinda: Because she wouldn't have believed me. She had to learn it for herself.

Class Field Trip

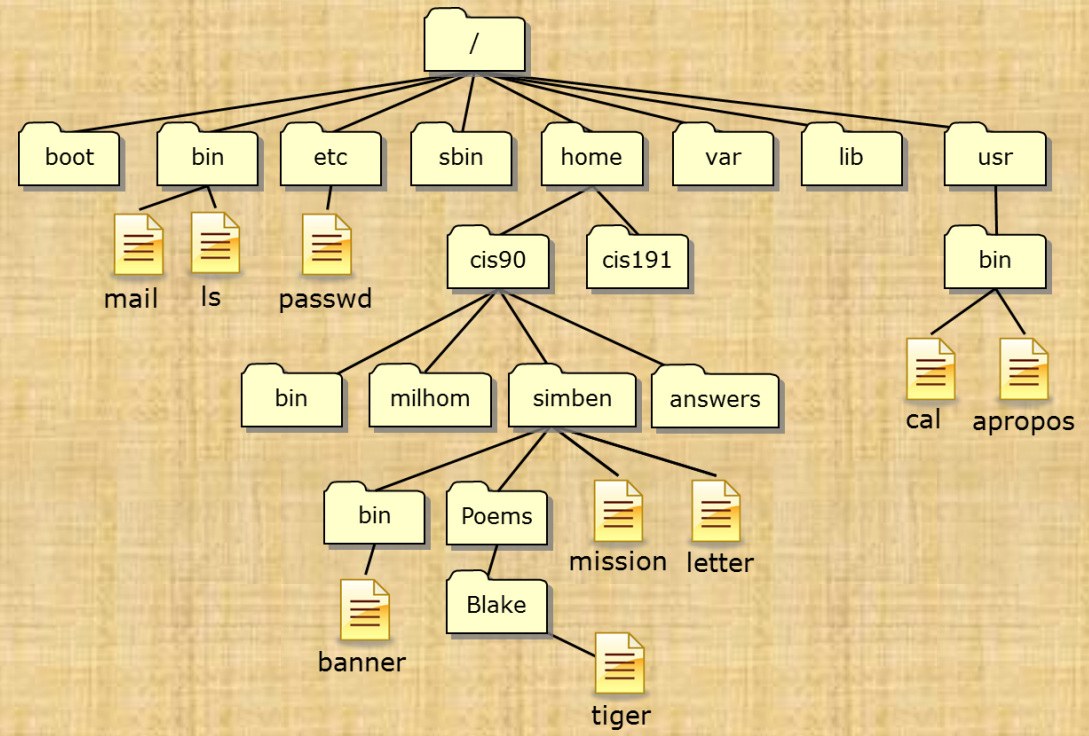
1) /boot
   - The kernel

2) /etc
   - motd
   - passwd

3) /var
   - mail/
   - www/html

4) /home/bin
   - depot
   - bin
   - answers

5) /home/simben/Poems
   - various poem directories



UNIX Files

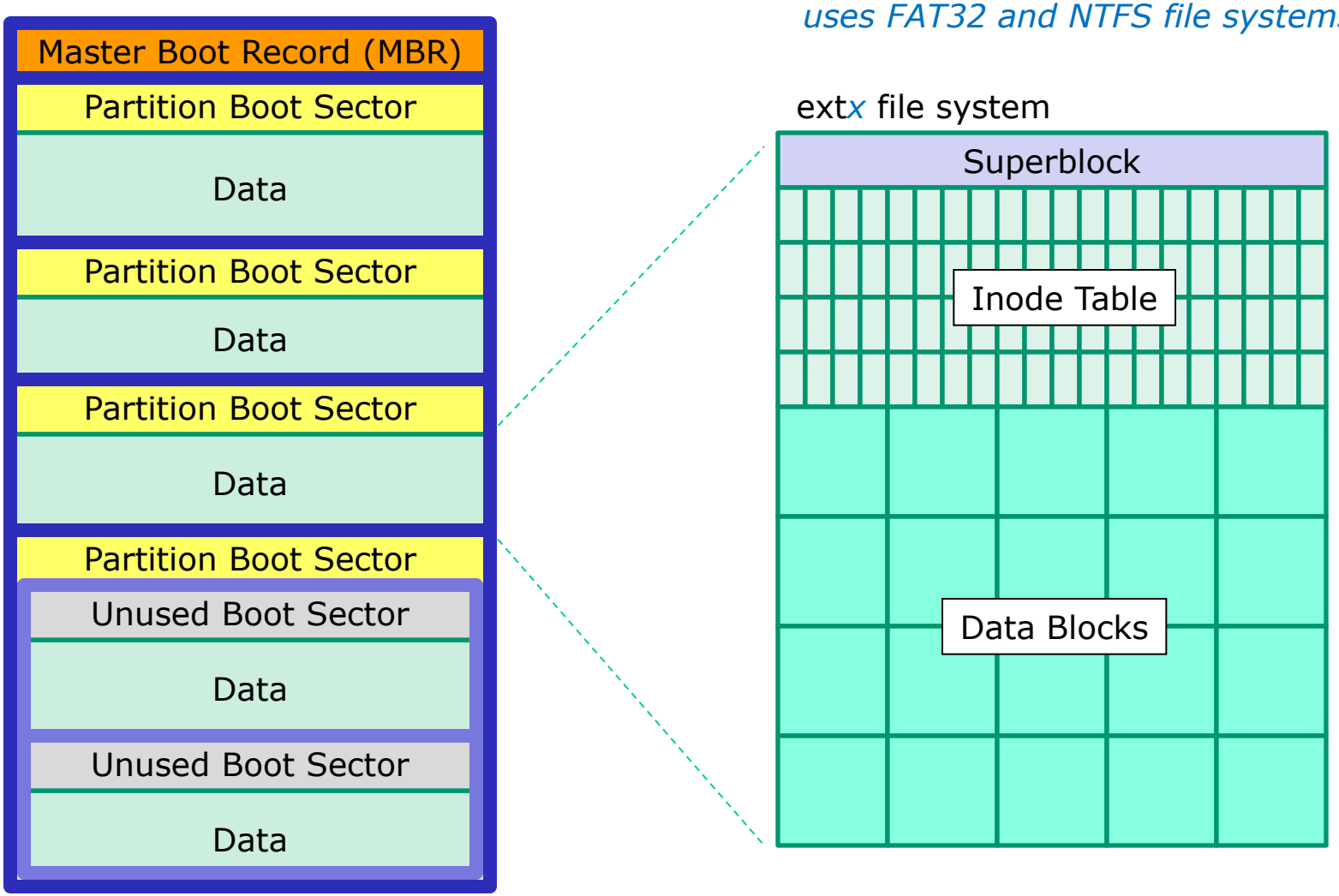
File Systems
Linux

A typical hard drive

This is where your files actually reside

Linux File Systems

The hard drive is partitioned and the data areas can be formatted as a file system. Linux typically uses ext2, ext3 and ext4 file systems. Windows uses FAT32 and NTFS file systems.



The three elements of a UNIX file

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

/home/cis90/simben/Poems $ ls -li twister
102625 -rw-r--r-- 1 simben90 cis90 151 Jul 20  2001 twister

/home/cis90/simben/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?"
```

filename + inode + data

Let's look at the file named letter in Benji's home directory

ls -il letter *will show the inode number and a long listing of the letter file*

cat letter *will show the data contents of the letter file*

```
/home/cis90/simben $ ls -li letter
9662 -rw-r--r--. 1 simben90 cis90 1044 Jul 20  2001 letter
```

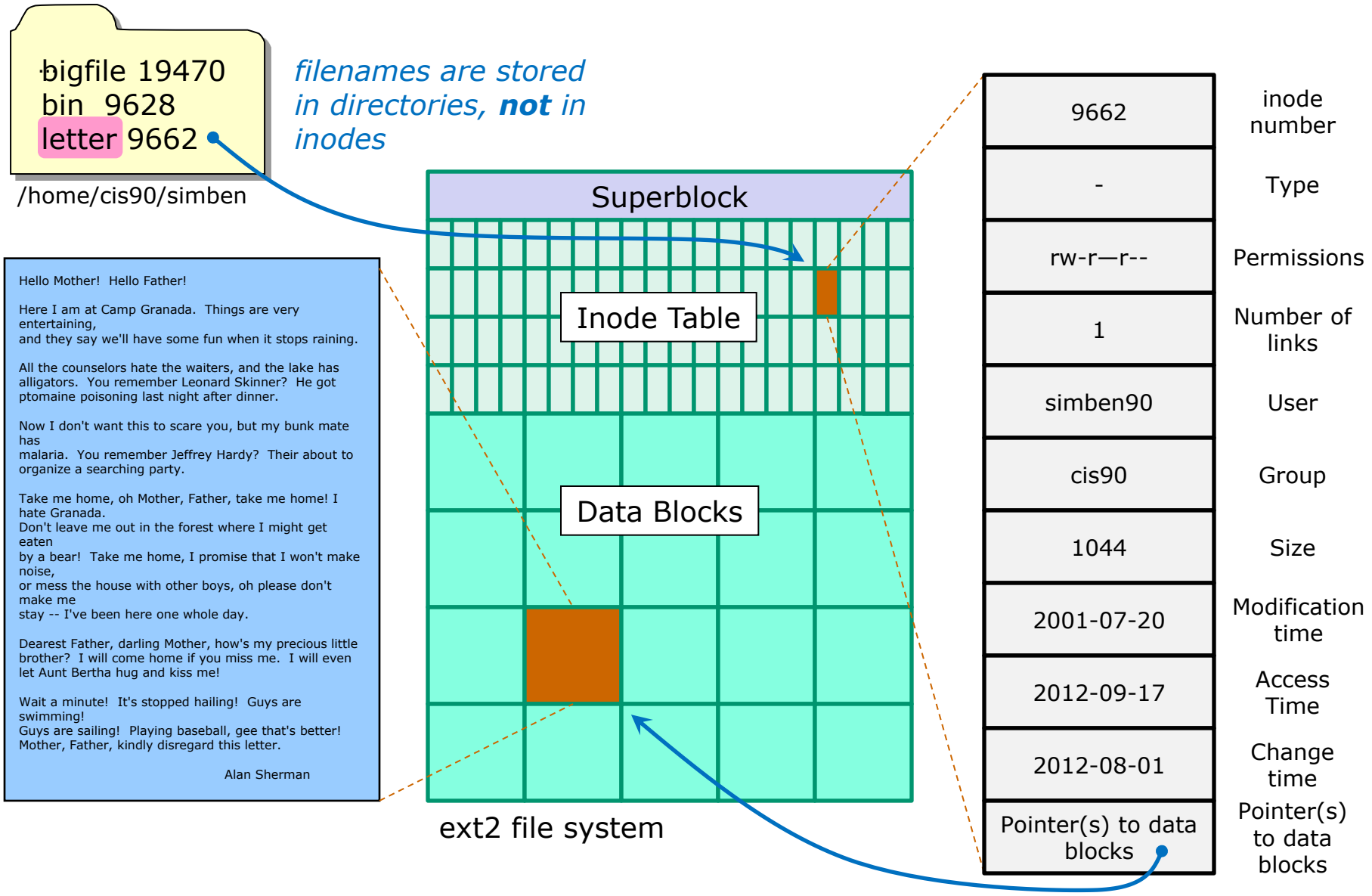
filename

inode

```
/home/cis90/simben $ cat letter
```

```
Hello Mother!  Hello Father!

Here I am at Camp Granada.  Things are very entertaining,
and they say we'll have some fun when it stops raining.

All the counselors hate the waiters, and the lake has
alligators.  You remember Leonard Skinner?  He got
ptomaine poisoning last night after dinner.

Now I don't want this to scare you, but my bunk mate has
malaria.  You remember Jeffrey Hardy?  Their about to
organize a searching party.

Take me home, oh Mother, Father, take me home! I hate Granada.
Don't leave me out in the forest where I might get eaten
by a bear!  Take me home, I promise that I won't make noise,
or mess the house with other boys, oh please don't make me
stay -- I've been here one whole day.

Dearest Father, darling Mother, how's my precious little
brother?  I will come home if you miss me.  I will even
let Aunt Bertha hug and kiss me!

Wait a minute!  It's stopped hailing!  Guys are swimming!
Guys are sailing!  Playing baseball, gee that's better!
Mother, Father, kindly disregard this letter.

                                                Alan Sherman
```

data




```
/home/cis90/simmsben $ ls -il letter
9662 -rw-r--r--. 1 simben90 cis90 1044 Jul 20  2001 letter
```

Directories are files too!

- Directories are implemented as files
- The data in a directory includes pairs of filenames and inode numbers (kind of like a phone book)
- Every directory can contain further sub-directories

In other operating systems like Mac and Windows, a directory is often referred to as a "folder" and represented as a office folder icon on the desktop.

Activity

Type these commands in your home directory:

ls -i

ls -il letter

cat letter

Type the inode of your letter file in the chat window

Unix Filename Conventions

UNIX file name conventions

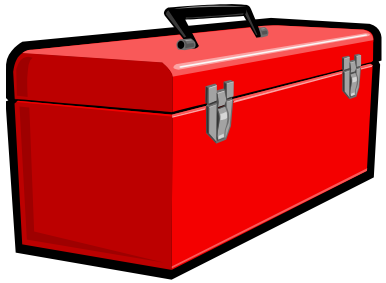
Unix filenames are case sensitive

File names can be any combination of the following:

- Upper and lower case letters: **A-Z** and **a-z**
- Numbers: **0-9**
- Periods, underscores, hyphens: **. _ -**
- Examples: letter, Lab2.1, my_files, my-files

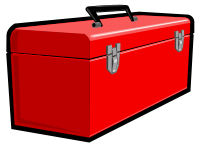
Avoid using the following characters in filenames

- **| ; , ! @ # $ ( ) < > / \ " ' ` ~ { } [ ] = + & ^ <space> <tab>**



More commands for your toolbox

Viewing Text Files



Commands for this lesson

	cat	*to print a text file*
NEW	more	*to print a large text file by scrolling down*
NEW	less	*to print a large text file by scrolling down and up*
NEW	head	*to print the beginning lines of a text file*
NEW	tail	*to print the last lines of a text file*
NEW	wc	*count the words and lines in a text file*
NEW	xxd	*view a binary data file using a hex dump*
	cd	*change to a different directory*
	ls	*list files*
NEW	pwd	*print name of current/working directory*
	file	*show additional file information*
	type	*show location of command on path*

Viewing **text** files:

- file — *useful for identifying if a file is text or binary*

- cat — *to print a file*
- more — *to scroll down through a file*
- less — *to scroll down and up a file*
- head — *to print the beginning lines of a file*
- tail — *to print the last lines of a file*
- wc — *count the words and lines in a text file*

ASCII Text Files

Computers store everything as binary 0's and 1's.

ASCII = American Standard Code for Information Interchange.

ASCII defines binary patterns of 0's and 1's to represent printable text characters.

For example, the letter O is represented by 01001111, the letter z is represented by 01111010.

If a file has data that only contains ASCII text patterns then it is considered a **text file** and "printable".

If some or all of the bit patterns are not ASCII characters then the file is considered a **binary file** and unprintable.

To see all the ASCII characters use the **man ascii** command.

Thanks Hunter! See Hunter's post at http://oslab.cishawks.net/forum/viewtopic.php?f=88&t=2258&p=8357

Identifying text files with the file command


```
/home/cis90/simben $ file letter Poems proposal1 mission uhistory what_am_i
letter:     ASCII English text
Poems:      directory
proposal1: ASCII English text
mission:    ASCII English text
uhistory:   ASCII mail text
what_am_i: data
/home/cis90/simben $
```

Look for the word "text" in the output to indicate an ASCII text file

If you don't see "text" it's a binary file and unprintable. Note: what_am_i and Poems are not text files

The text viewing commands like cat, more, head, etc. only work on text files. They are not meant to be used to view binary data files or directories.

cat command

used to view a text file

A single argument, letter, is given to the cat command to process

```
/home/cis90/simben $ cat letter
Hello Mother!  Hello Father!

Here I am at Camp Granada.  Things are very entertaining,
and they say we'll have some fun when it stops raining.

All the counselors hate the waiters, and the lake has
alligators.  You remember Leonard Skinner?  He got
ptomaine poisoning last night after dinner.
```

< Snipped >

```
Wait a minute!  It's stopped hailing!  Guys are swimming!
Guys are sailing!  Playing baseball, gee that's better!
Mother, Father, kindly disregard this letter.

                                                Alan Sherman

/home/cis90/simben $
```

cat command

viewing multiple text files

```
/home/cis90/simben $ cat spellk letter
Spell Check


Eye halve a spelling chequer
It came with my pea sea
It plainly marques four my revue
< snipped >
Eye have run this poem threw it
I am shore your pleased two no
Its letter perfect awl the weigh
My chequer tolled me sew.

Hello Mother!  Hello Father!

Here I am at Camp Granada.  Things are very entertaining,
and they say we'll have some fun when it stops raining.
< snipped >
Wait a minute!  It's stopped hailing!  Guys are swimming!
Guys are sailing!  Playing baseball, gee that's better!
Mother, Father, kindly disregard this letter.

                                                  Alan Sherman
/home/cis90/simben $
```

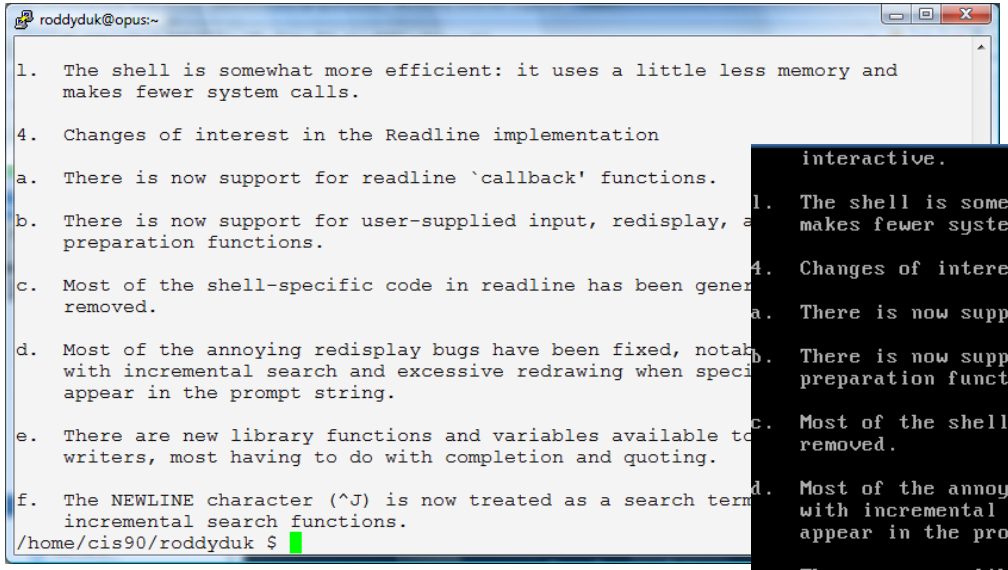
spellk

letter

Multiple arguments, spellk and letter, are passed to the cat command to process

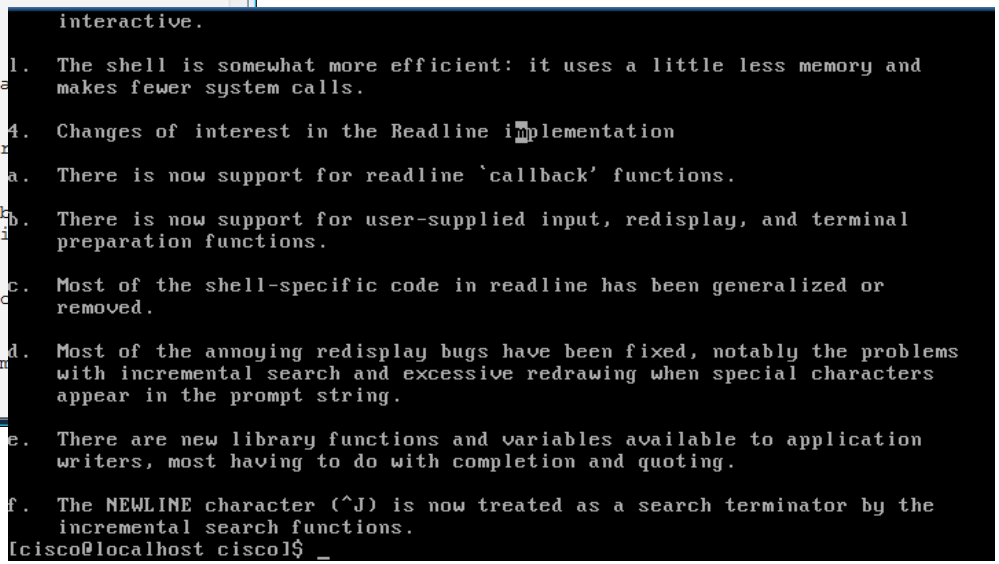
cat command
viewing long text files

- 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.

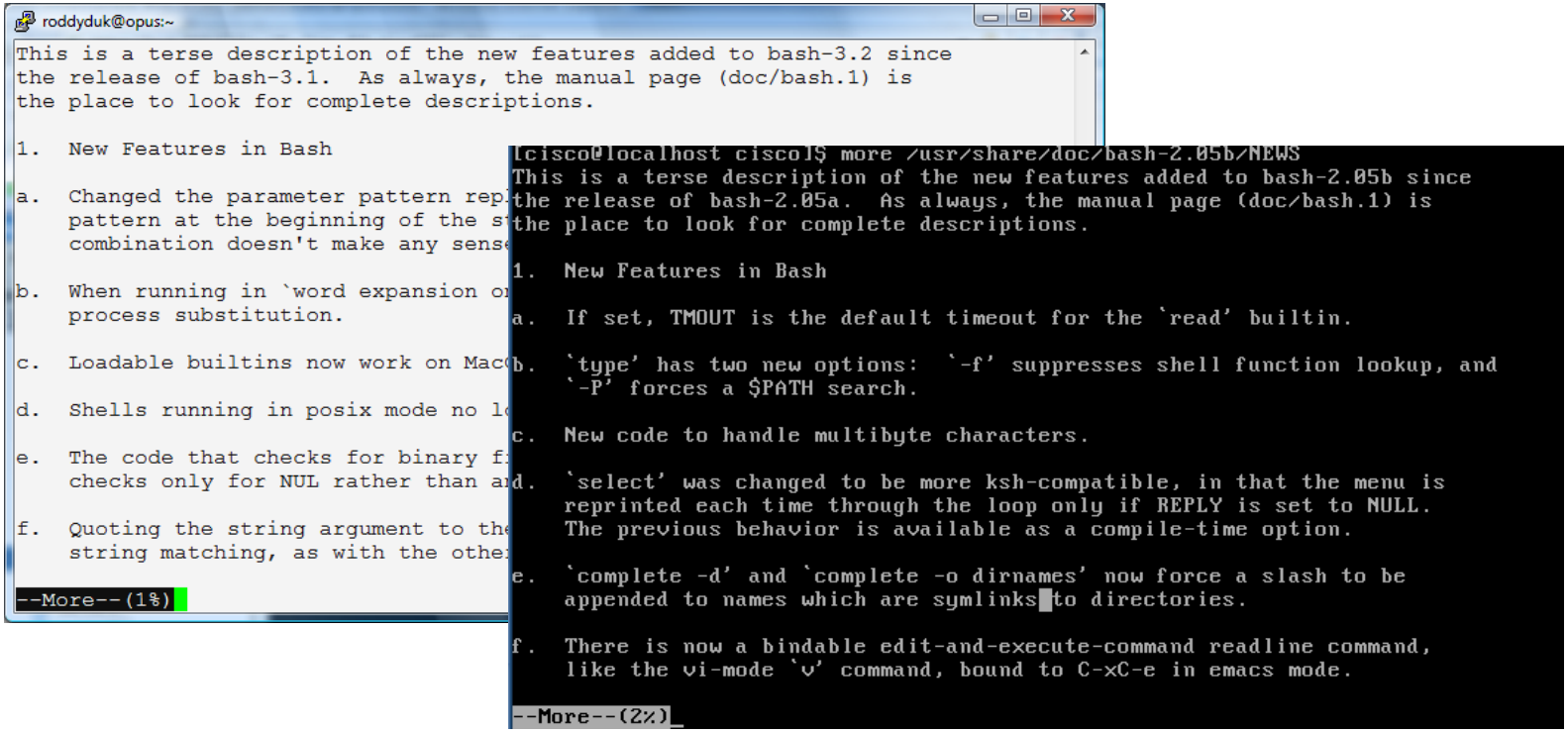
And virtual terminals have no scroll bars!



more command

viewing long text files

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



*Use the **space bar** to page forward and **q** to quit*

more command
viewing multiple text files

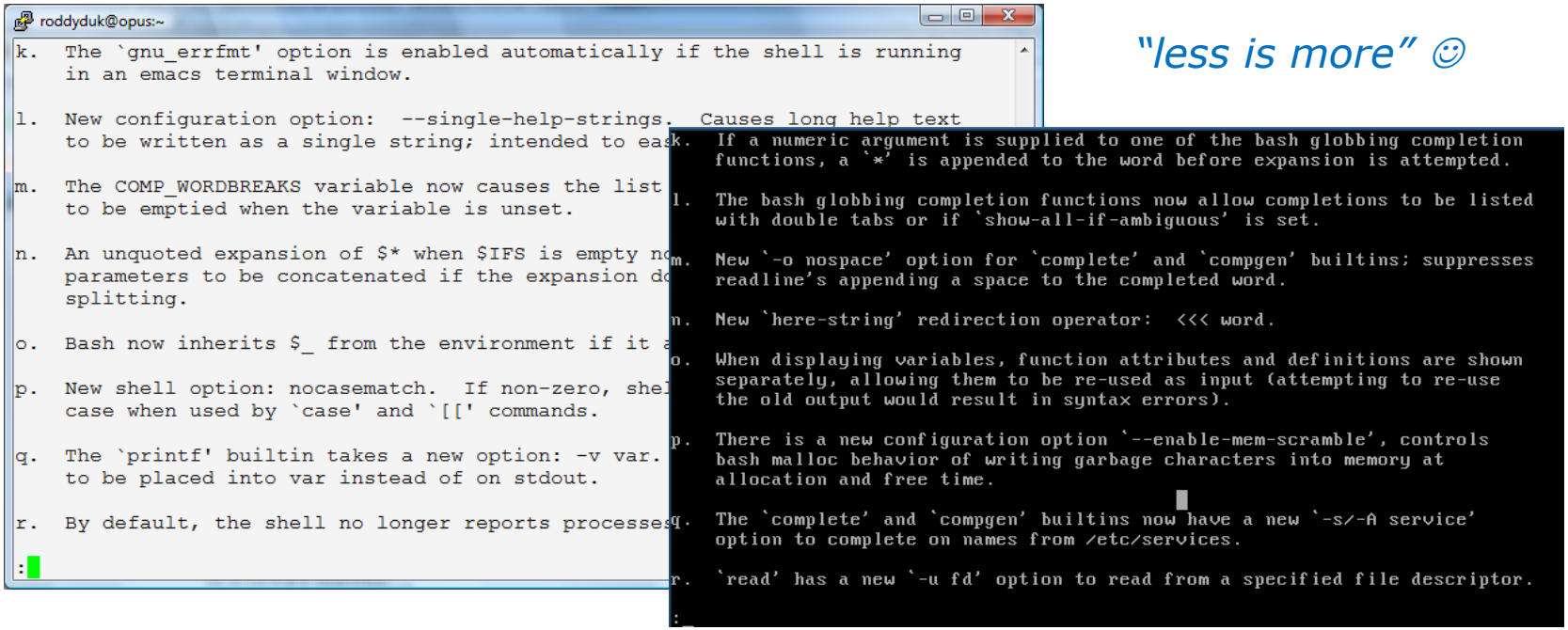
- The **more** command can take multiple arguments

```
/home/cis90/simben $ more spellk letter
::::::::::::::
spellk
::::::::::::::
Spell Check


Eye halve a spelling chequer
It came with my pea sea
< snipped >
Its letter perfect awl the weigh
My chequer tolled me sew.

::::::::::::::
letter
::::::::::::::
Hello Mother!  Hello Father!
< snipped >
Guys are sailing!  Playing baseball, gee that's better!
Mother, Father, kindly disregard this letter.

