Rich's lesson module checklist

Last updated 02/20/2019

- ❑ Zoom recording named and published for previous lesson

- ❑ Slides and lab posted
- ❑ Print out agenda slide and annotate page numbers

- ❑ 1st minute quiz
- ❑ Flash cards
- ❑ Calendar page updated

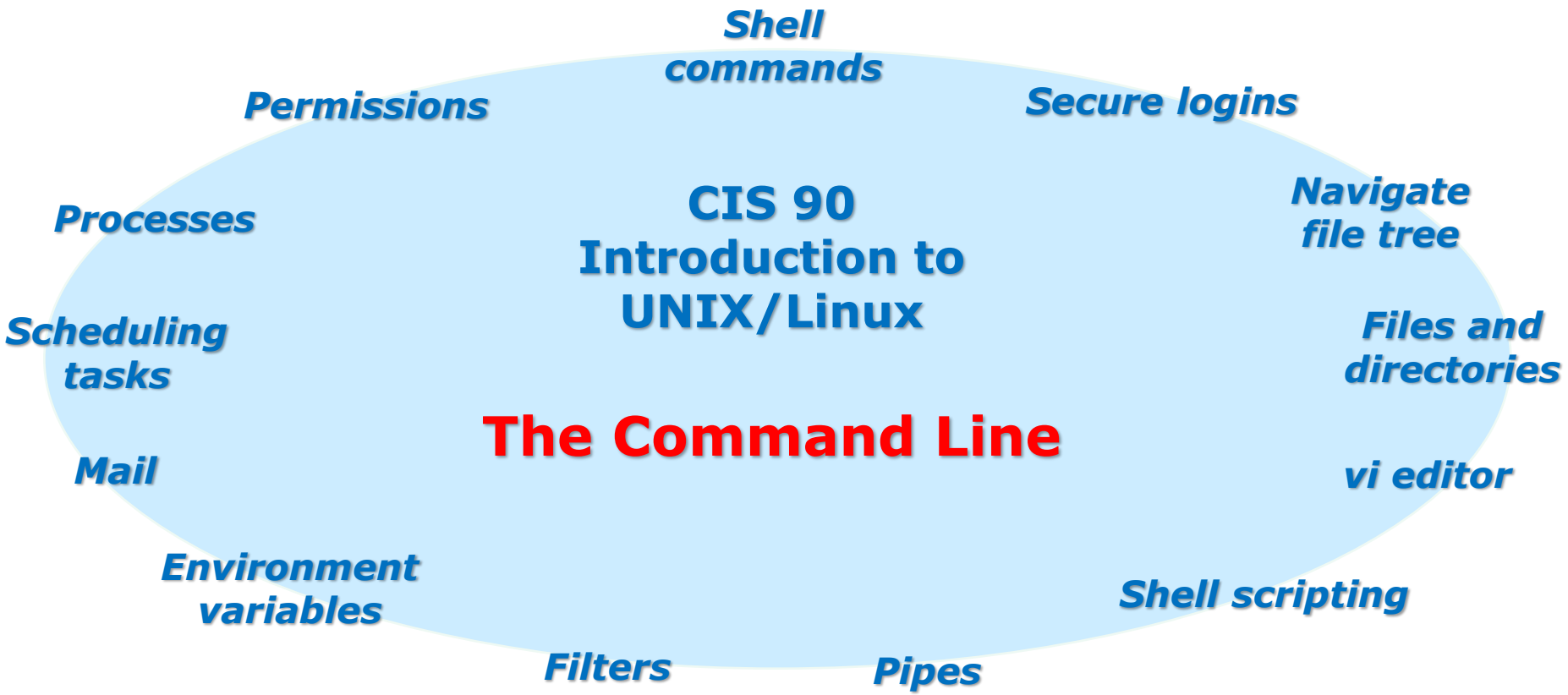
- ❑ VTEA instructions & forum post
- ❑ Linux home loan inventory (optional)

- ❑ https://zoom.us
  - ❑ Putty, slides, Chrome
  - ❑ Enable/Disable attendee sharing
    ^ > Advanced Sharing Options > Only Host
  - ❑ Enable/Disable attended annotations
    Share > More > Disable Attendee Sharing

- ❑ Lab 4 tested
- ❑ check4 feedbot (update data/user-pod-map file)
- ❑ scripts/schedule-submit-locks

- ❑ Enlightenment script tested
- ❑ Check example long file, /usr/share/doc/openssh-7.4p1/ChangeLog for change (Viewing Text Files, more & less commands)
- ❑ Check example kernel file for change (Basic File Types, Activity)

- ❑ 9V backup battery for microphone
- ❑ Backup slides, CCC info, handouts on flash drive
- ❑ Key card for classroom door



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.

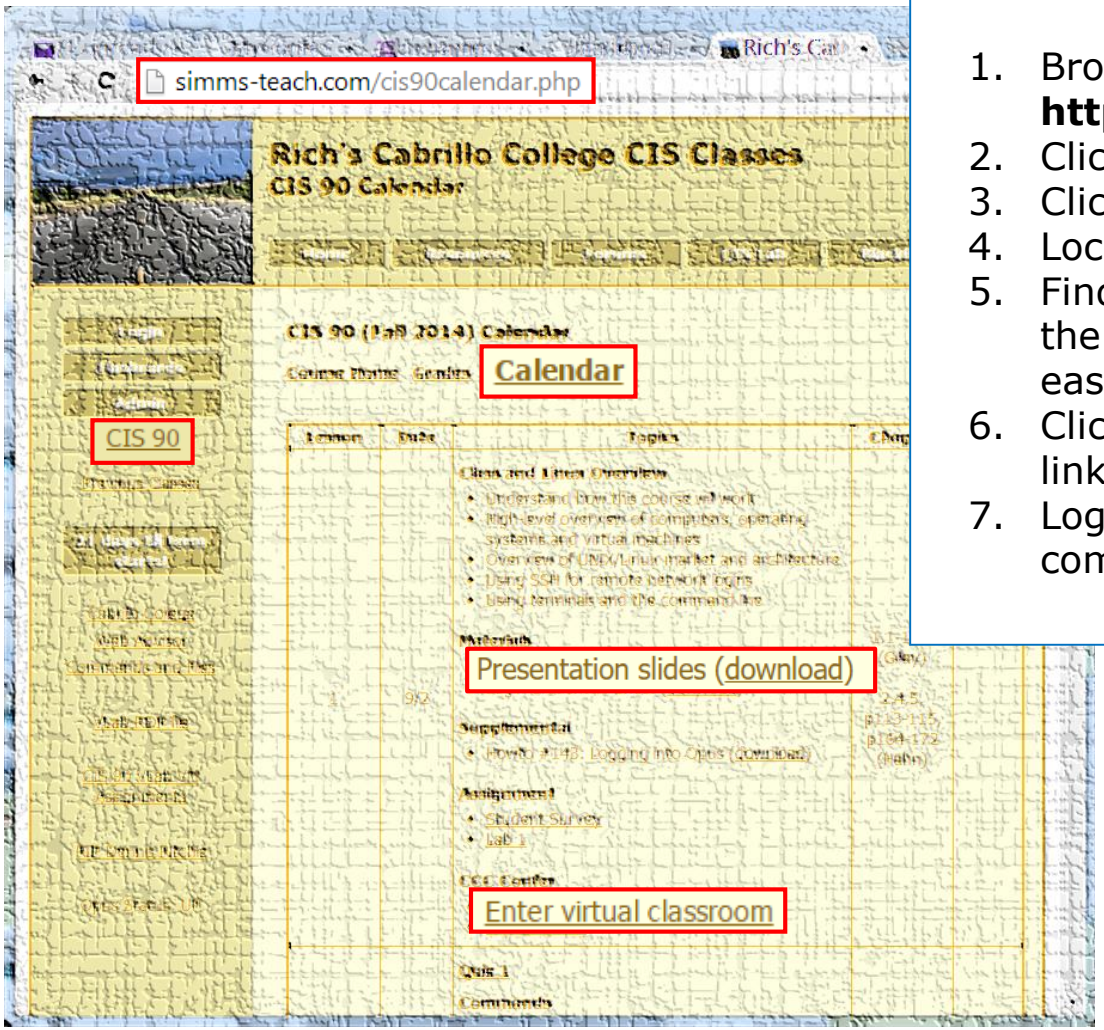
Introductions and Credits

Jim Griffin
- Created this Linux course
- Created Opus and the CIS VLab
- Jim's site: https://web.archive.org/web/20140209023942/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. John's site: http://teacherjohn.com/
- Jaclyn Kostner for many webinar best practices: e.g. mug shot page.

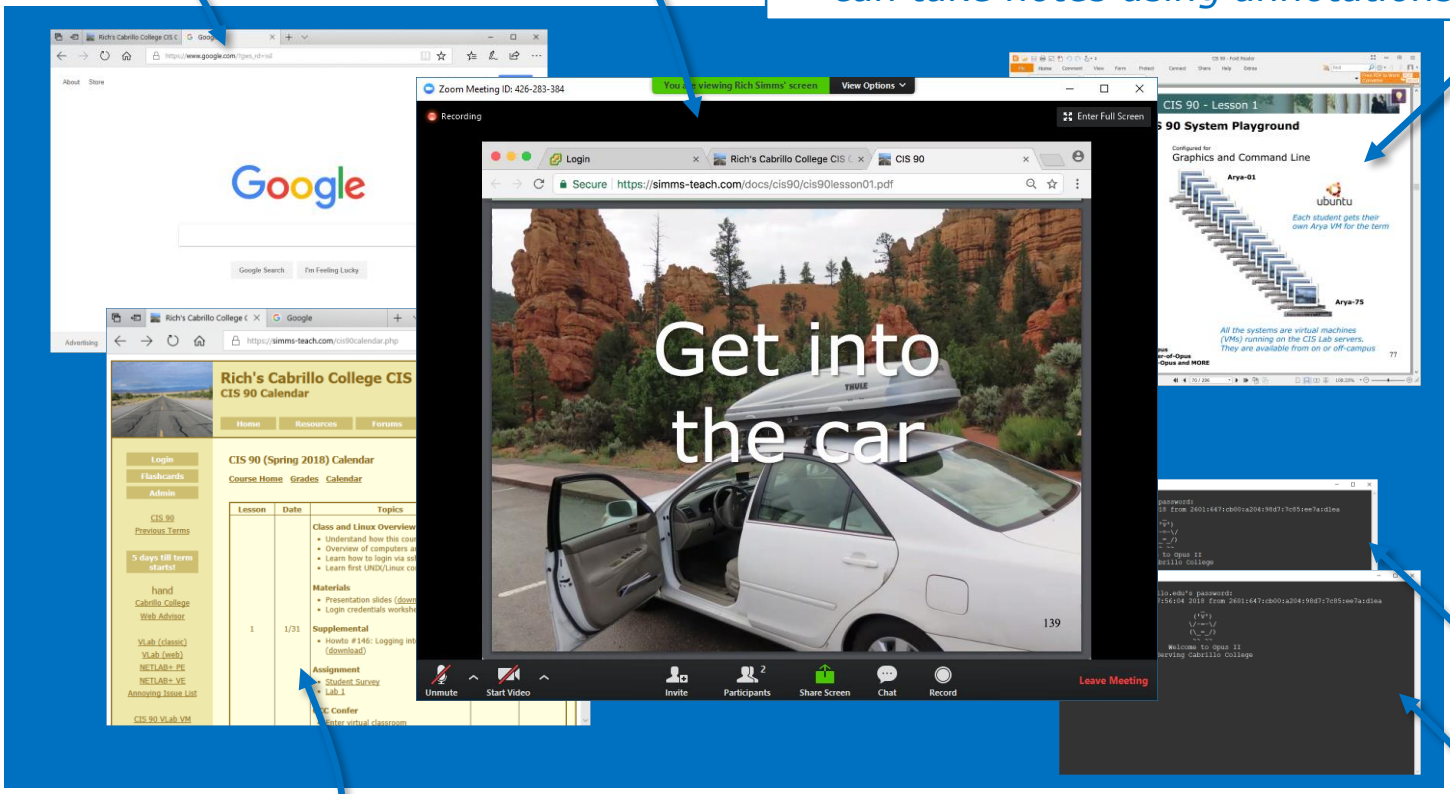
Student checklist - Before class starts



1. Browse to: **http://simms-teach.com**
2. Click the **CIS 90** link.
3. Click the **Calendar** link.
4. Locate today's lesson.
5. Find the **Presentation slides** for the lesson and **download** for easier viewing.
6. Click the **Enter virtual classroom** link to join ConferZoom.
7. Log into Opus-II with Putty or ssh command.

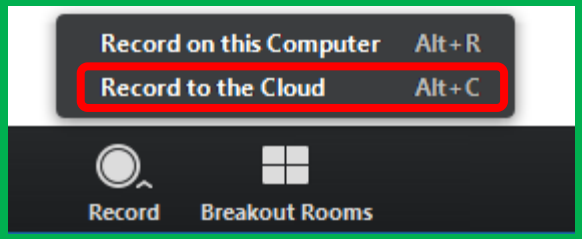
Student checklist - Before class starts

- ❑ *Google*
- ❑ *ConferZoom*
- ❑ *Downloaded PDF of Lesson Slides. I like Foxit Reader so I can take notes using annotations.*



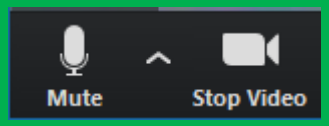
- ❑ *CIS 90 website Calendar page*
- ❑ *One or more login sessions to Opus-II*

Start



Start Recording

Audio Check



Start Recording

Audio & video Check

CIS 90 - Lesson 4

Instructor: **Rich Simms**
Dial-in: **669-900-6833 (toll)**
Meeting ID: **426 283 384**




Nick Ryan Erik Matt David Jon Cheryl Wais



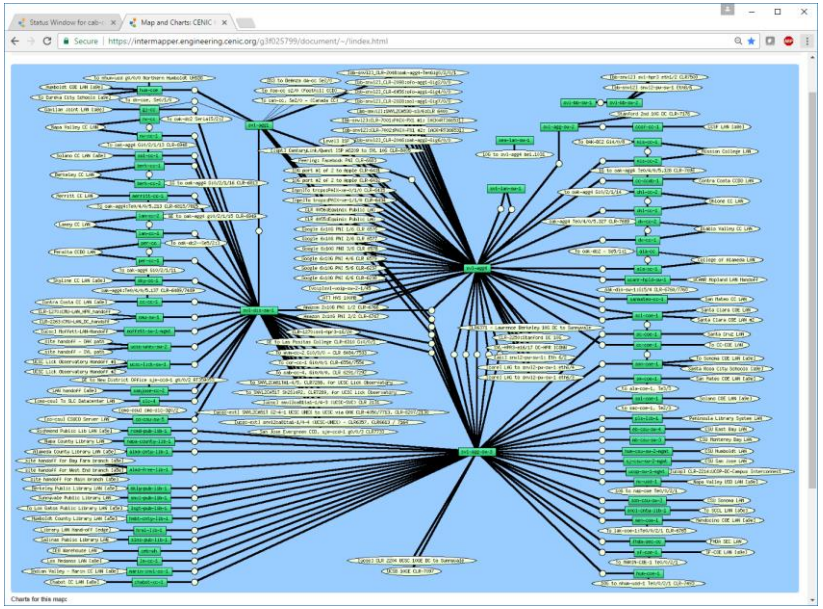

Tanisha Daniel Ohunayo Sequoia Scott Lucky Cole Shane




Jim Joseph Mark Adina Evie Cody

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

Network Check



https://intermapper.engineering.cenic.org/g3f025799/document/~/!index.html

First Minute Quiz

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

Use CCC Confer White Board

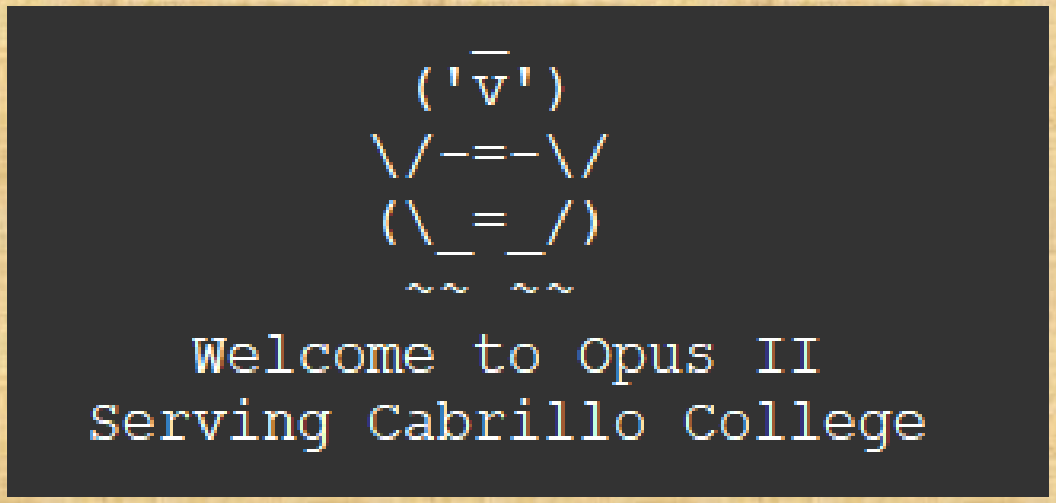
email answers to: risimms@cabrillo.edu

(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 tree • Unix files • UNIX filename conventions • Viewing text files • Viewing binary files • Basic file types • Further classification of files • Pathnames • Absolute pathnames • Relative pathnames • / . .. and ~ directories • Shell tips • Using pathnames as arguments • More on cd, pwd and ls commands • Home directories • Filename expansion with * • The path to enlightenment • Assignment and wrap up

Class Activity



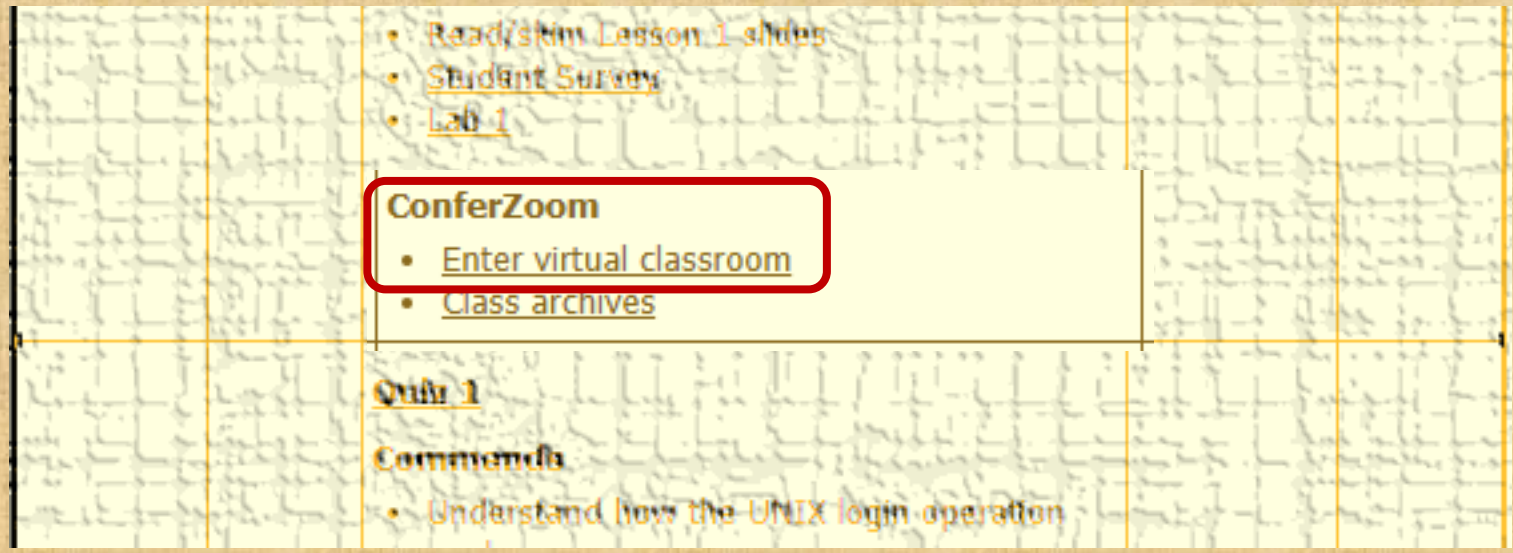
If you haven't already, log into Opus-II

Class Activity

https://simms-teach.com/cis90calendar.php

If you haven't already, download the lesson slides

Class Activity



https://simms-teach.com/cis90calendar.php

If you haven't already, join ConferZoom classroom

Questions

Questions?

Lesson material?

Labs? Tests?

How this course works?