                                                    Alan Sherman

/home/cis90/simben $
```

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

less command
viewing long text files

- Use the **less** command to scroll forward and backward through really long text files. (just like the man command works)
- For example: **`less /usr/share/doc/bash-3.2/NEWS`**



"less is more" ☺

*Use the **pg up/dn** and up/down arrows to move through text file. Use **q** to quit. For multiple arguments use **:n** and **:p** to move between multiple text files. See the man page for many more options like searching.*

head command

view the first lines in a text file

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

Print the first lines of the file proposal1

```
/home/cis90/simben $ head proposal1
A Plan for the Improvement of English Spelling
   by Mark Twain
For example, in Year 1 that useless letter "c" would be dropped to be replased
either by "k" or "s", and likewise "x" would no longer be part of the alphabet.
The only kase in which "c" would be retained would be the "ch" formation, which
will be dealt with later. Year 2 might reform "w" spelling, so that "which" and
"one" would take the same konsonant, wile Year 3 might well abolish "y"
replasing it with "i" and Iear 4 might fiks the "g/j" anomali wonse and for all.
Jenerally, then, the improvement would kontinue iear bai iear with Iear 5 doing
awai with useless double konsonants, and Iears 6-12 or so modifaiing vowlz and
/home/cis90/simben $
```

Print the first 3 lines of the file proposal1

```
/home/cis90/simben $ head -n 3 proposal1
A Plan for the Improvement of English Spelling
   by Mark Twain
For example, in Year 1 that useless letter "c" would be dropped to be replased
/home/cis90/simben $
```

head command

view the first lines of multiple text files

```
/home/cis90/simben $ head -n2 mission letter spellk log
==> mission <==
                        Mission * Purpose * Values

==> letter <==
Hello Mother!  Hello Father!

==> spellk <==
Spell Check

==> log <==
lab01 was submitted on Wed Feb  8 16:23:35 PST 2012
lab01 was submitted on Wed Feb  8 16:58:20 PST 2012
```

Print the first 2 lines of each of these files

Note the small banners containing the filename which separates each file.

The second line of the first three files are blank.

tail command

view the last lines in a text file

- Use the **tail** command to show the last several lines of a file.
- Use the **-n** <*number*> option to control the number of lines printed.

```
/home/cis90/simben $ tail mission
```

Print the tail end of the file

```
       environment which aids students in their pursuit of transfer,
       career preparation, personal fulfillment, job advancement, and
       retraining goals.

       Our core values are academic freedom, critical and independent
       thinking, and respect for all people and cultures. Our commitment
       is to encourage excellence, offer a balanced curriculum, promote
       teaching methods for diverse learning styles, and involve and
       enrich our community.
```

```
/home/cis90/simben $ tail -n3 mission
```

Print the last 3 lines of the file

```
       teaching methods for diverse learning styles, and involve and
       enrich our community.
```

wc command

count words and lines in a text file


```
/home/cis90/simben $ wc letter
  28   182 1044 letter
```

#bytes
#words
#lines

```
/home/cis90/simben $ wc -l letter
28 letter
```

Use the -l option to count just the number of lines

```
/home/cis90/simben $ wc -w letter
182 letter
```

Use the -w option to count just the number of words

```
/home/cis90/simben $ wc letter mission proposal1
  28   182 1044 letter
  18   107   759 mission
  16   196 1074 proposal1
  62   485 2877 total
```

The wc command can take multiple arguments

Class Exercise
Viewing Text Files

- Print the first 3 lines of the log file

  head -n3 log

- Count the number of words in small_town

  wc -w small_town

- Print the proposal1 file

  cat proposal1

What happens if you use tac instead of cat? (tac is cat spelled backwards)

Viewing binary files

Viewing **binary** files:

- file *useful for identifying whether a file is text or binary*
- xxd *show the contents of a binary file as a "hex dump"*

Identifying Binary Files

binary files

```
/home/cis90/simben $ file /bin/uname what_am_i spellk bin/enlightenment
/bin/uname:          ELF 32-bit LSB executable, Intel 80386, version 1
(SYSV), dynamically linked (uses shared libs), for GNU/Linux 2.6.18,
stripped
what_am_i:           data
spellk:              ASCII English text
bin/enlightenment: POSIX shell script text executable
```

text files

If the output of the file command does not contain "text" then the file is most likely a binary file

Binary Files

Binary files should not be viewed with cat, more, less, head, tail, etc.

```
/home/cis90/simben $ cat /bin/uname
ELF04`I4(444444▒>▒>@▒( A  ▒▒HHH  P▒td▒644Q▒td/lib/ld-
linux.so.2GNU       (B▒`(*▒K▒▒G-▒▒>K▒▒▒▒y▒cg▒}Ti▒▒▒▒▒ w▒)
                                 ▒▒C52L▒/9=@▒x▒H_▒^fOI ▒
G▒<▒▒▒▒▒'▒▒6?▒▒▒▒w▒C*Y▒▒A▒▒$),K,∫▒"▒),K▒▒H▒.▒▒▒▒▒▒▒.▒▒▒.▒▒▒▒▒▒.▒▒▒▒
▒▒▒.▒▒▒▒▒▒/▒d8/▒▒▒▒▒▒</▒▒▒▒▒▒▒/▒▒▒▒▒▒▒/▒▒▒▒▒▒▒▒sii▒▒▒▒/▒▒ii▒▒▒▒w▒▒▒~▒▒w
▒▒~▒▒w▒▒▒~▒▒▒w▒▒▒~▒▒▒w▒▒ii
▒▒▒▒)▒▒*+, $(,08▒ <▒
< snipped >
uTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTT
YPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPu
TTYPuTTYPuTTYPuTTY
/home/cis90/simben $
```

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

Binary Files

Use xxd command to view

The file /bin/uname is viewed as a hex dump

E=ASCII 45 at 00000001
L=ASCII 4c at 00000002
F=ASCII 46 at 00000003

```
/home/cis90/simben $ xxd /bin/uname
0000000: 7f45 4c46 0101 0100 0000 0000 0000 0000  .ELF............
0000010: 0200 0300 0100 0000 308b 0408 3400 0000  ........0...4...
0000020: 6049 0000 0000 0000 3400 2000 0800 2800  `I......4. ...(.
0000030: 1f00 1e00 0600 0000 3400 0000 3480 0408  ........4...4...
0000040: 3480 0408 0001 0000 0001 0000 0500 0000  4...............
0000050: 0400 0000 0300 0000 3401 0000 3481 0408  ........4...4...
0000060: 3481 0408 1300 0000 1300 0000 0400 0000  4...............
0000070: 0100 0000 0100 0000 0000 0000 0080 0408  ................
< snipped >
0004df0: 0000 0000 0000 0000 d842 0000 6c05 0000  .........B..l...
0004e00: 0000 0000 0000 0000 0400 0000 0100 0000  ................
0004e10: 0100 0000 0300 0000 0000 0000 0000 0000  ................
0004e20: 4448 0000 1901 0000 0000 0000 0000 0000  DH..............
0004e30: 0100 0000 0000 0000                      ........
/home/cis90/simben $
```

Hexadecimal offsets into the file

The printable "ELF" above is located between hex offsets 00000000 and 00000010 shown on the left column

Class Exercise

Where is the hostname command?

```
type hostname
```

What kind of file is the hostname command?

```
file /bin/hostname
```

Try to cat the hostname command:

```
cat /bin/hostname
```

Do a hex dump of the hostname command:

```
xxd /bin/hostname
```

File Types

Understanding a Long Listing


```
/home/cis90/simben $ ls letter
letter
```

The l option on the ls command produces a "long listing" that shows more information

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Jul 20  2001 letter
```

permissions

owner (the username that owns the file)

group

size (in bytes)

modification date

filename

number of hard links

file type

Understanding a Long Listing

The l option on the ls command produces a "long listing" that shows more information

```
/home/cis90/simben $ ls -l
total 132
-rw-rw-r--. 1 simben90 cis90  4008 Sep 11 22:23 archives
-rw-r--r--. 2 simben90 cis90 10576 Jul 20  2001 bigfile
drwxr-xr-x. 2 simben90 cis90  4096 Sep 11  2005 bin
-rw-------. 1 simben90 cis90  1445 Sep 13 15:13 dead.letter
-rw-r--r--. 1 simben90 cis90     0 Jul 20  2001 empty
d---------. 2 simben90 cis90  4096 Feb  1  2002 Hidden
-r--------. 1 simben90 staff  2780 Sep  6 13:47 lab01.graded
-r--------. 1 simben90 staff  1312 Sep 13 12:27 lab02.graded
drwxr-xr-x. 2 simben90 cis90  4096 Feb 17  2001 Lab2.0
drwxr-xr-x. 3 simben90 cis90  4096 Feb 17  2001 Lab2.1
-rw-r--r--. 1 simben90 cis90  1044 Jul 20  2001 letter
   < snipped  >
-rw-r--r--. 1 simben90 cis90   485 Aug 26  2003 spellk
-rw-r--r--. 1 simben90 cis90   250 Jul 20  2001 text.err
-rw-r--r--. 1 simben90 cis90   231 Jul 20  2001 text.fxd
-rwxr-xr-x. 1 simben90 cis90   509 Jun  6  2002 timecal
-rw-rw-r--. 1 simben90 cis90 20829 Sep 17 18:06 uhistory
-rw-r--r--. 1 simben90 cis90   352 Jul 20  2001 what_am_i
```

*A "d" indicates a **directory***

*A "-" indicates a **regular file***

Column 1 of long listings shows basic file types

Directory filenames also appear in blue

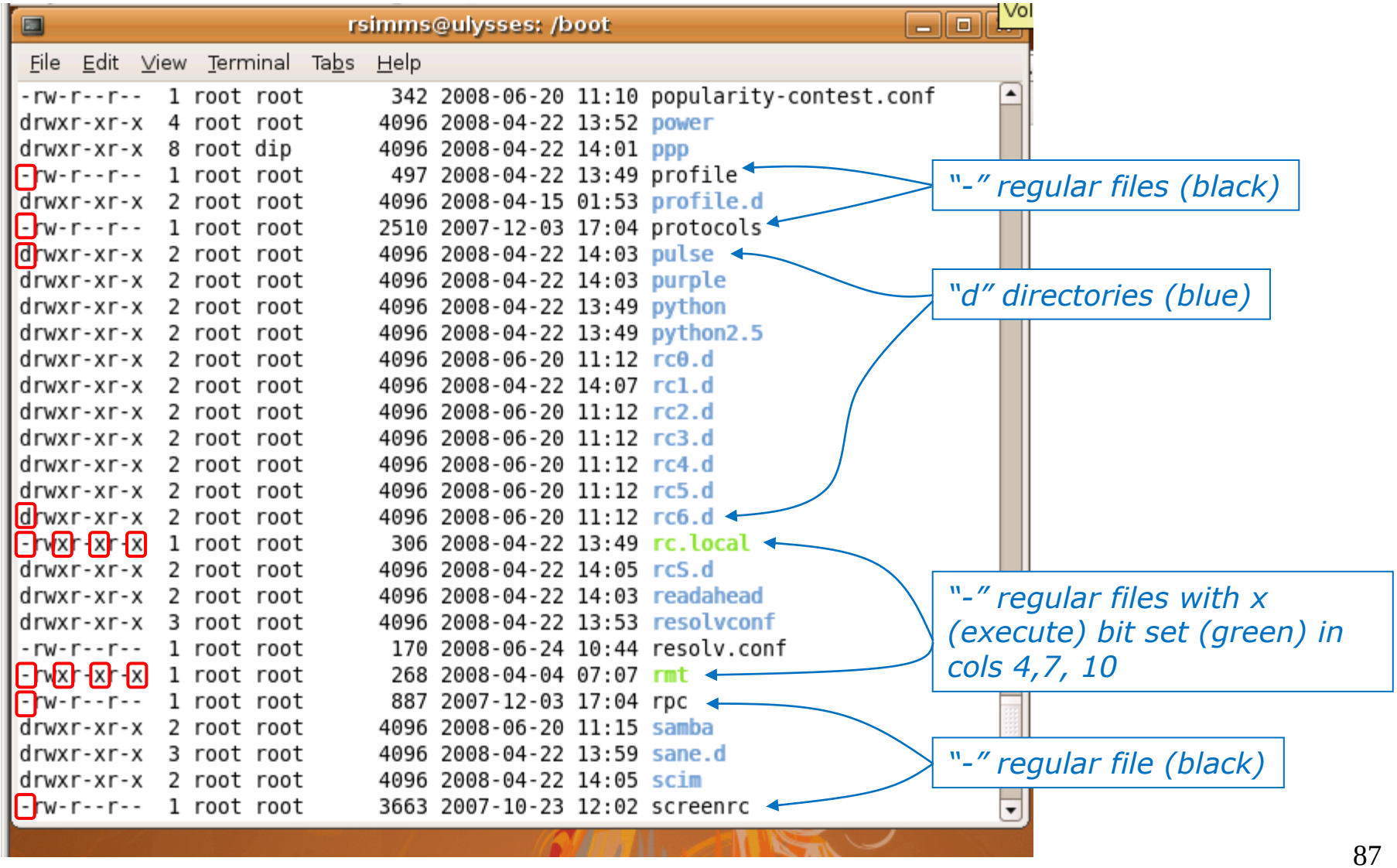
Some Common File Types

Column 1 of long listing	Type	How to make one
d	**Directory**	mkdir
-	**Regular** • Programs • Text • Data (binary) • Many more … *Use the **file** command to further classify regular files*	touch vi >
l	**Symbolic link**	ln -s
c	**Character special device**	mknod
b	**Block special device**	mknod

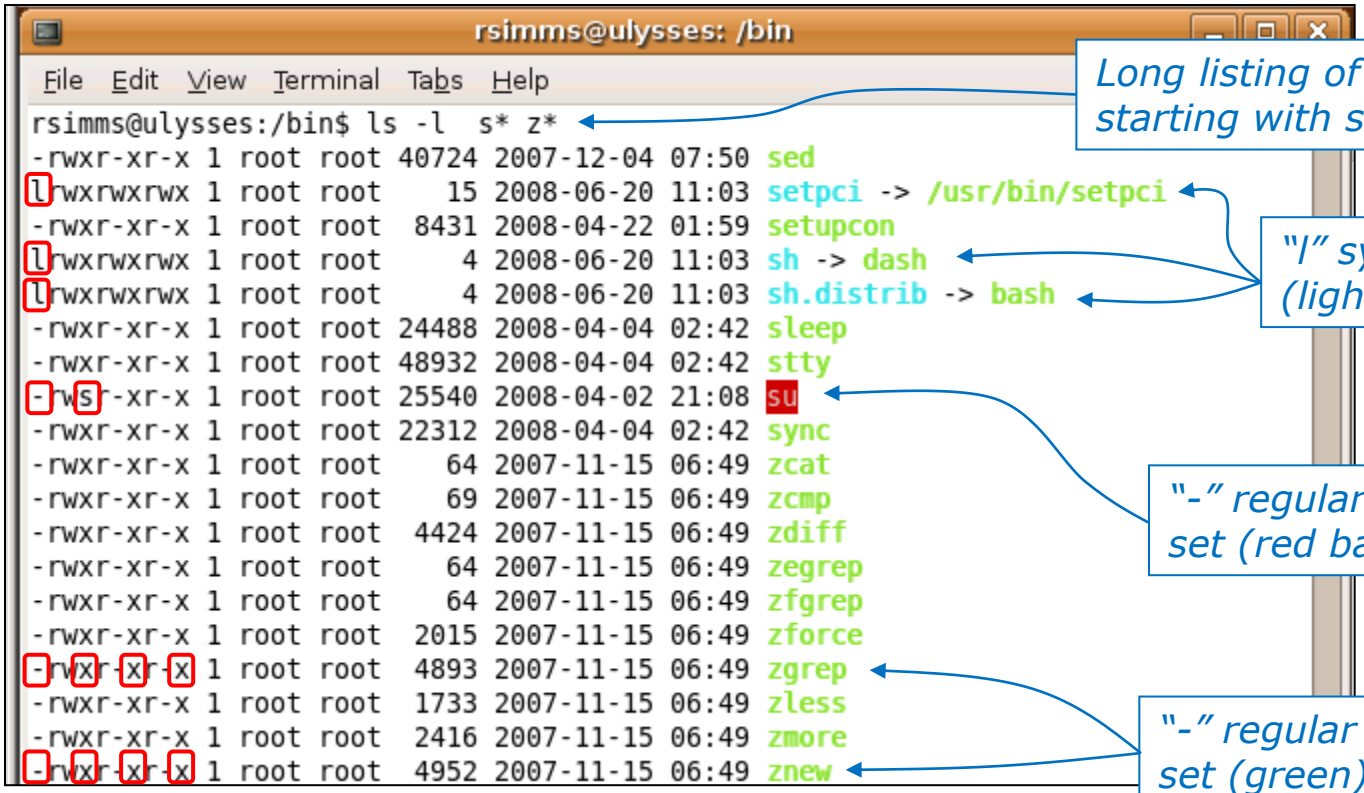
Every file has a specific type attribute which is stored in the inode.

*File types can be viewed in column 1 of **long listings**.*

The /etc directory (Ubuntu)



A portion of the /bin directory (Ubuntu)



*Long listing of files with names starting with s or z (more on * later)*

"l" symbolic links (light blue)

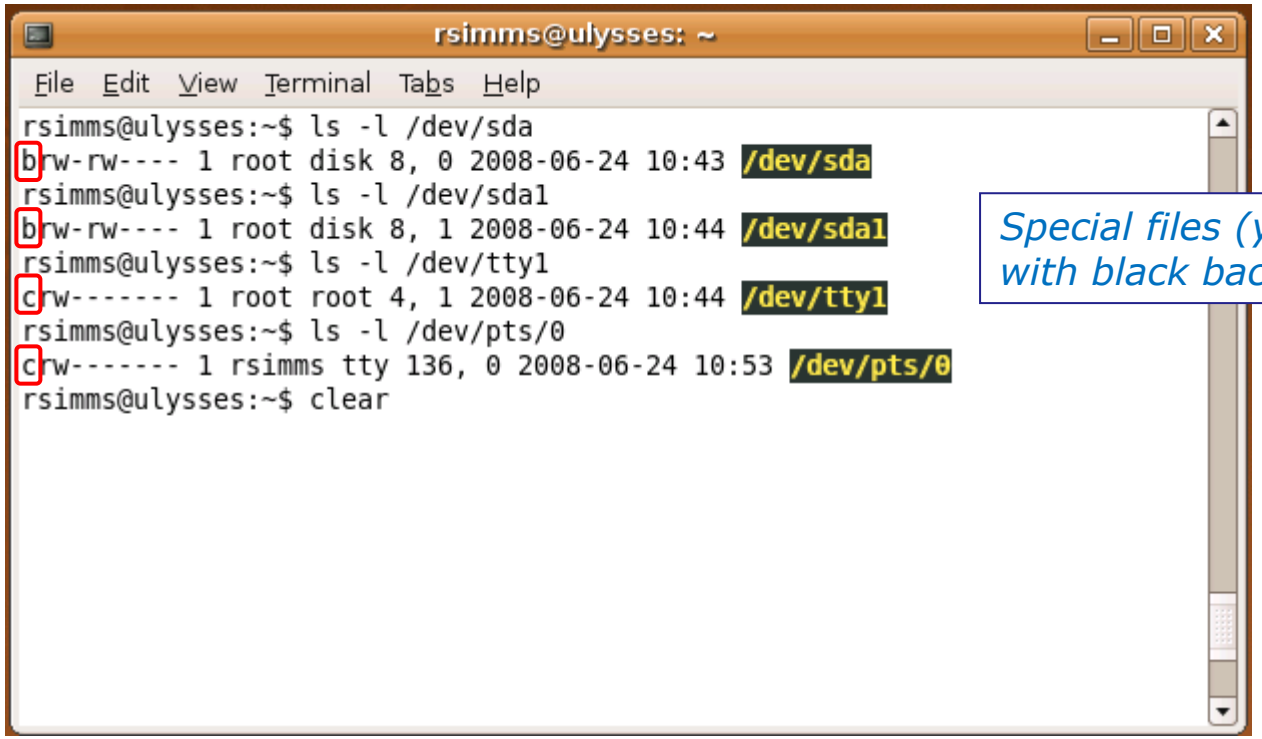
"-" regular file with setuid bit set (red background)

"-" regular file with execute bit set (green)

Some special files in the /dev directory (Ubuntu)

A "b" indicates a Block Special Device

A "c" indicates a Character Special Device



Special files (yellow with black background)

*Hard drives are **block** devices (data is transferred in large chunks for efficiency).*

*Terminals are **character** devices (data is transferred one character at a time).*

Viewing the /boot directory (RH9)

root@frida:~

File Edit View Terminal Go Help

```
[root@frida root]# ls -l /boot
total 5127
-rw-r--r--    1 root     root         5824 Jan 24  2003 boot.b
-rw-r--r--    1 root     root          612 Jan 24  2003 chain.b
-rw-r--r--    1 root     root        44309 Feb 27  2003 config-2.4.20-6
drwxr-xr-x    2 root     root         1024 Jun  5 19:10 grub
-rw-r--r--    1 root     root       254430 Jun  5 18:47 initrd-2.4.20-6.img
-rw-r--r--    1 root     root          473 Jun  5 18:47 kernel.h
drwx------    2 root     root        12288 Jun  5 11:45 lost+found
-rw-r--r--    1 root     root        23108 Feb 24  2003 message
-rw-r--r--    1 root     root        21282 Feb 24  2003 message.ja
lrwxrwxrwx    1 root     root           20 Jun  5 18:47 module-info -> module-info-2.4.20-6
-rw-r--r--    1 root     root        15436 Feb 27  2003 module-info-2.4.20-6
-rw-r--r--    1 root     root          640 Jan 24  2003 os2_d.b
lrwxrwxrwx    1 root     root           19 Jun  5 18:47 System.map -> System.map-2.4.20-6
-rw-r--r--    1 root     root       520099 Feb 27  2003 System.map-2.4.20-6
-rw-r--r--    1 root     root      3193468 Feb 27  2003 vmlinux-2.4.20-6
lrwxrwxrwx    1 root     root           16 Jun  5 18:47 vmlinuz -> vmlinuz-2.4.20-6
-rw-r--r--    1 root     root      1122363 Feb 27  2003 vmlinuz-2.4.20-6
[root@frida root]#
```

"-" regular files (black)

"d" directories (blue)

The kernel

Symbolic link to kernel

The kernel (compressed)

Class Exercise

Do a long listing of the /boot directory: **ls -l /boot**

- Is *grub* a directory or a regular file?

- Is *vmlinuz-2.6.32-71.el6.i686* a directory or a regular file?

Write you answers in the chat window

Further Classifying Files

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 on the file contents.

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

file command

Examples

Use the **file** command to determine if a regular file is text or binary

letter and /bin/uname are both regular files

```
/home/cis90/simben $ ls -l letter /bin/uname
-rwxr-xr-x. 1 root     root  26004 Dec  7  2011 /bin/uname
-rw-r--r--. 1 simben90 cis90  1044 Jul 20  2001 letter
```

```
/home/cis90/simben $ file letter
letter: ASCII English text
/home/cis90/simben $
```

The data portion of the letter file is text and can be viewed by cat, more, head, etc.

```
/home/cis90/simben $ file /bin/uname
/bin/uname: ELF 32-bit LSB executable, Intel 80386, version 1
(SYSV), for GNU/Linux 2.6.9, dynamically linked (uses shared
libs), for GNU/Linux 2.6.9, stripped
/home/cis90/simben $
```

The data portion of the /bin/uname file is binary and can be viewed with the xxd command

Using file command to further classify files

Long listings show basic file types in column 1
"-"=regular file
"d"=directory

```
/home/cis90/depot/filetypes $ ls -l
total 108
-rw-r--r--. 1 rsimms cis90  8983 Aug  1 18:49 Adjective.frm
-rw-r--r--. 1 rsimms cis90  5976 Aug  1 18:49 Adjective.MYD
-rw-r--r--. 1 rsimms cis90  2048 Aug  1 18:49 Adjective.MYI
-rw-r--r--. 1 rsimms cis90 10240 Aug  1 18:49 backup.tar
-rw-r-----. 1 rsimms cis90   191 Aug  1 18:49 bash_profile
-rwxr-----. 1 rsimms cis90  4846 Aug  1 18:49 cprog
-rwxr-----. 1 rsimms cis90  4846 Aug  1 18:49 go-cprog
-rw-r--r--. 1 rsimms cis90   119 Aug  1 18:49 letter
-rw-r-----. 1 rsimms cis90  2968 Aug  1 18:49 mbox
-rw-r--r--. 1 rsimms cis90 34611 Aug  1 18:49 rich-260x216.jpg
-rwxr-xr-x. 1 rsimms cis90   445 Aug  1 18:49 runit
drwxr-xr-x. 2 rsimms cis90  4096 Aug  1 18:40 travel
```

Output from the file command provides additional file classification information

```
/home/cis90/depot/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 (GNU)
bash_profile:     ASCII English text
cprog:            ELF 32-bit LSB executable, Intel 80386, version 1 (SYSV),
dynamically linked (uses shared libs), for GNU/Linux 2.2.5, not stripped
go-cprog:         ELF 32-bit LSB executable, Intel 80386, version 1 (SYSV),
dynamically linked (uses shared libs), for GNU/Linux 2.2.5, not stripped
letter:           ASCII English text
mbox:             ASCII mail text
rich-260x216.jpg: JPEG image data, JFIF standard 1.02
runit:            POSIX shell script text executable
travel:           directory
```

Class Activity

Classify the following these files in your home directory:

- uhistory
- letter
- Poems
- timecal

- Which is a bash script?

Write your answer in the chat window

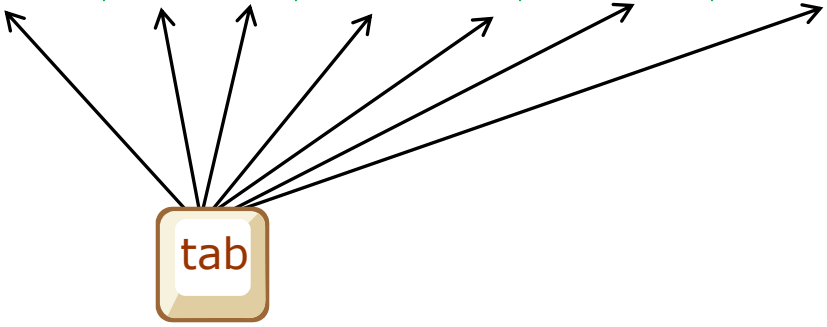
Shell tips

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/simben/Poems/Shakespeare/
```

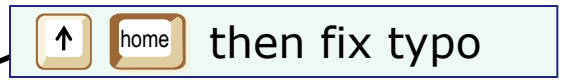


bash shell tip

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
```

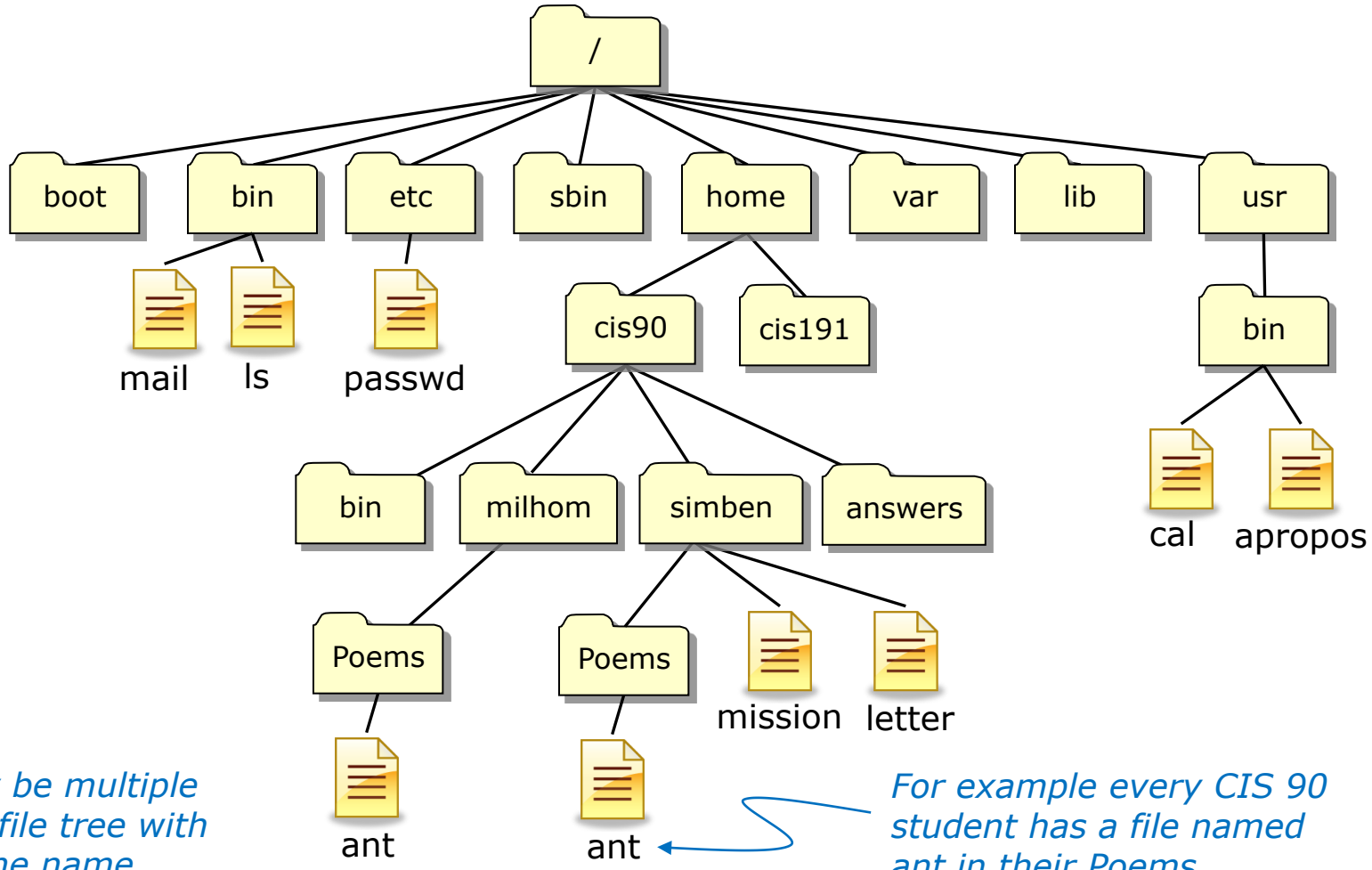



```
/home/cis90/simmsben $ ls /home/cis90/simmsben/Poems/Shakespeare/
sonnet1   sonnet11  sonnet17  sonnet26  sonnet35  sonnet5  sonnet9
sonnet10  sonnet15  sonnet2   sonnet3   sonnet4   sonnet7
/home/cis90/simmsben $
```

Pathnames

The need for pathnames

Question: How can we unambiguously specify any file or directory in the file tree?