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

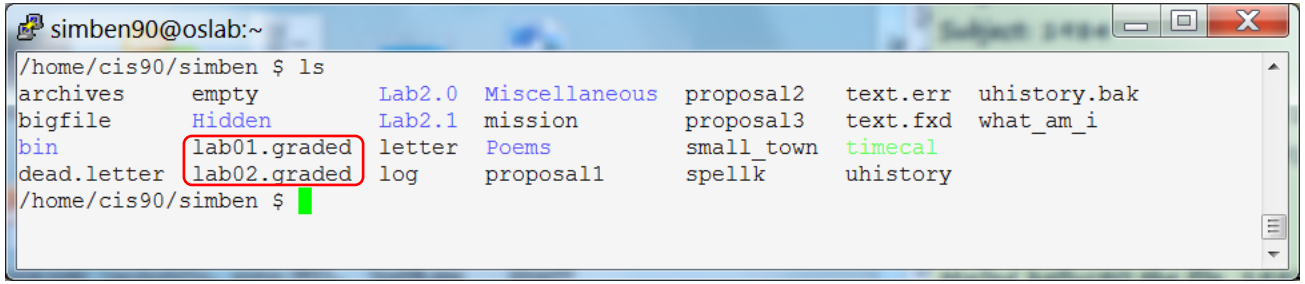
Who questions much, shall learn much, and retain much.
- Francis Bacon

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.*

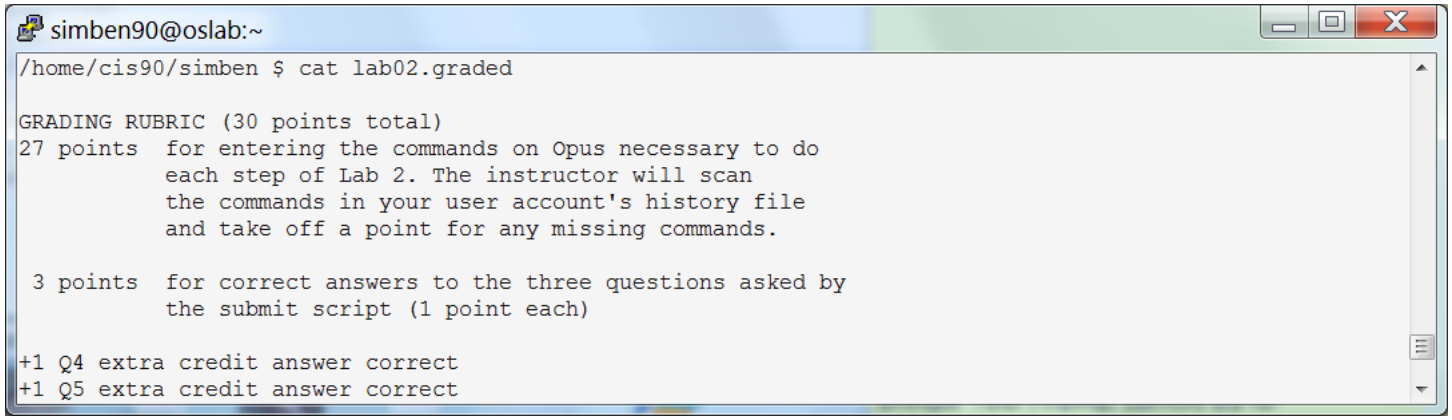
Graded work is copied to your home directories

ls



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

cat lab02.graded



The answers/ directory on Opus

cat /home/cis90/answers/quiz02

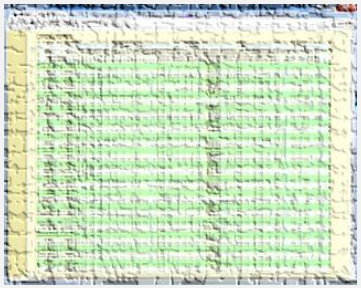
cat /home/cis90/answers/lab02

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

Review your progress in the course

Check the website Grades page

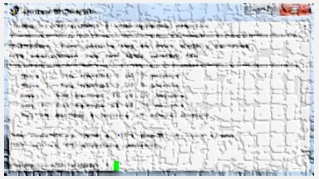
http://simms-teach.com/cis90grades.php



Or check on Opus-II

checkgrades *codename*

(where codename is your LOR codename)



Written by Jesse Warren a past CIS 90 Alumnus

- **Send me your survey to get your LOR codename.**
- **Graded labs and tests are in your home directories.**

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

Points that could have been earned:	
2 quizzes:	6 points
2 labs:	60 points
Total:	**66 points**

Extra Credit

On the forum

Be sure to monitor the forum as I may post extra credit opportunities without any other notice!

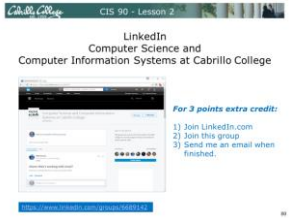
On some labs

Extra credit (2 points)

For a small taste of what you would learn in CIS 191 let's add a new user to your Arya VM. Once added we will see how the new account is represented in */etc/passwd* and */etc/shadow*.

1. Log into your Arya VM as the cis90 user. Make sure it's your VM and not someone else's.
2. Install the latest updates:
   ```
   sudo apt-get update
   sudo apt-get upgrade
   ```
3. Add a new user account for yourself. You may make whatever username you wish. The example below shows how Benji would make the same username he uses on Opus:
   ```
   sudo useradd -G sudo -c "Benji Simms" -m -s /bin/bash simben90
   ```

In lesson slides (search for extra credit)

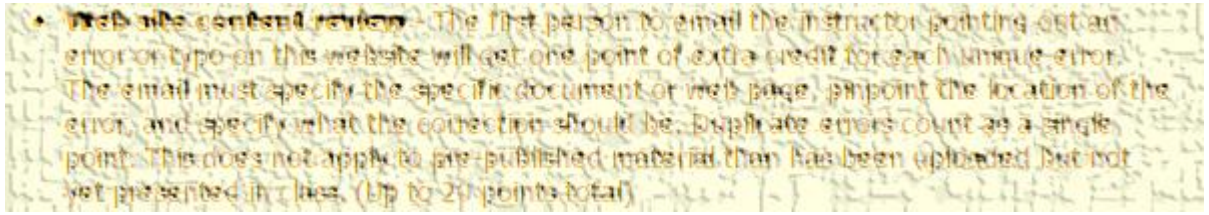


On the website

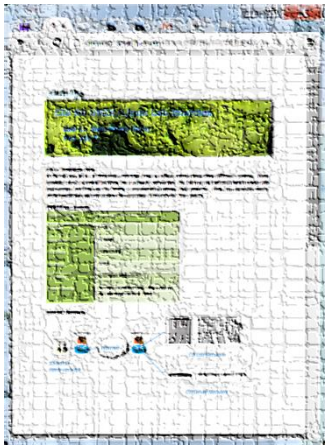
http://simms-teach.com/cis90grades.php

For some flexibility, personal preferences or family emergencies there is an additional 90 points available of **extra credit** activities.

http://simms-teach.com/cis90extracredit.php



Lab Assignments -- Pearls of Wisdom



- Don't wait till the last minute to start.
- Plan for things to go wrong and give yourself time to ask questions and get answers.
- The *slower* you go the *sooner* you will be finished.
- A few minutes reading the forum can save you hour(s).
- Line up materials, references, equipment and software ahead of time.
- It's best if you fully understand each step as you do it. Use Google or refer back to lesson slides to understand the commands you are using.
- Keep a growing cheat sheet of commands and examples.
- Study groups are very productive and beneficial.
- Use the forum to collaborate, ask questions, get clarifications and share tips you learned while doing a lab.
- **Late work is not accepted** so submit what you have for partial credit.

Getting Help When Stuck on an Assignment

- Google the topic/error message.
- Search the Lesson Slides (they are PDFs) for a relevant example on how to do something.
- Check the forum. Someone else may have run into the same issue and found a way past it. If not start a new topic, explain what you are trying to do and what you have tried so far.
- Talk to a tutor/assistant at the CTC (room 1403) or CIS Lab (STEM Center).
- Come see me during my office or lab hours:
  https://www.cabrillo.edu/salsa/listing.php?staffId=1426
  I'm in the CTC (room 1403) every Tuesday from 3:30-6:00 pm.
- Make use of the Open Questions time at the start of every class.
- Make a cheat sheet of commands and examples so you never again get stuck on the same thing!

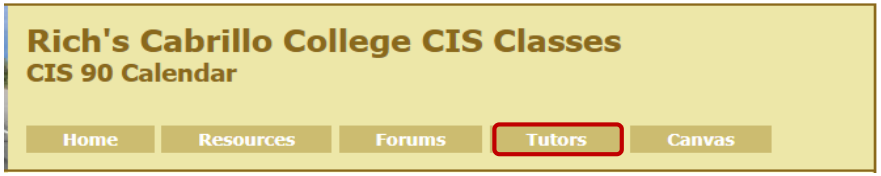
CIS Labs always involve some troubleshooting!

Help Available!

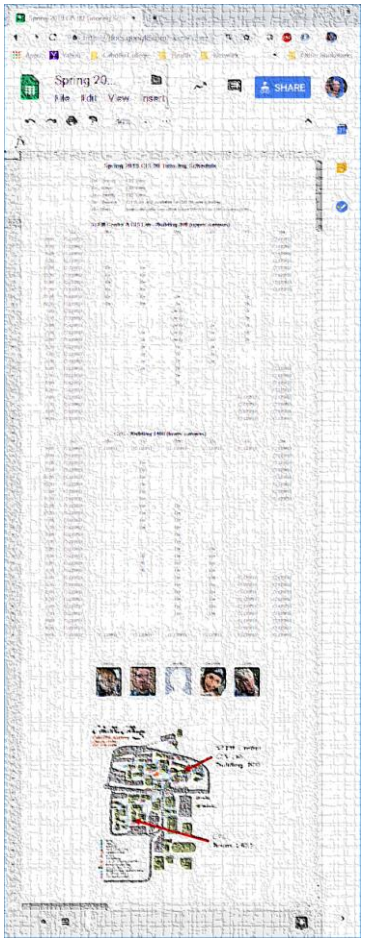
In the CTC and CIS Lab

CIS Lab
in STEM Center
Building 800

CTC
Room 1403

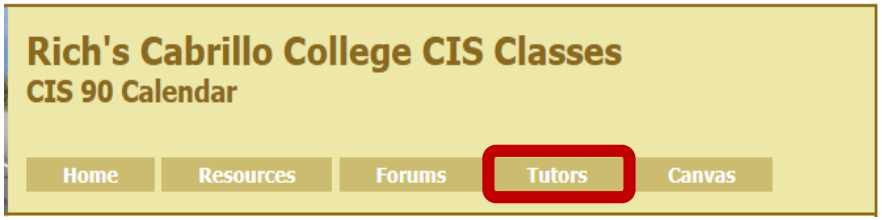


To see tutor schedule, click the Tutors link on the website.



Instructors, tutors and equipment are available for CIS students to work on assignments.

Help Available!
In the CTC and CIS Lab



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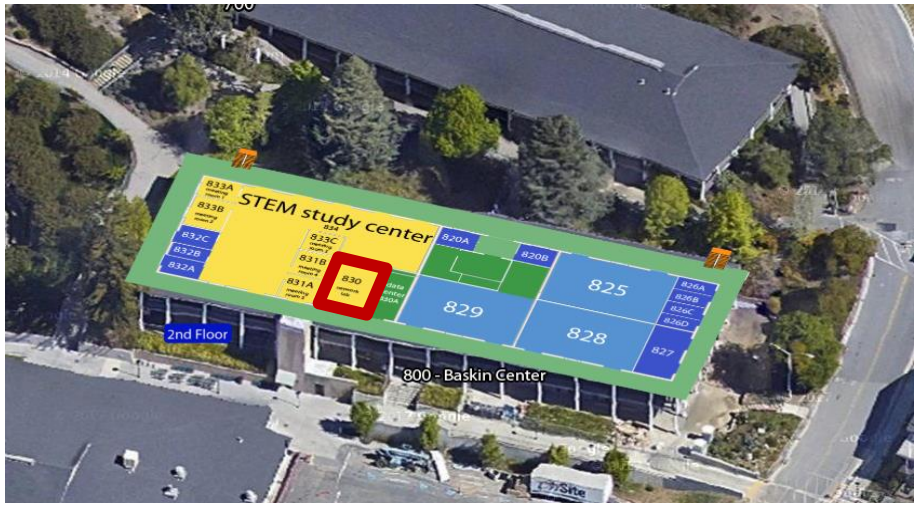


The CIS Lab is in the STEM center (Building 800)

Room 1403 is in the CTC (Building 1400)

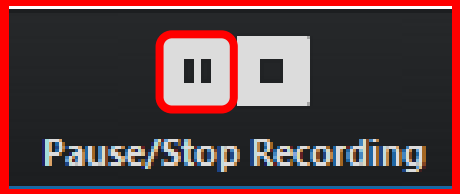
The slippery slope

1) If you didn’t submit the last lab ...
2) If you were in class and didn’t submit the last quiz ...
3) If you didn’t send me the student survey assigned in Lesson 1 ...
4) If you haven't made a forum post in the last quarter of the course ...

Please contact me by email, see me during my office hours or when I'm in the CTC

Email: risimms@cabrillo.edu

Housekeeping



Pause Recording

Audio Check

Roll Call

If you are watching the archived video please email me to let me know you were here.

risimms@cabrillo.edu

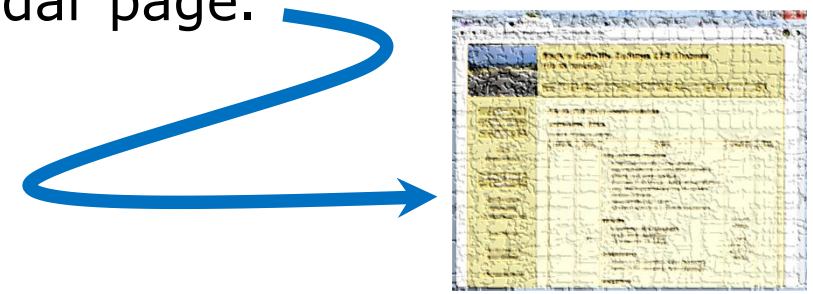
Overlap Students

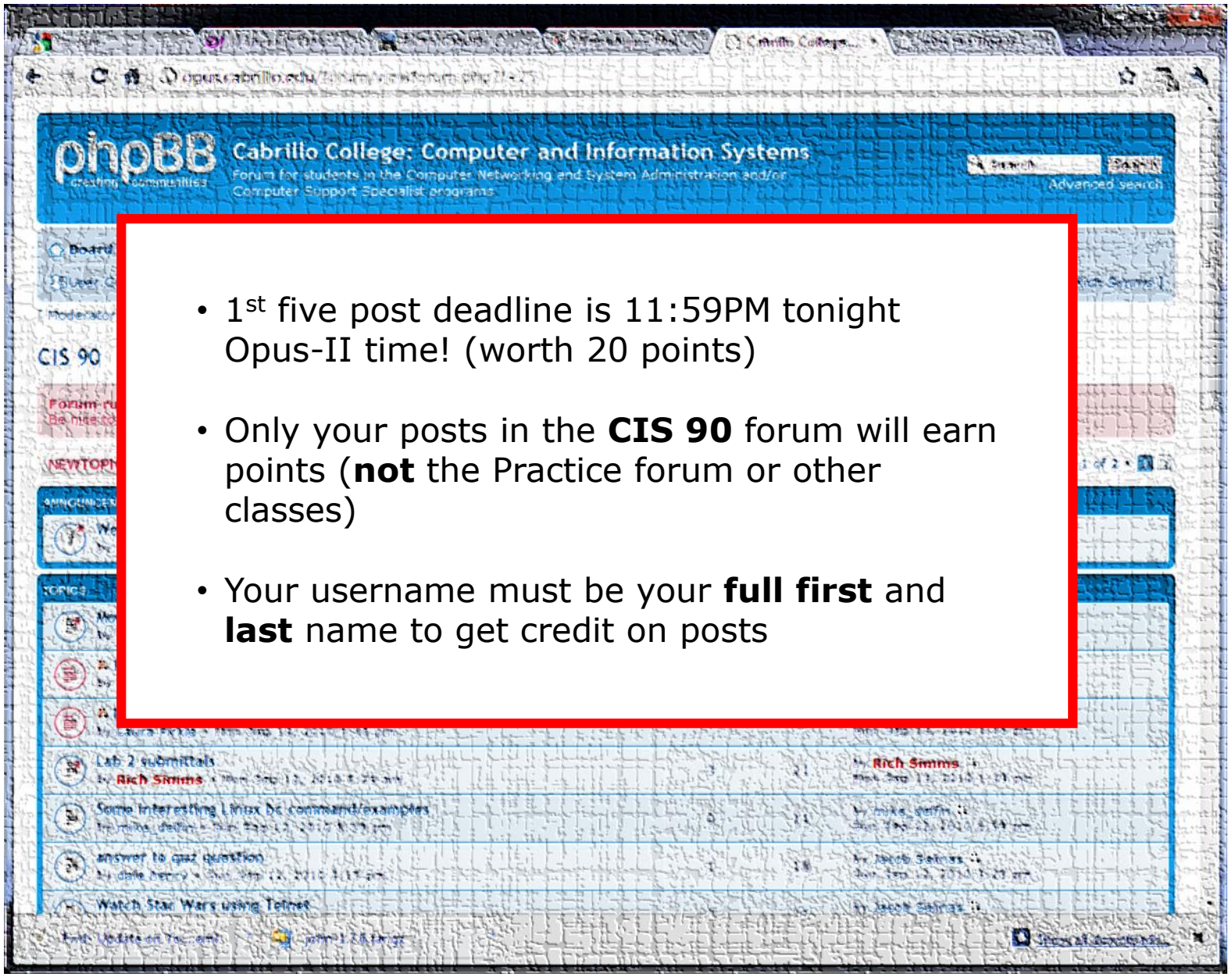
Don't forget to update the Google Docs Log when watching the recording

Resume Recording

Audio Check

- Lab 3 due tonight at 11:59PM (Opus-II time)
  - Use **check3** to review your collection.
  - Use **submit** to turn in your work. Submit as many times as you wish up till the deadline.
  - Use **verify** to see what you submitted for grading.
- Five forum posts due tonight at 11:59PM (Opus-II time).
- Reminder - all quizzes, all tests, all due dates for all work is on the website Calendar page.





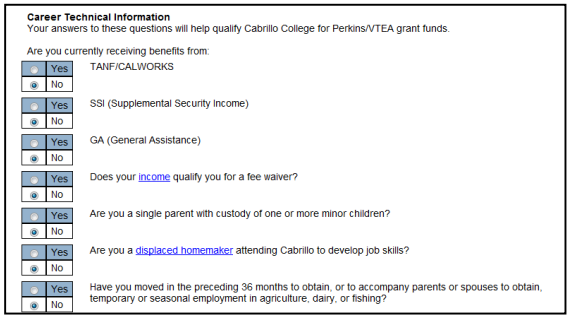
- 1st five post deadline is 11:59PM tonight Opus-II time! (worth 20 points)
- Only your posts in the **CIS 90** forum will earn points (**not** the Practice forum or other classes)
- Your username must be your **full first** and **last** name to get credit on posts

Perkins VTEA CTE Survey

This is an important source of funding for Cabrillo College.

Send me an email stating you completed the "VTEA survey" for **three points extra credit!**

Even if you took the survey in another CIS class!



Career Technical Information
Your answers to these questions will help qualify Cabrillo College for Perkins/VTEA grant funds.

Are you currently receiving benefits from:

○ Yes ◉ No	TANF/CALWORKS
○ Yes ◉ No	SSI (Supplemental Security Income)
○ Yes ◉ No	GA (General Assistance)
○ Yes ◉ No	Does your income qualify you for a fee waiver?
○ Yes ◉ No	Are you a single parent with custody of one or more minor children?
○ Yes ◉ No	Are you a displaced homemaker attending Cabrillo to develop job skills?
○ Yes ◉ No	Have you moved in the preceding 36 months to obtain, or to accompany parents or spouses to obtain, temporary or seasonal employment in agriculture, dairy, or fishing?

https://opus-ii.cis.cabrillo.edu/forum/viewtopic.php?f=8&t=701

If you haven't already

Change your default password on Opus-II

```
[simben90@opus-ii ~]$ passwd
Changing password for user simben90.
Changing password for simben90.
(current) UNIX password:
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
[simben90@opus-ii ~]$
```

LPI Linux Essentials Certificate

Linux Essentials Certificate of Achievement

Objective	# of Questions	Cabrillo	Urban Penguin	NDG Linux Essentials
Topic 1: The Linux Community and a Career in Open Source				
1.1 Linux Evolution and Popular Operating Systems	2	CIS90 Lesson 1	1.1	Module 1
1.2 Major Open Source Applications	2	CIS90 Lesson 1	1.2	Module 2
1.3 Understanding Open Source Software and Licensing	1	CIS90 Lesson 1	1.3	Module 2
1.4 ICT Skills and Working in Linux	2	not covered	1.4	Module 3
Topic 2: Finding Your Way on a Linux System				
2.1 Command Line Basics	2	CIS90 Lesson 2	2.1	Module 4
2.2 Using the Command Line to Get Help	2	CIS90 Lesson 2	2.2	Module 5
2.3 Using Directories and Listing Files	2	CIS 90 Lesson 4	2.3	Module 6
2.4 Creating, Moving and Deleting Files	2	CIS90 Lesson 5	2.4	Module 6
Topic 3: The Power of the Command Line				
3.1 Archiving Files on the Command Line	2	CIS 90 Lesson 14	3.1	Module 7
3.2 Searching and Extracting Data from Files	4	CIS 90 Lesson 8	3.2	Module 8
3.3 Turning Commands into a Script	4	CIS 90 Lesson 13 & 14	3.3	Module 9
Topic 4: The Linux Operating System				
4.1 Choosing an Operating System	1	not covered	4.1	Module 1
4.2 Understanding Computer Hardware	2	CIS 90 Lesson 1	4.2	Module 10
4.3 Where Data is Stored	3	CIS 90 Lesson 1	4.3	Module 11
4.4 Your Computer on the Network	2	CIS 192	4.4	Module 12
Topic 5: Security and File Permissions				
5.1 Basic Security and Identifying User Types	2	CIS 191	5.1	Module 13
5.2 Creating Users and Groups	2	CIS 191	5.2	Module 14
5.3 Managing File Permissions and Ownership	2	CIS 90 Lesson 7	5.3	Module 15
5.4 Special Directories and Files	1	CIS 90 Lesson 4	5.4	Module 16

http://www.lpi.org/our-certifications/exam-010-objectives

The Urban Penguin

- Intro: What is LPI Linux Essentials:
- 1.1: Linux Evolution and Popular Operating Systems:
- 1.2: Major Open Source Applications:
- 1.2.2: Installing and Using Libre Office on the Raspberry Pi:
- 1.2.3: Using GIMP for Graphic and Photos:
- 1.2.4: Image Manipulation with ImageMagick:
- 1.2.5: Apache Web Server on the Raspberry Pi:
- 1.2.6: MySQL Databases on the Raspberry Pi:
- 1.2.7: openLDAP Directories on the Raspberry Pi:
- 1.2.8: Creating Your First C Program on the Raspberry Pi:
- 1.2.9: Using Python 3 on the Raspberry Pi:
- 1.3: Understanding Open Source Software and Licensing:
- 1.4: ICT Skills and Working with Linux:
- 2.1: Command Line Basics:
- 2.2: Using the Command Line to get Help:
- 2.3: Using Directories and Listing Files:
- 2.4: Creating, Moving and Deleting:
- 3.1: Archiving Files from the Command Line:
- 3.2: Searching and Extracting Data from Files:
- 3.3: Turning Commands into Script:
- 4.1: Choosing an Operating System:
- 4.2: Understanding Computer Hardware:
- 4.3: Where Data is Stored:
- 4.4: Your Computer on the Network:
- 5.1: Basic Security and User Types:
- 5.2: Creating Users and Groups:
- 5.3: Manage File Permissions and Ownership:
- 5.4: Special Directories and Files:

https://www.theurbanpenguin.com/lpi-training-from-theurbanpenguin/linux-essentials/

No registration, no logging in, just click and watch the videos

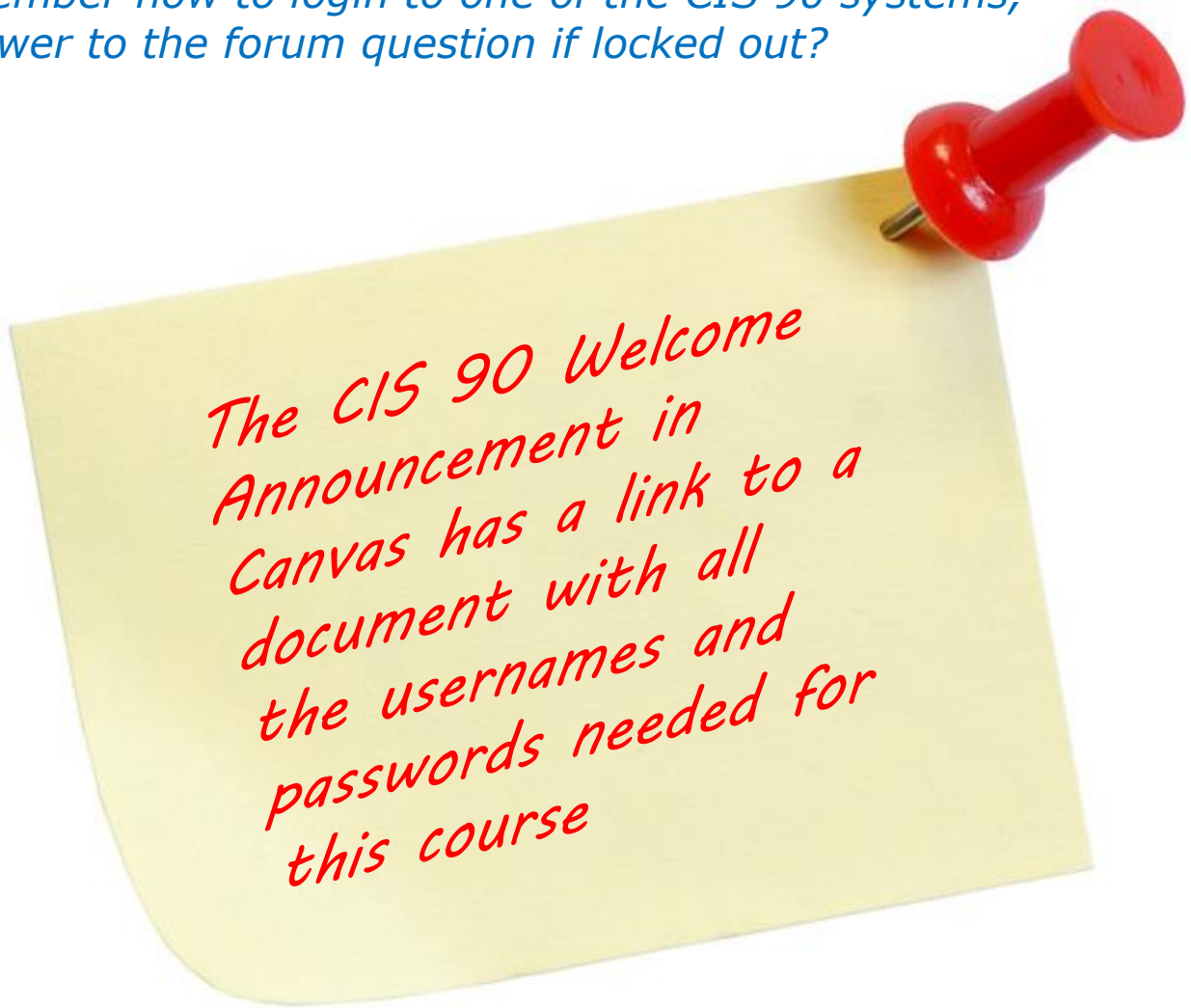
NDG Linux Essentials via Cisco Networking Academy

https://www.netacad.com/

Complete course with reading, live VM and tests.

Contact me if you would like a student account for the NDG Linux Essentials course.

Can't remember how to login to one of the CIS 90 systems, or the answer to the forum question if locked out?



To get notifications of new forum posts

Subscribe to the forum to get email notifications of new posts

After logging in:

1. Go to the CIS 90 class forum.
2. At the bottom of the page, click the "Subscribe forum" link on the lower left. When subscribed you get email notifications when new posts are made.
3. To unsubscribe, click it again.

Unsubscribed looks like this.

Subscribed looks like this.

The UNIX File Tree

File Cabinet

UNIX File Tree

```
/home/cis90/simben $ ls -ld /
dr-xr-xr-x. 17 root root 224 Jan 27 10:24 /
```

Folders

Directories

```
/home/cis90/simben $ ls -ld bin/ Poems/
drwxr-xr-x. 2 simben90 cis90 109 Aug 13  2017 bin/
drwxr-xr-x. 8 simben90 cis90 138 Aug  6  2014 Poems/
```

Documents

Regular files

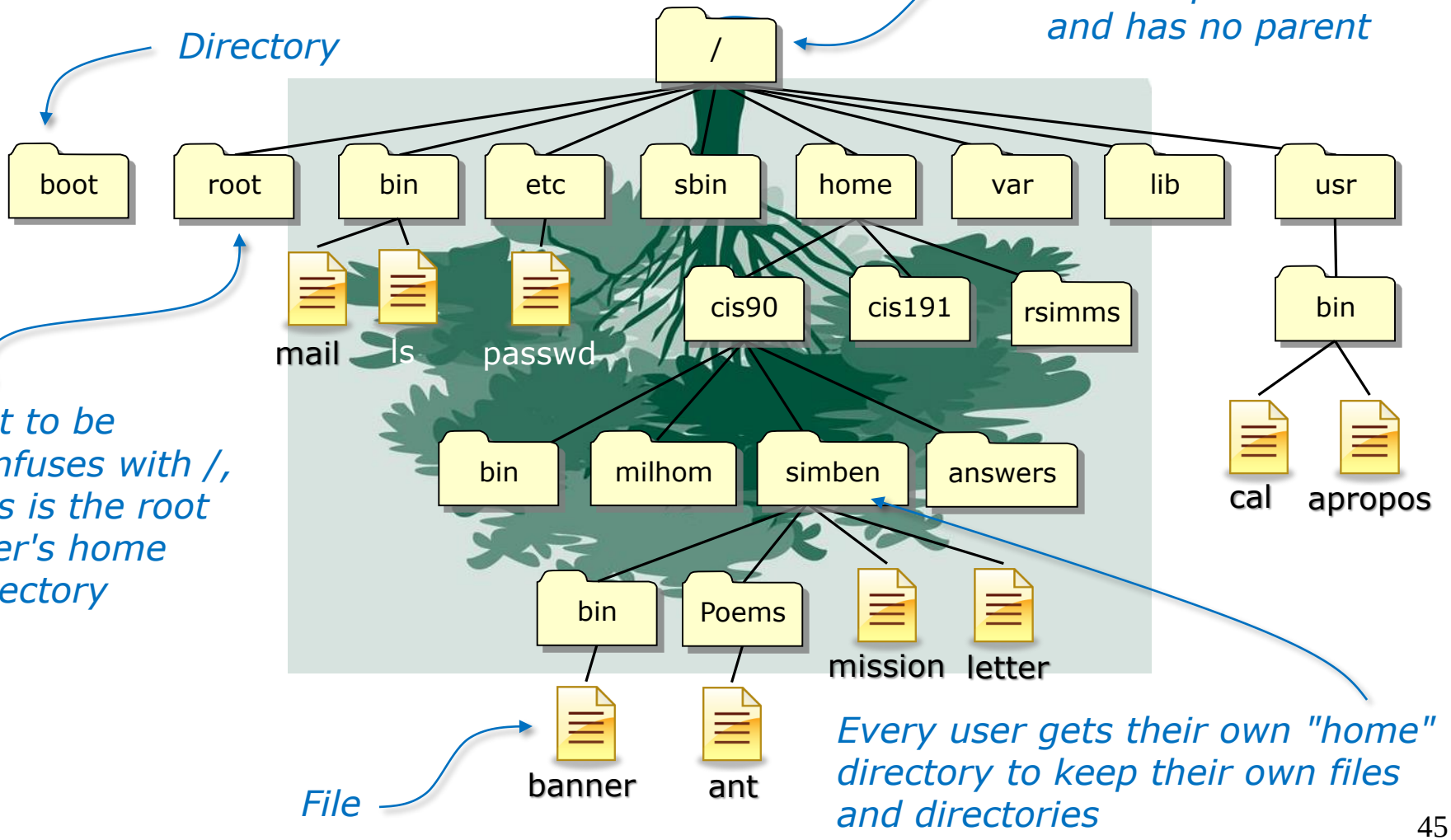
```
/home/cis90/simben $ ls -l letter timecal
-rw-r--r--. 1 simben90 cis90 1044 Jul 20  2001 letter
-rwxr-xr-x. 1 simben90 cis90  519 Aug  6  2014 timecal
```

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

ls /

```
/home/cis90/simben $ ls /
bin   dev  home  lib64  mnt  proc  run   srv  tmp  var
boot  etc  lib   media  opt  root  sbin  sys  usr
/home/cis90/simben $
```

ls /home

```
/home/cis90/simben $ ls /home
backup  cis90    ehbot02  ehbot04  rsimms
cis76   ehbot01  ehbot03  ledmgr   turnin
/home/cis90/simben $
```

ls /home/cis90

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

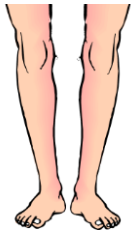
Varies by term

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

Put the name of your home directory in the chat window

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`***

cd - change directory command

cd *pathname*

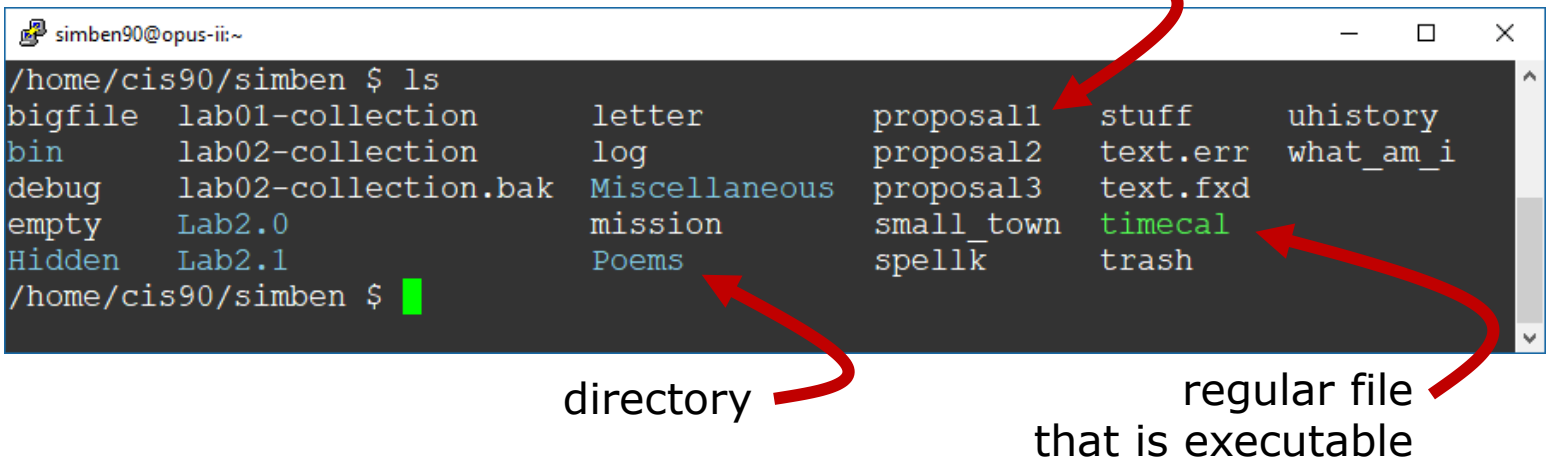
will change to the directory specified by the pathname argument.

cd ..

will change to the parent of the current directory (up one level).

ls - list directory command

ls

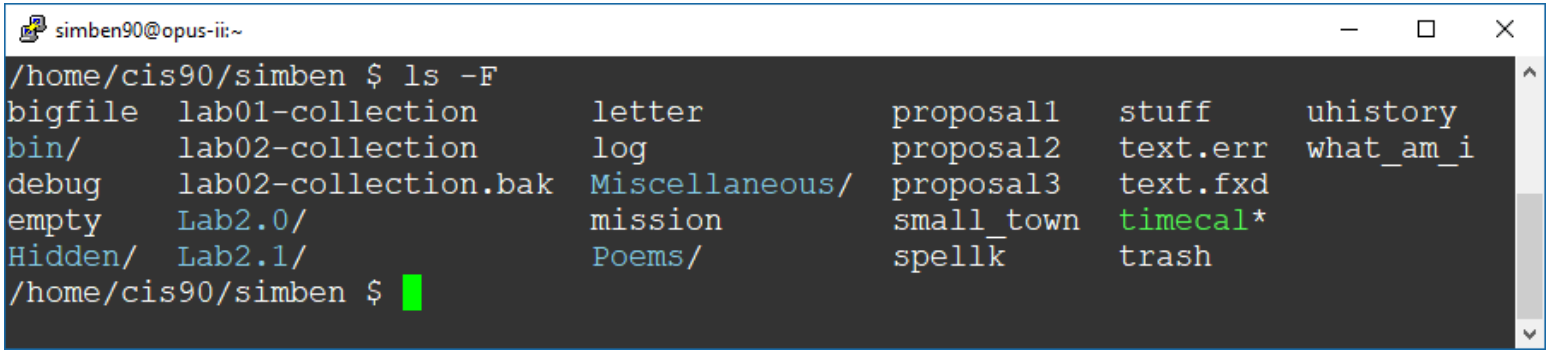


The ls command with no arguments will list the contents of the current directory.

Color is used to distinguish directories, regular files, regular files that are executable and symbolic links.

ls - list directory

ls -F

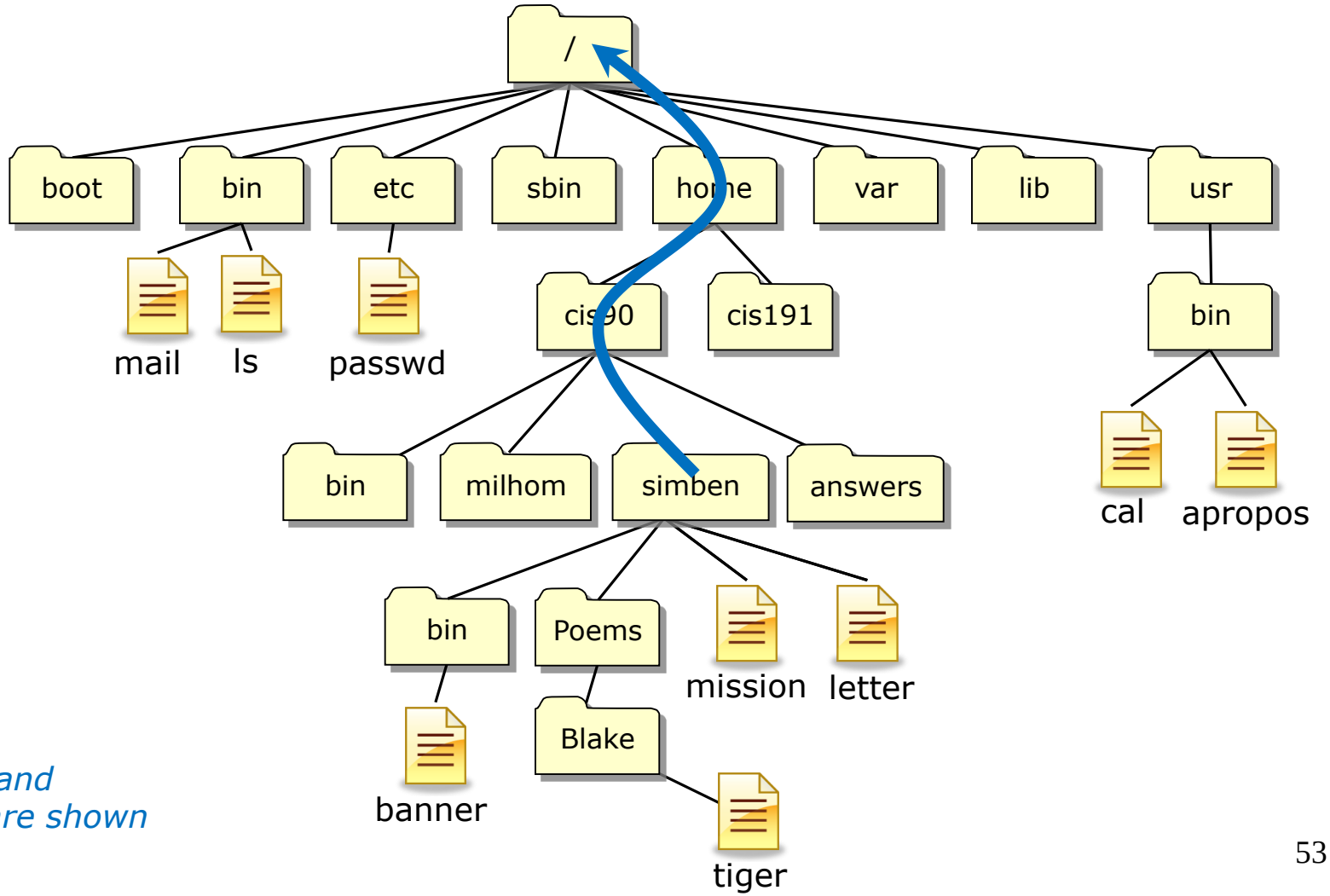


If color blind, use the -F option to distinguish the different basic file types:

/ = directory
nothing = regular file
* = regular file that is executable

UNIX File Tree

Navigate from your home directory up to the / directory



Not all files and directories are shown

Follow me and navigate from your home directory up to the / directory

simben90@opus-ii:/

```
/home/cis90/simben $ ls
bigfile             lab02-collection  log            proposal2   text.fxd
bin                 lab04-mydata      Miscellaneous  proposal3   timecal
empty               Lab2.0            mission        small_town  trash
Hidden              Lab2.1            Poems          spellk      uhistory
lab01-collection    letter            proposal1      text.err    what_am_i
/home/cis90/simben $ cd ..
/home/cis90 $ ls
[varies by term]
/home/cis90 $ cd ..
/home $ ls
backup  cis76  cis90  ehbot01  ehbot02  ehbot03  ehbot04  ledmgr  rsimms  turnin
/home $ cd ..
/ $ ls
bin   dev  home  lib64  mnt  proc  run   srv  tmp  var
boot  etc  lib   media  opt  root  sbin  sys  usr
/ $
```

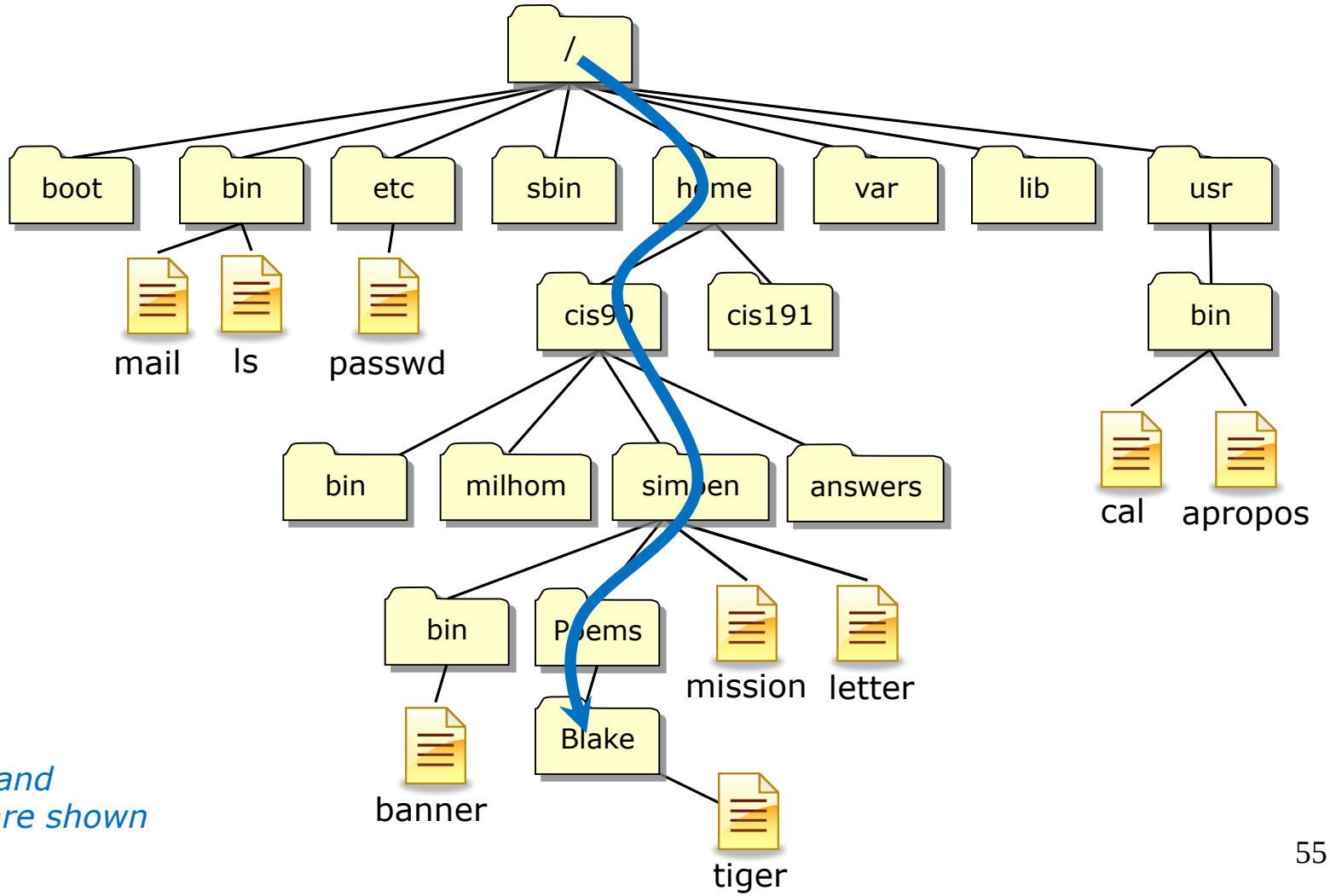
Varies by term

symbolic link

Notice how your prompt changes. Let me know in the chat window when you get to the top of the tree.