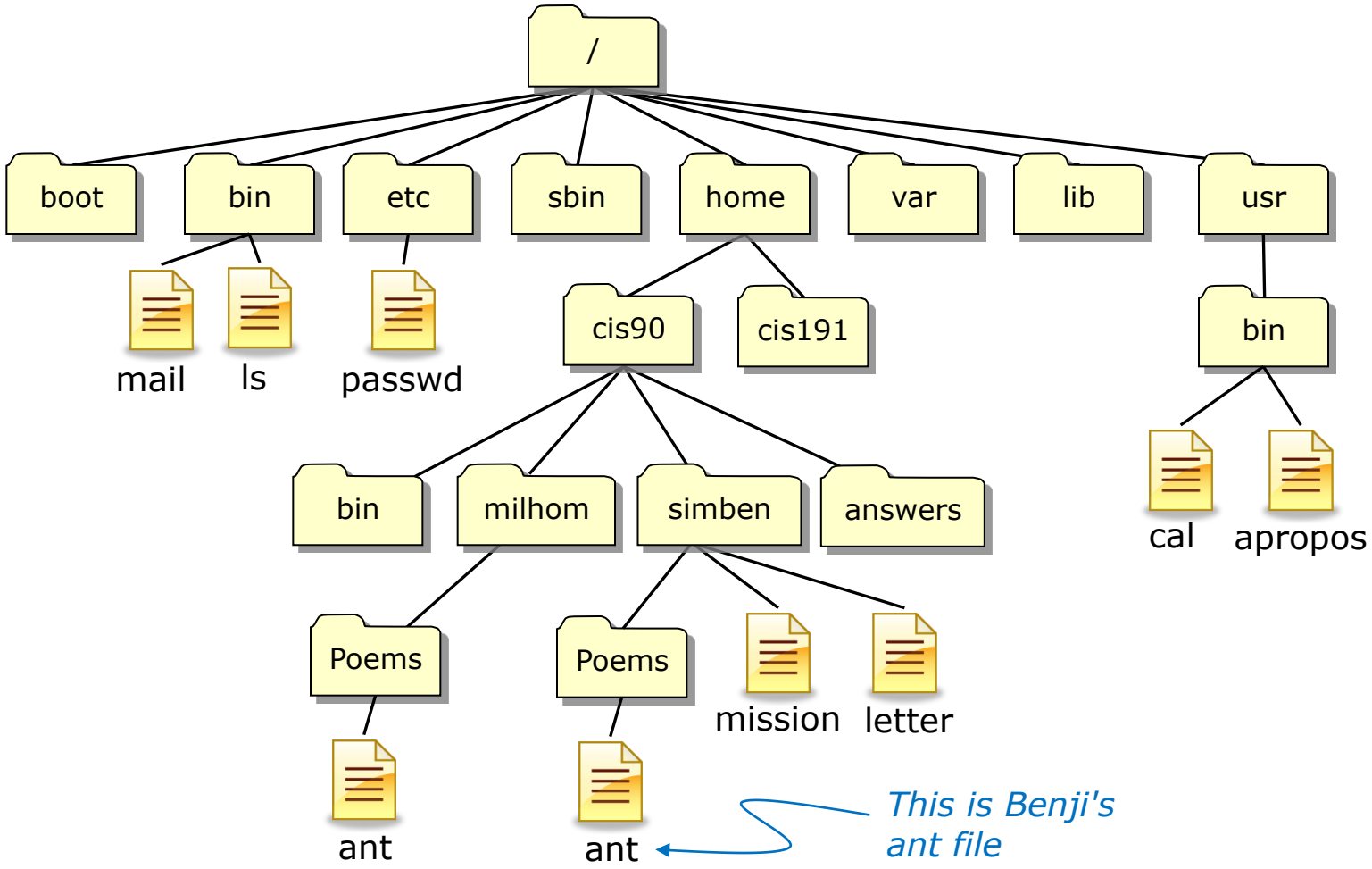


There may be multiple files in the file tree with the same name.

For example every CIS 90 student has a file named ant in their Poems directory

The need for pathnames

Answer: We use **absolute** or **relative pathnames**



Pathnames

What the heck are they?

A pathname is a precise way to specify exactly 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 on all commands that deal with files and directories.

Absolute Pathnames

Absolute Pathnames

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

Examples:

/home/cis90/simben/Poems/ant *(file)*

/boot *(directory)*

/usr/bin/cal *(file)*

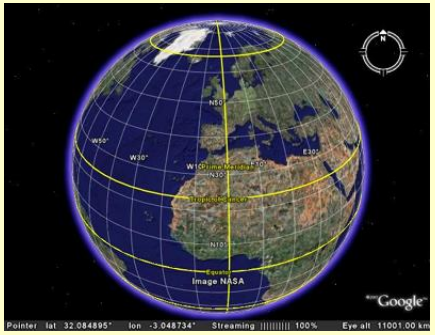
/home/cis90/bin/ *(directory)*

/bin/mail *(file)*

**** Important ****
Notice all absolute pathnames start with a / (forward slash)

An analogy …

http://www.engineeringtoolbox.com/

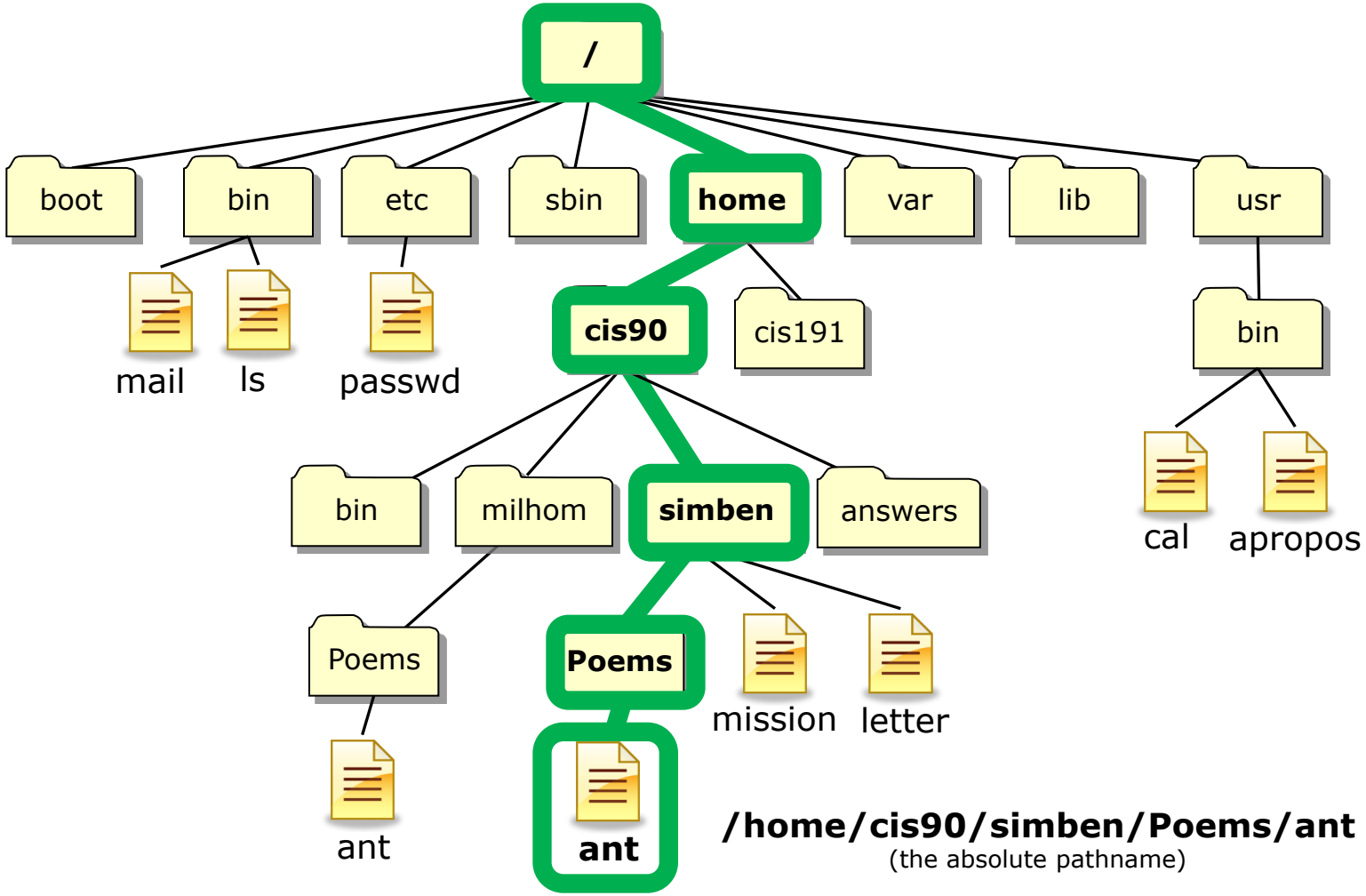


Latitude and longitude is an example of specifying a location in an absolute fashion based on the equator and prime meridian

Aptos, CA
Latitude: 36-58'52" N
Longitude: 121-52'28" W

Absolute Pathnames

*An **absolute** pathname specifies a path starting from the top of the tree all the way to the file*



Class Activity - absolute pathnames

Show the last two lines of your ant file using an absolute pathname

```
/home/cis90/simben $ tail -n2 /home/cis90/simben/Poems/ant
'till one who seemed the least
of all absorbed my whole of mind.
```

replace with your own home directory name

Show the last two lines of Homer's ant file using an absolute pathname

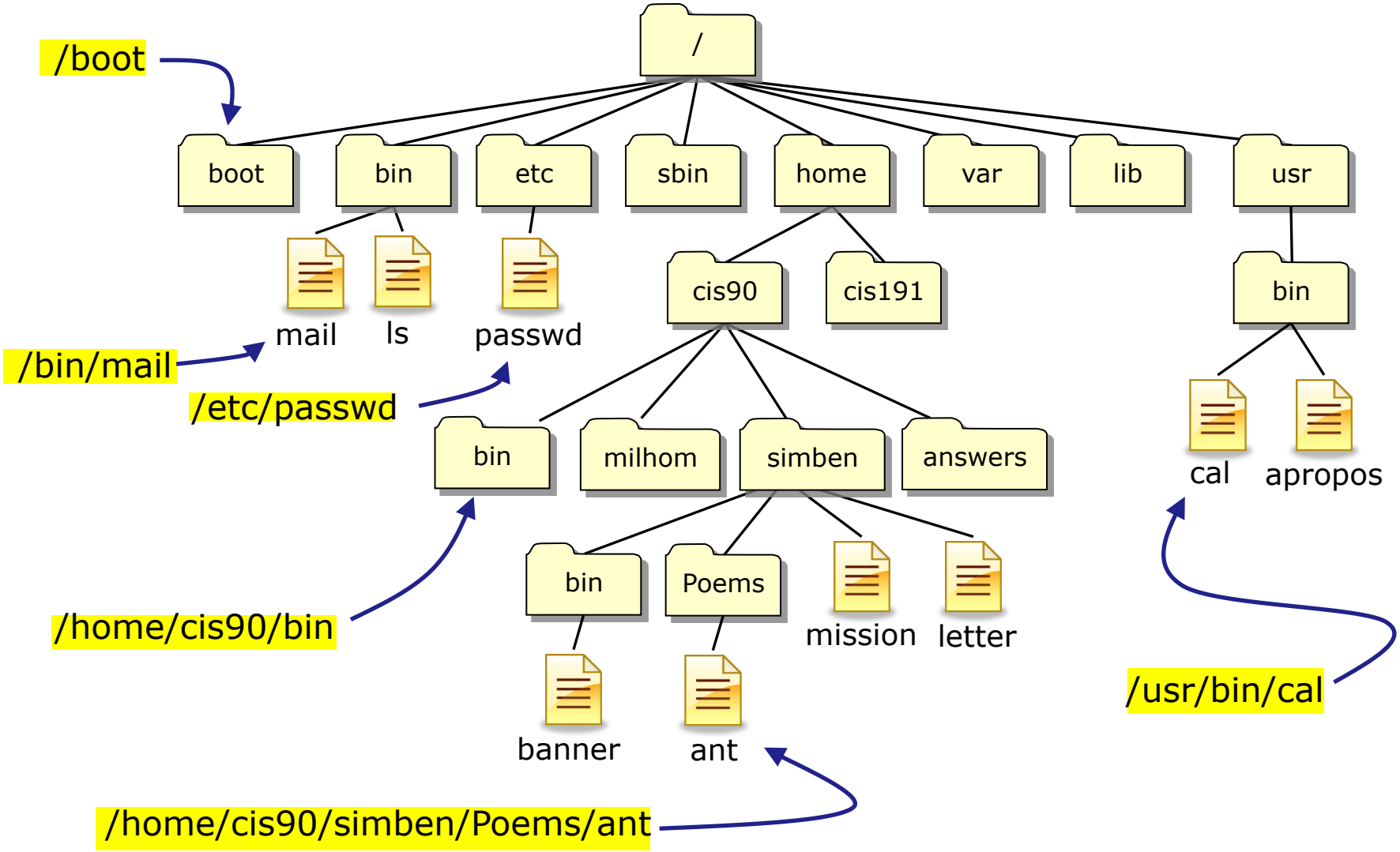
```
/home/cis90/simben $ tail -n2 /home/cis90/milhom/Poems/ant
'till one who seemed the least
of all absorbed my whole of mind.
```

Show the last two lines of your ant file using a variable for part of an absolute pathname

```
/home/cis90/simben $ echo $HOME/Poems/ant
/home/cis90/simben/Poems/ant
/home/cis90/simben $ tail -n2 $HOME/Poems/ant
'till one who seemed the least
of all absorbed my whole of mind.
```

Absolute Pathnames

Some example absolute pathnames



Absolute Pathnames

Some example absolute pathnames being used as arguments

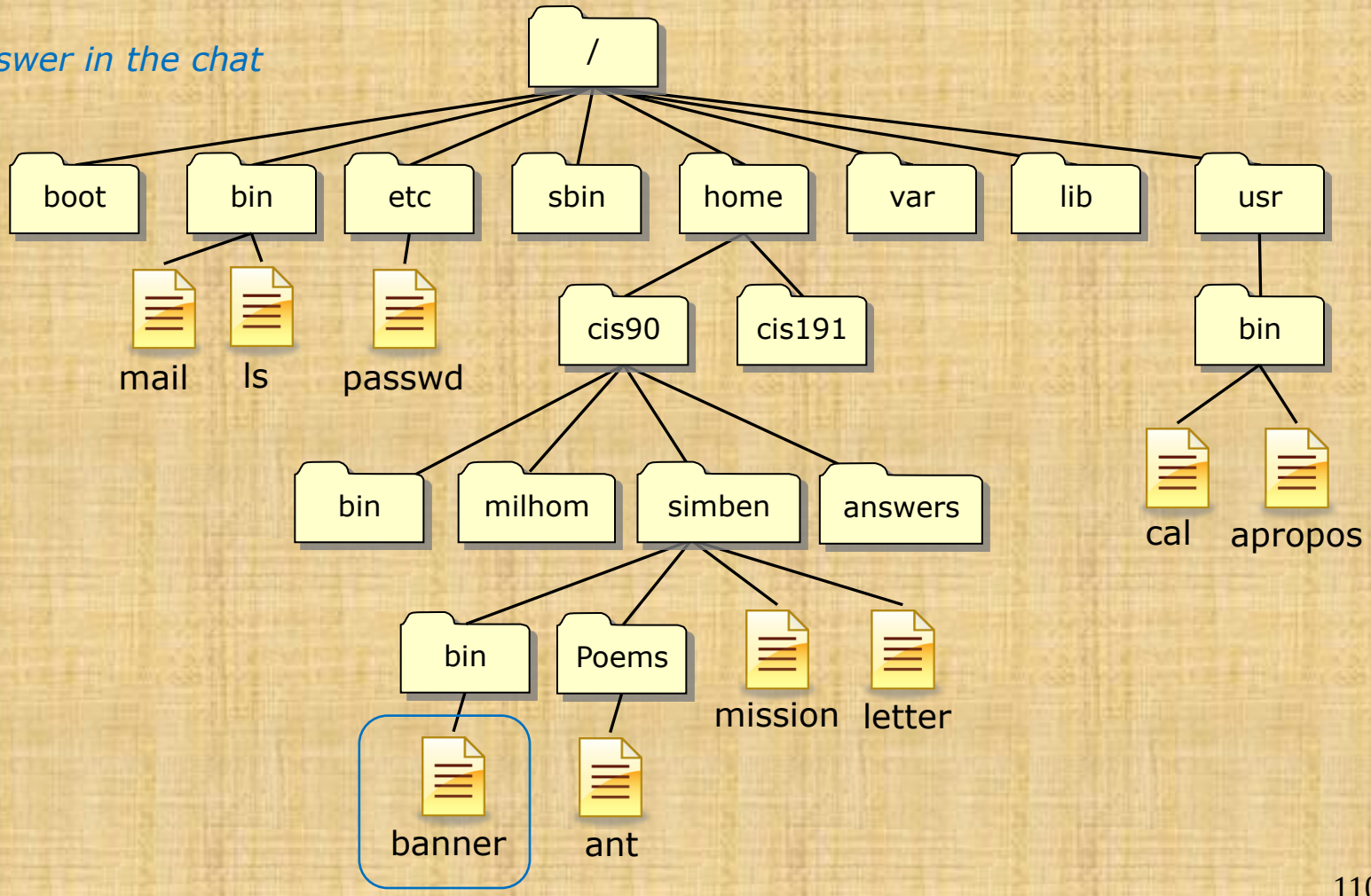
```
ls   /bin /sbin /usr/bin /usr/sbin
file   /usr/bin/cal
cd   /home/cis90/simben/Poems/Shakespeare
tail   -n1   /etc/passwd
more   /home/cis90/simben/bigfile
```

**** Important ****
Notice all absolute pathnames start with a / (forward slash)

Activity - identify an absolute pathname

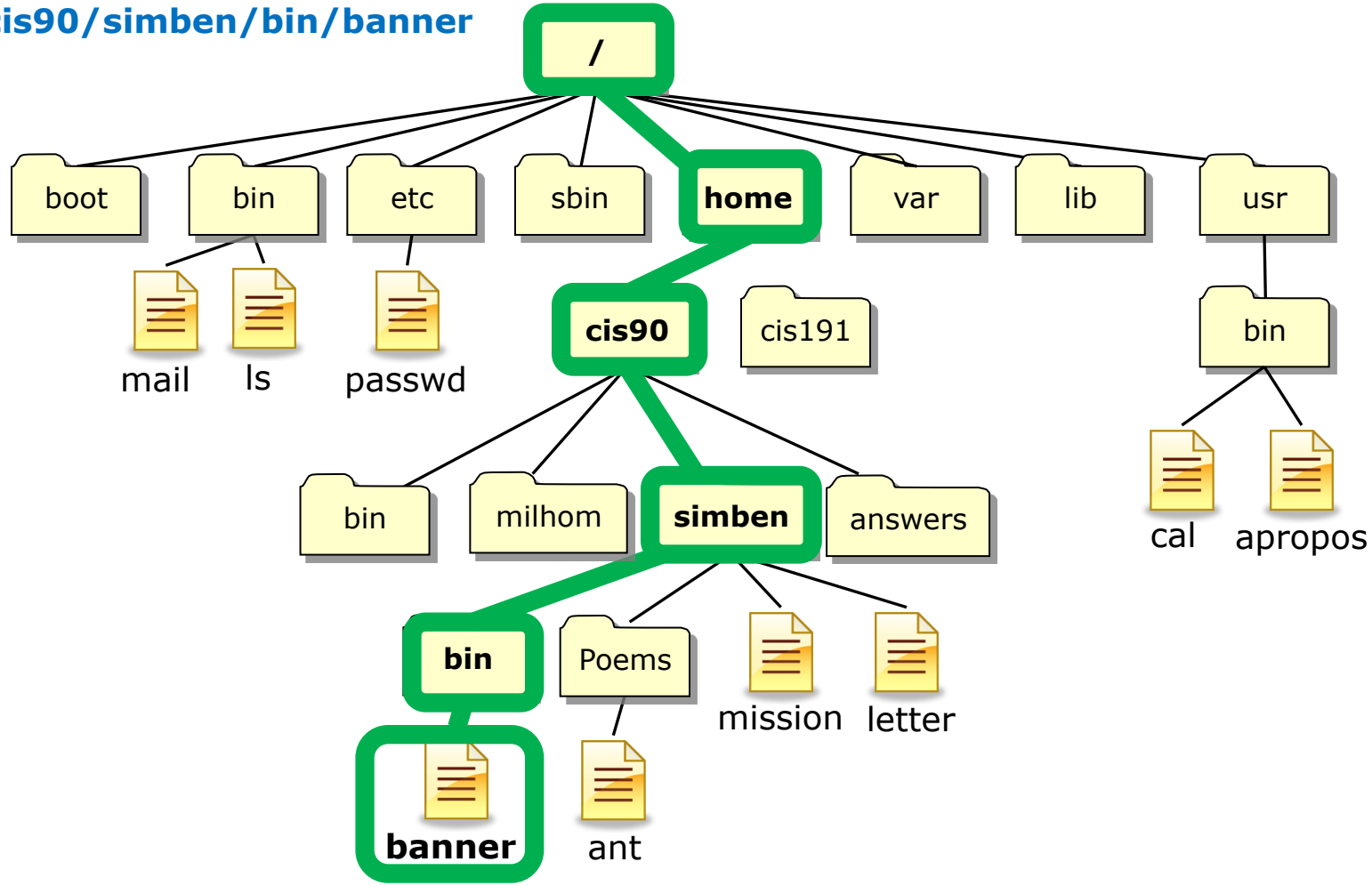
***Question**: what is the absolute pathname to Benji's banner file?*

(write your answer in the chat window)



Question: what is the absolute pathname to Benji's banner file?

Answer:
/home/cis90/simben/bin/banner



/home/cis90/simben/bin/banner

Translation of this absolute pathname in English:
Start at the top of the tree and descend into the *home* directory, then descend into the *cis90* directory, then descend into the *simben* directory, then descend into the *bin* directory, there you will find the *banner* file.

Relative Pathnames

Relative Pathnames

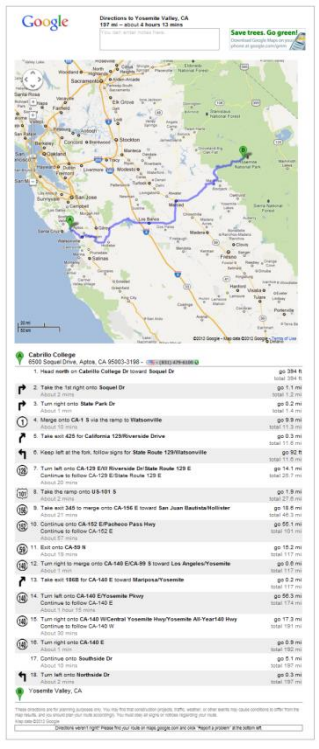
*A **relative pathname** specifies the path from your current directory to the target directory or file.*

Examples:

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

Note that relative pathnames do NOT start with a /

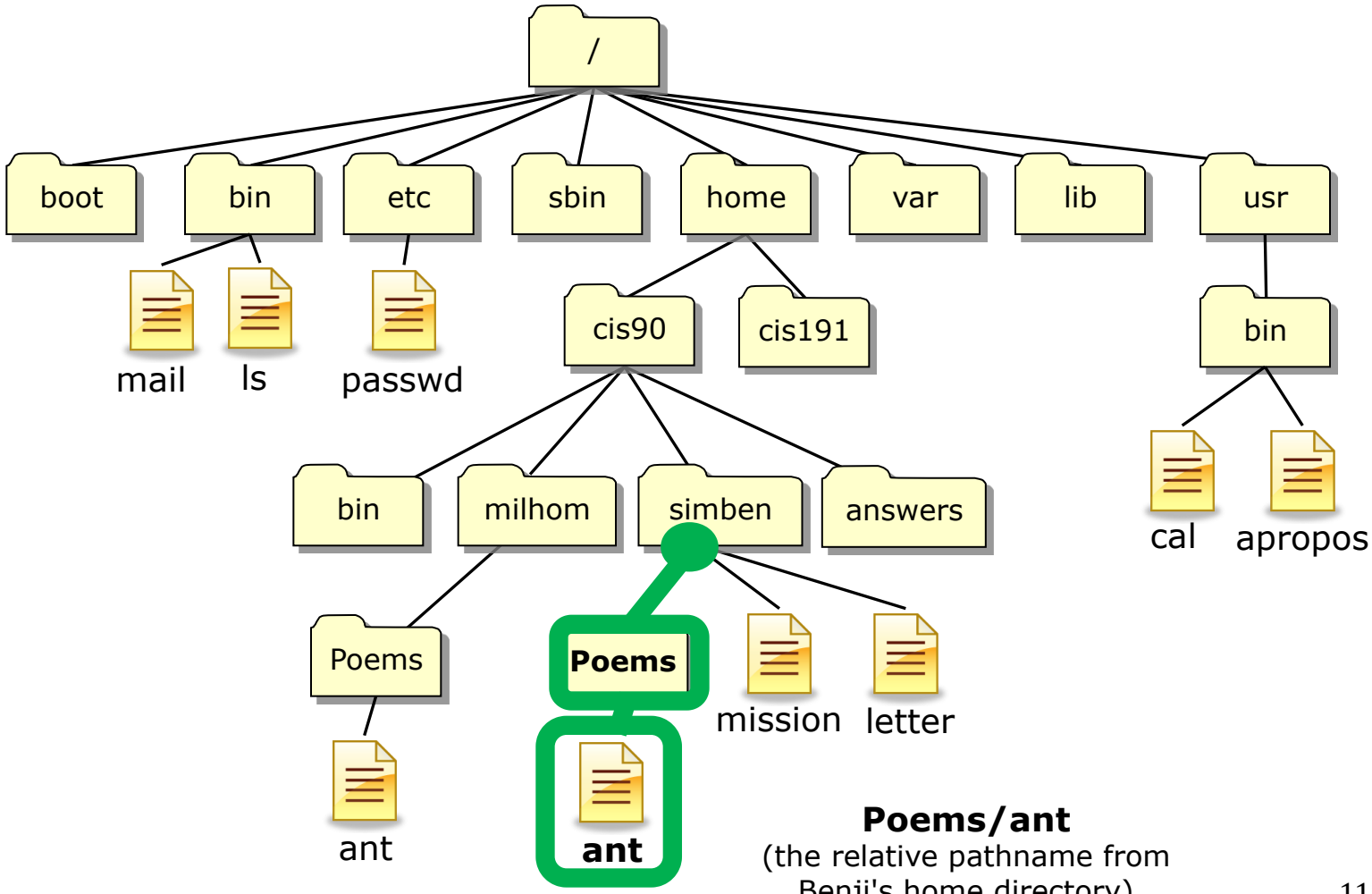
An analogy …



Google Maps can specify a route to a destination beginning with your current location

Relative Pathnames

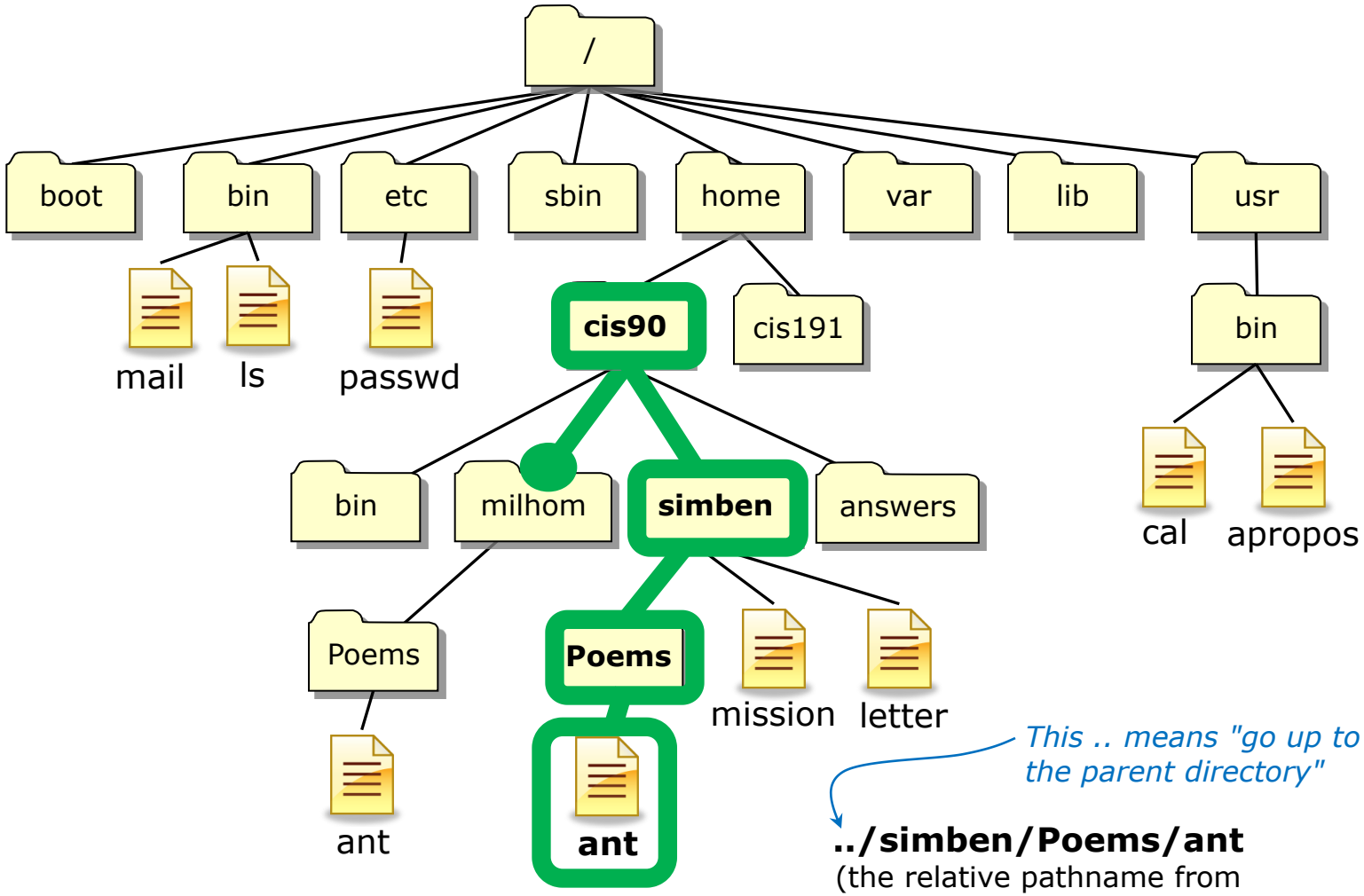
A **relative** pathname specifies a path from our current location in the tree all the way to the specific file.



Poems/ant
(the relative pathname from Benji's home directory)

Relative Pathnames

A **relative** pathname specifies a path from our current location in the tree all the way to the specific file.



Class Activity - relative pathnames

Show the first three lines of your ant file using a relative pathname

```
/home/cis90/simben $ cd
/home/cis90/simben $ head -n3 Poems/ant
        Death of an Ant

With a magnifying glass
```

Go to your home directory if you are not already there

Show the first three lines of Homer's ant file using a relative pathname

```
/home/cis90/simben $ head -n3 ../milhom/Poems/ant
        Death of an Ant

With a magnifying glass
```

.. *means to go up one level in the tree to the parent directory of the current working directory*

Show the first three lines of your Shakespeare sonnet5 file

```
/home/cis90/simben $ head -n3 Poems/Shakespeare/sonnet5
Those hours that with gentle work did frame
The lovely gaze where every eye doth dwell
Will play the tyrants to the very same,
```

Relative Pathnames

Using relative pathnames as command arguments

#Geneva

Examples of using relative pathnames as command arguments:

ls -l ant

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

cd Poems/Blake

head ../bin/check3

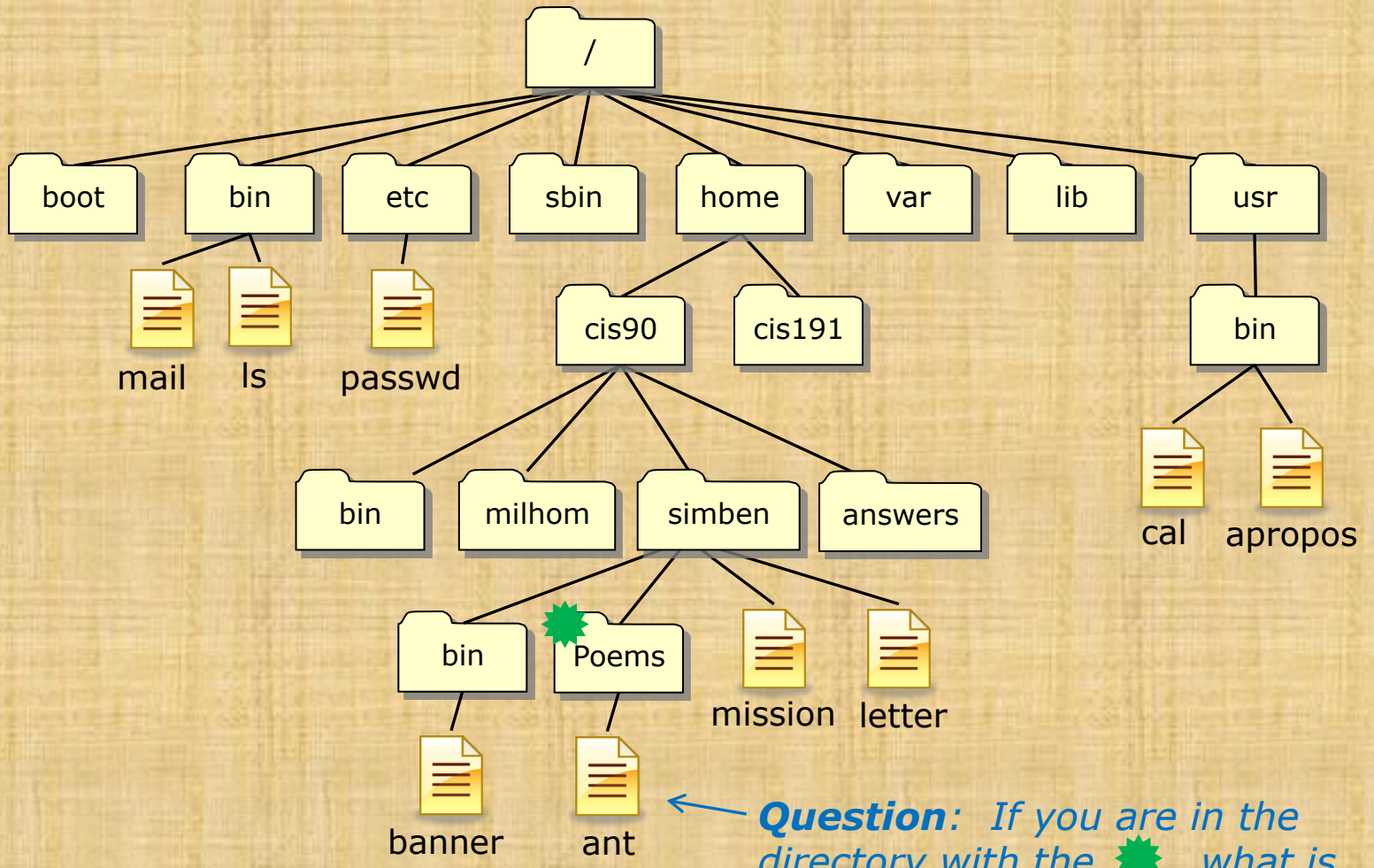
file Poems/Shakespeare/sonnet4

cd Poems/Shakespeare

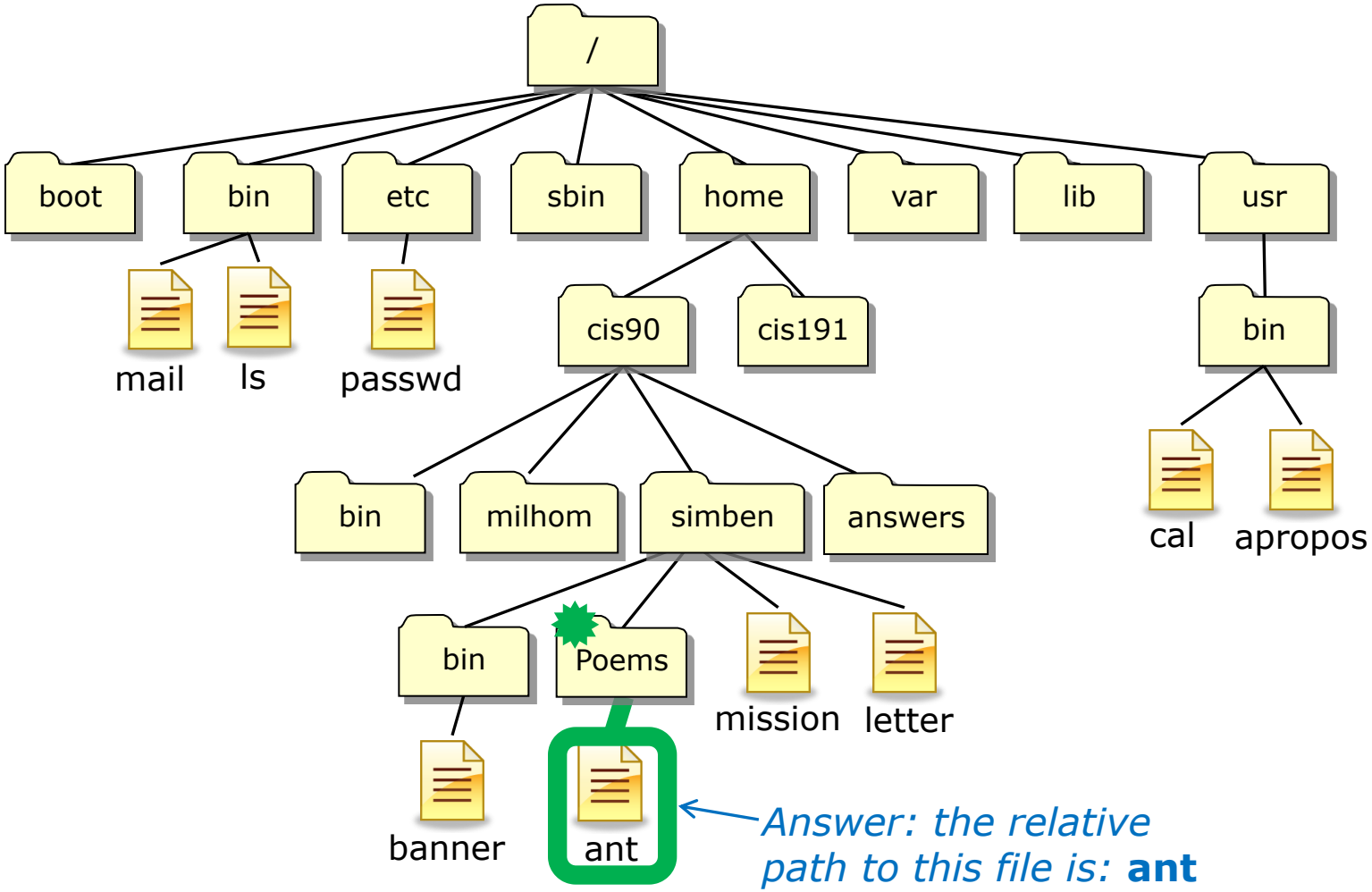
The .. is used to represent the parent directory

Notice that these pathnames do NOT start with the /

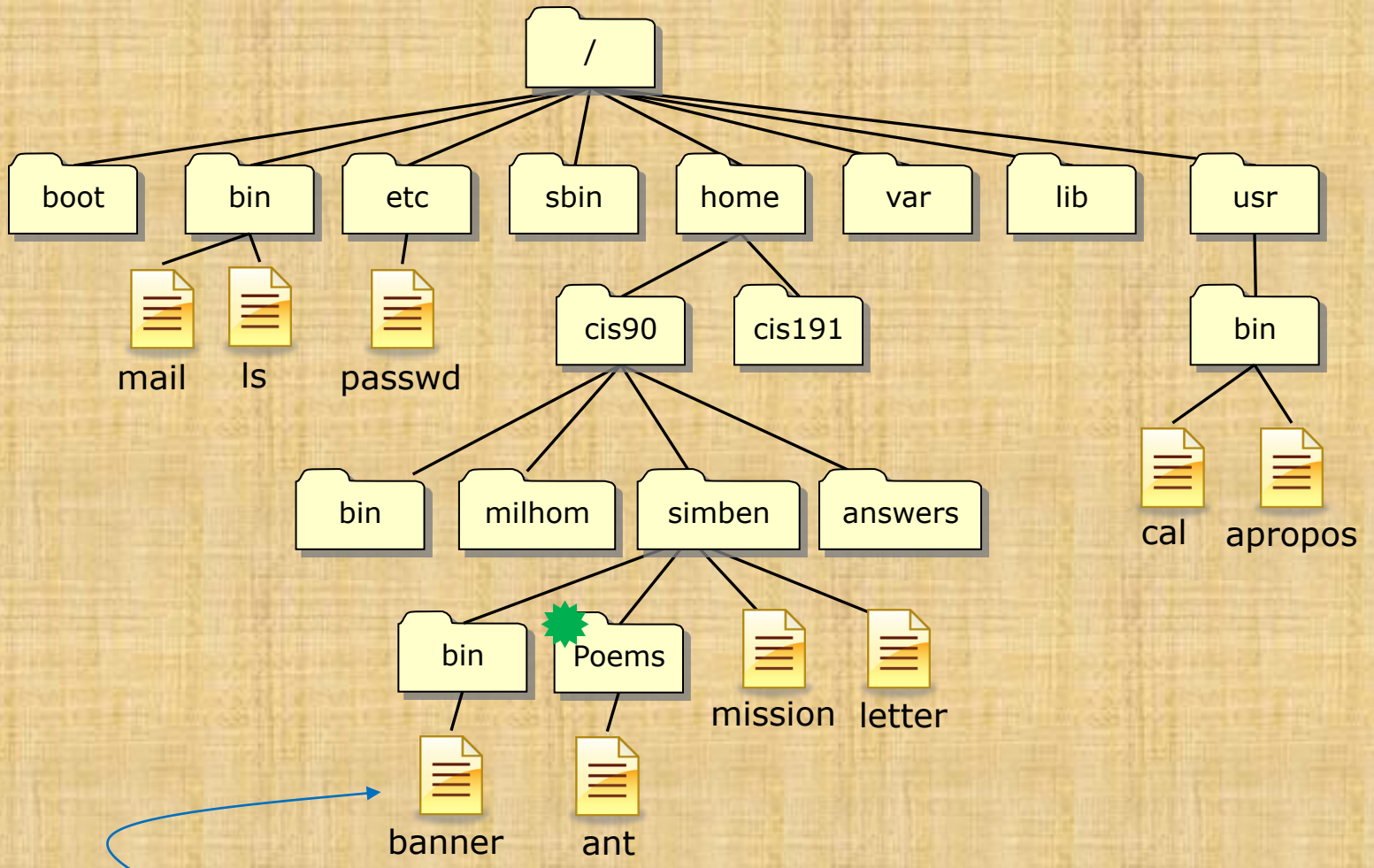
Activity - identify a relative pathname



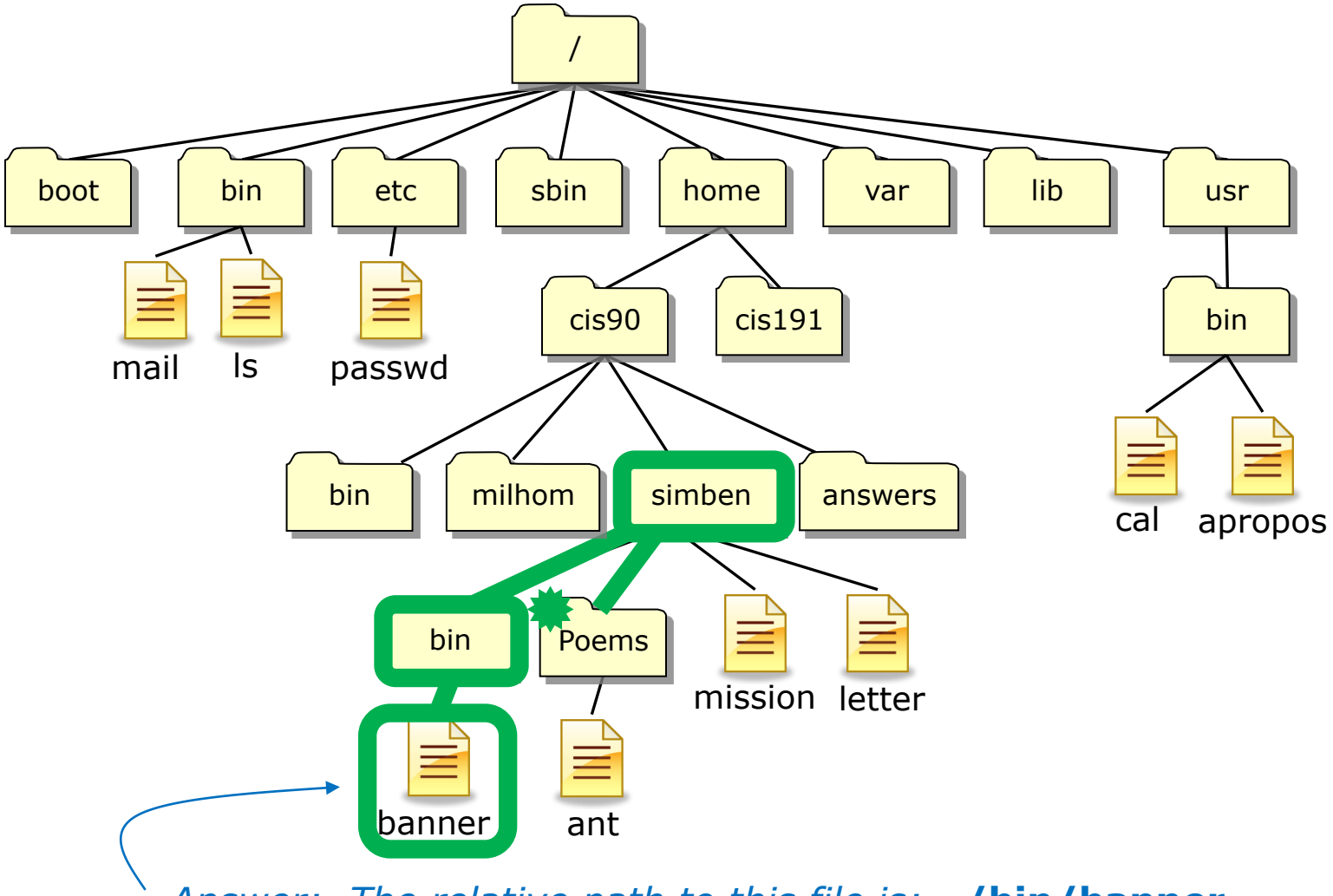
***Question**: If you are in the directory with the , what is the relative path to this file?*


/
boot
bin
etc
sbin
home
var
lib
usr
mail
ls
passwd
cis90
cis191
bin
bin
milhom
simben
answers
cal
apropos
bin
Poems
mission
letter
banner
ant
Answer: the relative path to this file is: ant

Activity - identify a relative pathname



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

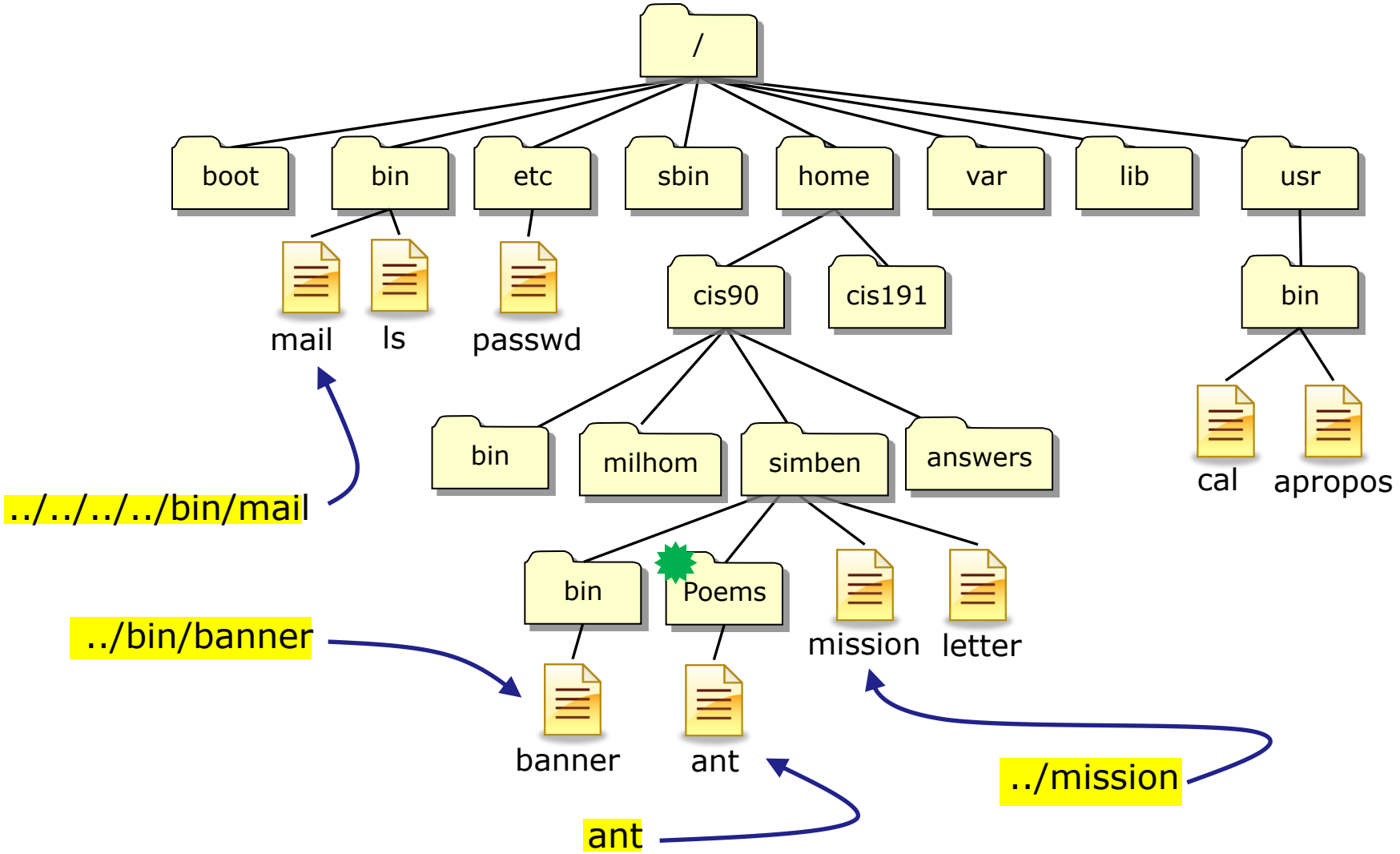


Answer: The relative path to this file is: **../bin/banner**

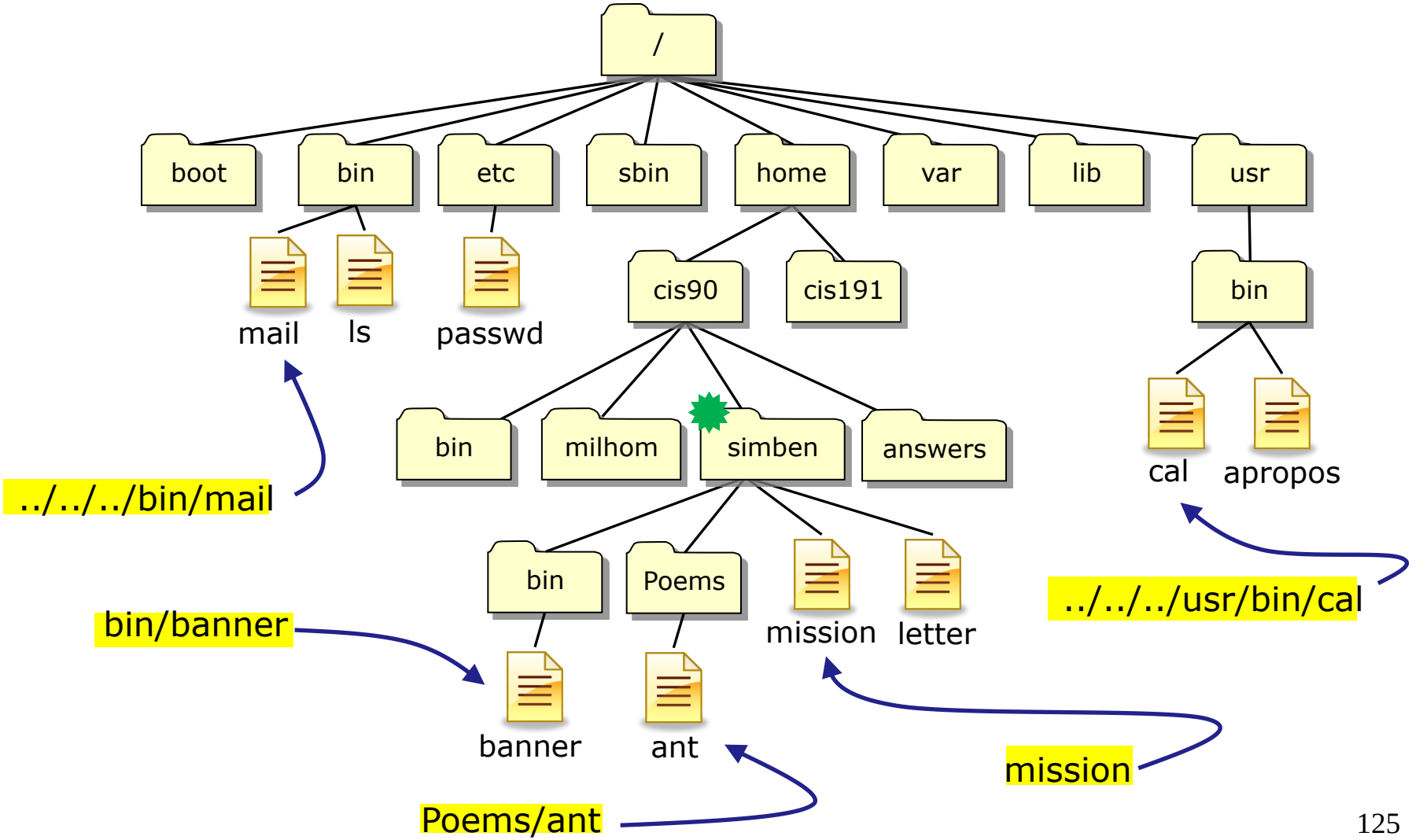
../bin/banner

Translation of this relative pathname in English:
Starting in your current directory, go up one level to the parent directory, then descend into the *bin* directory, there you will find the *banner* file.