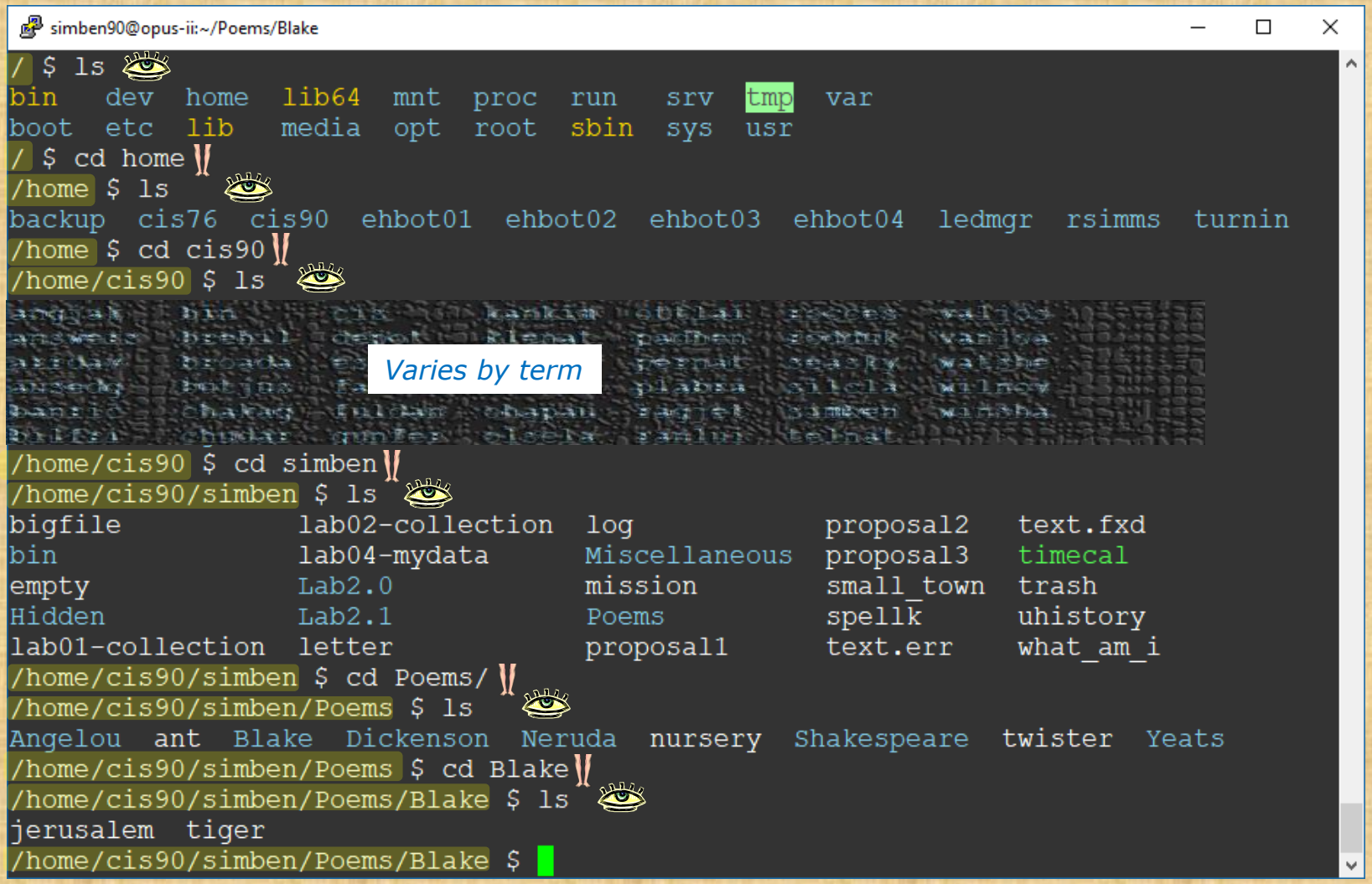
UNIX File Tree

Navigate from the / directory down to your Blake directory



Not all files and directories are shown

Follow me and navigate from the / directory down to your Blake directory



Let me know in the chat window when you get to the top of the tree.

Navigate back to your home directory


```
simben90@opus-ii:~
/home/cis90/simben/Poems/Blake $ ls
jerusalem  tiger
/home/cis90/simben/Poems/Blake $ cd
/home/cis90/simben $ ls
bigfile            lab02-collection  log            proposal2   text.fxd
bin                lab04-mydata      Miscellaneous  proposal3   timecal
empty              Lab2.0            mission        small_town  trash
Hidden             Lab2.1            Poems          spellk      uhistory
lab01-collection   letter            proposal1      text.err    what_am_i
/home/cis90/simben $
```

*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 - Follow Me

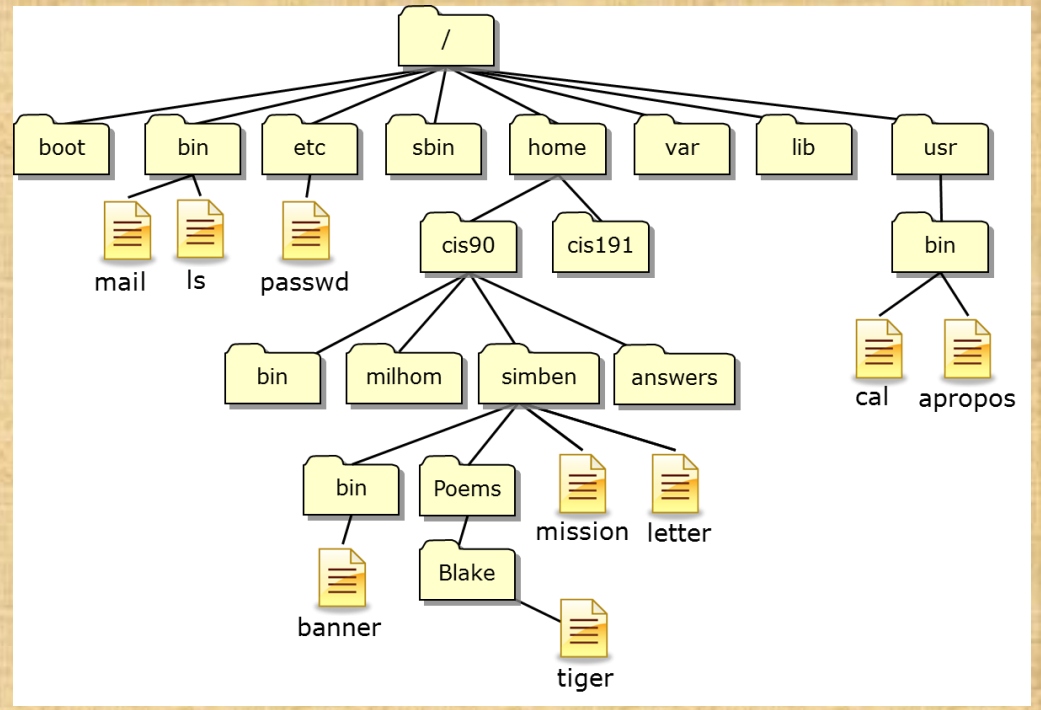
1) /boot
   - The kernel

2) /etc
   - motd
   - passwd

3) /var
   - mail/
   - www/html

4) /home/cis90/bin
   - depot
   - bin
   - answers

5) /home/cis90/simben/Poems
   - various poem directories



UNIX Files

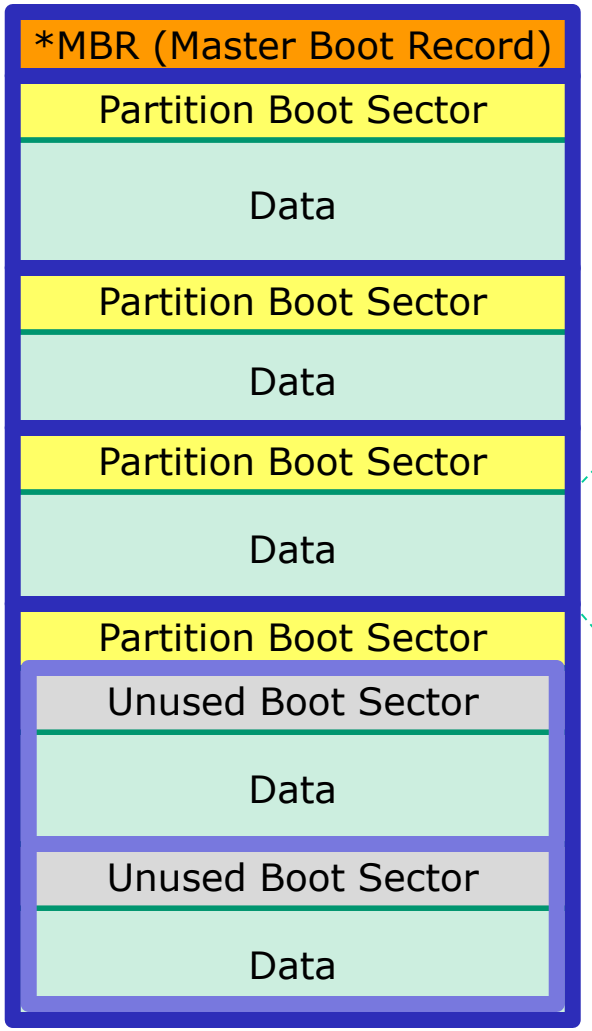
File Systems
Linux

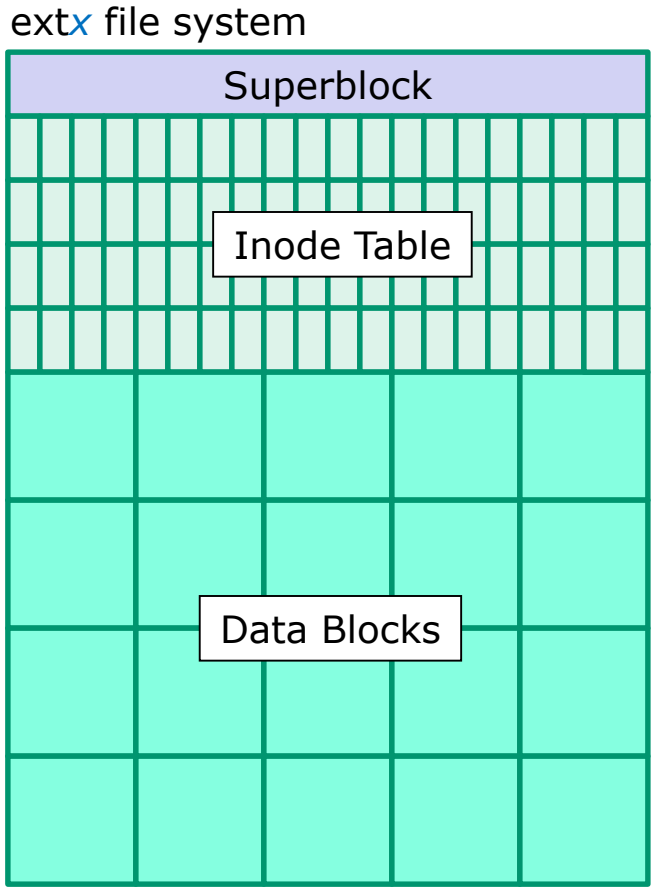
A typical hard drive

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, ext4 and xfs file systems. Windows uses FAT32 and NTFS file systems.





**Hard drives can be partitioned using either MBR or GPT (GUID Partition Table)*

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
```

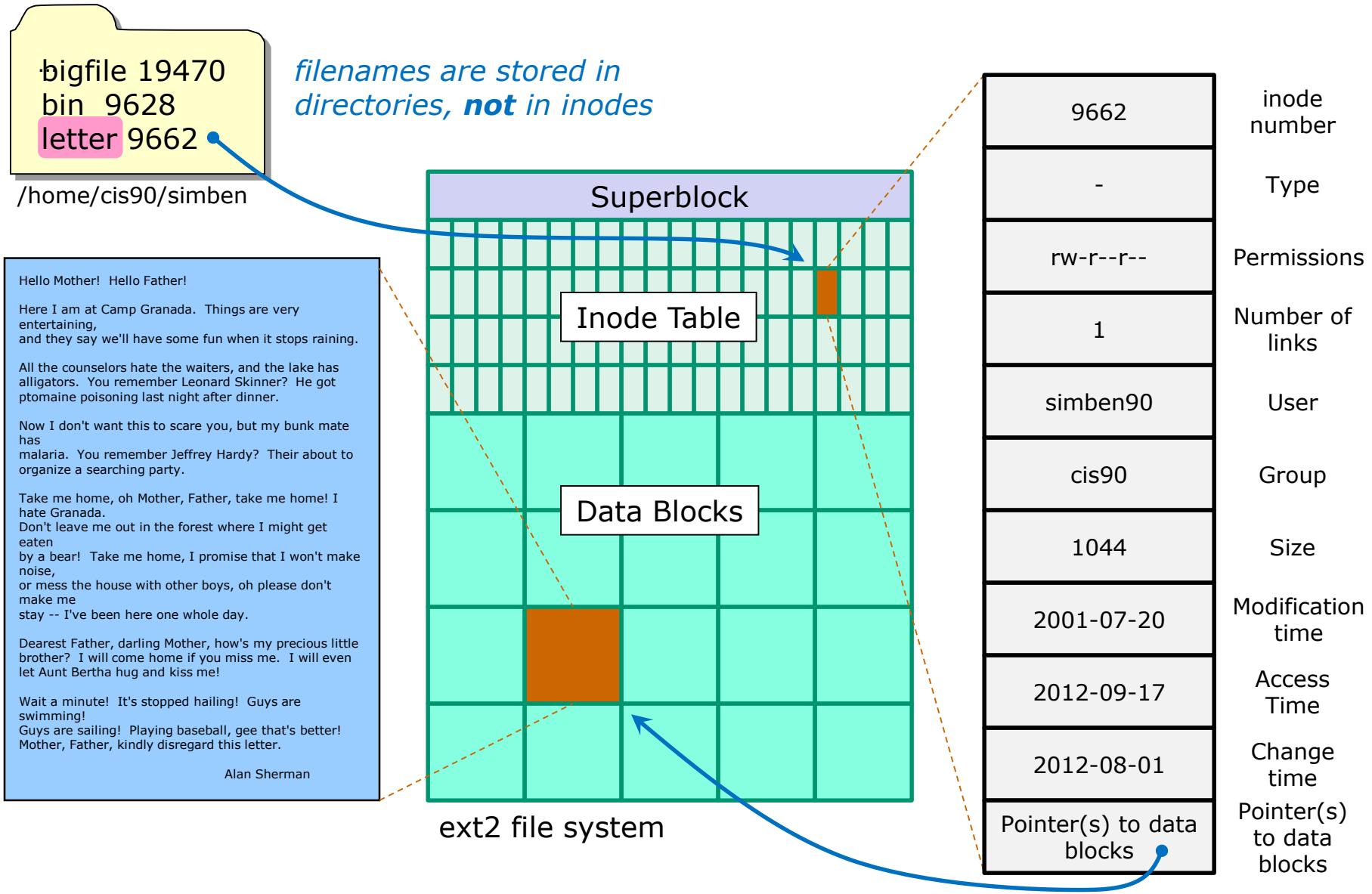
filename

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.

Filename Activity

Directories contain filename/inode number pairs.

1) On Opus-II, go to your home directory using:

```
cd
```

2) Look at the filename/inode pairs in your home directory using:

```
ls -i
```

Type the filename/inode number pair for your letter file in the chat window.

Inode Activity

Every file is associated with an inode. The inode contains various properties about the file.

Show the information in the inode associated with your letter file using a long listing:

```
ls -l letter
```

Look at the output from the long listing. Except for one item everything displayed is a property stored in the inode.

Type the one property not stored in the inode into the chat window.

Data Activity

The contents or date portion of a file is stored in a data block.

Show the data contents of your letter file:

```
cat letter
```

Read the letter. What is the name of the Summer Camp?

Type this name into the chat window.

Unix Filename Conventions

UNIX file name conventions

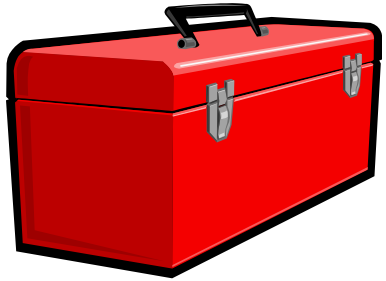
Unix filenames are case sensitive

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

Lesson 4 commands for your toolbox

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

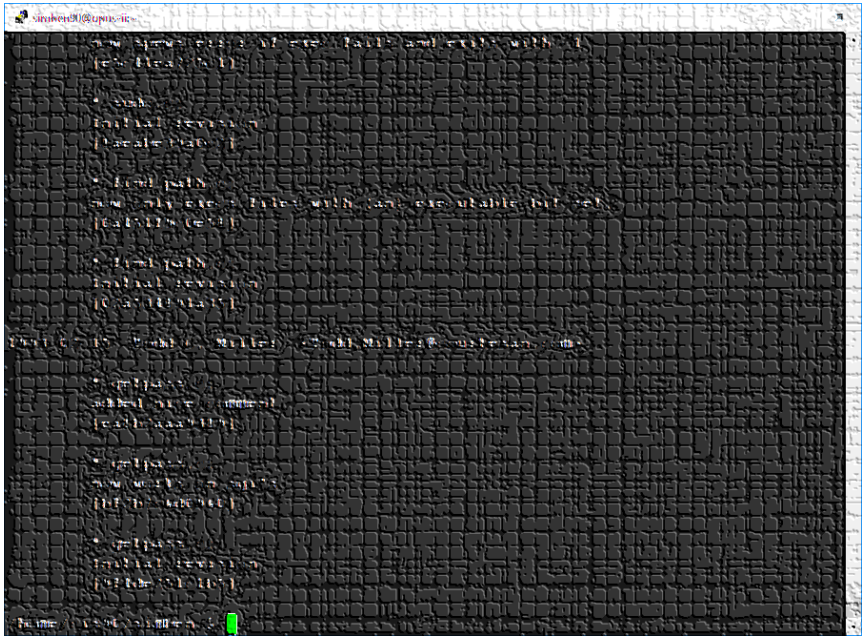
Multiple arguments, spellk and letter, are passed to the cat command to process

cat command

viewing long text files

- Problem: The **cat** command doesn't work well for large files. The test prints so fast you will only see the end of the file. If the terminal buffer is not big enough you will not be able to scroll back to view the beginning of the file.

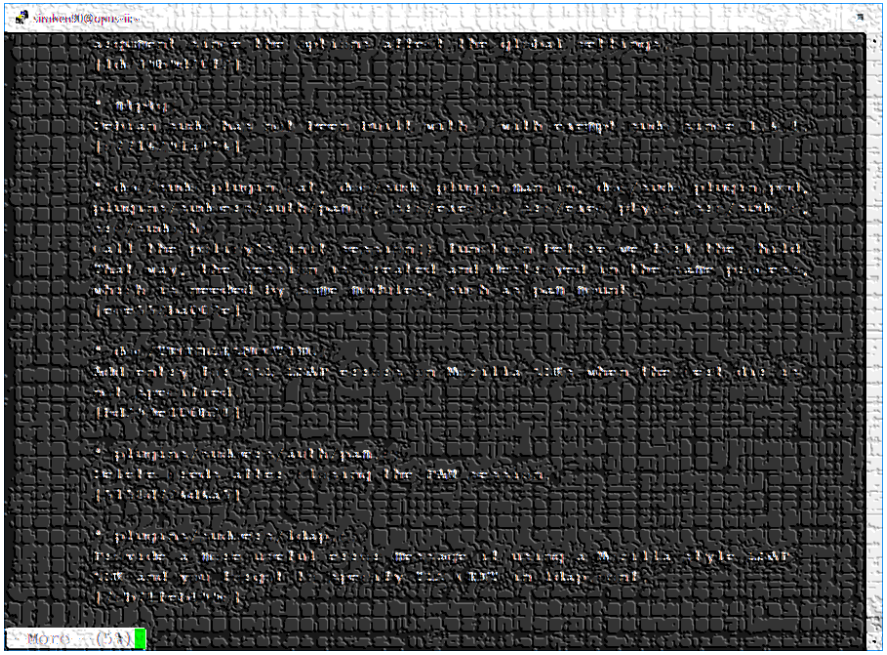
- For example: **`cat /usr/share/doc/openssh-7.4p1/ChangeLog`**



more command

viewing long text files

- Use the **more** command for scrolling through really long text files
- For example: **`more /usr/share/doc/openssh-7.4p1/ChangeLog`**



*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 $
```

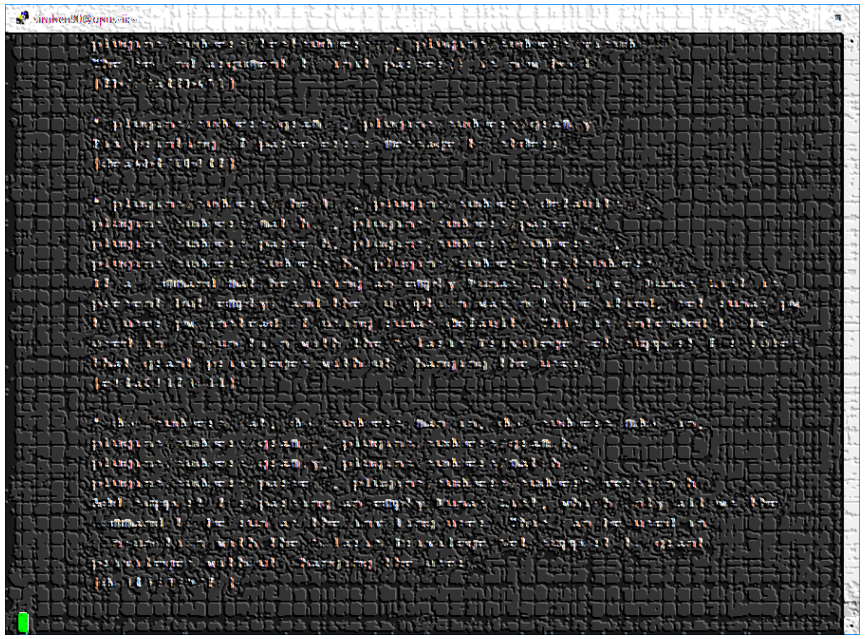
Notice with multiple files as arguments, each file has a header to separate it from the other files

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/openssh-7.4p1/ChangeLog`**



"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

Text File Activity

- In your home directory on Opus-II, print the first 3 lines of the log file:

```
head -n3 log
```

- Review the three proposals:

```
more proposal1 proposal2 proposal3
```

- Count the number of words in small_town:

```
wc -w small_town
```

Put the number of words in small_town into the chat window.

Text File Activity

- Print the last line of small_town:

```
tail -n1 small_town
```

- Count the number of lines in mission:

```
wc -l mission
```

- Probe and classify the following three files:

```
file mission Miscellaneous what_am_i
```

Of the three files probed which is a text file and meant to be viewed using one of the text file commands (e.g. cat, more, wc, ..., etc.)?

Put your answer in the chat window.

Text File Activity

- Browse bigfile is a way that you can scroll up and down through the file:

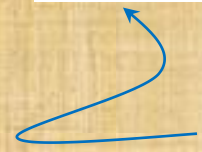
```
less bigfile
```

- Count the number of characters in bigfile:

```
wc -c small_town
```

- Read proposal1:

```
cat proposal1
```



What happens if you use tac instead of cat? (tac is cat spelled backwards)
Put your answer in the chat window.

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

Binary File Activity

Where is the hostname command?

```
type hostname
```

What kind of file is the hostname command?

```
file /usr/bin/hostname
```

Try to cat the hostname command:

```
cat /usr/bin/hostname
```

Do a hex dump of the hostname command:

```
xxd /usr/bin/hostname
```

What text string is found at hex offset 242-246 of /usr/bin/hostname? Put your answer in the chat window.

Basic file types

(according to the filesystem)

Understanding a Long Listing

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

Except for the filename "letter", all other information shown above is stored in the file's inode

Filesystem 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**.

"-" Regular Files

ls -l

simben90@opus-ii:~

```
/home/cis90/simben $ ls -l
total 92
-rw-r--r--. 2 simben90 cis90 10576 Jul 20  2001 bigfile
drwxr-xr-x. 2 simben90 cis90   109 Aug 13  2017 bin
-rw-r--r--. 1 simben90 cis90     0 Jul 20  2001 empty
d---------. 2 simben90 cis90    36 Feb  1  2002 Hidden
-rw-r--r--. 1 simben90 cis90   373 Jan 31 12:04 lab01-collection
-rw-r--r--. 1 simben90 cis90  5241 Feb 15 13:33 lab02-collection
-rw-------. 1 simben90 cis90  1221 Feb 18 09:25 lab04-mydata
drwxr-xr-x. 2 simben90 cis90   184 Feb 17  2001 Lab2.0
drwxr-xr-x. 3 simben90 cis90   130 Feb 17  2001 Lab2.1
-rw-r--r--. 1 simben90 cis90  1044 Jul 20  2001 letter
-rw-r--r--. 1 simben90 cis90   364 Feb 18 09:26 log
drwxr-xr-x. 2 simben90 cis90    97 Sep 11  2005 Miscellaneous
-rw-r--r--. 1 simben90 cis90   759 Jun  6  2002 mission
drwxr-xr-x. 8 simben90 cis90   138 Aug  6  2014 Poems
-rw-r--r--. 1 simben90 cis90  1074 Aug 26  2003 proposal1
-rw-r--r--. 1 simben90 cis90  2175 Jul 20  2001 proposal2
-rw-r--r--. 1 simben90 cis90  2054 Sep 14  2003 proposal3
-rw-r--r--. 1 simben90 cis90  1580 Nov 16  2004 small_town
-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   519 Aug  6  2014 timecal
-rw-rw-r--. 1 simben90 cis90  2265 Feb 14 17:12 trash
-rw-rw-r--. 1 simben90 cis90 10297 Feb 18 08:05 uhistory
-rw-r--r--. 1 simben90 cis90   352 Jul 20  2001 what_am_i
/home/cis90/simben $
```

column 1

"Total 92" indicates directory is using 92 data blocks

sudo blockdev --getbsz /dev/sda1
sudo blockdev --getbsz /dev/sda2

*The **regular** files are highlighted above. Note they each have a dash "-" in column one and the filenames are not colored.*

"l" Symbolic Links

ls -l /

simben90@opus-ii:~

```
/home/cis90/simben $ ls -l /
total 24
lrwxrwxrwx.   1 root root    7 Aug  4  2017 bin -> usr/bin
dr-xr-xr-x.   5 root root 4096 Jan 21 09:21 boot
drwxr-xr-x.  19 root root 3240 Jan 21 09:20 dev
drwxr-xr-x. 102 root root 8192 Feb 15 14:27 etc
drwxr-xr-x.  12 root root  148 Jan  7 17:24 home
lrwxrwxrwx.   1 root root    7 Aug  4  2017 lib -> usr/lib
lrwxrwxrwx.   1 root root    9 Aug  4  2017 lib64 -> usr/lib64
drwxr-xr-x.   2 root root    6 Nov  5  2016 media
drwxr-xr-x.   2 root root    6 Nov  5  2016 mnt
drwxr-xr-x.   2 root root    6 Nov  5  2016 opt
dr-xr-xr-x. 225 root root    0 Jan 21 09:20 proc
dr-xr-x---.   6 root root 4096 Feb  1 17:21 root
drwxr-xr-x.  34 root root 1000 Jan 21 09:21 run
lrwxrwxrwx.   1 root root    8 Aug  4  2017 sbin -> usr/sbin
drwxr-xr-x.   2 root root    6 Nov  5  2016 srv
dr-xr-xr-x.  13 root root    0 Jan 21 09:20 sys
drwxrwxrwt.  13 root root 4096 Feb 18 15:00 tmp
drwxr-xr-x.  13 root root  155 Aug  4  2017 usr
drwxr-xr-x.  20 root root  278 Aug 13  2017 var
/home/cis90/simben $
```

column 1

*The **symbolic link** files are highlighted above. Note they each have the letter "l" in column one and an arrow "->"pointing to the linked file.*

"d" directories

ls -l /

```
simben90@opus-ii:~
/home/cis90/simben $ ls -l /
total 24
lrwxrwxrwx.   1 root root    7 Aug  4  2017 bin -> usr/bin
dr-xr-xr-x.   5 root root 4096 Jan 21 09:21 boot
drwxr-xr-x.  19 root root 3240 Jan 21 09:20 dev
drwxr-xr-x. 102 root root 8192 Feb 15 14:27 etc
drwxr-xr-x.  12 root root  148 Jan  7 17:24 home
lrwxrwxrwx.   1 root root    7 Aug  4  2017 lib -> usr/lib
lrwxrwxrwx.   1 root root    9 Aug  4  2017 lib64 -> usr/lib64
drwxr-xr-x.   2 root root    6 Nov  5  2016 media
drwxr-xr-x.   2 root root    6 Nov  5  2016 mnt
drwxr-xr-x.   2 root root    6 Nov  5  2016 opt
dr-xr-xr-x. 225 root root    0 Jan 21 09:20 proc
dr-xr-x---.   6 root root 4096 Feb  1 17:21 root
drwxr-xr-x.  34 root root 1000 Jan 21 09:21 run
lrwxrwxrwx.   1 root root    8 Aug  4  2017 sbin -> usr/sbin
drwxr-xr-x.   2 root root    6 Nov  5  2016 srv
dr-xr-xr-x.  13 root root    0 Jan 21 09:20 sys
drwxrwxrwt.  13 root root 4096 Feb 18 15:00 tmp
drwxr-xr-x.  13 root root  155 Aug  4  2017 usr
drwxr-xr-x.  20 root root  278 Aug 13  2017 var
/home/cis90/simben $
```

column 1

*The **directories** are highlighted above. Note they each have the letter "d" in column one and the names are blue.*

"b" block and "c" character devices

```
ls -l /dev/sda
ls -l /dev/sda1
ls -l /dev/tty1
ls -l /dev/pts/4
```

column 1

The first SCSI hard drive (/dev/sda) and the first partition on the first ASCSI hard drive are block devices with a "b" in column 1.

The first tty terminal (/dev/tty1) and the fourth pseudo terminal (/dev/pts/4) are character devices with a "c" in column 1.

Activity

Do a long listing of the system /boot directory:

```
ls -l /boot
```

- Is *grub* a directory or a regular file?
- Is *vmlinuz-3.10.0-693.11.6.el7.x86_64* a directory or a regular file?

Write your answers in the chat window

Activity

Do a long listing of your Miscellaneous directory:

```
ls -l Miscellaneous/
```

- Which file is a symbolic link file?
- What file does the symbolic link file reference?

Write your answers in the chat window

Further classification of files

(by using the **file** command)

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

Class Activity

Classify the files in /boot

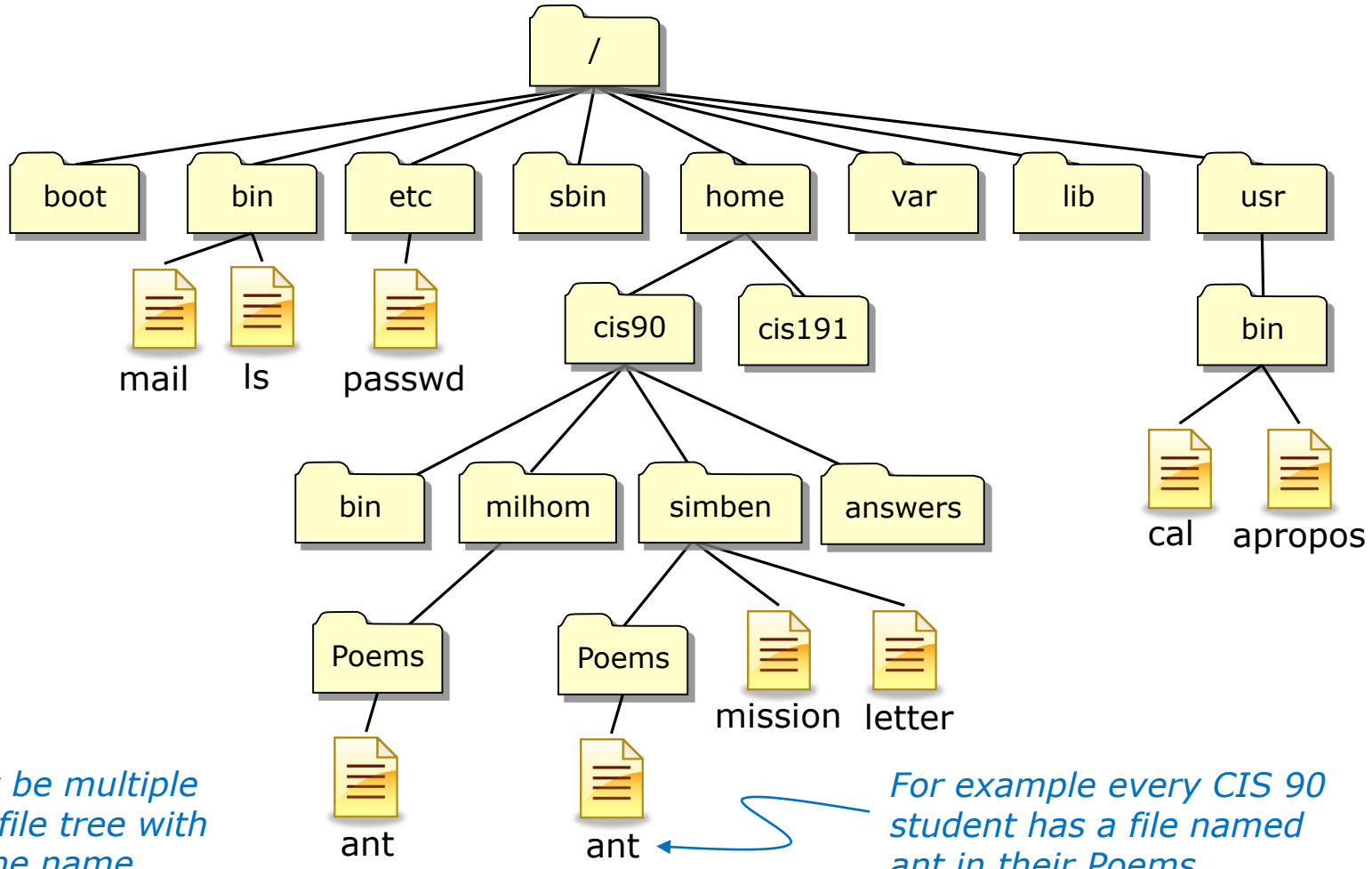
- Which are Linux kernel files?

Write your answer in the chat window

Pathnames

The need for pathnames

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

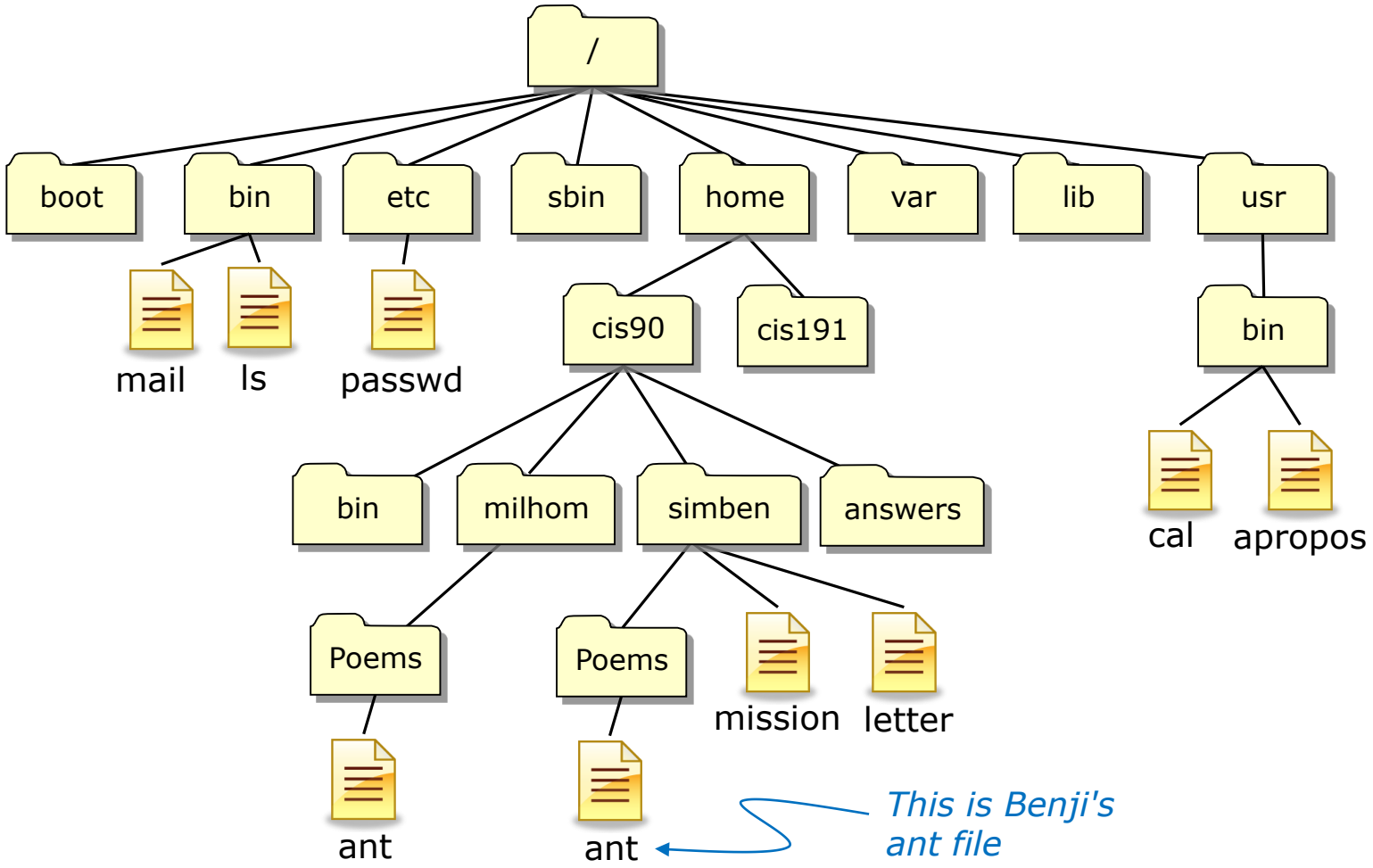


There may be multiple files in the file tree with the same name.

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.

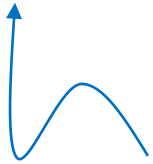
Absolute Pathnames

Absolute Pathnames

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

Examples:

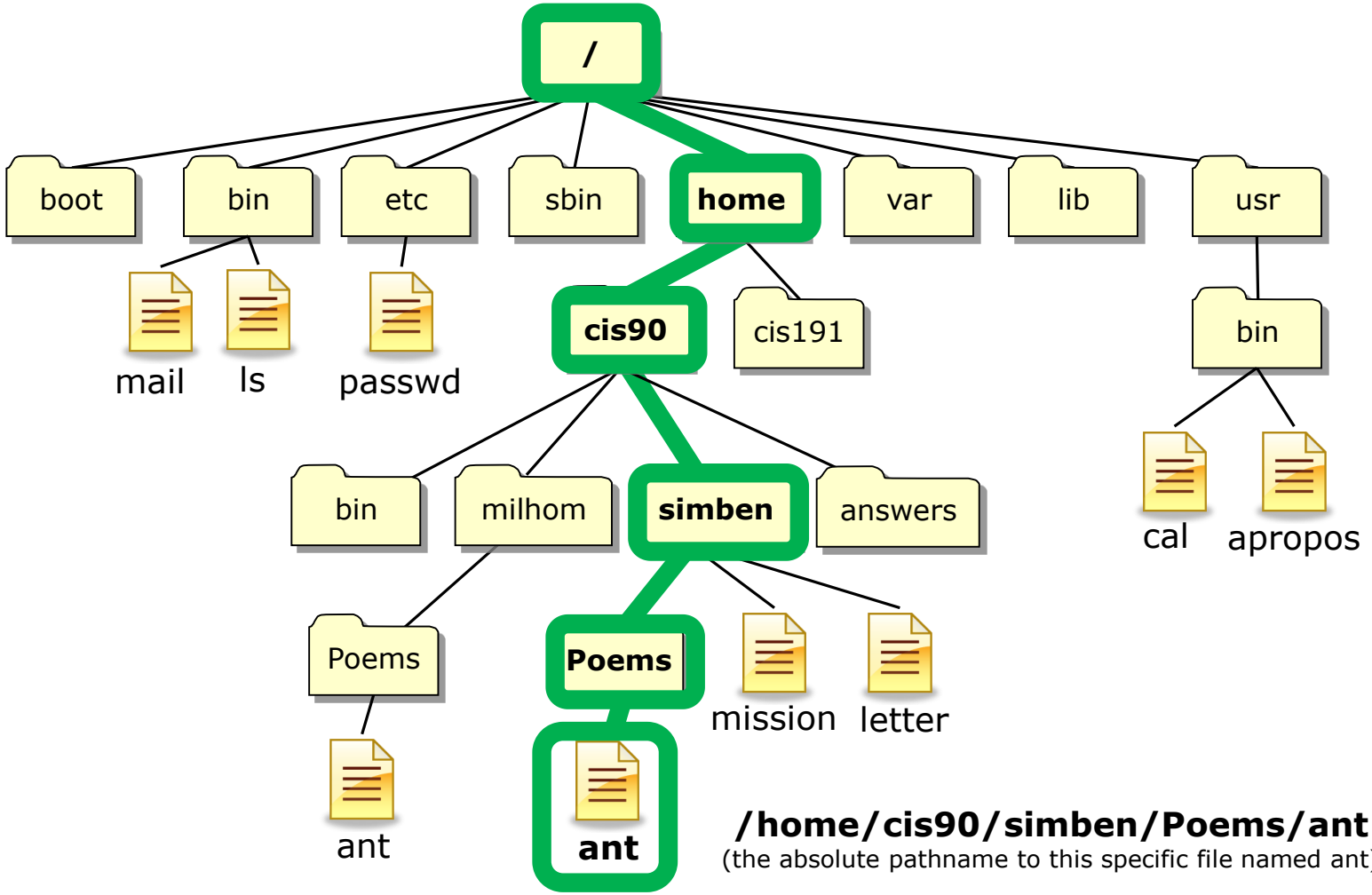
/home/cis90/simben/Poems/ant	*(file)*
/boot	*(directory)*
/usr/bin/cal	*(file)*
/home/cis90/bin/	*(directory)*
/bin/mail	*(file)*



**** Important ****
Notice all absolute pathnames start with a / (forward slash) which represents the top of the file tree

Example Absolute Pathname

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



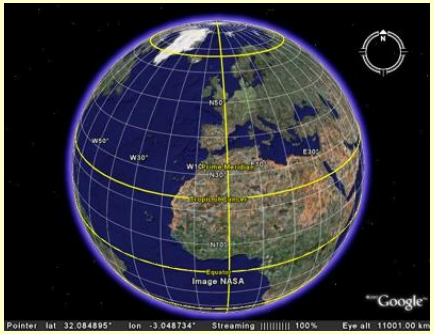
/home/cis90/simben/Poems/ant
(the absolute pathname to this specific file named ant)

Absolute Pathname Analogy

Where is Watsonville Airport using latitude and longitude?