Some example relative pathnames (from the directory marked with a ✹)



Some example relative pathnames (from the directory marked with a ✹)



Class Exercise

From your home directory:

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

```
/home/cis90/simben $ ls -l ../../../etc/passwd
-rw-r--r--. 1 root root 10162 Feb 18 09:26 ../../../etc/passwd
```

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

```
/home/cis90/simben $ ls -l /etc/passwd
-rw-r--r--. 1 root root 10162 Feb 18 09:26 /etc/passwd
```

Sometimes it's easier to specify a filename using an absolute pathname

Heads up on a future test question

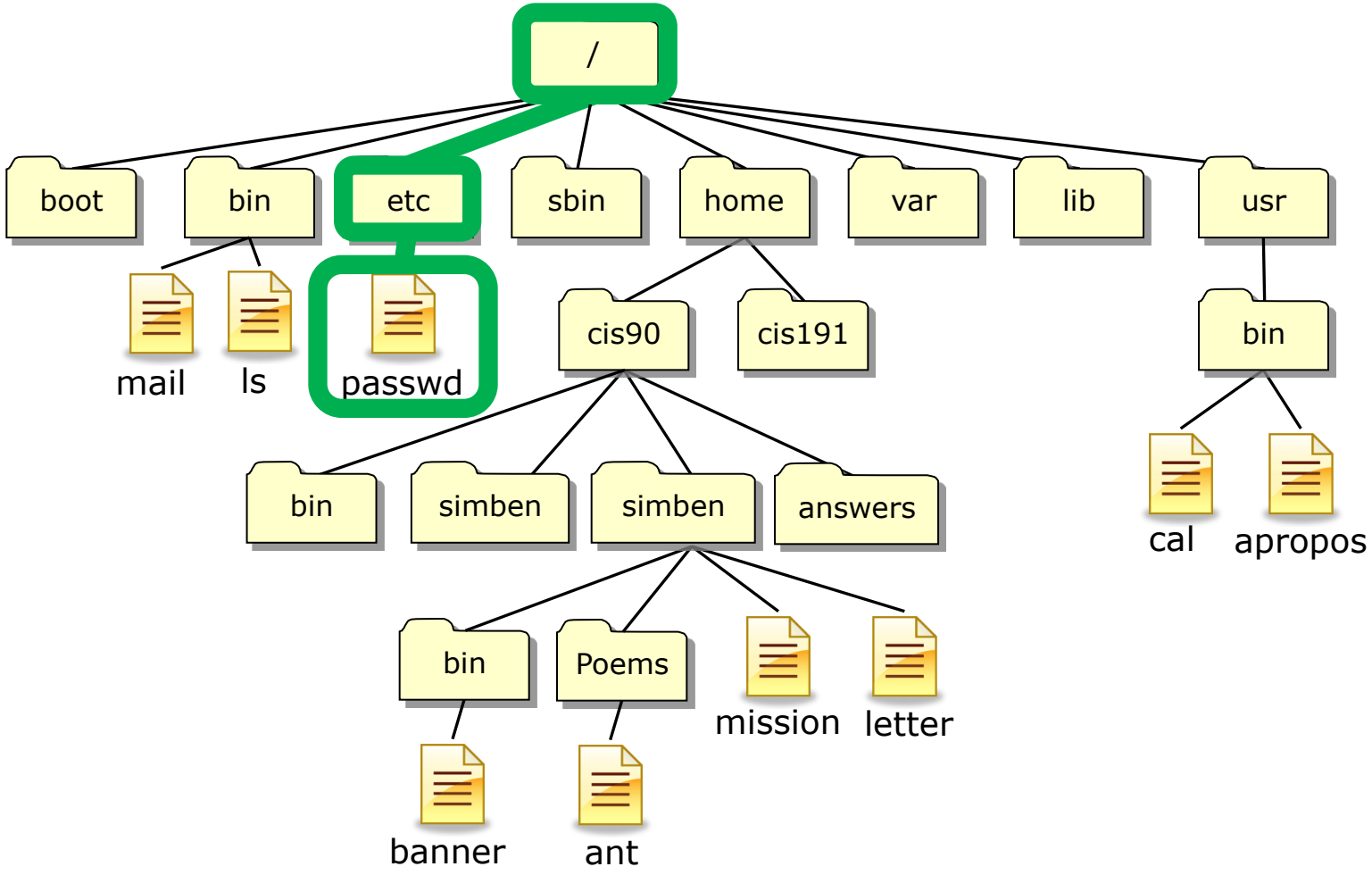
Question: What is the absolute pathname of /etc/passwd?

Answer: /etc/passwd

What is the color of Washington's white horse?

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

Answer: /etc/passwd



/

.

. .

~

/ .. . ~

/ by itself is the root or "slash" directory, the top of the tree, not to be confused with the root user's home directory (/root)

/ at the beginning of a pathname indicates an absolute path

/ at the end of a filename indicates it is a directory

.. is always your current **parent** directory

. is always your current directory ("here")

~ is always your home directory

Note:
. and .. are hidden files since they start with a "."
Hidden files don't show up in ls listings unless the -a option is used

Example Sequence using / . .. and ~

1. Change to your Poems/Blake directory using a relative pathname

```
/home/cis90/simben $ cd Poems/Blake/
/home/cis90/simben/Poems/Blake $
```

2. List the directories in the / directory using an absolute pathname

```
/home/cis90/simben/Poems/Blake $ ls /
bin   dev  home  lost+found  misc  net  proc  sbin     srv  tftpboot  u    var
boot  etc  lib   media       mnt   opt  root  selinux  sys  tmp       usr
```

3. List the directories in your current parent directory using ..

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

4. List the directories in your current directory using .

```
/home/cis90/simben/Poems/Blake $ ls .
jerusalem  tiger
```

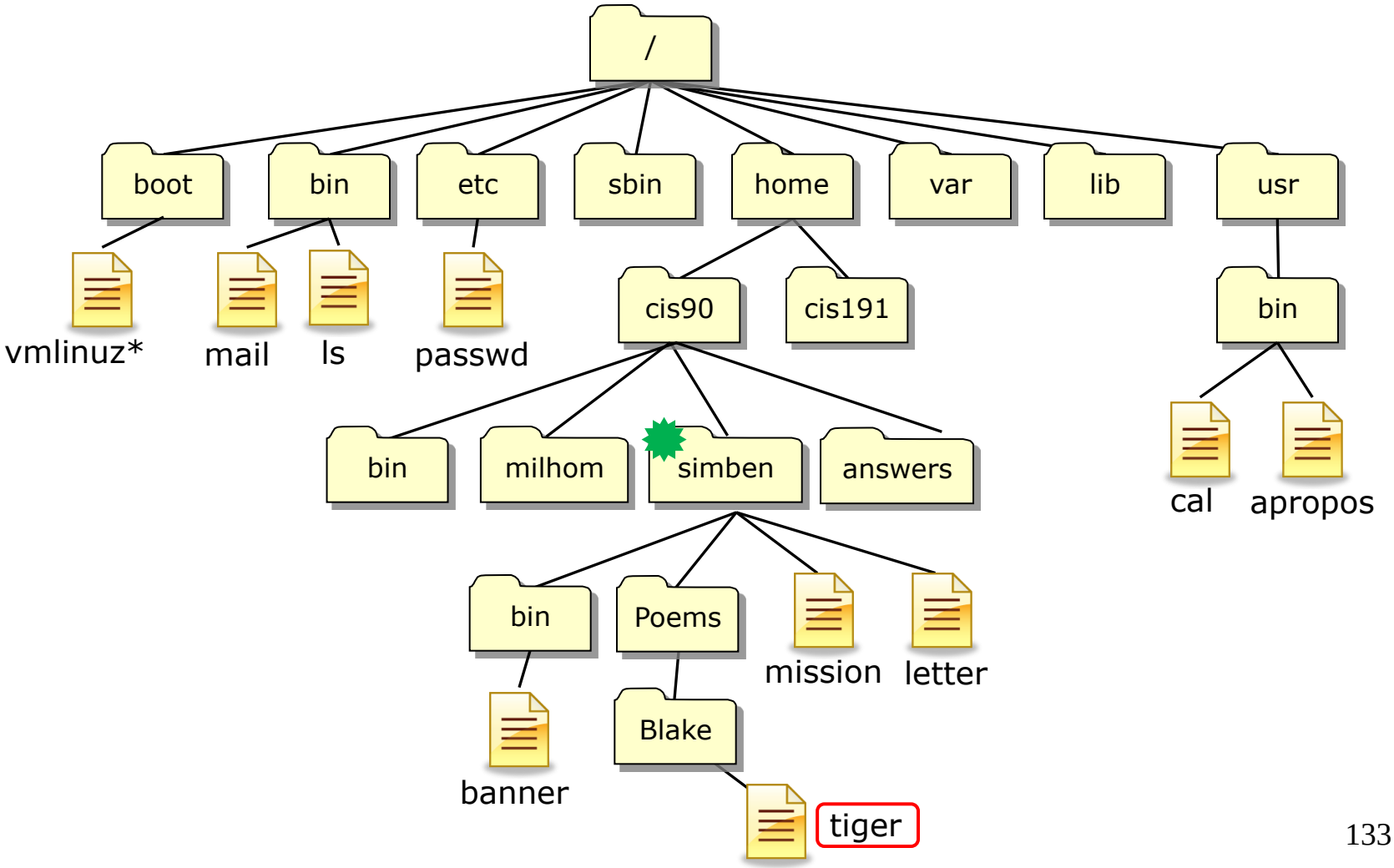
5. List the files in your home directory using ~

```
/home/cis90/simben/Poems/Blake $ ls ~
1976         empty           Lab2.0  Miscellaneous  proposal3   text.fxd
android      Hidden          Lab2.1  mission        scott       timecal
bigfile      lab01.graded    letter  Poems          small_town  uhistory
bin          lab01-submitted log     proposal1      spellk      what_am_i
dead.letter  lab02.graded    mbox    proposal2      text.err
```

Using pathnames as arguments

Task: cat the tiger file from your home directory

How can we do this?



Task: cat the tiger file from your home directory

Option 1: "Navigate" to the directory then cat the file

```
/home/cis90/simben $ cd          start in our home directory

/home/cis90/simben $ 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/cis90/simben $ cd Poems/   descend into the Poems directory
/home/cis90/simben/Poems $ ls    see what's there
ant  Blake  nursery  Shakespeare  twister  Yeats

/home/cis90/simben/Poems $ cd Blake/     descend into the Blake directory
/home/cis90/simben/Poems/Blake $ ls      see what's there
jerusalem  tiger

/home/cis90/simben/Poems/Blake $ cat tiger
Tiger, Tiger burning bright
In the forest of the night,
What immortal hand or eye
Dare frame thy fearful symmetry?
```

Task: cat the tiger file from your home directory

Option 2: Use a relative pathname

```
/home/cis90/simben $ 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/cis90/simben $
```

Task: cat the tiger file from your home directory
Option 3: Use an absolute pathname

```
/home/cis90/simben $ cat /home/cis90/simben/Poems/Blake/tiger
Tiger, Tiger burning bright
In the forest of the night,
What immortal hand or eye
Dare frame thy fearful symmetry?
/home/cis90/simben $
```

Task: cat the tiger file from your home directory

Option 4: communicating with the shell using ESP

```
/home/cis90/simben $ cat tiger
cat: tiger: No such file or directory
/home/cis90/simben $
```

ESP is not an option!

There is no tiger file in the /home/cis90/simben directory.

There are over 40 tiger files on Opus.

If you don't give the shell a correct pathname that unambiguously specifies the location of a file in the file tree you should expect this error.

Don't expect the shell to read your mind as to which file in the file tree you are thinking about!

Task: cat the tiger file from your home directory

Navigating to the directory then catting the file

```
/home/cis90/simben $ cd Poems/; cd Blake; cat tiger; cd
Tiger, Tiger burning bright
In the forest of the night,
What immortal hand or eye
Dare frame thy fearful symmetry?
```

Using a relative pathname

```
/home/cis90/simben $ cat Poems/Blake/tiger
Tiger, Tiger burning bright
In the forest of the night,
What immortal hand or eye
Dare frame thy fearful symmetry?
```

This is the option I would choose (fewest keystrokes)

Using an absolute pathname

```
/home/cis90/simben $ cat /home/cis90/simben/Poems/Blake/tiger
Tiger, Tiger burning bright
In the forest of the night,
What immortal hand or eye
Dare frame thy fearful symmetry?
```

Using ESP method

```
/home/cis90/simben $ cat tiger
cat: tiger: No such file or directory
```

cd command (your legs)

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/simben/Poems/Yeats**
  A relative pathname, e.g. **cd Poems/Yeats**
  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/simben $ type cd
cd is a shell builtin
```

The .. directory

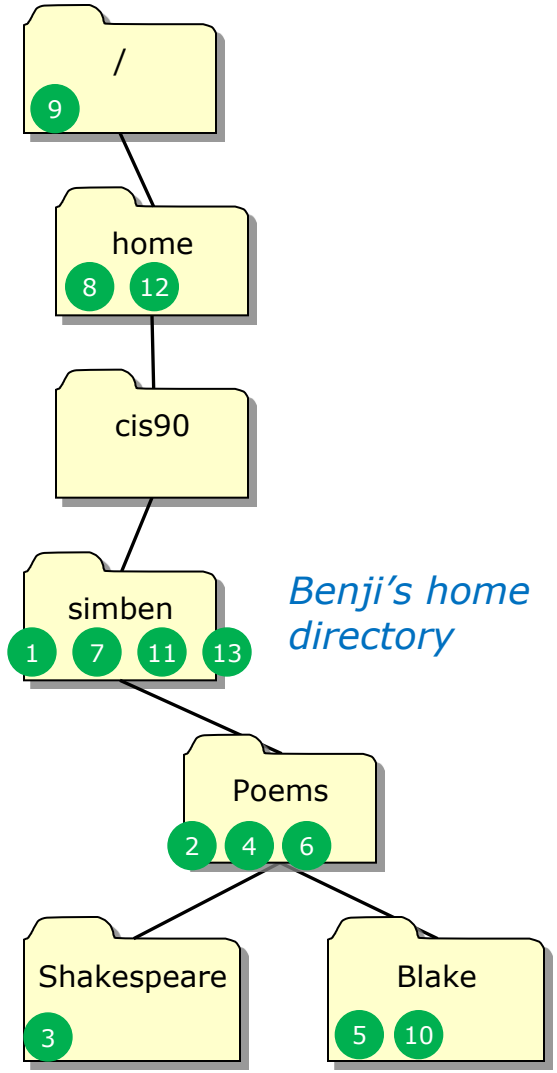
To move up the tree use: **cd ..**

.. is a hidden file located in every single directory and it is hard linked to the absolute pathname of the parent directory

cd command

change directory example

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



pwd command (your GPS)

pwd command
print working directory

- The **pwd** command is your "GPS" to show your current location on the UNIX file tree. Especially with more typical prompts!

- The **pwd** command is equivalent to displaying the value of the PWD environment variable

```
[rsimms@opus net]$ pwd
/lib/modules/2.6.18-164.el5/kernel/drivers/net
```

This is a UNIX command

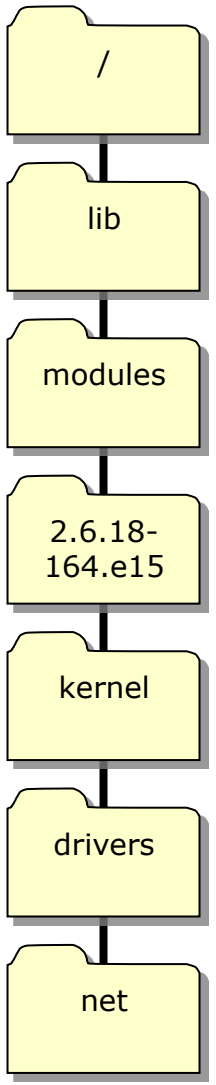
```
[rsimms@opus net]$ echo $PWD
/lib/modules/2.6.18-164.el5/kernel/drivers/net
```

This is a UNIX command

This is shell environment variable (used as an argument to the echo command)

Note: The default shell prompt CIS 90 students utilizes the PWD variable to always show the current working directory.

i.e. When CIS 90 students login this command: PS1='$PWD $ ' is automatically done as part of setting up their shell environment.



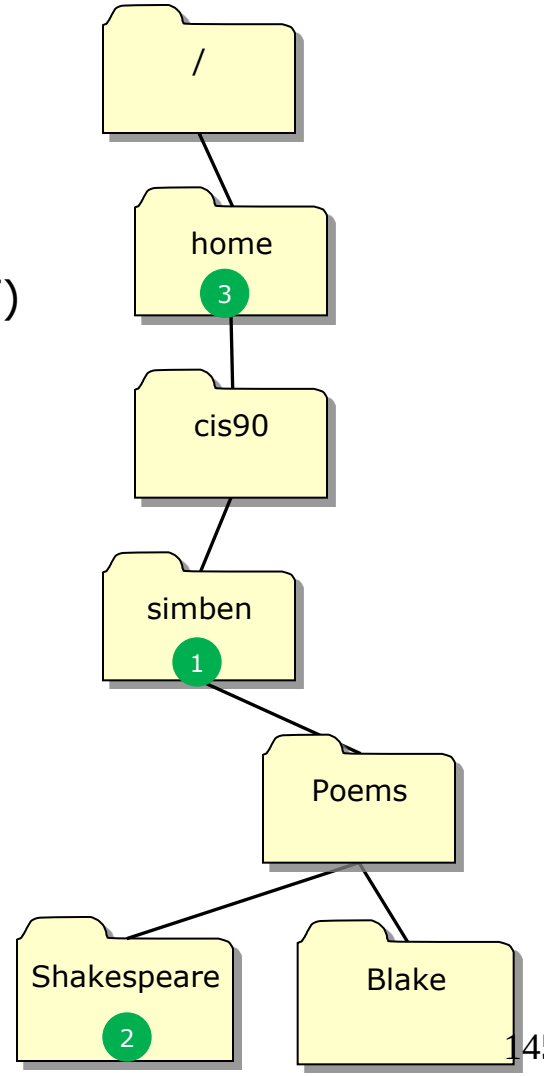
pwd command

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/simben $ **type pwd**
  pwd is a shell builtin

```
/home/cis90/simben $ PS1='[\u@\h \W]\$ '
1 [simben90@opus ~]$ pwd
/home/cis90/simben
[simben90@opus ~]$ cd Poems/Shakespeare/
2 [simben90@opus Shakespeare]$ pwd
/home/cis90/simben/Poems/Shakespeare
[simben90@opus Shakespeare]$ cd /home/
3 [simben90@opus home]$ pwd
/home
/home/cis90/simben $ PS1='$PWD $ '
/home/cis90/simben $
```



ls command (your eyes)

ls command

Using files vs directories as arguments

With no arguments specified, all files in the current directory will be listed

```
/home/cis90/simben $ 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/simben $ ls bigfile
bigfile
```

*With a **filename** specified as an argument, just that file will be listed*

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

*With a **directory** specified as an argument, the contents of the directory will be listed*

ls command

specifying multiple directories

*The **ls** command can take multiple arguments*

When a file is specified, just the filename is listed

When a directory is specified, the contents of the directory are listed

```
/home/cis90/simben $ ls Poems/ bin/ letter
letter

bin/:
app  banner  enlightenment  hi  I  treed  tryme  zoom

Poems/:
ant  Blake  nursery  Shakespeare  twister  Yeats
```

regular file

directories

ls command

- Syntax: **ls [options] [*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
-t	Sort by date
-R	Recursive (show all sub-directories)

- The *directory* argument can be:
  An absolute pathname, e.g. **cd /home/cis90/milhom/Poems/**
  A relative pathname, e.g. **cd Poems**
  If no directory is specified, the current working directory is used.
  More than one directory can be specified

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

ls command

List Files

FYI …

- **ls** is in /bin and has been aliased to use color on terminal output

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

Using the type command to show where a command resides on the path

Note: the `--color=tty` is an option on the **ls** command. Options that are fully spelled usually use two dashes -- instead of 1

We will learn about aliases later in the course

ls command example

with 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

*Using the **ls** command with no arguments will list the files in the current directory*

ls command example

with the -F option

Regular files have no suffix

```
/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 **

*Use the **-F** option to show file types with symbols rather than color (helpful if you are color blind)*

ls command example

with the -a option

#Grenoble

```
/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 $
```

Use the -a option to show hidden files (files whose names start with a ".")

***..** a hidden file, is the parent directory*

***.** a hidden file, is this the current directory, think of . as meaning "here"*

ls command example

with the -S option


```
/home/cis90/simben $ ls -lS
total 132
-rw-rw-r--. 1 simben90 cis90 21762 Sep 18 15:30 uhistory
-rw-r--r--. 2 simben90 cis90 10576 Jul 20  2001 bigfile
drwxr-xr-x. 2 simben90 cis90  4096 Sep 11  2005 bin
d---------. 2 simben90 cis90  4096 Feb  1  2002 Hidden
drwxr-xr-x. 2 simben90 cis90  4096 Feb 17  2001 Lab2.0
drwxr-xr-x. 3 simben90 cis90  4096 Feb 17  2001 Lab2.1
drwxr-xr-x. 2 simben90 cis90  4096 Sep 11  2005 Miscellaneous
drwxr-xr-x. 5 simben90 cis90  4096 Sep 18 08:49 Poems
-rw-rw-r--. 1 simben90 cis90  4008 Sep 11 22:23 archives
-rw-rw-r--. 1 simben90 cis90  3766 Sep 12 18:53 mbox
-r--------. 1 simben90 staff  2780 Sep  6 13:47 lab01.graded
-rw-r--r--. 1 simben90 cis90  2175 Jul 20  2001 proposal2
-rw-r--r--. 1 simben90 cis90  2054 Sep 14  2003 proposal3
-rw-------. 1 simben90 cis90  1892 Sep 18 15:29 dead.letter
-rw-r--r--. 1 simben90 cis90  1580 Nov 16  2004 small_town
-r--------. 1 simben90 staff  1312 Sep 13 12:27 lab02.graded
-rw-rw-r--. 1 simben90 cis90  1194 Sep 12 15:19 mymessages
-rw-r--r--. 1 simben90 cis90  1074 Aug 26  2003 proposal1
-rw-r--r--. 1 simben90 cis90  1044 Jul 20  2001 letter
-rw-r--r--. 1 simben90 cis90   759 Jun  6  2002 mission
-rwxr-xr-x. 1 simben90 cis90   509 Jun  6  2002 timecal
-rw-r--r--. 1 simben90 cis90   485 Aug 26  2003 spellk
-rw-r--r--. 1 simben90 cis90   352 Jul 20  2001 what_am_i
-rw-r--r--. 1 simben90 cis90   250 Jul 20  2001 text.err
-rw-r--r--. 1 simben90 cis90   231 Jul 20  2001 text.fxd
-rw-r--r--. 1 simben90 cis90    52 Sep  3 10:03 log
-rw-r--r--. 1 simben90 cis90     0 Jul 20  2001 empty
/home/cis90/simben $
```

Note directories all have the same size (4096 bytes)

*Use the **-S** option to sort files by size*

ls command example

with the -i option


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

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

```
/home/cis90/simmsben $ ls -i
 9171 archives       9351 lab02.graded  12107 mission      12137 spellk
12613 bigfile       12080 Lab2.0        9233 mymessages   12138 text.err
12067 bin           12091 Lab2.1       12109 Poems        12139 text.fxd
 9087 dead.letter    9662 letter       12133 proposal1    12140 timecal
12076 empty         14208 log          12134 proposal2     9249 uhistory
12077 Hidden         9142 mbox         12135 proposal3    12141 what_am_i
15725 lab01.graded  12102 Miscellaneous 12136 small_town
```

*Use the **-i** option to show the inode associated with a filename*

This command shows exactly what is kept in a directory: filename & inode pairs (kind of like a phone book)

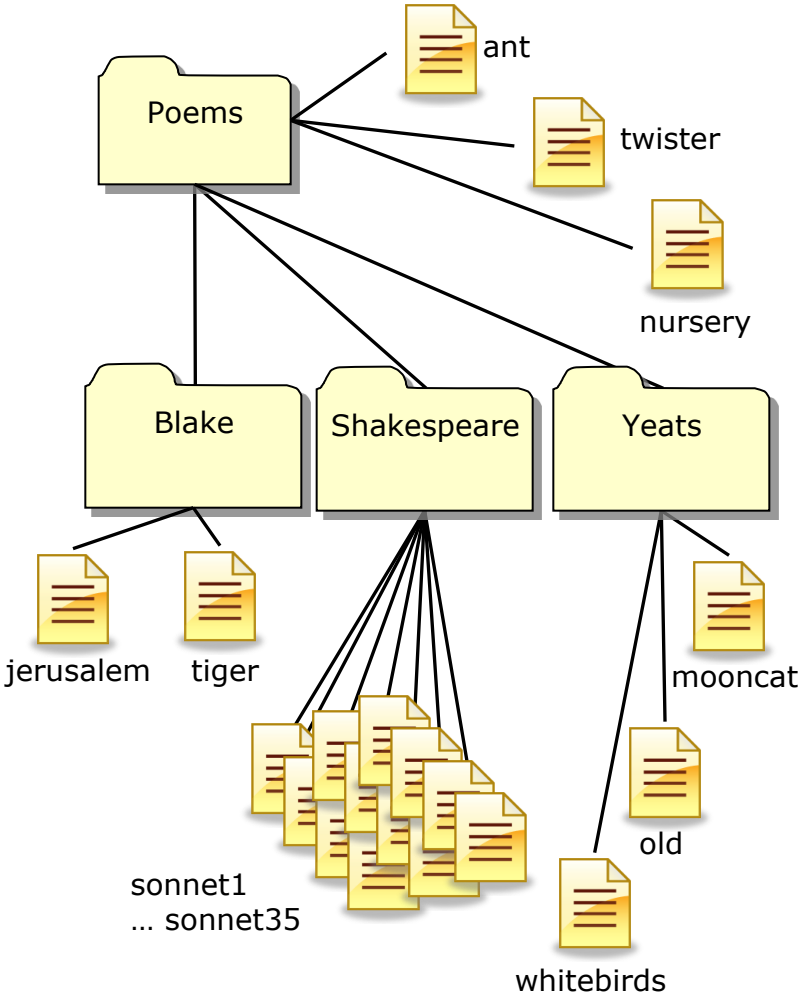
ls command

with the -lR options

long listing and recursive

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]$
```



ls command

with the -d option

#Tahiti

```
/home/cis90/simben $ ls bin
app  banner  enlightenment  hi  I  treed  tryme  zoom
```

The contents of the directory are shown

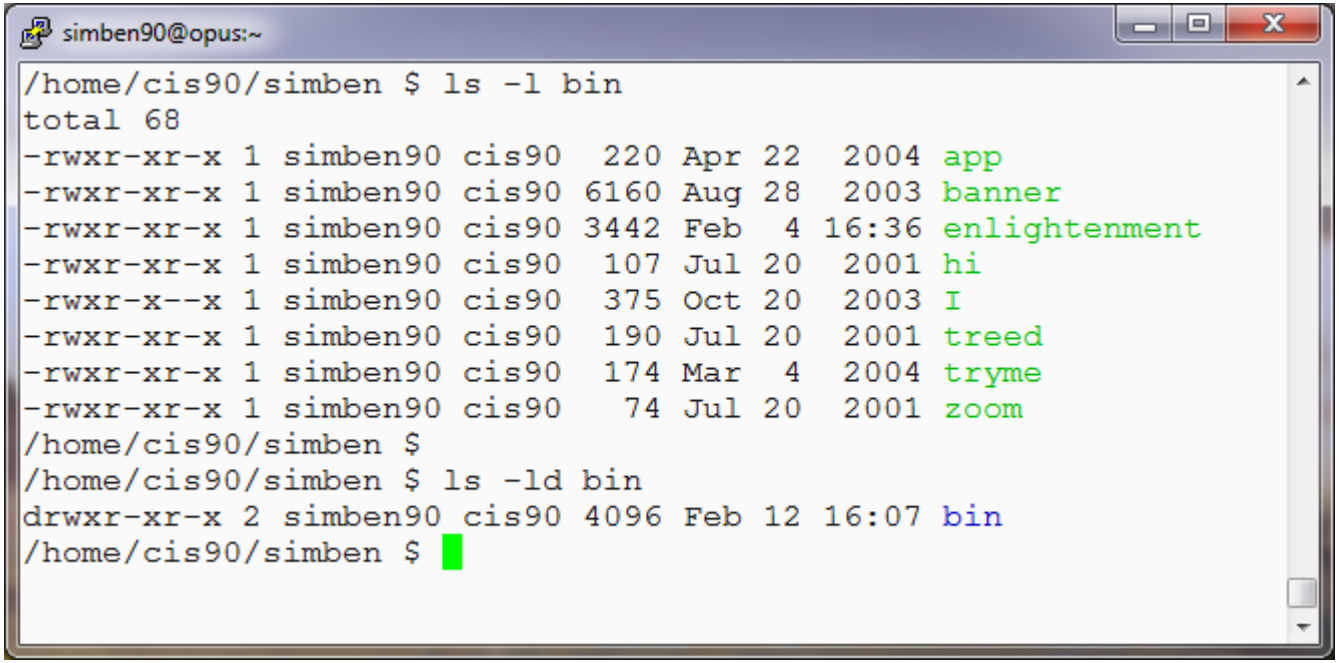
```
/home/cis90/simben $ ls -d bin
bin
```

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

with the -d option



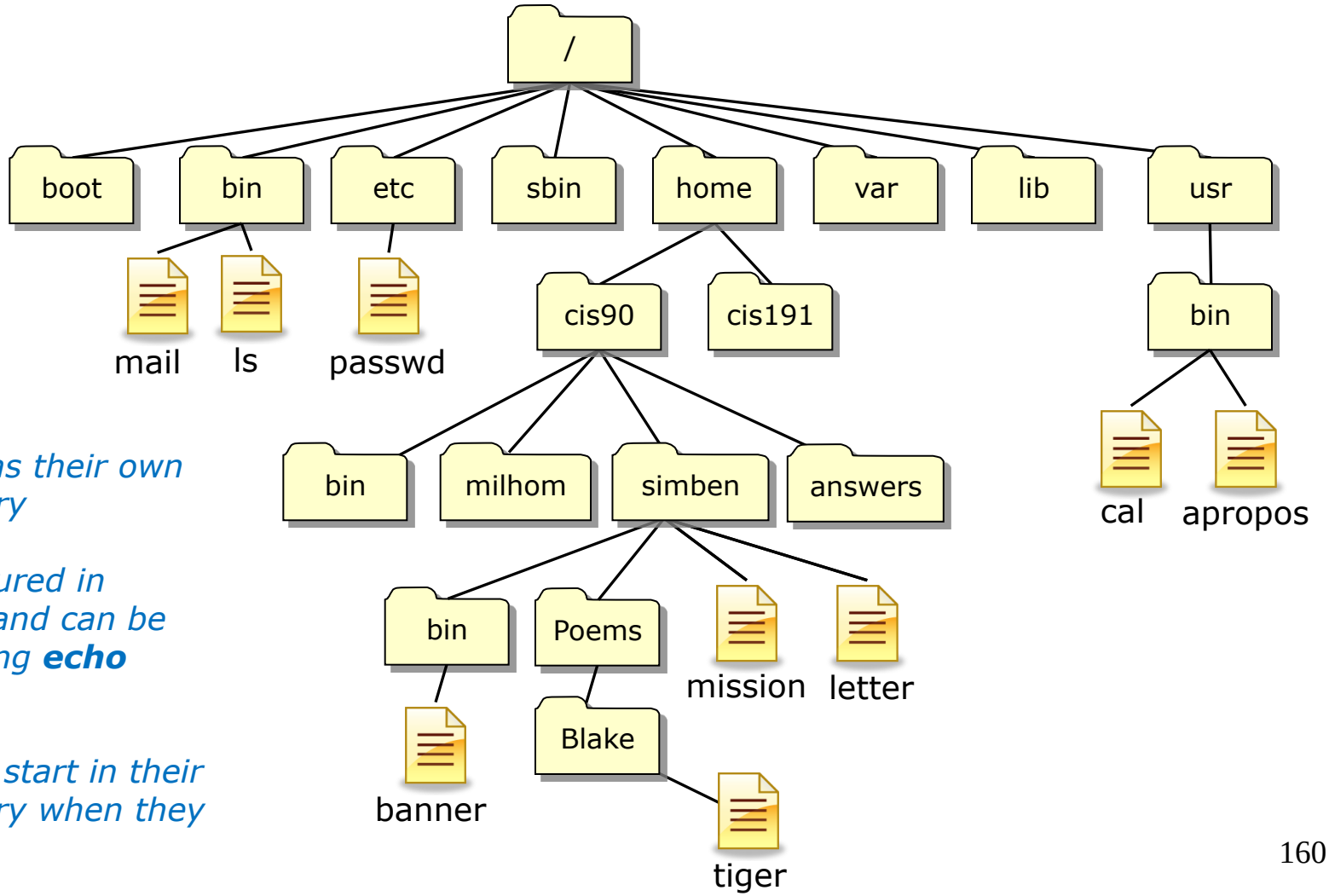
The directory contents are shown

The directory itself is shown with the -d option

Your home directory

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

Class Activity

1) Find your entry (use your own logname) in /etc/passwd

```
/home/cis90/simben $ grep simben90 /etc/passwd
simben90:x:1047:190:Benji Simms:/home/cis90/simben:/bin/bash
```

2) Show the contents of the HOME variable

```
/home/cis90/simben $ echo $HOME
/home/cis90/simben
```

3) List the contents of your home directory

```
/home/cis90/simben $ ls /home/cis90/simben
archives      empty          Lab2.0  Miscellaneous  proposal2   text.err  uhistory.bak
bigfile       Hidden         Lab2.1  mission        proposal3   text.fxd  what_am_i
bin           lab01.graded   letter  Poems          small_town  timecal
dead.letter   lab02.graded   log     proposal1      spellk      uhistory
```

Question:

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

Question: What are some different ways to get the inode number of your home directory while you are in your home directory?

Answer: At least four ways:

Specify the absolute pathname of the home directory

```
① /home/cis90/simben $ ls -id /home/cis90/simben/
 9017 /home/cis90/simben/
```

Using the . if you are currently in your home directory

```
② /home/cis90/simben $ ls -id .
 9017 .
```

The ~ is always an absolute pathname to home directory

```
③ /home/cis90/simben $ ls -id ~
 9017 /home/cis90/simben
```

Using contents of the parent directory

```
④ /home/cis90/simben $ ls -i /home/cis90
13658 answers  12656 depot    9342 keljos   9605 mosmic   9559 specod
 9062 beakie    9154 fahmic   9348 lefnic   9460 patcar   9635 thinic
12625 bin       9277 fitcon   9354 lehreb   9484 perste   9573 tilbuz
 9074 calmic    9647 genmar   9374 lemrob   9653 ramenr   9579 vasjor
 9087 casenr   11282 guest    9389 malmil   9535 ramjua   9629 vivrut
 9100 casric    9283 gutemi   9641 matjon   9032 rodduk   9611 weljon
 6782 cis       9297 hictre   9131 mccpat   9544 rudtro   9585 weltim
 9137 daweli    9312 hormat   9023 milhom   9017 simben
```

Note the use of the -d option on ls to focus on the directory itself rather than the directory contents

*

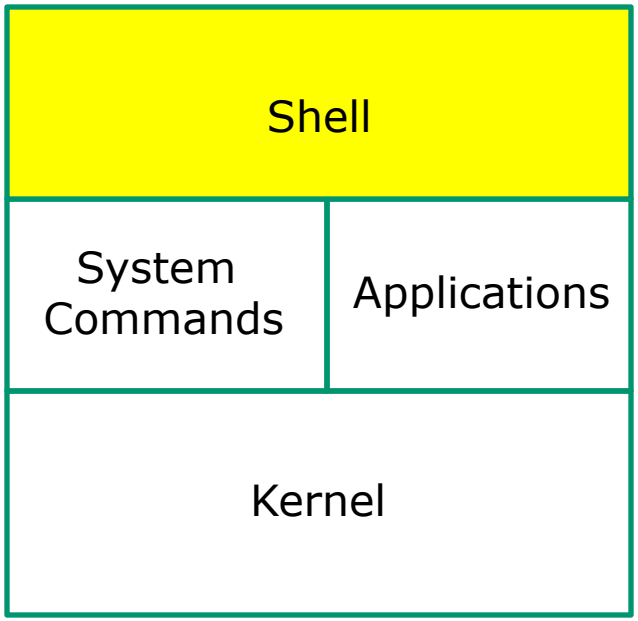
metacharacter

The "*" metacharacter

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

```
/home/cis90/simben $ file *
archives:       ASCII mail text
bigfile:        ISO-8859 English text, with overstriking
bin:            directory
dead.letter:    ASCII text
empty:          empty
Hidden:         directory
lab01.graded:   ASCII English text
lab02.graded:   ASCII English text
Lab2.0:         directory
Lab2.1:         directory
letter:         ASCII English text
log:            ASCII text
Miscellaneous:  directory
mission:        ASCII English text
Poems:          directory
proposal1:      ASCII English text
proposal2:      ASCII English text
proposal3:      ASCII English text
small_town:     ASCII English text
spellk:         ASCII English text
text.err:       ASCII text
text.fxd:       ASCII text
timecal:        Bourne-Again shell script text executable
uhistory:       ASCII mail text
uhistory.bak:   ASCII mail text
what_am_i:      data
```

Life of the Shell



1) Prompt
2) **Parse**
3) Search
4) Execute
5) Nap
6) Repeat

*Metacharacters, like the *, are processed and expanded during the Parse step*

(before the selected command is even run)

*

filename expansion metacharacter

- The * is a shell metacharacter
- During the **parse step** the shell expands * and replaces it with matching filenames in the current directory or as part of any pathnames specified as arguments.
- The commands loaded by the shell never see the *, instead then see the expanded filenames.
- The * will only match non-hidden filenames when used by itself.

*

filename expansion metacharacter

```
/home/cis90/simben/Poems/Yeats $ ls
mooncat  old  whitebirds
```

```
/home/cis90/simben/Poems/Yeats $ file mooncat old whitebirds
mooncat:    ASCII English text
old:        ASCII English text
whitebirds: ASCII English text
```

user manually types in each filename in directory

```
/home/cis90/simben/Poems/Yeats $ file *
mooncat:    ASCII English text
old:        ASCII English text
whitebirds: ASCII English text
```

User let's the shell do the work instead

*In the second example, the shell, during the parse step, expands the * and replaces it with mooncat old whitebirds.*

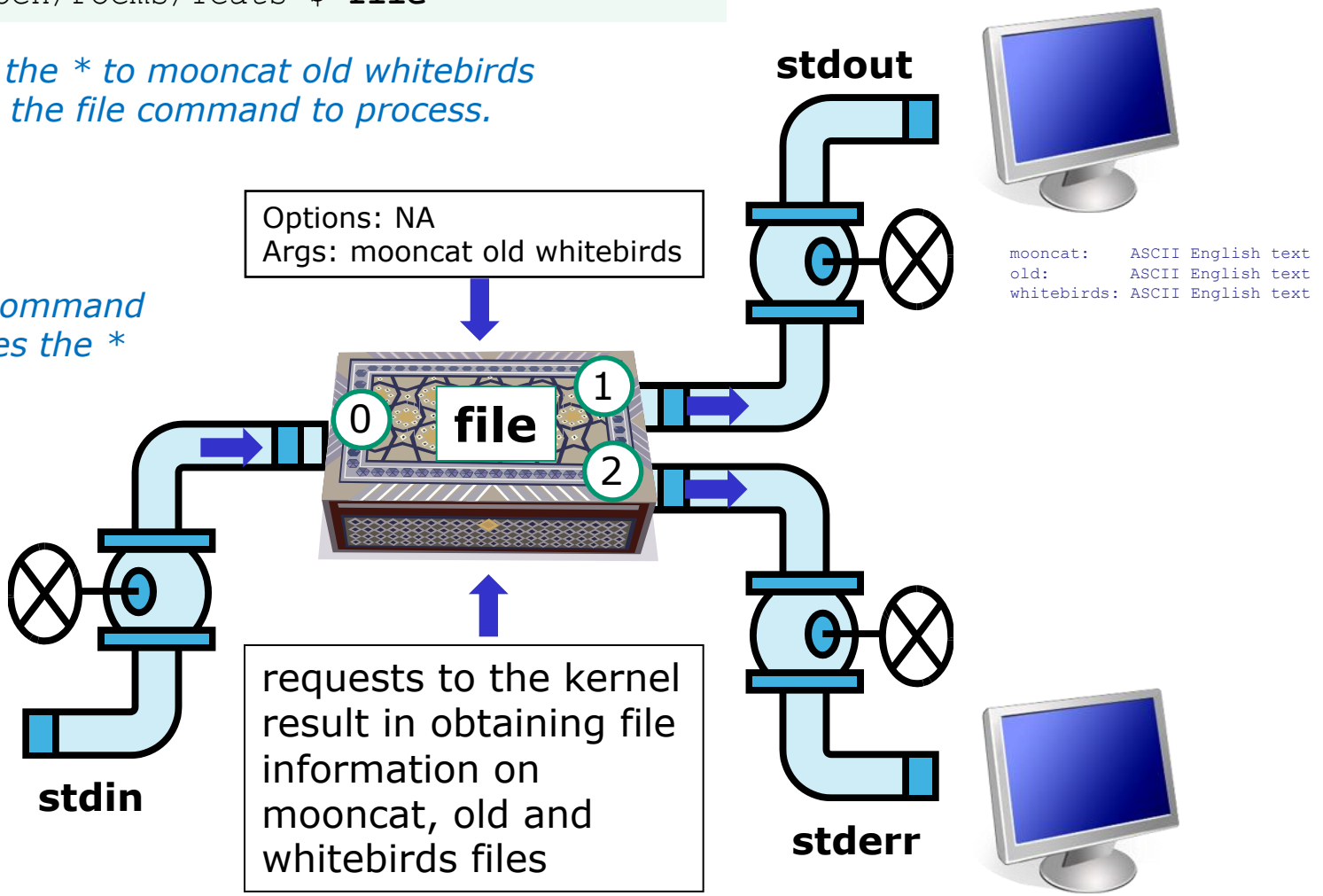
*The **file** command never sees the "*"*

Example program to process: file command

```
/home/cis90/simben/Poems/Yeats $ file *
```

*The shell expands the * to mooncat old whitebirds which is passed to the file command to process.*

*The file command never sees the **



* metacharacter

used as a *prefix* character

```
/home/cis90/simben $ 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/simben $ 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?*

* metacharacter

used as an *infix* character

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

am *matches all file names* ***containing*** *"am"*

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

* metacharacter

used as a *postfix* character

```
/home/cis90/simben $ 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/simmen $ ls p*
proposal1  proposal2  proposal3
```

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

Class Activity

List all poems in the CIS 90 student home directories whose filename contains "cat"

Type the name of these files in the chat window

```
ls ../*/Poems/*/*cat*
```

The path to enlightenment

UNIX Files
The three elements of a file

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

/home/cis90/simben/Poems $ ls -li twister
102625 -rw-r--r-- 1 simben90 cis90 151 Jul 20  2001 twister

/home/cis90/simben/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?"
```

filename
+
inode
+
data

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 (without the 90)*
/etc/passwd	

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 pathnames?

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

Backup

Parsing & Command Syntax

Shell prints this to prompt user to enter a command

Shell parses this command line

Prompt	Command	Options	Arguments	Redirection

Examples

***Options** modify the behavior of the command*

***Arguments** are what the command works upon*

***Redirection** is covered later in the course*

```
/home/cis90/simben $
/home/cis90/simben $ ls
/home/cis90/simben $ ls -l
/home/cis90/simben $ ls -l -t
/home/cis90/simben $ ls -li Poems/
/home/cis90/simben $ ls -a Poems/ bin/
/home/cis90/simben $ ls -d Poems/ bin/ > mylist
```

***Spaces (blanks)** are used to separate the command, options and arguments. Additional blanks are ignored.*

Lab 2

Lab 2 Results - S2

2. The type command takes another command as an argument and shows whether that command is on the path and if so where it resides. Type each of the following commands and notice where the commands supplied as arguments are located.

type man
type uname
type tryme
type echo
type type
type bogus
type man uname type

Lab 2 Results - S2

```
/home/cis90/simben $ type man
man is /usr/bin/man
```

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

```
/home/cis90/simben $ type uname
uname is /bin/uname
```

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

```
/home/cis90/simben $ type tryme
tryme is /home/cis90/simben/bin/tryme
```

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

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

Lab 2 Results - S2

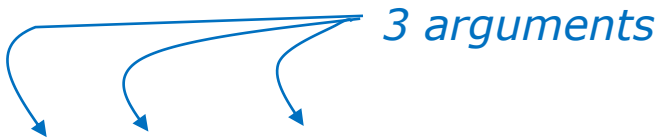
```
/home/cis90/simben $ type echo
echo is a shell builtin

/home/cis90/simben $ type type
type is a shell builtin
```

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

```
/home/cis90/simben $ type bogus
-bash: type: bogus: not found
```

There was no command named bogus on the path

Lab 2 Results - S2




```
/home/cis90/simben $ type man uname type
man is /usr/bin/man
uname is /bin/uname
type is a shell builtin
```

The type command can take multiple arguments

Lab 2 Results - S3

3. Use the echo command to show the value of several shell variables.

```
echo $HOME
echo $TERM
echo $LOGNAME
echo $PS1
echo $SHELL
echo $PATH
echo $TERM  $HOME  $LOGNAME
echo $LOGNAME
echo LOGNAME
echo $BOGUS
echo I am $LOGNAME and I like the $SHELL shell
```

Lab 2 Results - S3

```
/home/cis90/simben $ echo $HOME
/home/cis90/simben
```

The HOME variable contains the absolute pathname of your home directory

```
/home/cis90/simben $ echo $TERM
xterm
```

The TERM variable contains the type of the terminal you are using

```
/home/cis90/simben $ echo $LOGNAME
simben90
```

The LOGNAME variable contains the your username

Lab 2 Results - S3

```
/home/cis90/simben $ echo $PS1
$PWD $
```

The PS1 variable contains the your primary prompt string definition.

```
/home/cis90/simben $ echo $SHELL
/bin/bash
```

The SHELL variable contains the name of the shell being used.

```
/home/cis90/simben $ echo $PATH
/usr/lib/qt-
3.3/bin:/usr/local/bin:/bin:/usr/bin:/usr/local/sbin:/usr/sbin
:/sbin:/home/cis90/simben/../bin:/home/cis90/simben/bin:.
```

The PATH variable contains the directories the shell will search for commands you wish to run.

Lab 2 Results - S3

```
/home/cis90/simben $ echo $TERM $HOME $LOGNAME
xterm /home/cis90/simben simben90
```

You can specify multiple variables at a time (as multiple arguments) on the echo command

```
/home/cis90/simben $ echo $LOGNAME
simben90

/home/cis90/simben $ echo LOGNAME
LOGNAME
```

A "$" in front of a variable name instructs the shell to use the value rather than the name of the variable

```
/home/cis90/simben $ echo $BOGUS

/home/cis90/simben $
```

Undefined variables have a null value. "Null" means no value.

echo prints a blank line without any arguments

Lab 2 Results - S3

```
/home/cis90/simben $ echo I am $LOGNAME and I like the $SHELL shell
I am simben90 and I like the /bin/bash shell
```

This is an example of the echo command taking both text and variables as arguments.

Notice how the shell uses the value rather than the name of a variable when a $ metacharacter is used.

Lab 2 Results - S7

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 - S7

```
/home/cis90/simben $ echo one       two              threefour
one two threefour
```

(3 arguments)

Notice how the shell ignores additional unquoted blanks

```
/home/cis90/simben $ echo "My TERM type is " $TERM
My TERM type is  xterm
```

(2 arguments)

```
/home/cis90/simben $ echo one.two.three
one.two.three
```

(1 argument)

Lab 2 Results - S8

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 - S8

```
/home/cis90/simben $ echo red 'white
> and blue'
red white
and blue
```

*The unclosed single quote prevents the **<newline>** from signaling the end of the command.*

*The **<newline>** gets passed to the echo command which outputs two lines.*

*Pressing the Enter (or Return on Macs) key generates an invisible **<newline>** metacharacter.*

*The **<newline>** signals the shell to stop prompting and process the command line.*

```
/home/cis90/simben $ echo red white \
> 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>** is NOT passed to the echo command which outputs only a single line.*

Lab 2 Results - S8

Note: Primary prompt is determined by the value of PS1

```
/home/cis90/simben $ echo $PS1
$PWD $
```

The value of the PWD environment variable is your current working directory

```
/home/cis90/simben $ echo red 'white
> and blue'
red white
and blue
```

Note: Secondary prompt is determined by the value of PS2

```
/home/cis90/simben $ echo $PS2
>
```

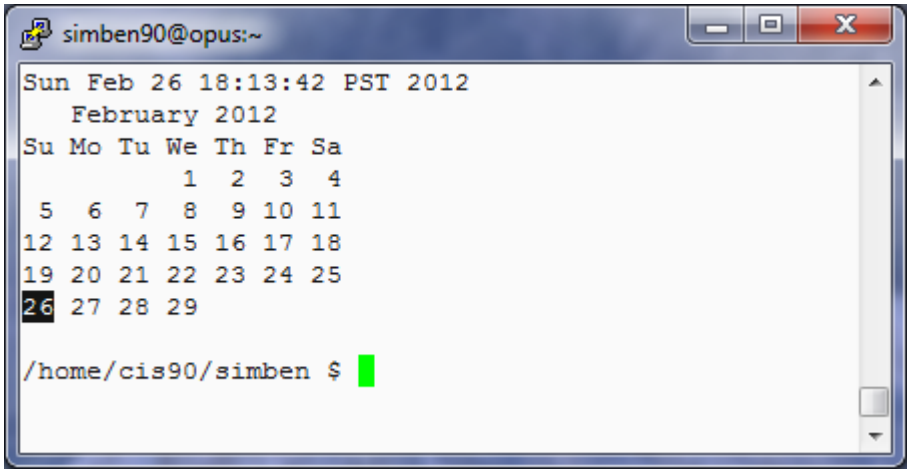
Lab 2 Results - S9

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 - S9

```
/home/cis90/simben $ clear; date; cal
```



The ; metacharacter allows multiple commands on one line

Lab 2 Results - S11

11. Use a single uname command with the necessary options to display ONLY the network node hostname, the kernel release number and the operating system. Your command should produce the following output:

oslab.cishawks.net 2.6.32-220.23.1.el6.i686 GNU/Linux

Hint: Use the man uname command, use q to quit.

Lab 2 Results - S11

Output from **man uname**

Use up and down arrows to scroll man page

```
-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, --mac
       pr

-p, --pro
       pr

-i, --har
       pr

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

```
/home/cis90/simben $ uname -orn
oslab.cabrillo.edu 2.6.32-220.23.1.el6.i686 GNU/Linux
or
/home/cis90/simben $ uname -o -r -n
oslab.cabrillo.edu 2.6.32-220.23.1.el6.i686 GNU/Linux
```

Use the man page to determine the necessary options for the: ***operating system****,* ***kernel release*** *numbers and* ***network node hostname***

Use q to quit the man page

FYI - a tangent on the GNU Public License (GPL)

Under the GPL, Free = Freedom to view and modify 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/cis90/simben $ 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*

This is one of the really cool things about Linux and the GNU General Public License … if you don't like something you can change it!

See: http://oslab.cabrillo.edu/forum/viewtopic.php?f=31&t=683&p=2632

Lab 2 Results - S16

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?

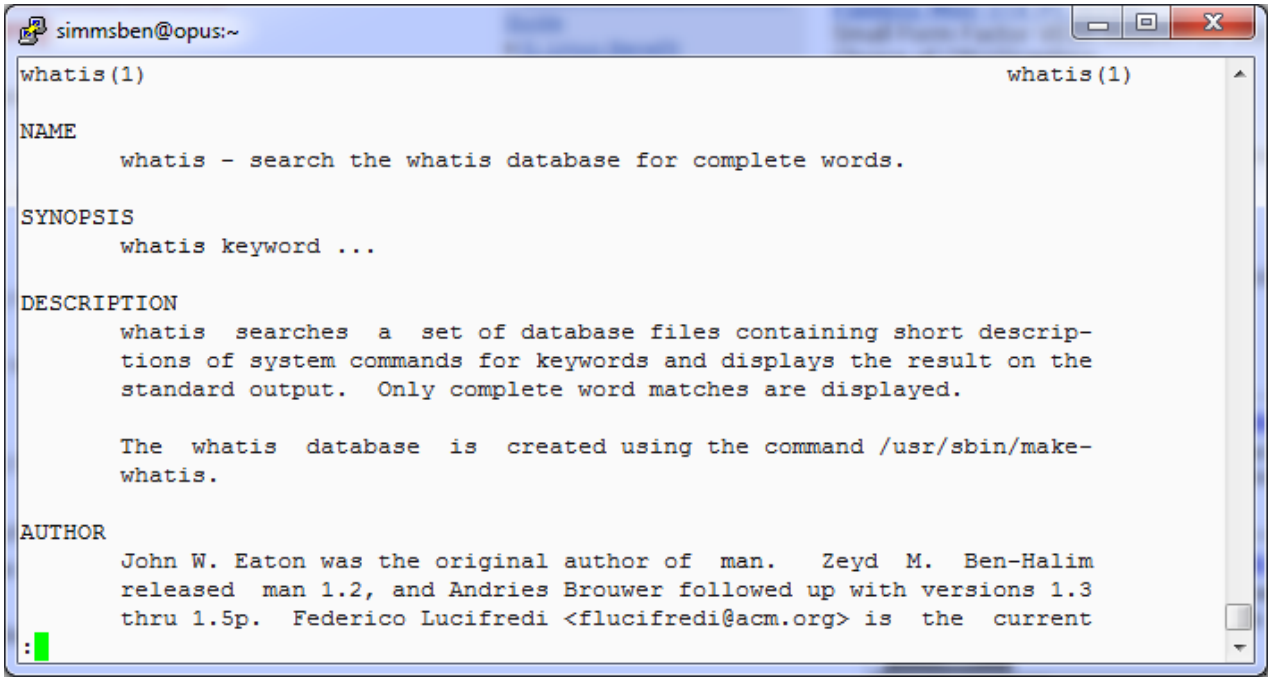
man -f bc

Lab 2 Results - S16

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

```
/home/cis90/simben $ whatis whatis
whatis                (1)  - search the whatis database for complete words

/home/cis90/simben $ man whatis
```

Output from **man whatis**



Lab 2 Results - S16

*Use the **whatis** to find out about the BC command*

```
/home/cis90/simben $ 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).
```

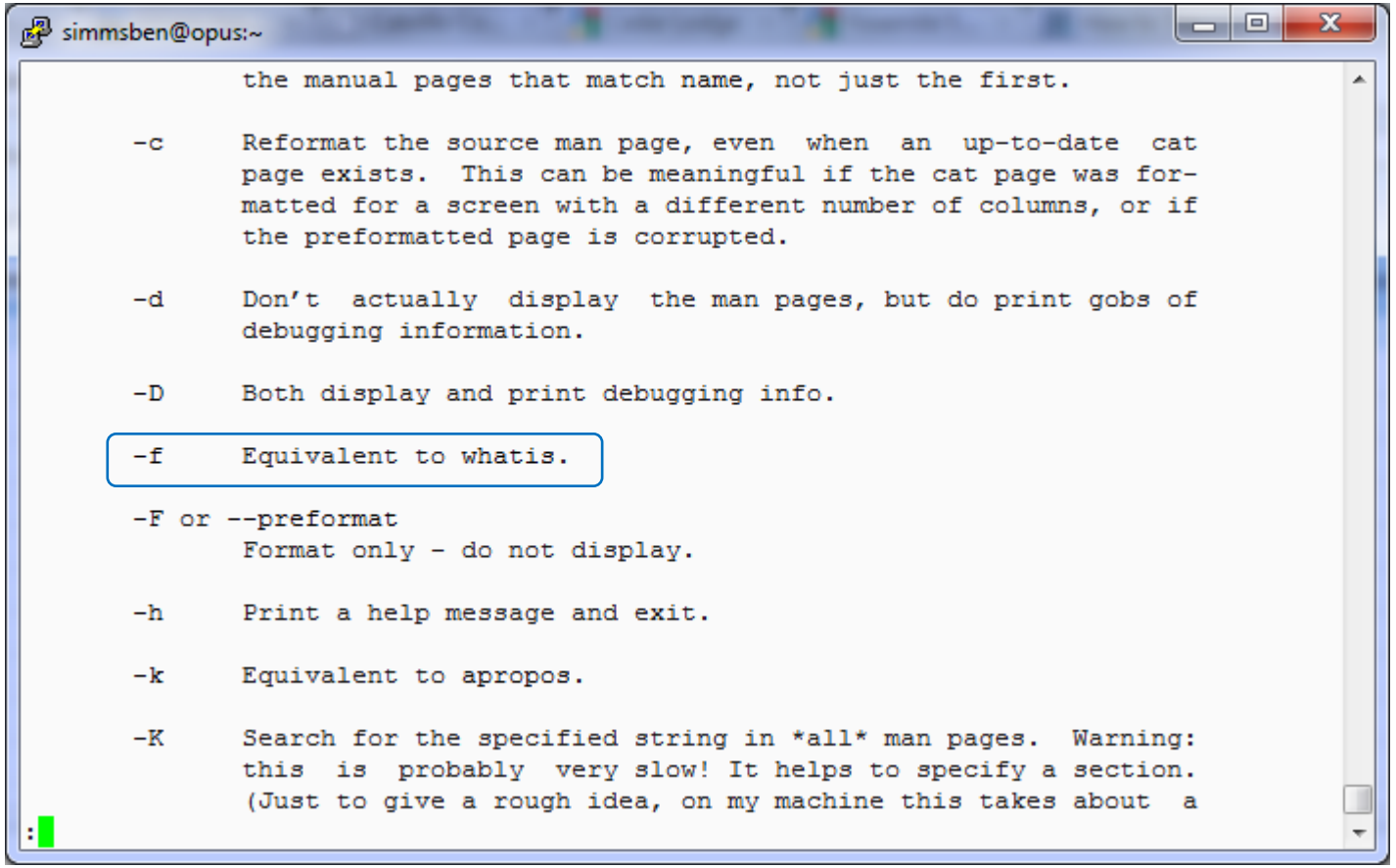
*Compare output with **man -f** command*

```
/home/cis90/simben $ 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/cis90/simben $
```

They are equivalent

Lab 2 Results - S16

Output from **man man**



***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 - S17

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

Lab 2 Results - S17

```
/home/cis90/simben $ tryme
My name is "tryme"
I am pleased to make your acquaintance, Benji Simms
/tmp

/home/cis90/simben $ whatis tryme
tryme: nothing appropriate

/home/cis90/simben $ 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 - S17

```
/home/cis90/simben $ type tryme
tryme is /home/cis90/simben/bin/tryme
```

***type** shows **tryme** resides in the bin/ directory of Benji's home directory*

```
/home/cis90/simben $ file /home/cis90/simben/bin/tryme
/home/cis90/simben/bin/tryme: Bourne-Again shell script text executable
```

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

```
/home/cis90/simben $ cat  /home/cis90/simben/bin/tryme
#!/bin/bash
```

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

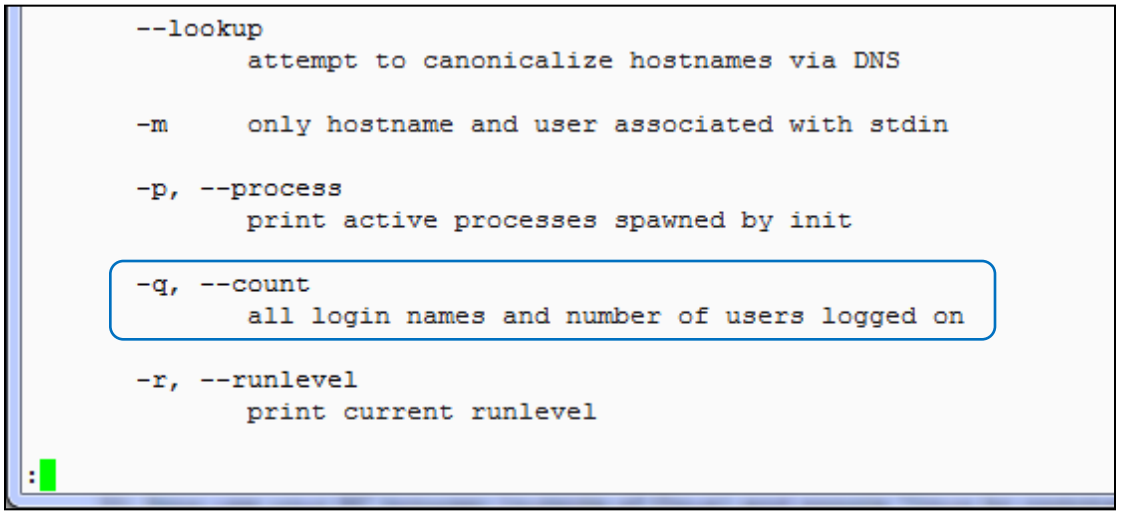
```
hello()
{
        cd /tmp
}
PATH=/bin
echo My name is \"`basename $0`\"
IFS=:
set `grep $LOGNAME /etc/passwd`
echo I am pleased to make your acquaintance, $5
hello
pwd
```

Lab 2 Results - S18

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

Lab 2 Results - S18

Output from **man who**



```
       --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. Use up and down arrows to scroll.*

```
[rsimms@opus ~]$ who -q
helrog90 jimmel90 rsimms saljac193 vascar193
# users=5
```

Lab 2 Results - S19

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 - S19

Output from **man man**

simmsben@opus:~

```
       -d     Don't  actually  display  the man pages, but do print gobs of
              debugging information.