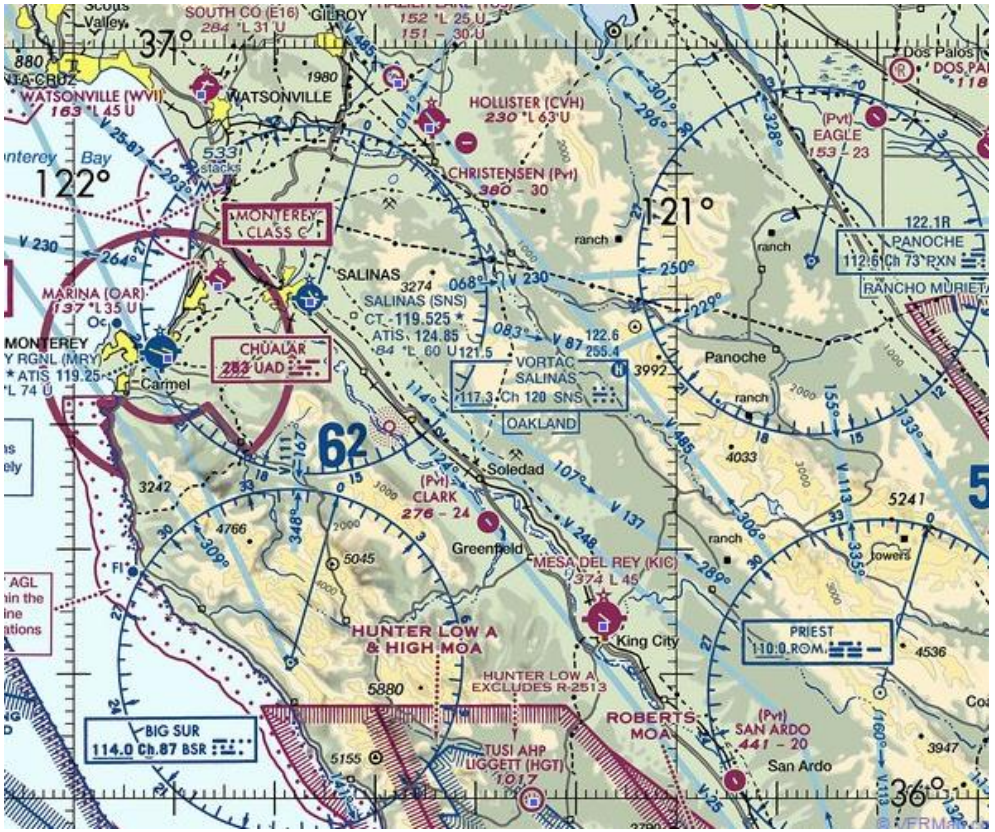
An analogy …

http://www.engineeringtoolbox.com/



Latitude is measured in degrees north or south of the equator. Longitude is measured in degrees east or west of the prime meridian.

Watsonville Airport
Latitude: 36-56'09" N
Longitude: 121-47'23" W



Latitude and longitude designate a target destination independent of your current location

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

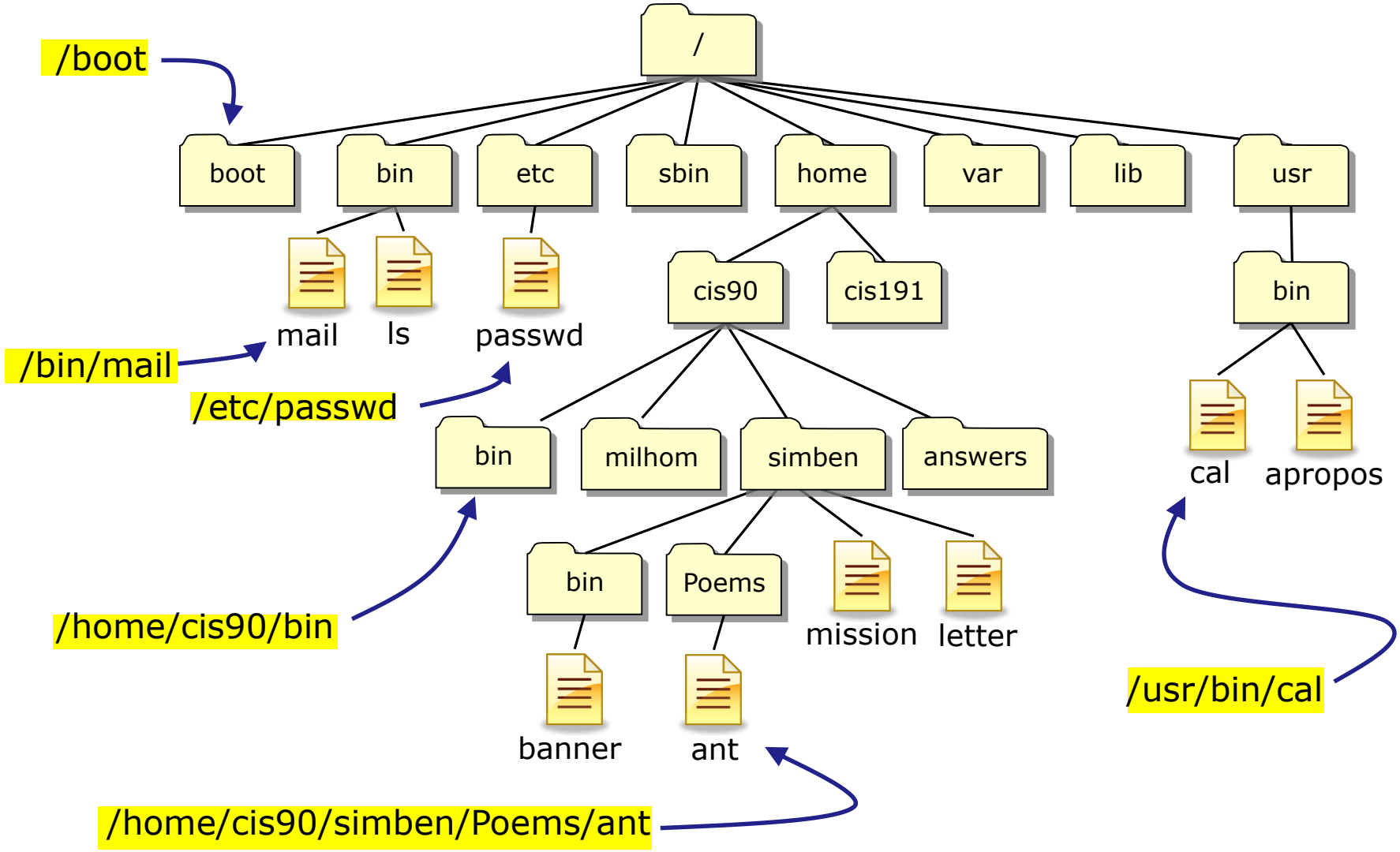
```
/home/cis90/simben $ tail -n2 /home/cis90/milhom/Poems/ant
'till one who seemed the least
of all absorbed my whole of mind.
```

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 more example absolute pathnames