       -D     Both display and print debugging info.

       -f     Equivalent to whatis.

       -F or --preformat
              Format only - do not display.

       -h     Print a help message and exit.

       -k     Equivalent to apropos.

       -K     Search for the specified string in *all* man pages.  Warning:
              this  is  probably  very slow! It helps to specify a section.
              (Just to give a rough idea, on my machine this takes about  a
              minute per 500 man pages.)

       -m  system
              Specify  an alternate set of man pages to search based on the
              system name given.

       -p  string
:
```

*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 - S19

Output from **apropos boot**

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 s
firstboot-tui       (rpm) - A text in
grub                (rpm) - GRUB - th
initrd               (4)  - boot load
kexec                (8)  - directly
mbchk                (1)  - check the
mkbootdisk           (8)  - creates a
mkbootdisk          (rpm) - Creates a
perlboot             (1)  - Beginner(
pxeboot              (8)  - Network B
pxeos                (8)  - PXEBoot C
ty
reboot               (2)  - reboot or
reboot [halt]        (8)  - stop the
rhgb                (rpm) - Red Hat G
sys-unconfig         (8)  - shell scr
syslinux            (rpm) - Simple ke
system-config-netboot (8)  - Network
system-config-netboot (rpm) - network
system-config-netboot-cmd (rpm) - net
/home/cis90ol/simmsben $
```

Output from **man -k boot**

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*

Lab 2 Results - Q1 Name a UNIX command that gets its input only from the command line?

Lab 2 Results - Q1 Name a UNIX command that gets its input only from the command line?

```
/home/cis90/simmen $ echo hello world
hello world
```

```
/home/cis90/simben $ banner hello world
#      # ####### #        #        #######
#      # #       #        #        #      #
#      # #       #        #        #      #
####### #####   #        #        #      #
#      # #       #        #        #      #
#      # #       #        #        #      #
#      # ####### ####### ####### #######

#      # ####### ######  #        ######
#   #  # #      # #      # #        #      #
#   #  # #      # #      # #        #      #
#   #  # #      # ######  #        #      #
#   #  # #      # #    #   #        #      #
#   #  # #      # #     #  #        #      #
 ## ##  ####### #      # ####### ######
```

*The **echo** and **banner** commands are examples of commands that get their input from the command line*

Lab 2 Results - Q2 Name an interactive command that reads its input from the keyboard?

Lab 2 Results - Q2 Name an interactive command that reads its input from the keyboard?

```
/home/cis90/simmsben $ bc
bc 1.06
Copyright 1991-1994, 1997, 1998, 2000 Free
Software Foundation, Inc.
This is free software with ABSOLUTELY NO
WARRANTY.
For details type `warranty'.
2+2
4
500-200+3
303
sqrt(64)
8
quit
```

```
/home/cis90/simmsben $ passwd
Changing password for user simmsben.
Changing password for simmsben
(current) UNIX password:
New UNIX password:
BAD PASSWORD: is too similar to the old
one
New UNIX password:
Retype new UNIX password:
passwd: all authentication tokens updated
successfully.
```

*The **bc** (binary calculator) and **passwd** commands are examples of interactive commands that read their input from the keyboard*

Lab 2 Results - Q3 Name a UNIX command that gets its input from the Operating System?

Lab 2 Results - Q3 Name a UNIX command that gets its input from the Operating System?

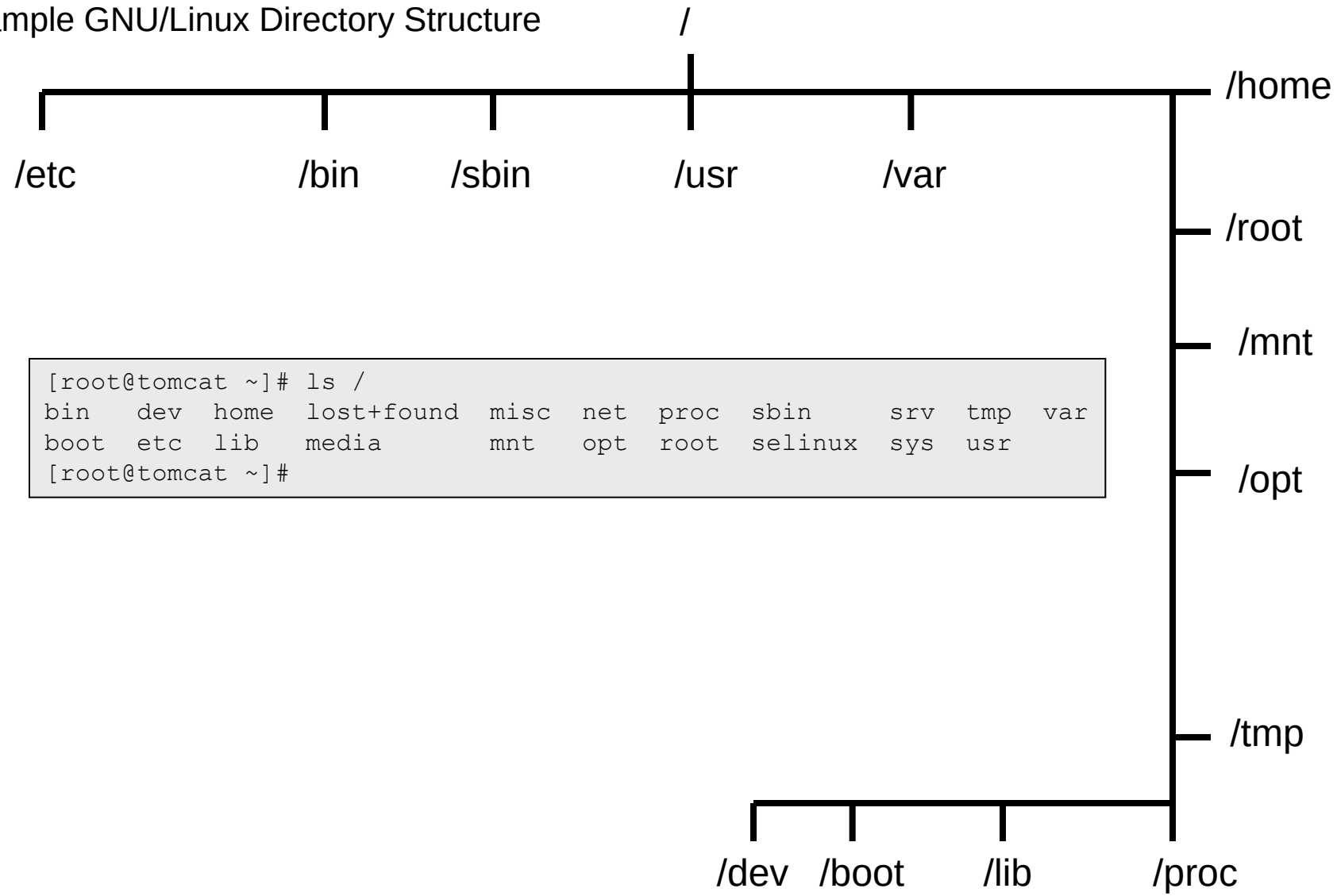
```
/home/cis90/simmen $ who
dycktim  pts/1        2010-09-07 17:07 (nosmo-nat.cabrillo.edu)
root     :0           2009-12-18 17:30
velasoli pts/2        2010-09-07 17:08 (adsl-35-201-114-102.dsl.net)
guest90  pts/3        2010-09-07 16:56 (nosmo-nat.cabrillo.edu)
rsimms   pts/4        2010-09-07 15:54 (dsl-45-78-13-81.dhcp.com)
guest90  pts/5        2010-09-07 16:59 (nosmo-nat.cabrillo.edu)
watsohar pts/6        2010-09-07 17:03 (nosmo-nat.cabrillo.edu)
swansgre pts/7        2010-09-07 17:10 (nosmo-nat.cabrillo.edu)
guest90  pts/8        2010-09-07 17:10 (nosmo-nat.cabrillo.edu)
abbenste pts/9        2010-09-07 17:11 (nosmo-nat.cabrillo.edu)
```

```
/home/cis90/simben $ uname
Linux
```

*The **who** and **uname** commands are examples of commands that get their input from the Operating System*