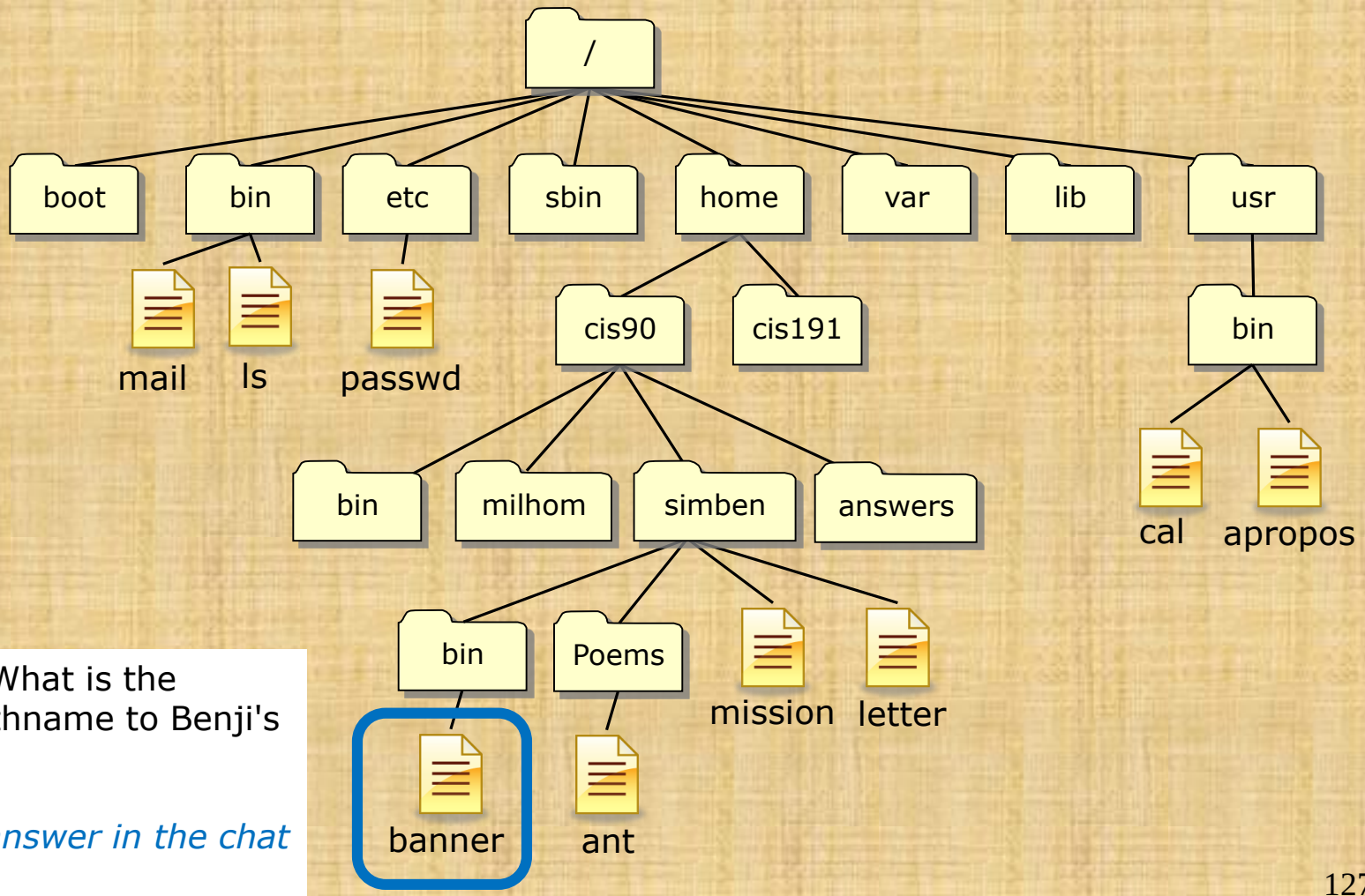
Absolute Pathnames

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
```

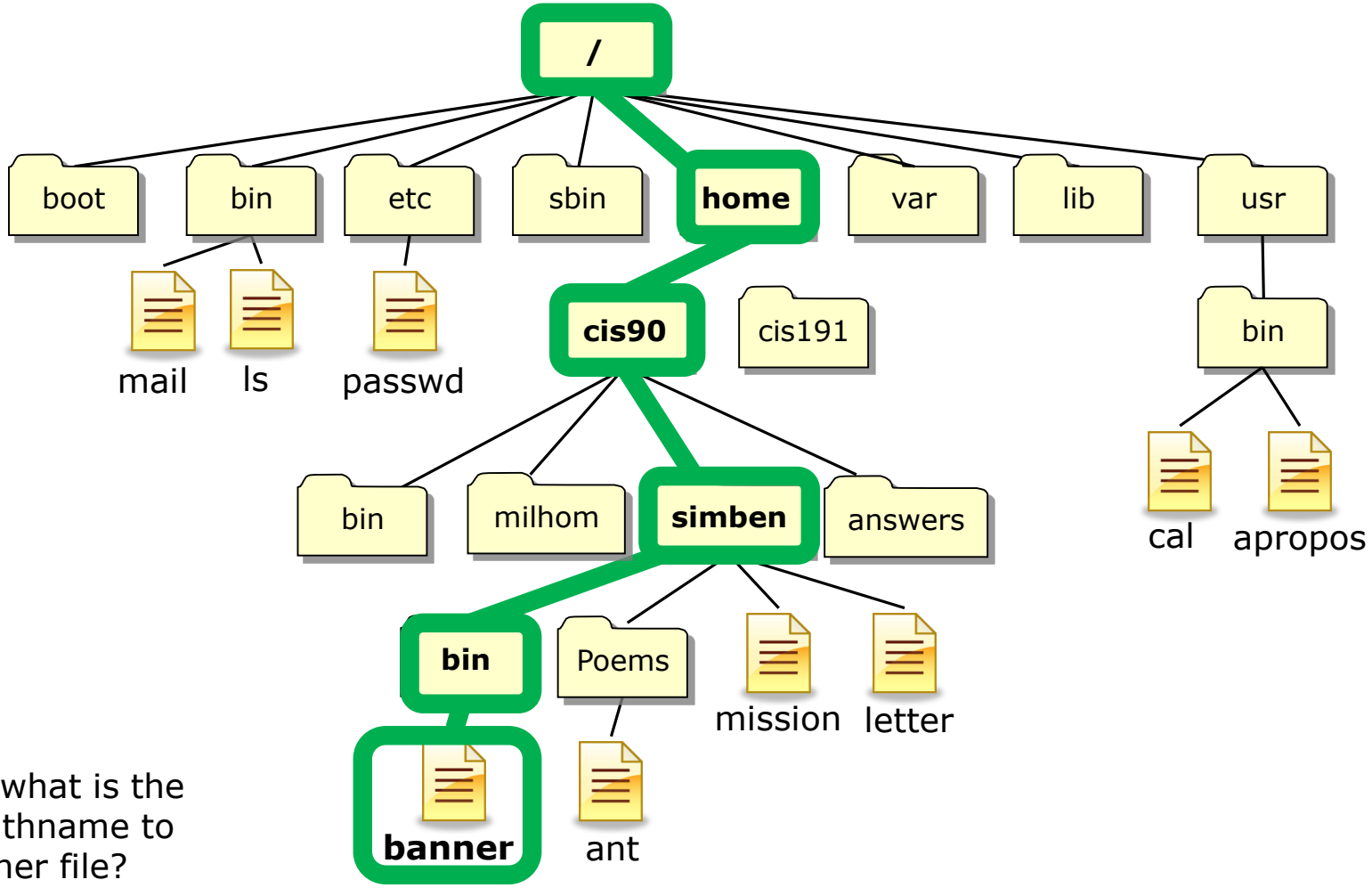
**** Important ****
Notice all absolute pathnames start with a / (forward slash) which represents the top of the file tree

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:

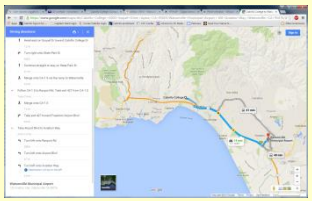
ant	*(file)*
Poems/Shakespeare/sonnet5	*(file)*
../mission	*(file)*
../bin/	*(directory)*
../../../boot/vmlinuz-2.6.18-164.el5	*(file)*

**** Important ****
Note that relative pathnames do NOT start with a /

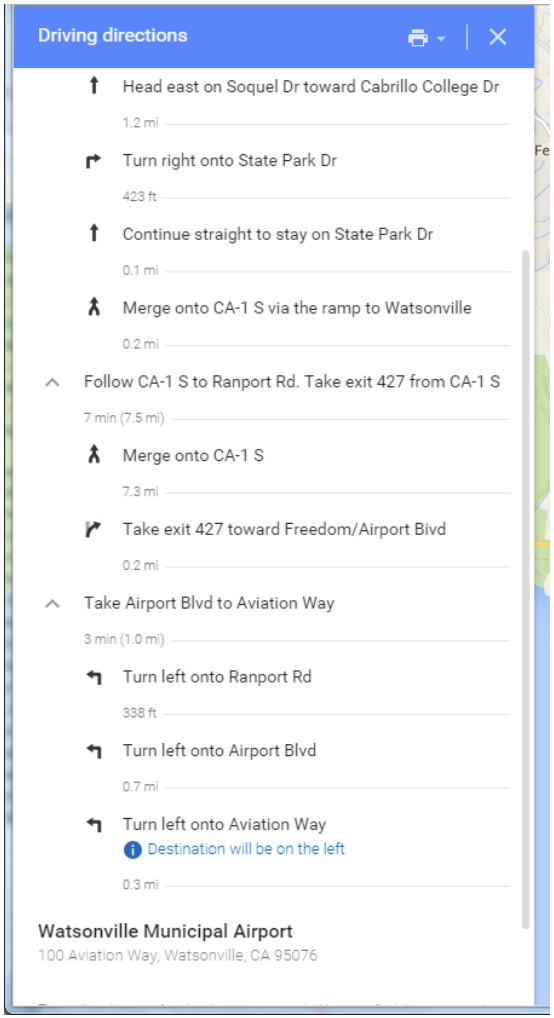
Relative Pathname Analogy

How do I get from Cabrillo College to Watsonville Airport using Google Maps?

An analogy …



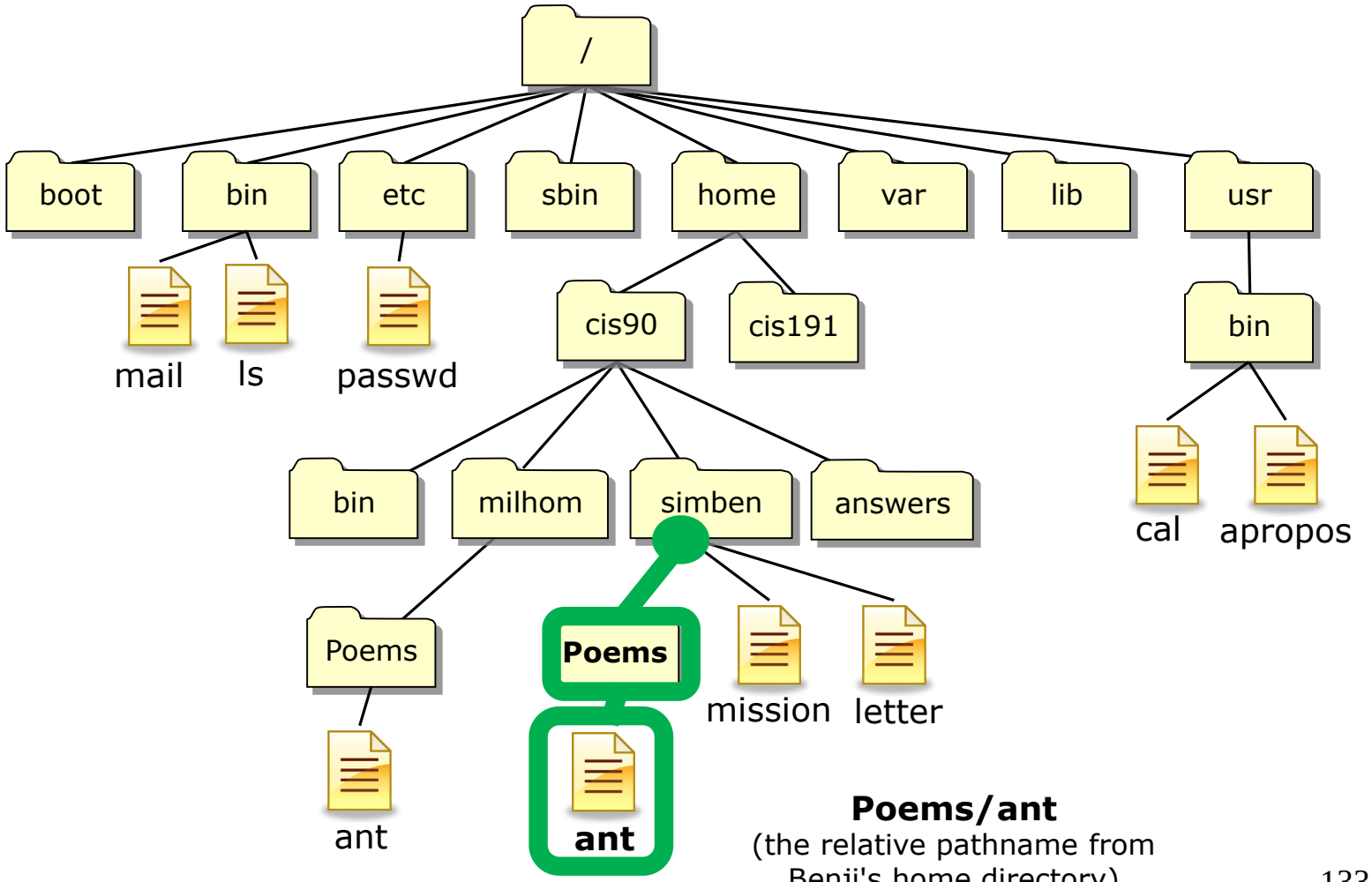
Google Maps show a driving route from your current location to a target destination



Google Maps instructions to a target destination depend on your starting location.

Relative Pathnames

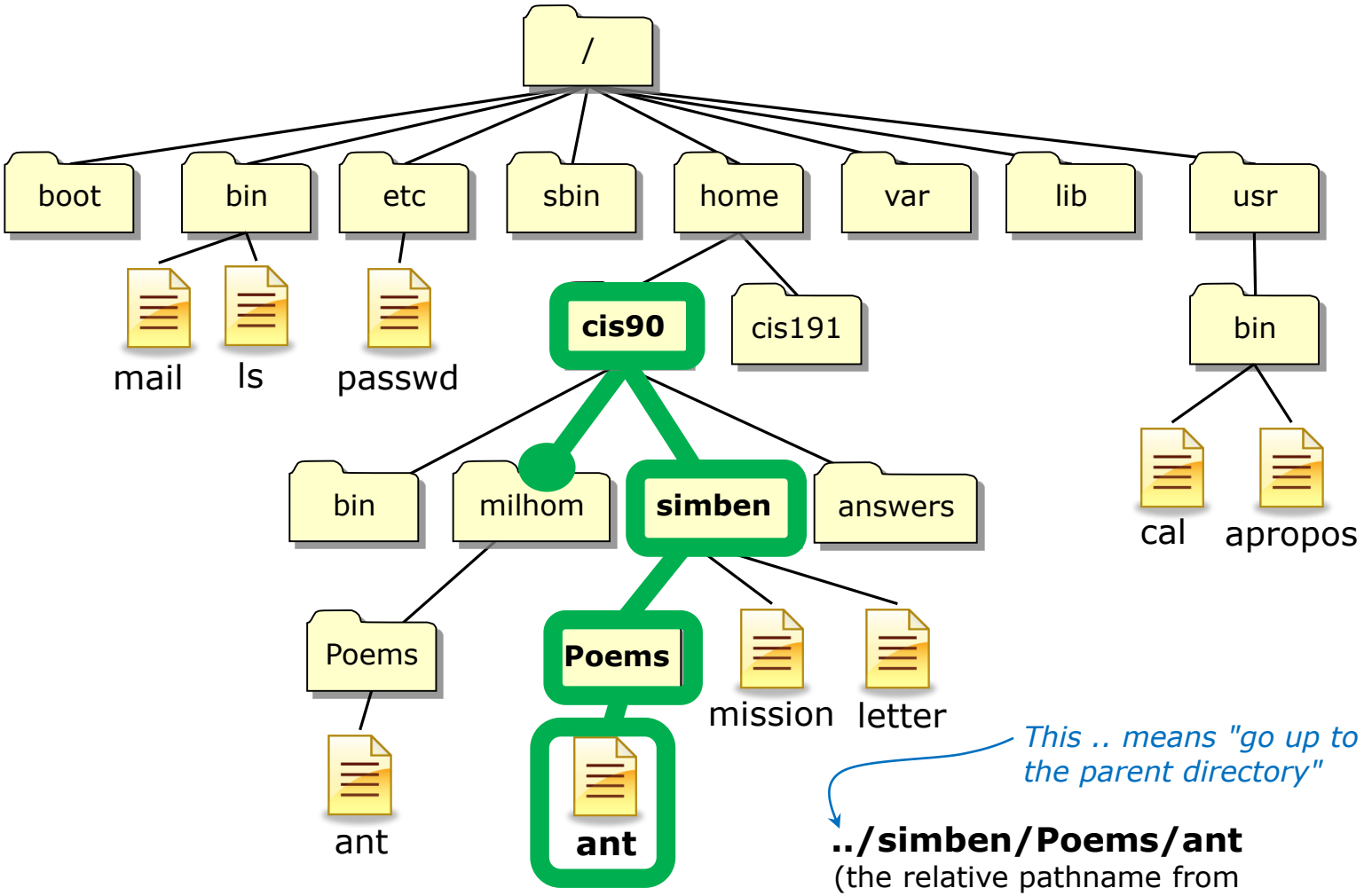
A **relative** pathname specifies a path from our current location in the tree all the way to the specific file.



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 - Follow Me

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

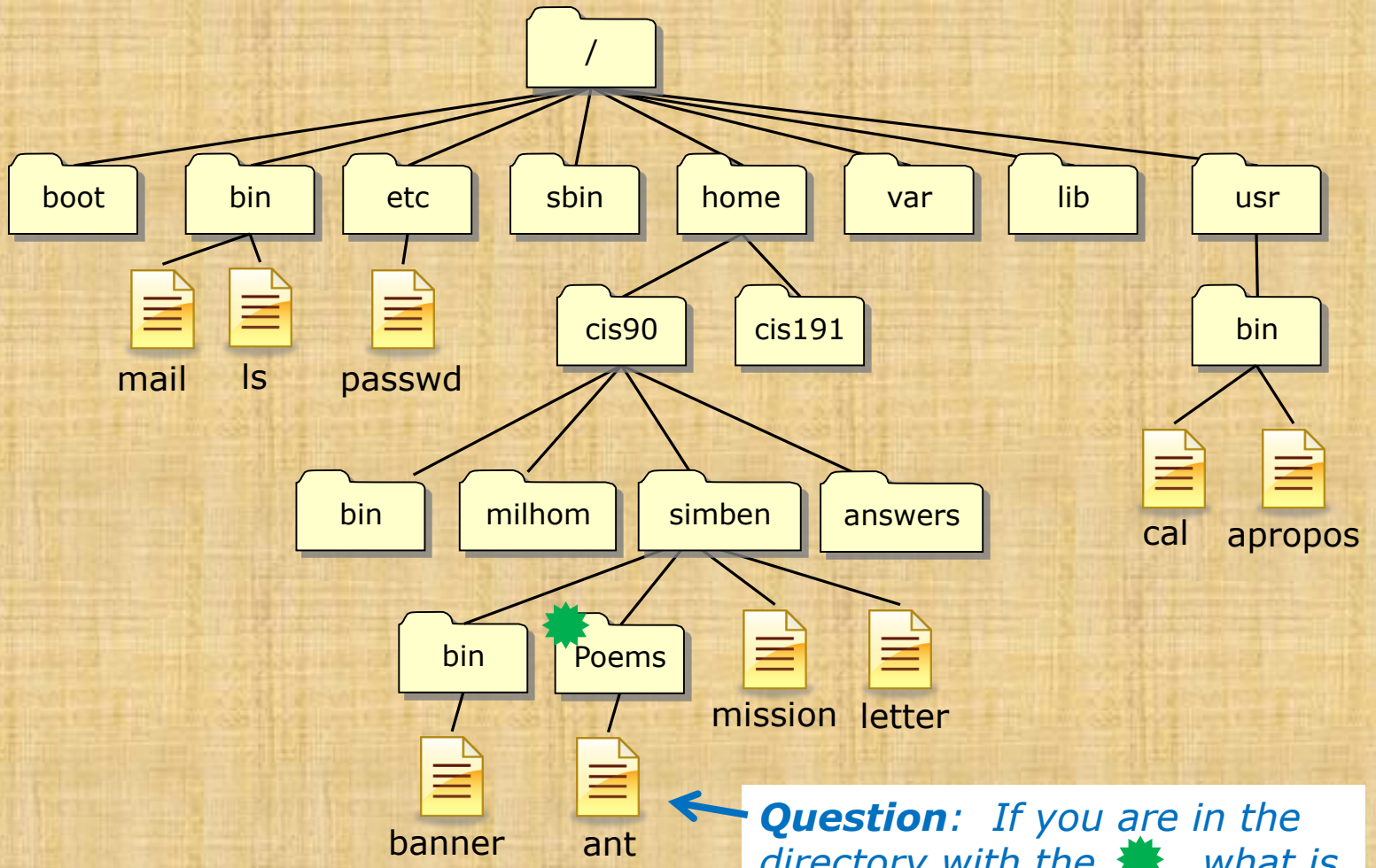
file Poems/Shakespeare/sonnet4

cd Poems/Shakespeare

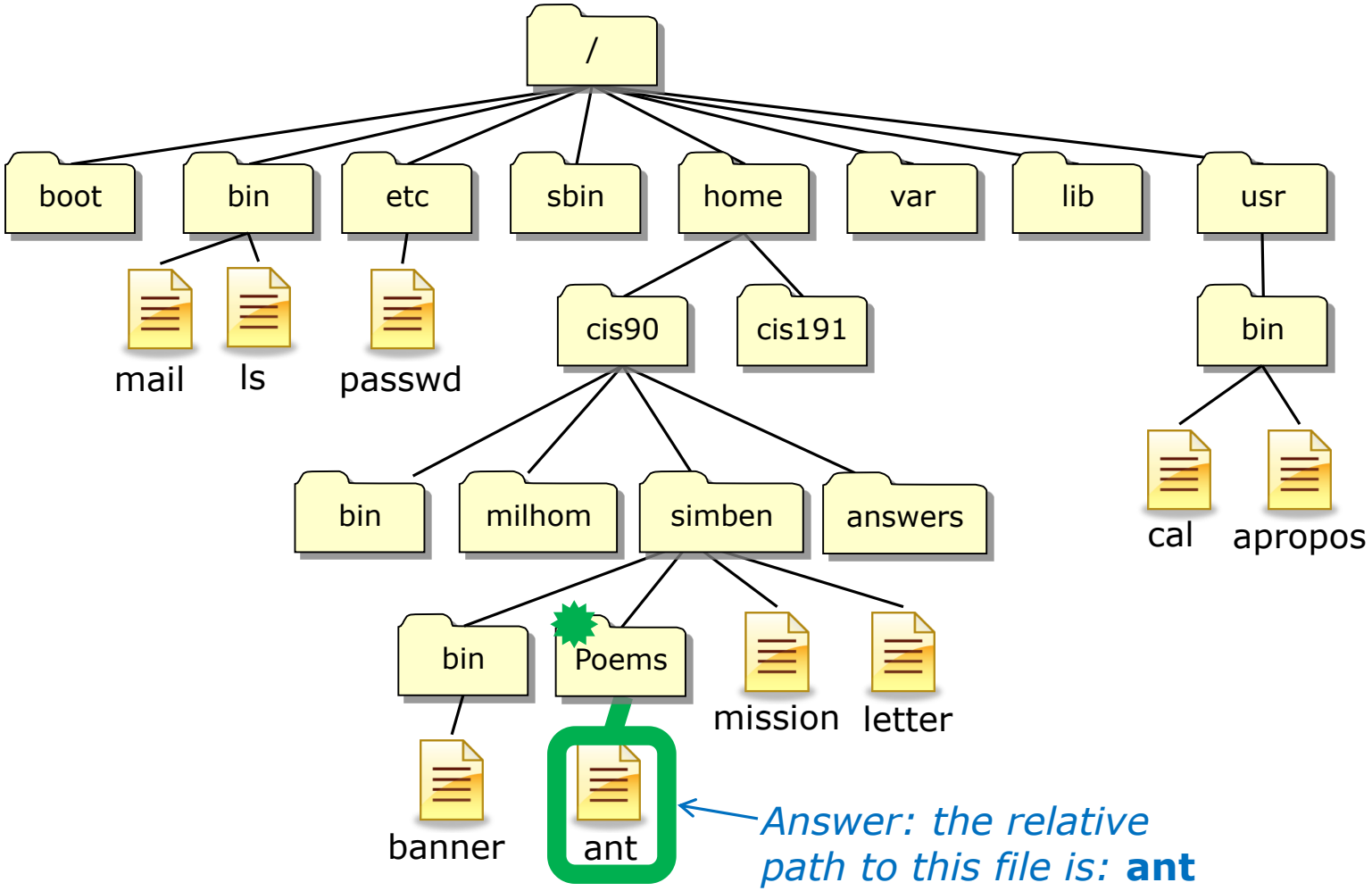
The .. is used to represent the parent directory

**** Important ****
Notice that these pathnames do NOT start with the /

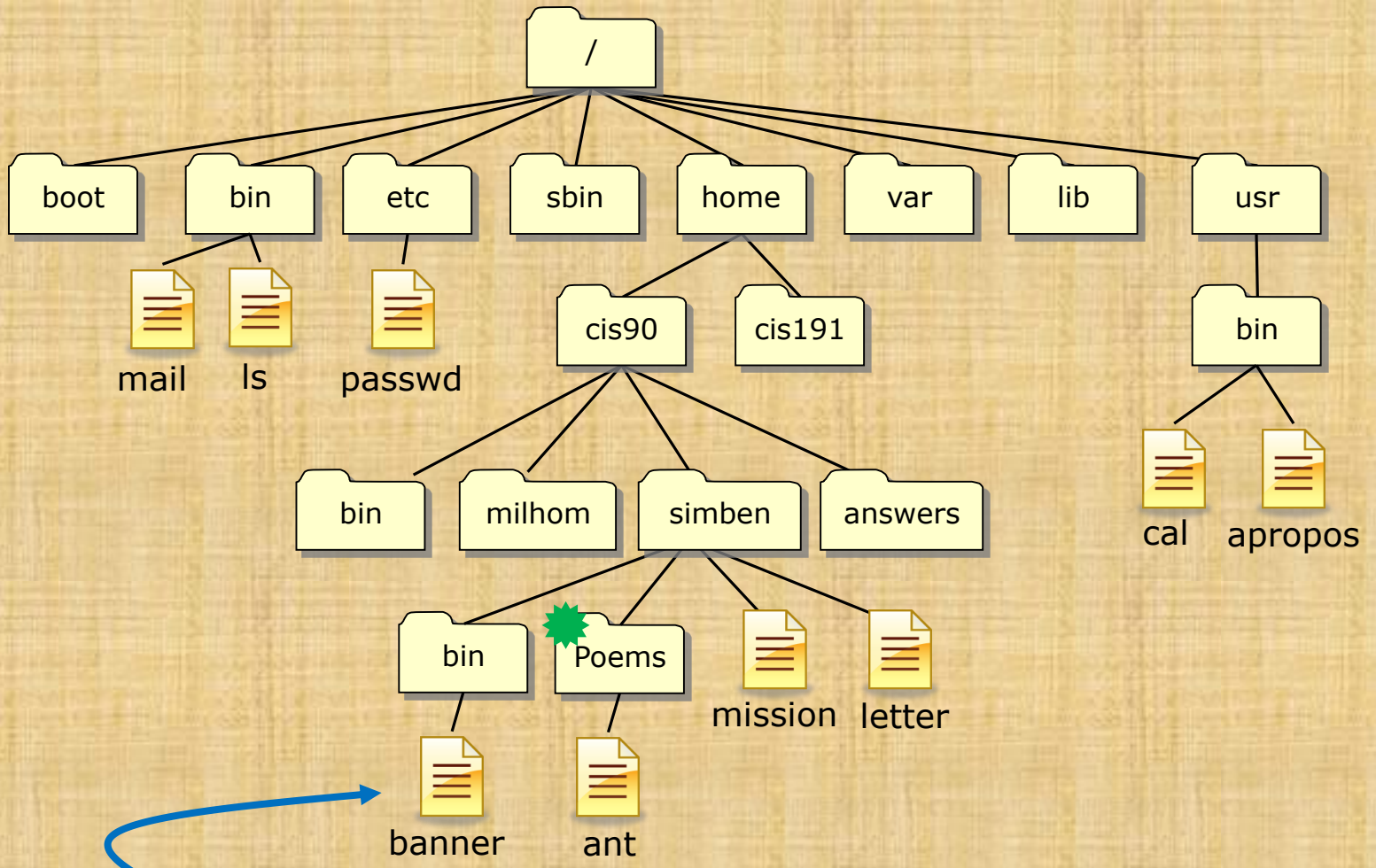
Activity - identify a relative pathname



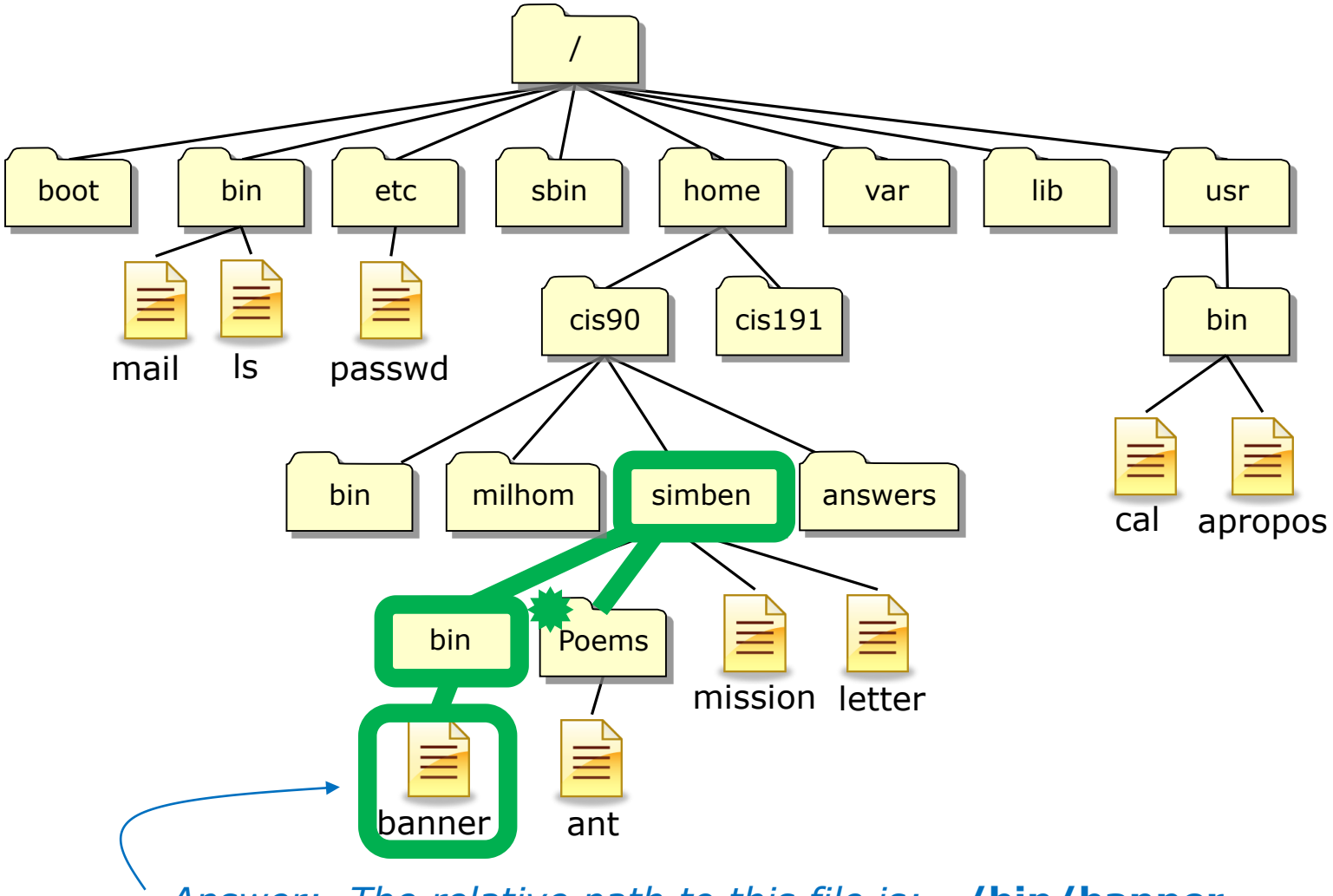
Question: *If you are in the directory with the , what is the relative path to this file?*


/
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?

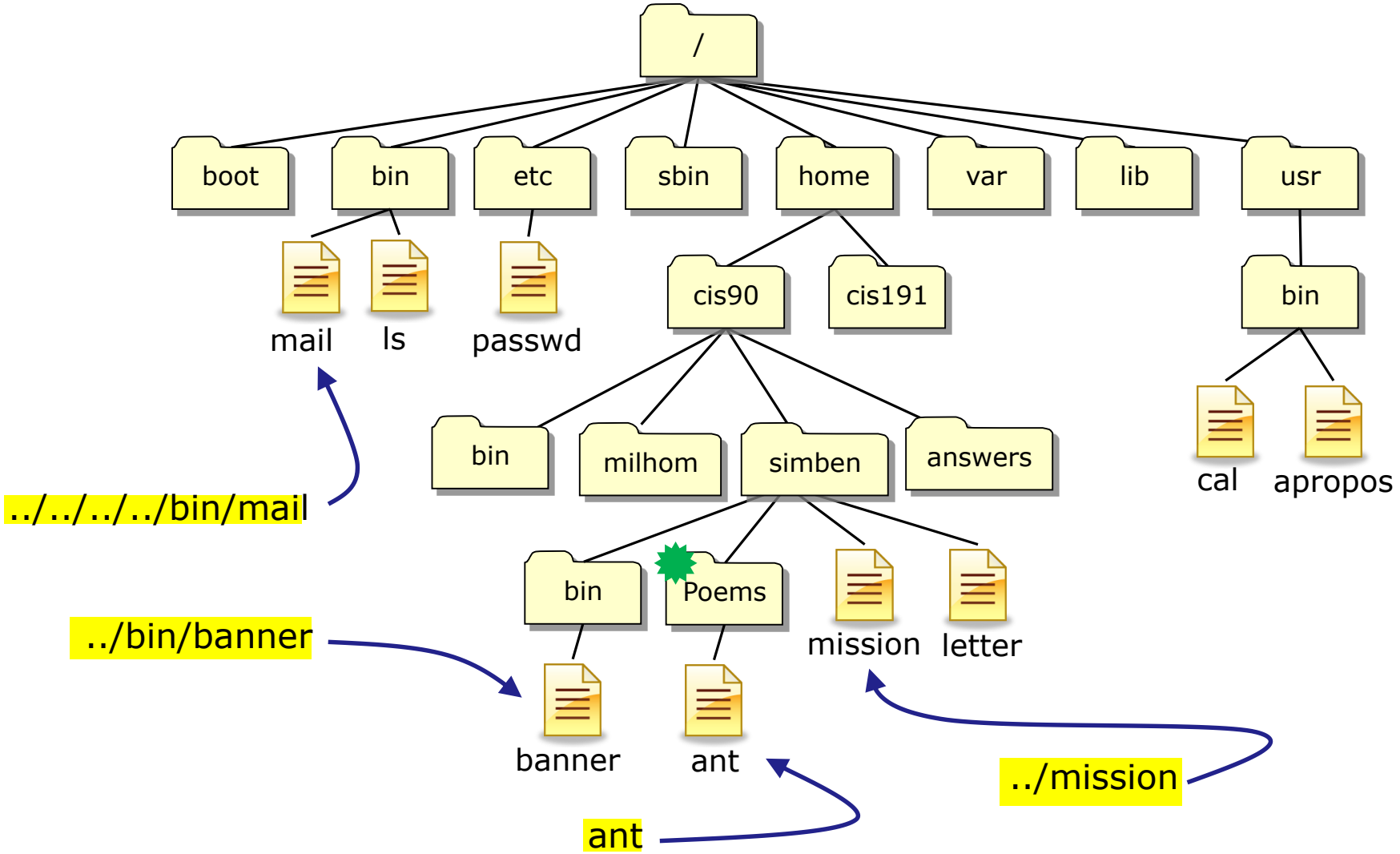


Answer: The relative path to this file is: **../bin/banner**

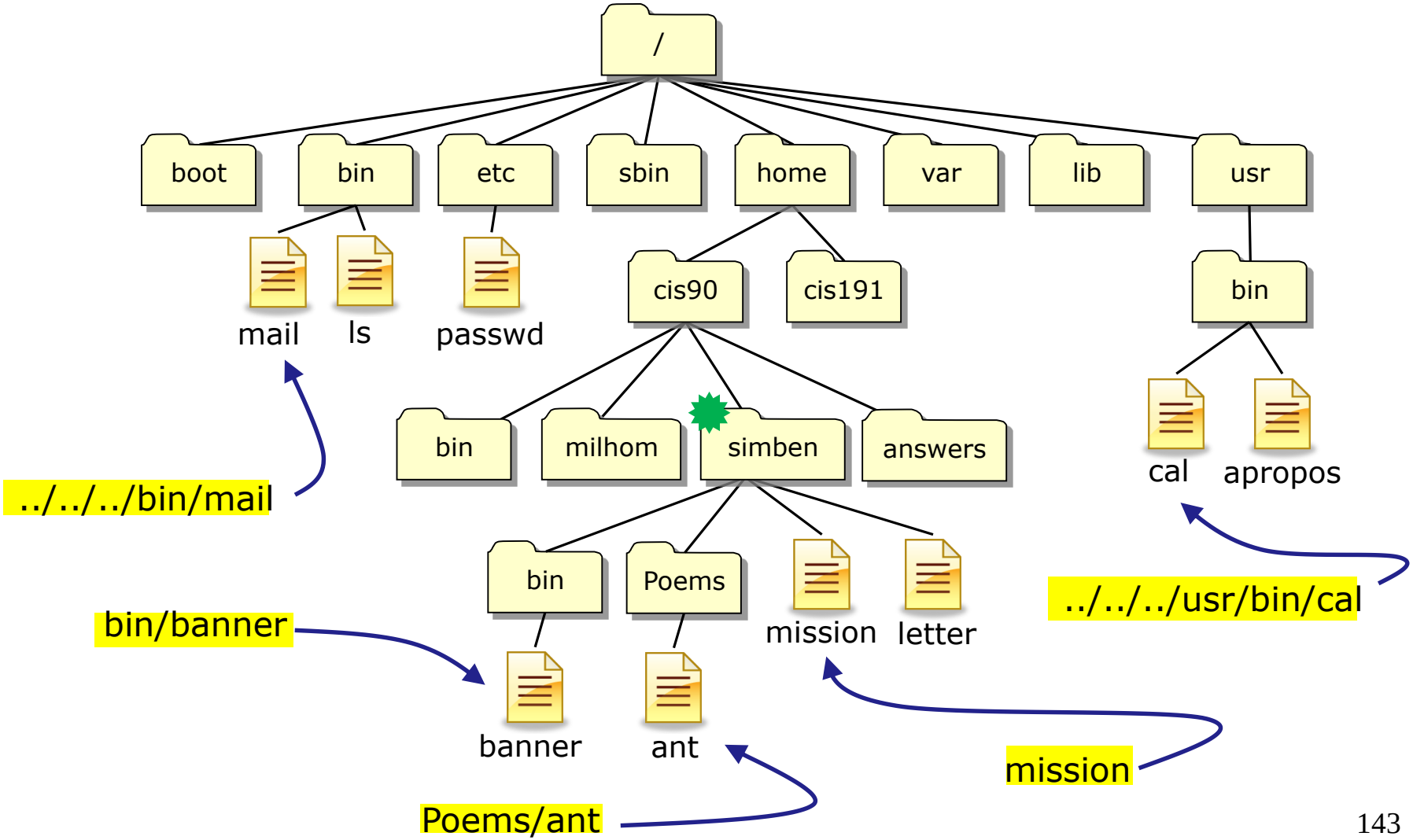
../bin/banner

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 - Follow Me

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

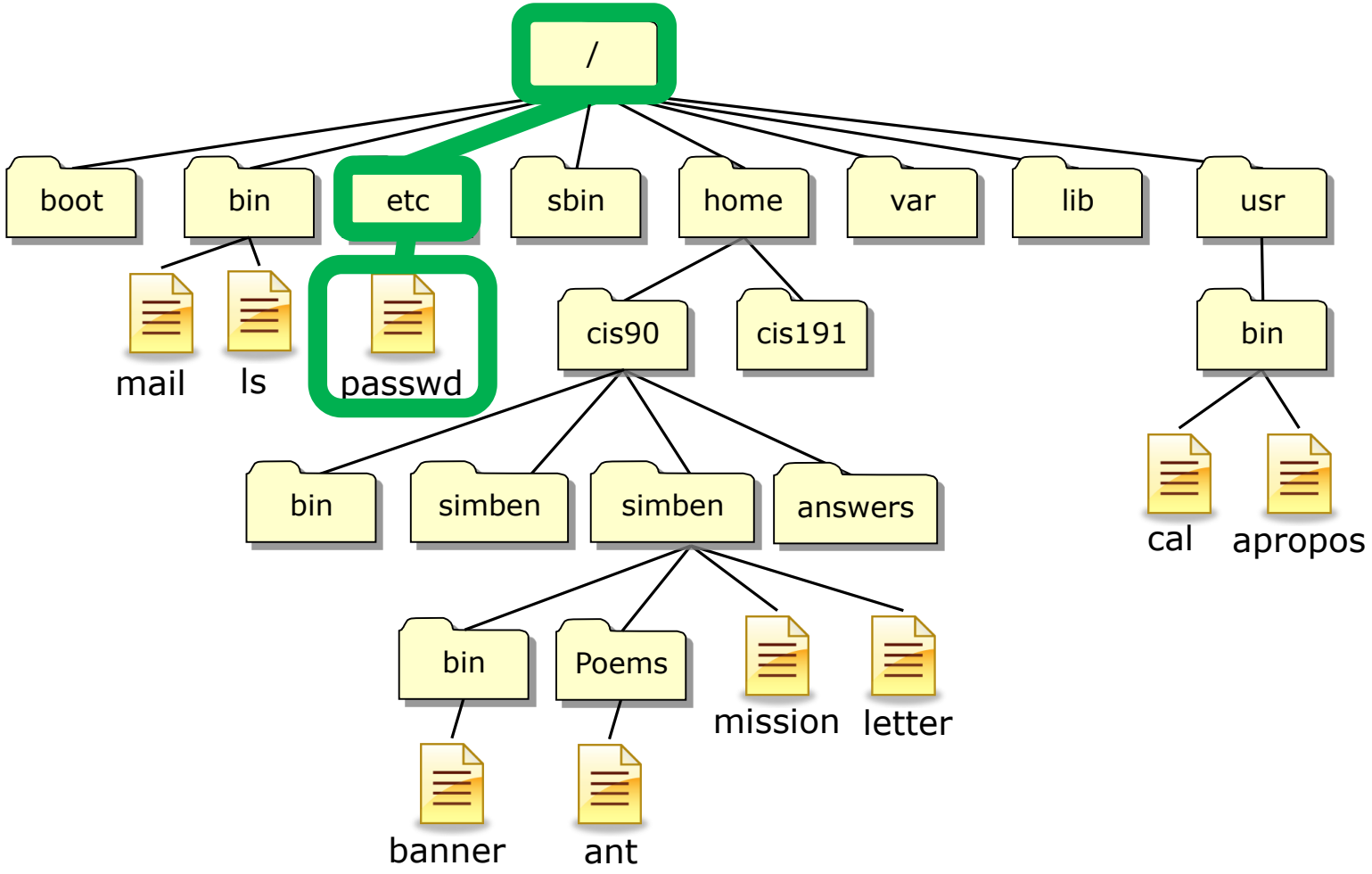
Question:
What is the absolute pathname of /etc/passwd?

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
```