CIS Directories and Files

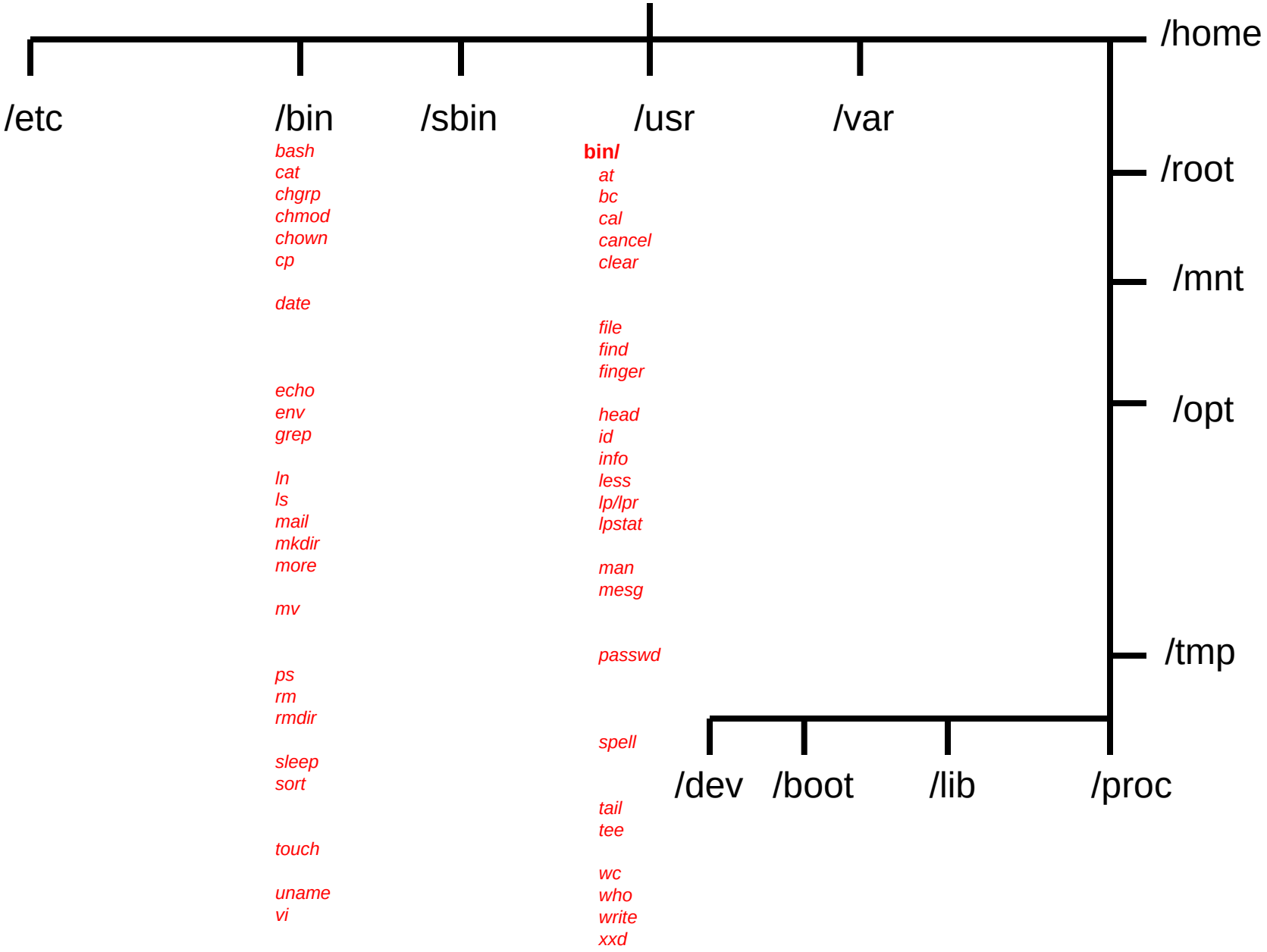
Example GNU/Linux Directory Structure




```
[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

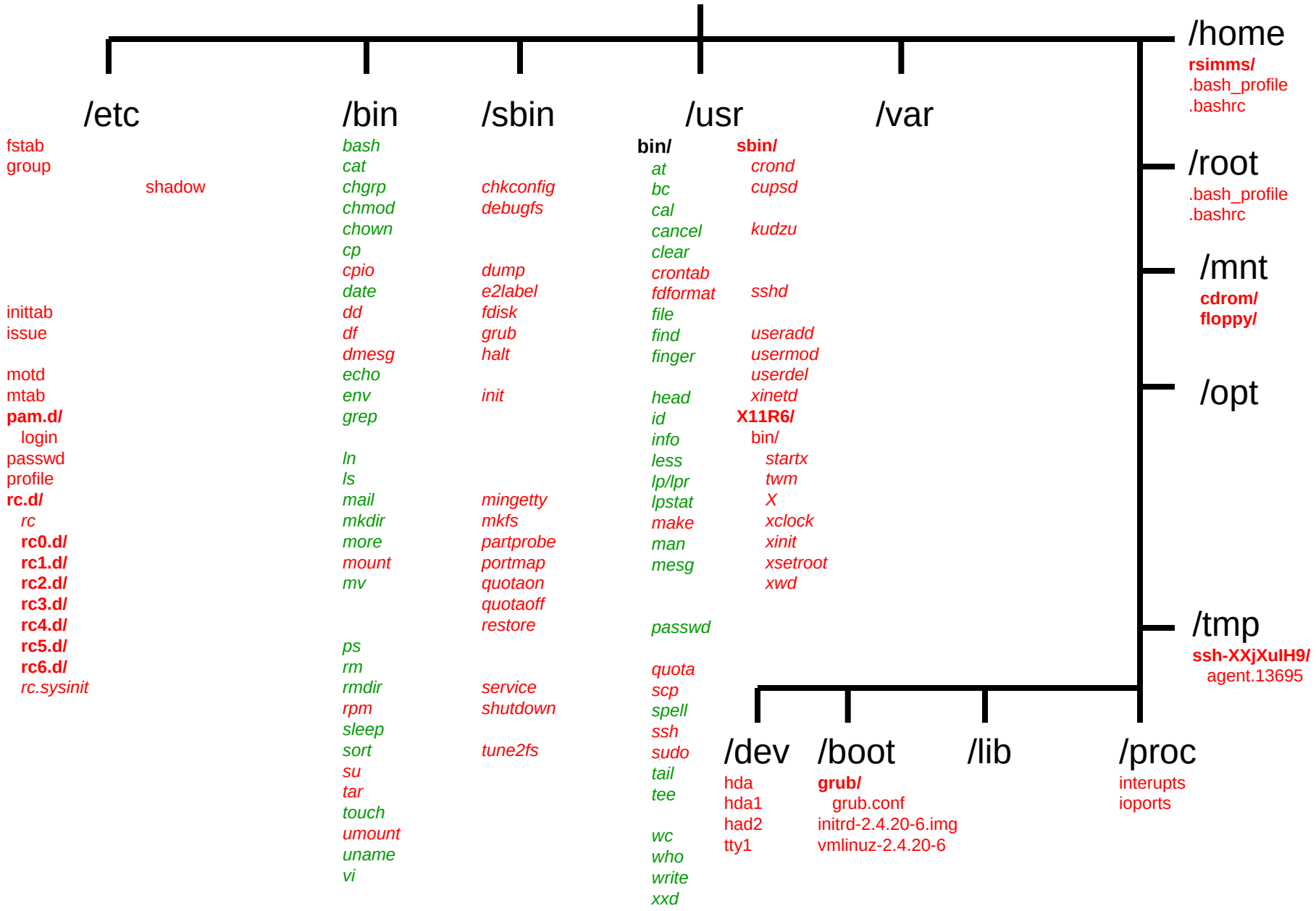
CIS 90 files, directories, commands



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

Example GNU/Linux Directory Structure

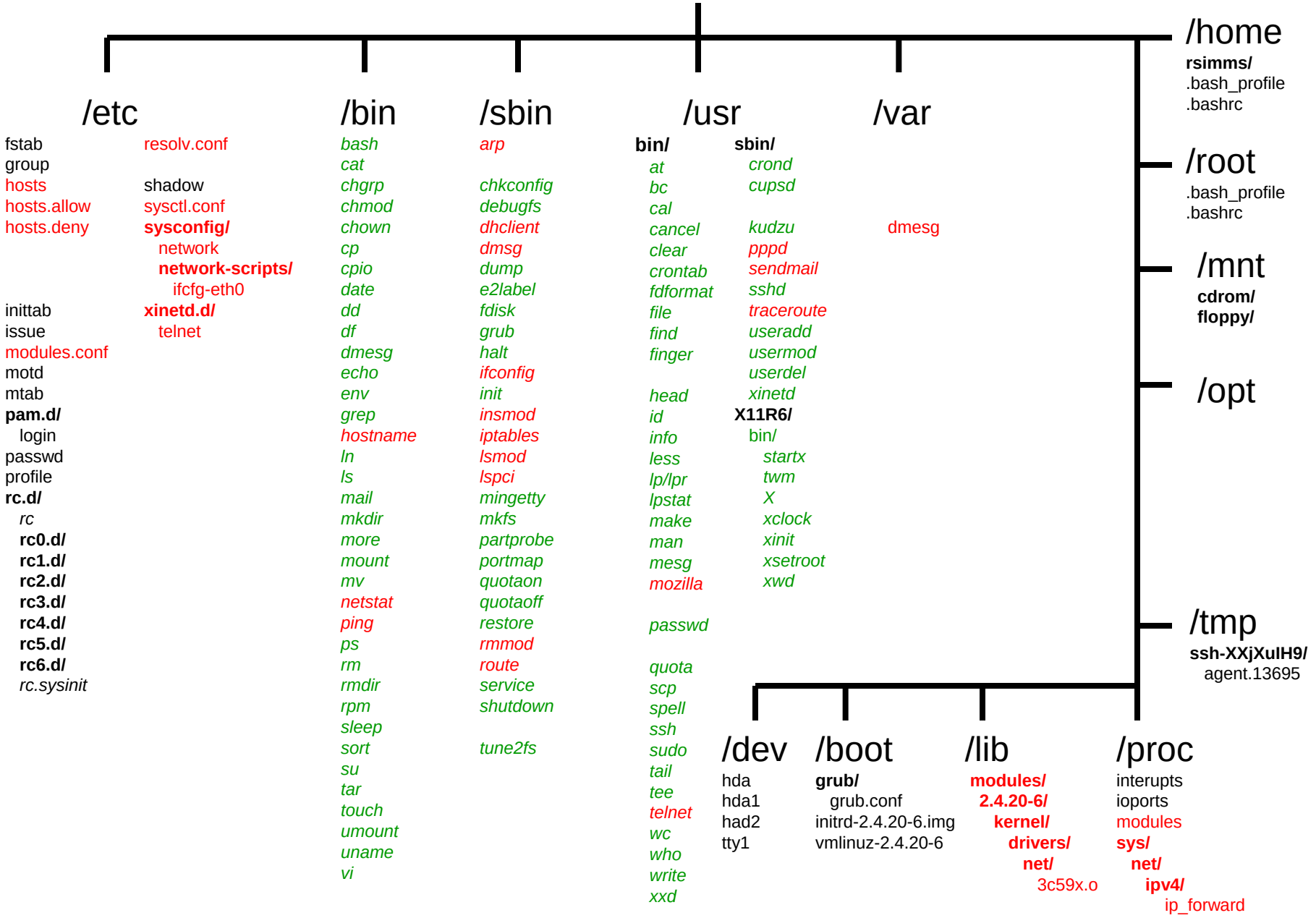
CIS 191 files, directories, commands



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

Example GNU/Linux Directory Structure

/



/etc

fstab
group
hosts
hosts.allow
hosts.deny
inittab
issue
modules.conf
motd
mtab
pam.d/
  login
passwd
profile
rc.d/
  rc
  rc0.d/
  rc1.d/
  rc2.d/
  rc3.d/
  rc4.d/
  rc5.d/
  rc6.d/
  rc.sysinit
resolv.conf
shadow
sysctl.conf
sysconfig/
  network
  network-scripts/
    ifcfg-eth0
xinetd.d/
  telnet

/bin

bash
cat
chgrp
chmod
chown
cp
cpio
date
dd
df
dmesg
echo
env
grep
hostname
ln
ls
mail
mkdir
more
mount
mv
netstat
ping
ps
rm
rmdir
rpm
sleep
sort
su
tar
touch
umount
uname
vi

/sbin

arp
chkconfig
debugfs
dhclient
dmsg
dump
e2label
fdisk
grub
halt
ifconfig
init
insmod
iptables
lsmod
lspci
mingetty
mkfs
partprobe
portmap
quotaon
quotaoff
restore
rmmod
route
service
shutdown
tune2fs

/usr

bin/
  at
  bc
  cal
  cancel
  clear
  crontab
  fdformat
  file
  find
  finger
  head
  id
  info
  less
  lp/lpr
  lpstat
  make
  man
  mesg
  mozilla
  passwd
  quota
  scp
  spell
  ssh
  sudo
  tail
  tee
  telnet
  wc
  who
  write
  xxd

sbin/
  crond
  cupsd
  kudzu
  pppd
  sendmail
  sshd
  traceroute
  useradd
  usermod
  userdel
  xinetd

X11R6/
  bin/
    startx
    twm
    X
    xclock
    xinit
    xsetroot
    xwd

/var

dmesg

/home

rsimms/
.bash_profile
.bashrc

/root

.bash_profile
.bashrc

/mnt

cdrom/
floppy/

/opt

/tmp

ssh-XXjXuIH9/
  agent.13695

/dev

hda
hda1
had2
tty1

/boot

grub/
  grub.conf
initrd-2.4.20-6.img
vmlinuz-2.4.20-6

/lib

modules/
  2.4.20-6/
    kernel/
      drivers/
        net/
          3c59x.o

/proc

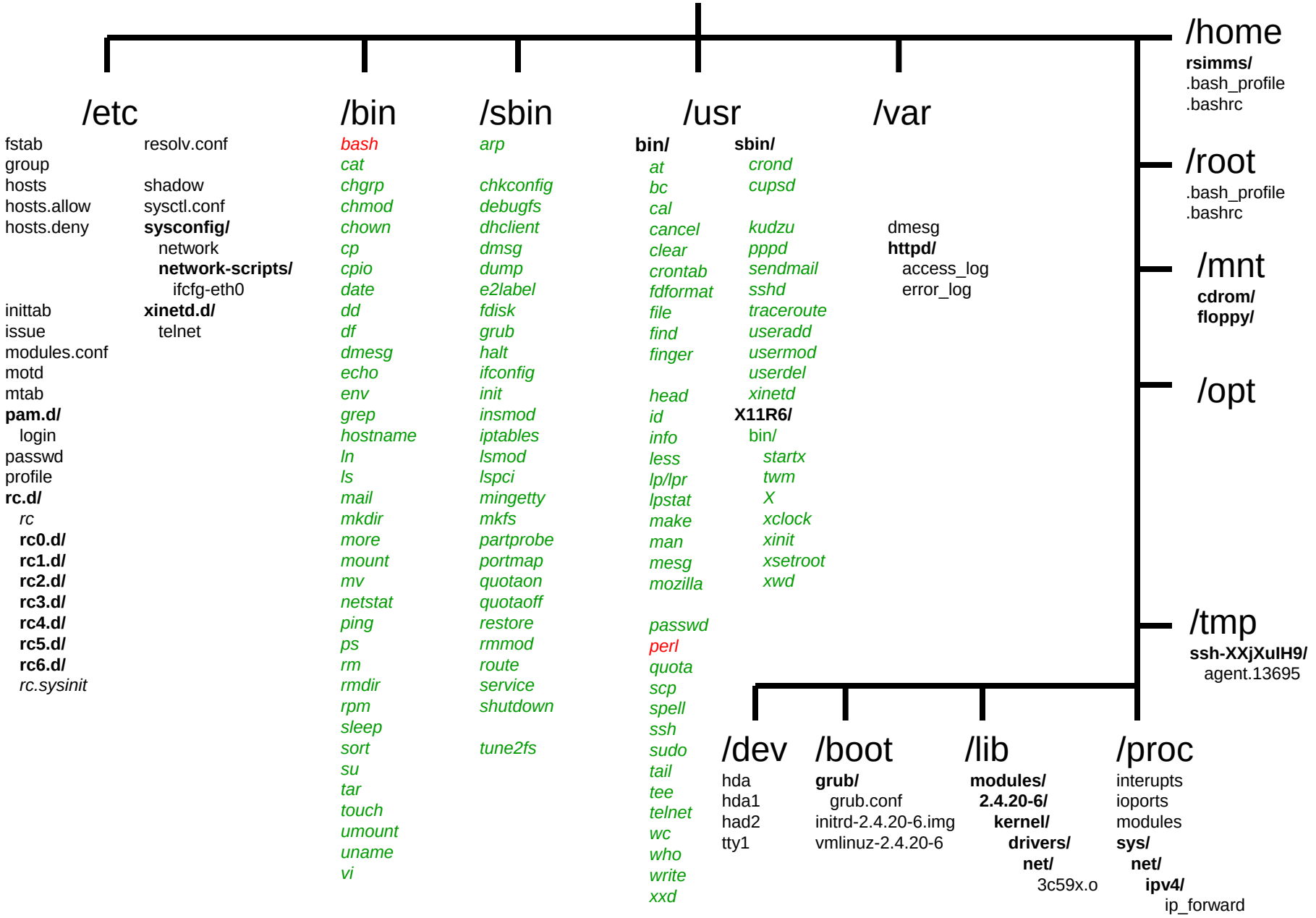
interupts
ioports
modules
sys/
  net/
    ipv4/
      ip_forward

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

Example GNU/Linux Directory Structure

/

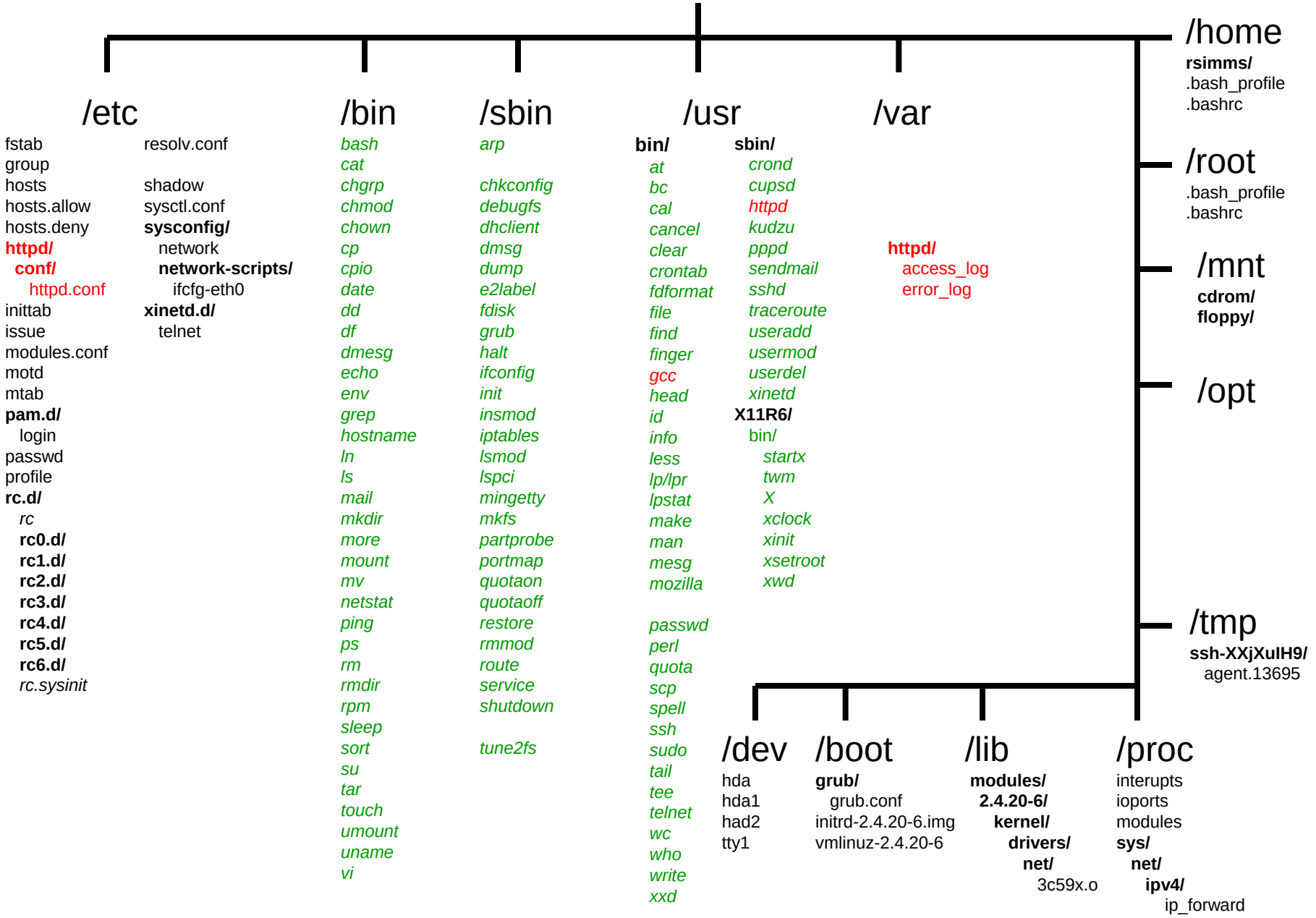
CIS 98 files, directories, commands



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

/



/etc

fstab
group
hosts
hosts.allow
hosts.deny
httpd/
conf/
httpd.conf
inittab
issue
modules.conf
motd
mtab
pam.d/
login
passwd
profile
rc.d/
rc
rc0.d/
rc1.d/
rc2.d/
rc3.d/
rc4.d/
rc5.d/
rc6.d/
rc.sysinit
resolv.conf
shadow
sysctl.conf
sysconfig/
network
network-scripts/
ifcfg-eth0
xinetd.d/
telnet

/bin

bash
cat
chgrp
chmod
chown
cp
cpio
date
dd
df
dmesg
echo
env
grep
hostname
ln
ls
mail
mkdir
more
mount
mv
netstat
ping
ps
rm
rmdir
rpm
sleep
sort
su
tar
touch
umount
uname
vi

/sbin

arp

chkconfig
debugfs
dhclient
dmsg
dump
e2label
fdisk
grub
halt
ifconfig
init
insmod
iptables
lsmod
lspci
mingetty
mkfs
partprobe
portmap
quotaon
quotaoff
restore
rmmod
route
service
shutdown

tune2fs

/usr

bin/
at
bc
cal
cancel
clear
crontab
fdformat
file
find
finger
gcc
head
id
info
less
lp/lpr
lpstat
make
man
mesg
mozilla

passwd
perl
quota
scp
spell
ssh
sudo
tail
tee
telnet
wc
who
write
xxd

sbin/
crond
cupsd
httpd
kudzu
pppd
sendmail
sshd
traceroute
useradd
usermod
userdel
xinetd

X11R6/
bin/
startx
twm
X
xclock
xinit
xsetroot
xwd

/var

httpd/
access_log
error_log

/home

rsimms/
.bash_profile
.bashrc

/root

.bash_profile
.bashrc

/mnt

cdrom/
floppy/

/opt

/tmp

ssh-XXjXuIH9/
agent.13695

/dev

hda
hda1
had2
tty1

/boot

grub/
grub.conf
initrd-2.4.20-6.img
vmlinuz-2.4.20-6

/lib

modules/
2.4.20-6/
kernel/
drivers/
net/
3c59x.o

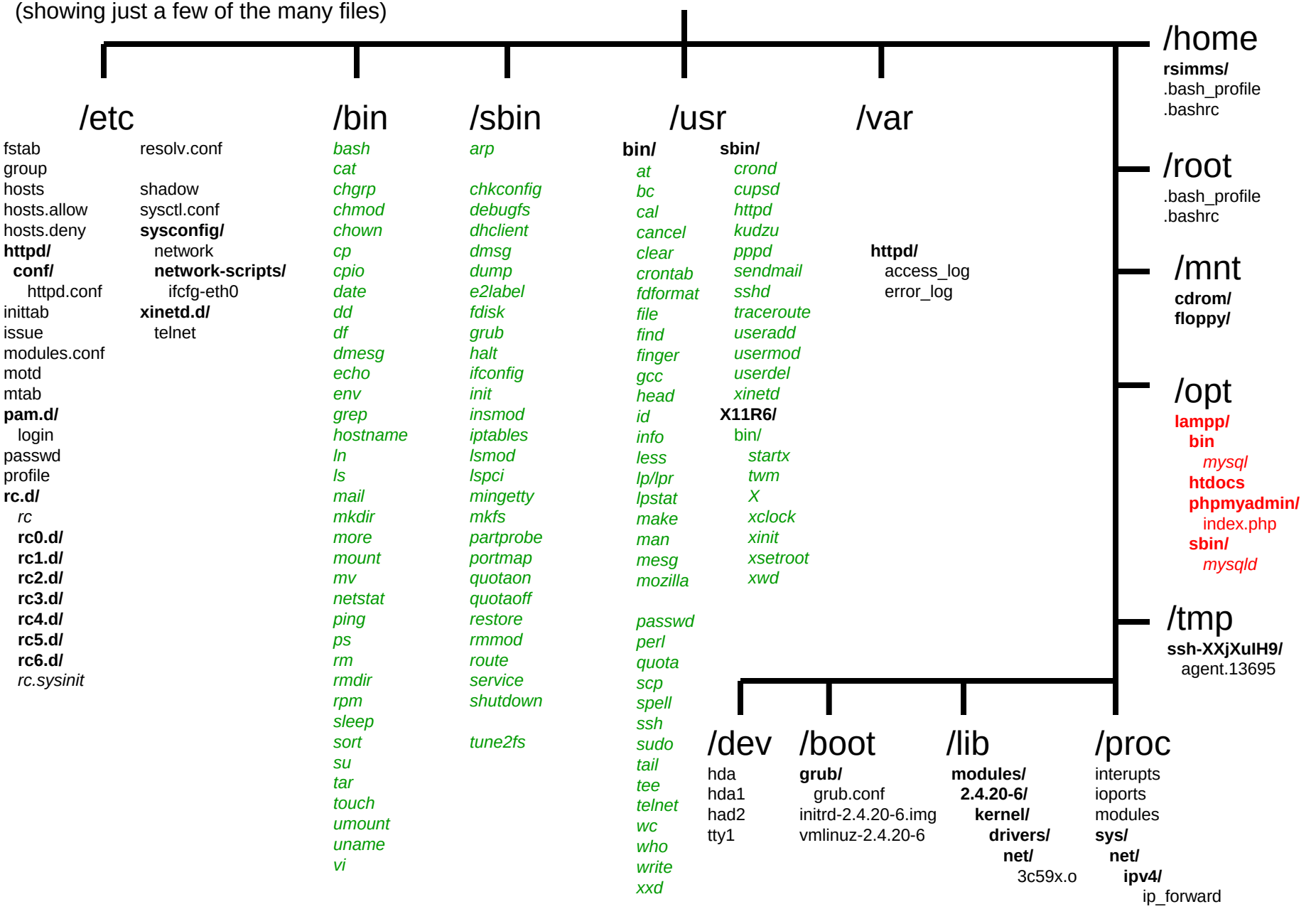
/proc

interupts
ioports
modules
sys/
net/
ipv4/
ip_forward

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)



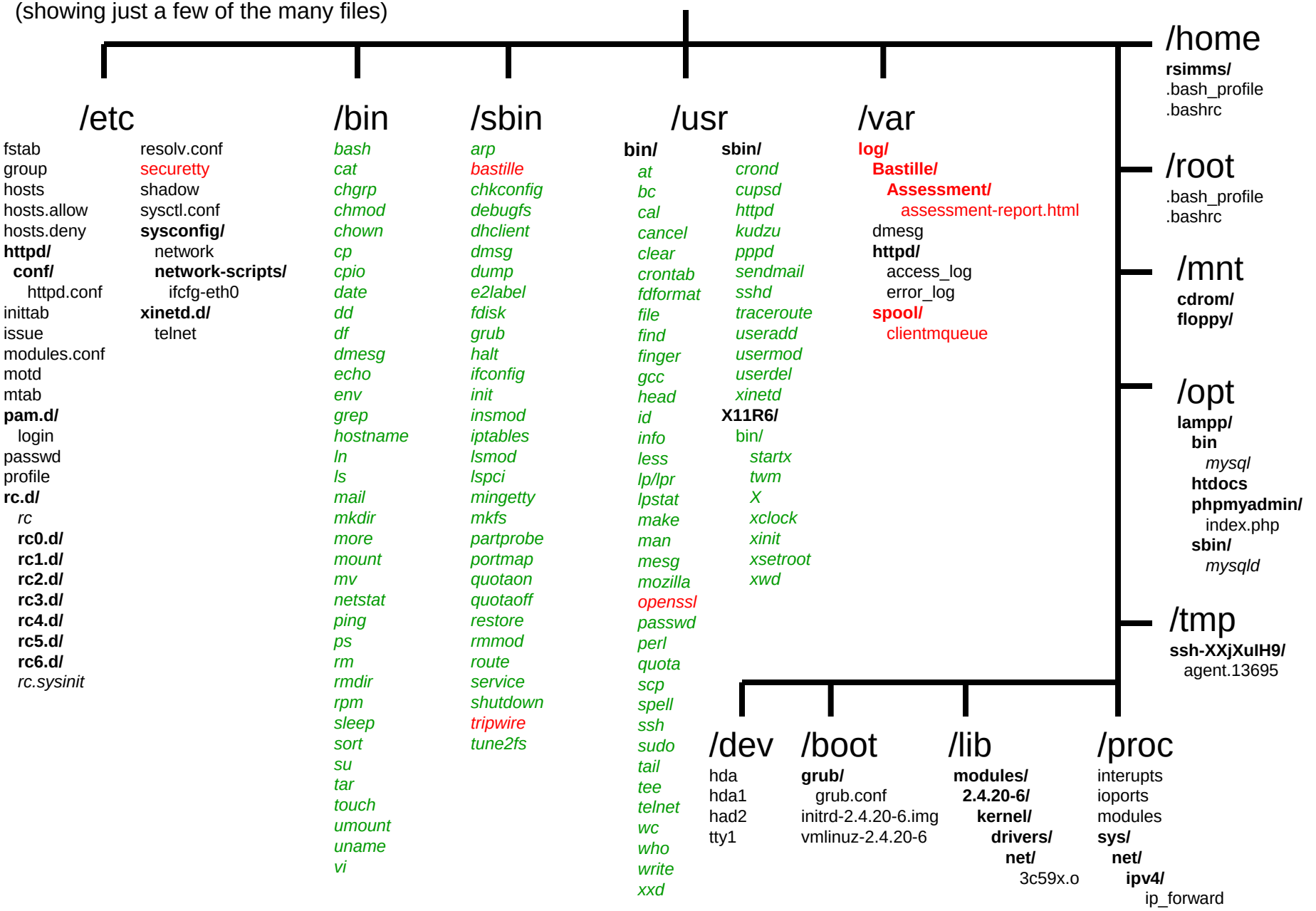
Note: shell builtins = cd, echo, exit, export, history, jobs, kill, pwd, set, type, umask, unset shell keywords = if, then, else, case, for, while

Example GNU/Linux Directory Structure

(showing just a few of the many files)

/

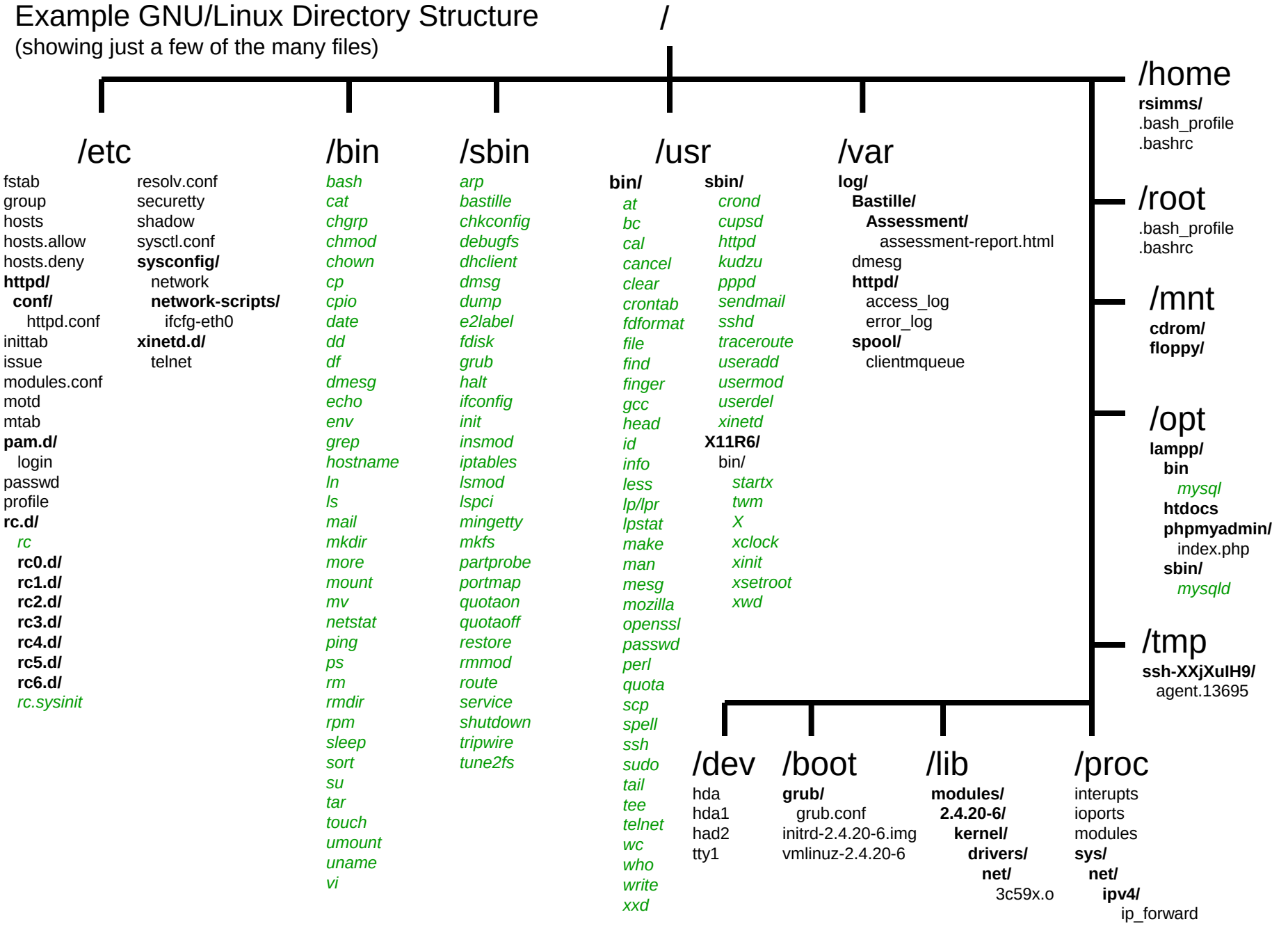
CIS 193 files, directories, commands



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)



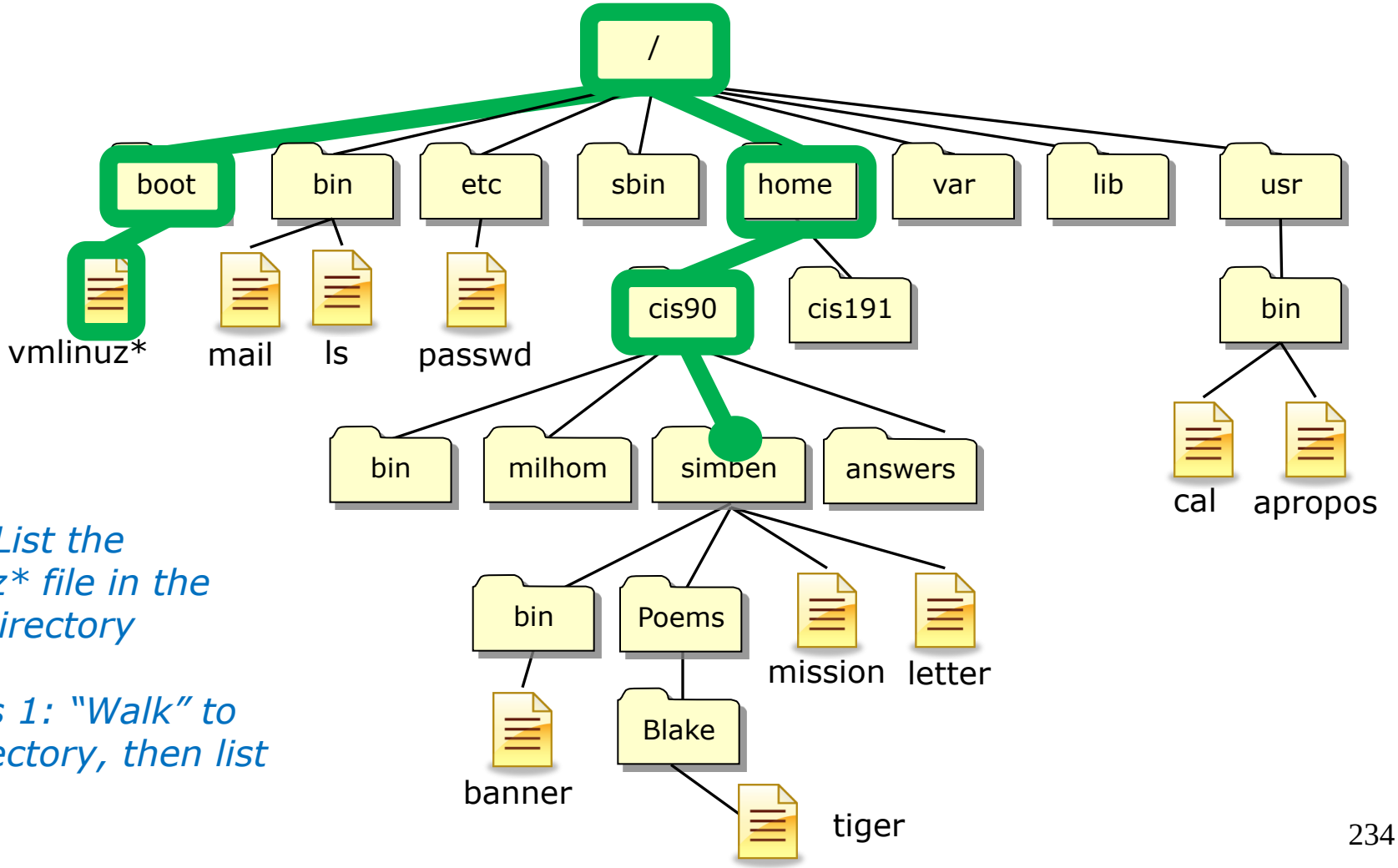
Note: shell builtins = cd, echo, exit, export, history, jobs, kill, pwd, set, type, umask, unset shell keywords = if, then, else, case, for, while

Class Exercise

- Go to your home directory, type: **cd**
- Do a long listing of every file in your home directory and sub-directories and include inode numbers

  ls -ilR

Listing a file in another directory - Option 1



Task: List the vmlinuz file in the /boot directory*

Options 1: "Walk" to the directory, then list the file.

Option 1: Listing a file by navigating to the directory first

```
/home/cis90/simben/Poems/Blake $ cd      start in your home directory
/home/cis90/simben $ cd ..               go up the tree
/home/cis90 $ ls                         look around
answers  davdon  farsha  hendaj  lyoben  mesmic  ramcar  simben
bin      depot   frocar  kanbry  marray  milhom  ramgus  verevi
calsea   ellcar  fyosea  kenrit  menfid  noreva  rawjes  wiljac
cis      evaand  guest   libkel  mescha  potjos  rodduk  zamhum
```

student home directories

```
/home/cis90 $ cd ..                      go up again
/home $ ls                               look around
cis172  cis90  cis98  gerlinde  guest  jimg  lost+found  rick  rsimms  turnin
```

my home directory

where labs are submitted

our class directory

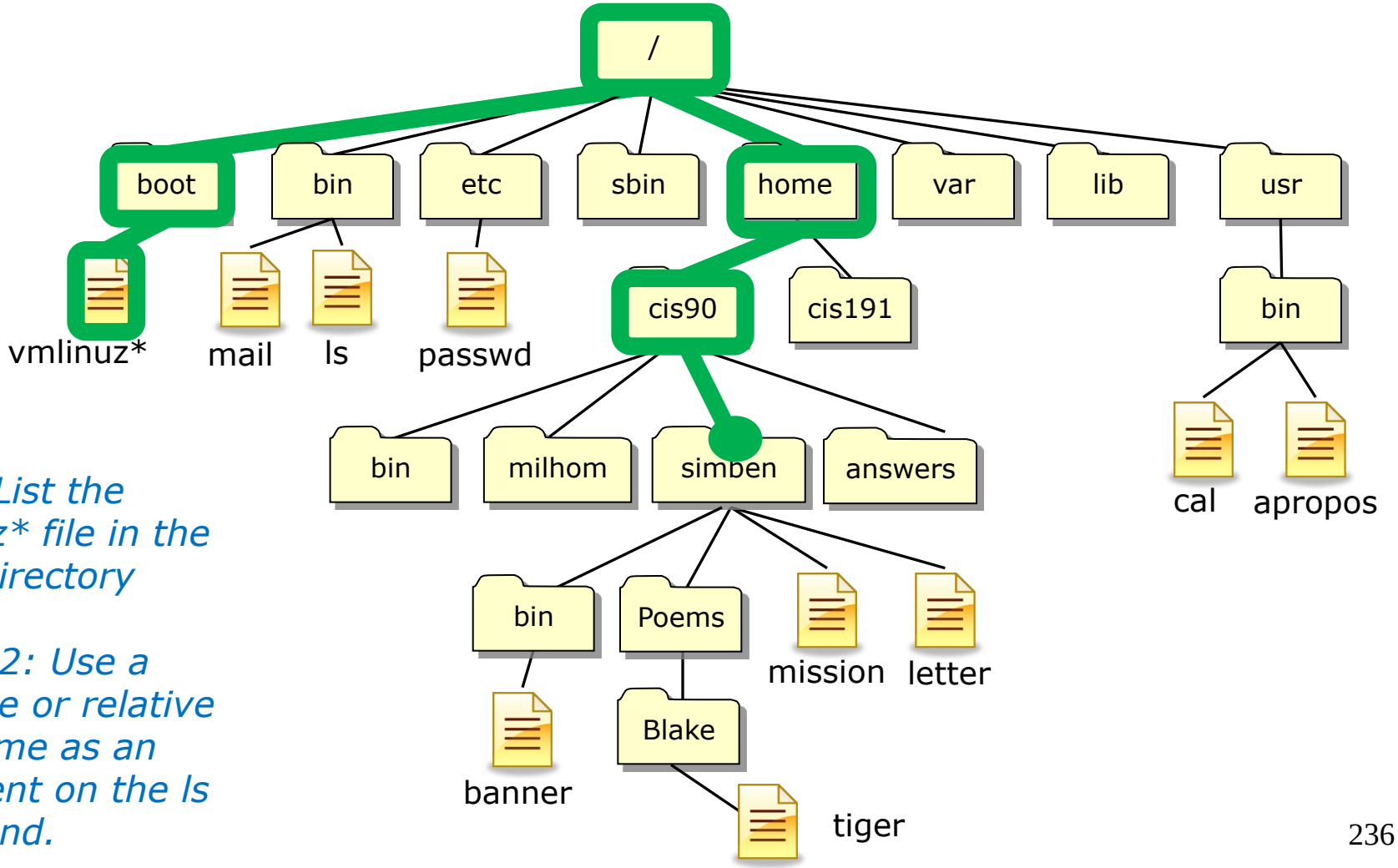
```
/home $ cd ..                            go up again
/ $ ls                                   look around
bin   cgroup  etc   lib         media  mnt  opt   root  selinux  sys  u    var
boot  dev     home  lost+found  misc   net  proc  sbin  srv      tmp  usr

/ $ cd boot                              go down into boot
/boot $ ls                               look around
config-2.6.32-220.23.1.el6.i686          symvers-2.6.32-220.23.1.el6.i686.gz
config-2.6.32-71.el6.i686                symvers-2.6.32-71.el6.i686.gz
efi                                      System.map-2.6.32-220.23.1.el6.i686
grub                                     System.map-2.6.32-71.el6.i686
initramfs-2.6.32-220.23.1.el6.i686.img   vmlinuz-2.6.32-220.23.1.el6.i686
initramfs-2.6.32-71.el6.i686.img         vmlinuz-2.6.32-71.el6.i686
```

Newer Linux kernel

Older Linux kernel

```
/boot $ ls -l vmlinuz-2.6.32-220.23.1.el6.i686
-rwxr-xr-x. 1 root root 3813888 Jun 18 09:14 vmlinuz-2.6.32-220.23.1.el6.i686
```

Listing a file in another directory - Option 2



Task: List the vmlinuz file in the /boot directory*

Option 2: Use a absolute or relative pathname as an argument on the ls command.

Option 2: Listing a file by using a pathname as an argument

```
/home/cis90/simben/Poems/Blake $ cd
```

start in your home directory

using an absolute pathname as the argument

```
/home/cis90/simben $ ls -l /boot/vmlinuz-2.6.32-220.23.1.el6.i686
-rwxr-xr-x. 1 root root 3813888 Jun 18 09:14 /boot/vmlinuz-2.6.32-220.23.1.el6.i686
/home/cis90/simben $
```

FYI, this is the Linux kernel