Shell tips

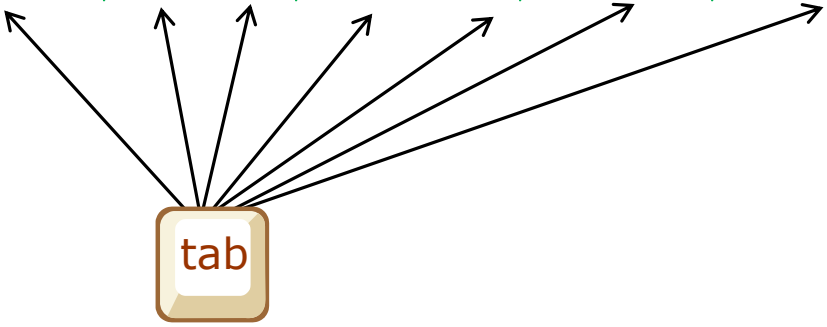
(review)

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/
```

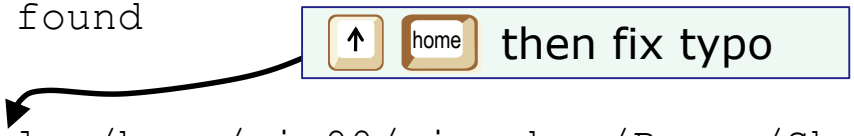


bash shell tip

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
```

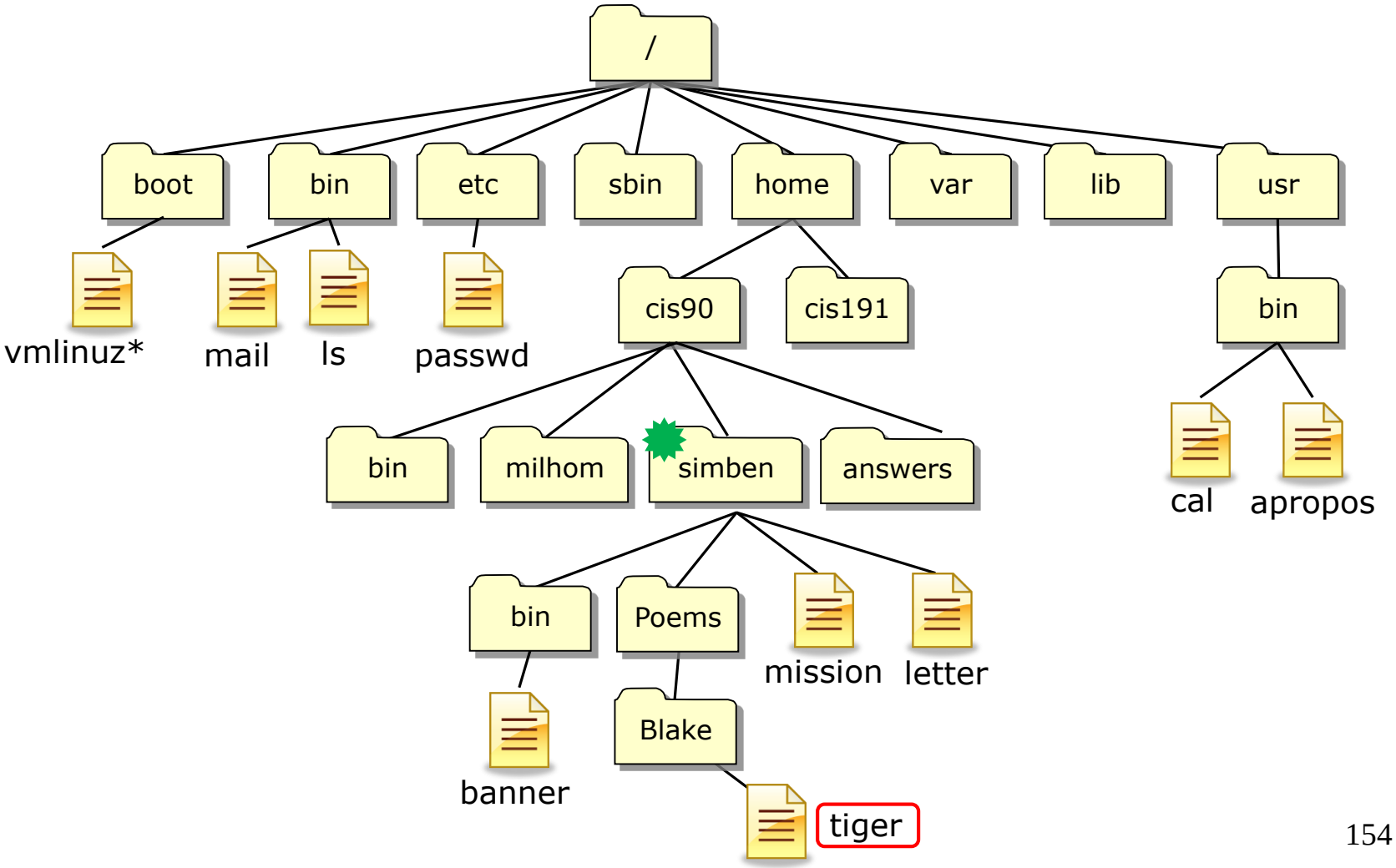



```
/home/cis90/simmsben $ ls /home/cis90/simmsben/Poems/Shakespeare/
sonnet1   sonnet11  sonnet17  sonnet26  sonnet35  sonnet5  sonnet9
sonnet10  sonnet15  sonnet2   sonnet3   sonnet4   sonnet7
/home/cis90/simmsben $
```

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

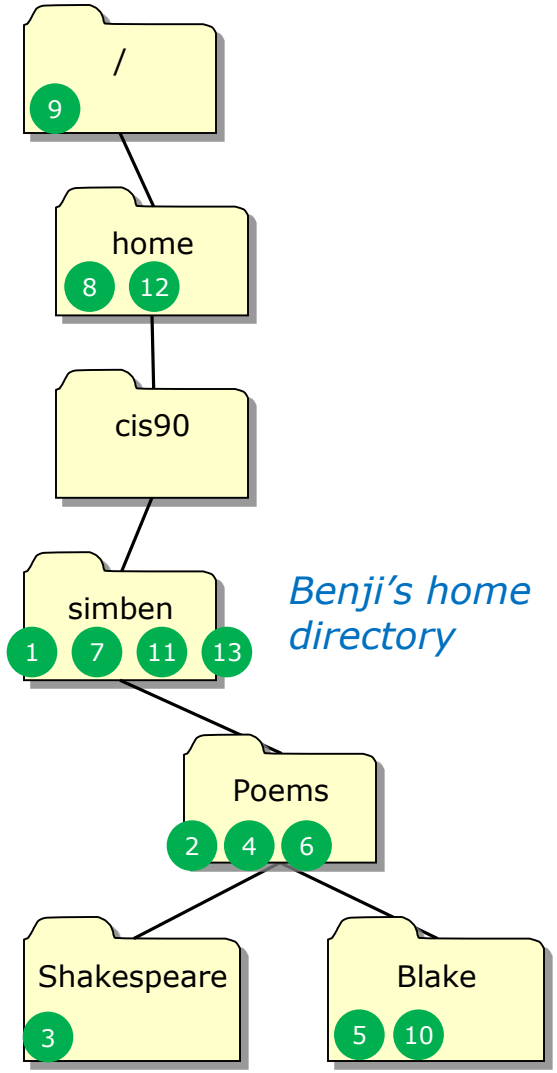
To move up the tree use: **cd ..**

.. 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

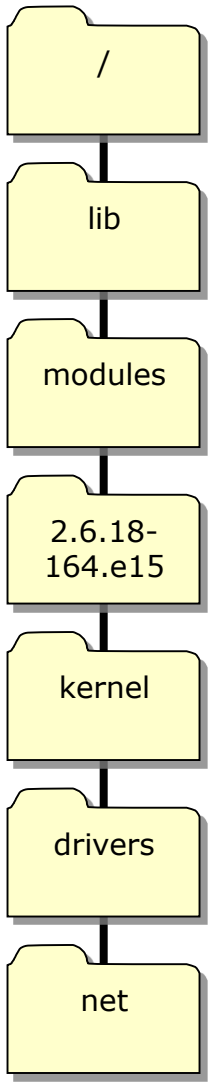
```
[rsimms@opus net]$ echo $PWD
/lib/modules/2.6.18-164.el5/kernel/drivers/net
```

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.



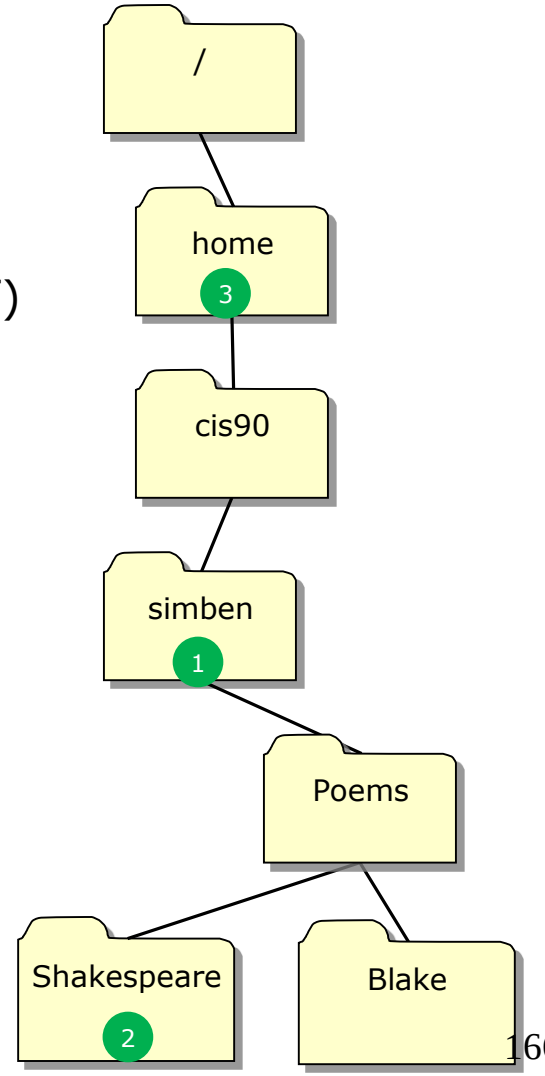
pwd command

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


```
/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)

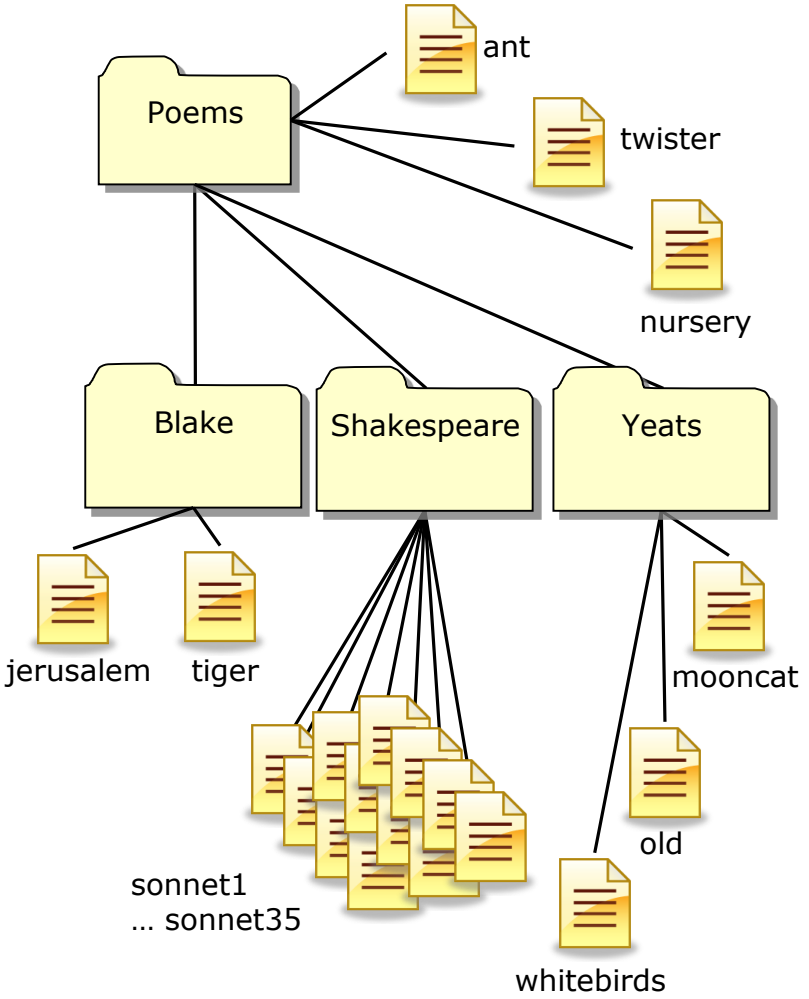
ls command

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


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

The contents of the directory are shown

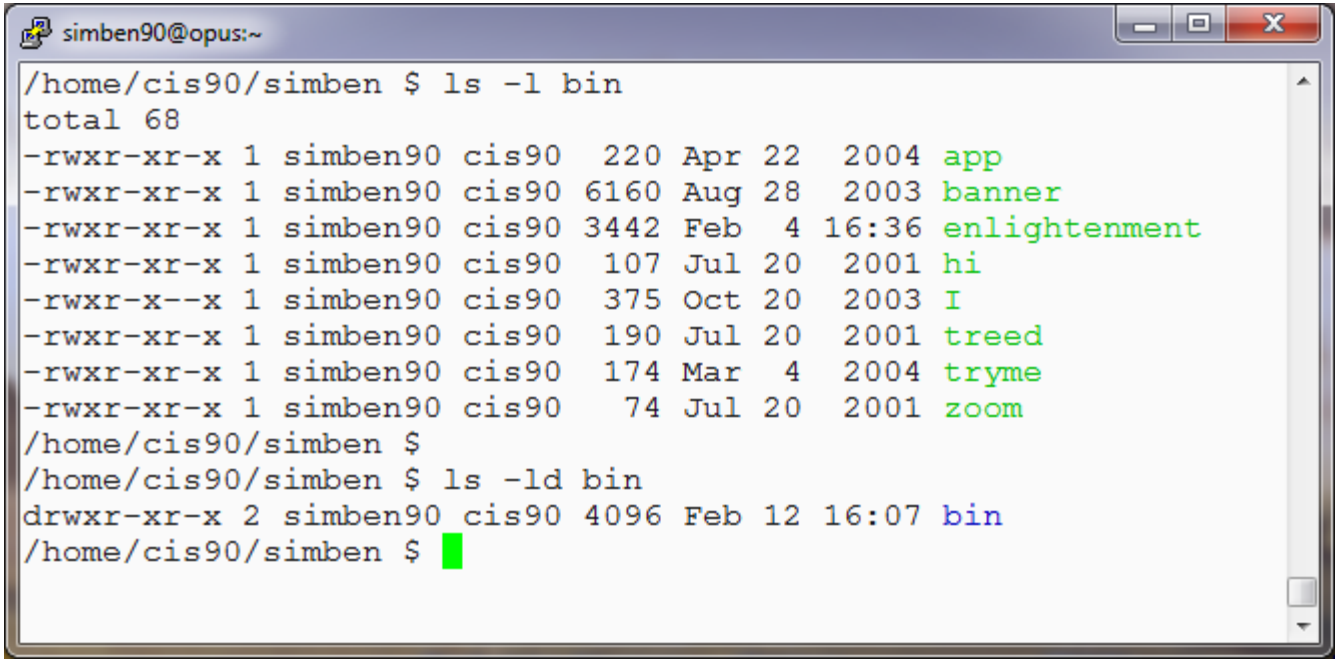
```
/home/cis90/simben $ ls -d bin
bin
```

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



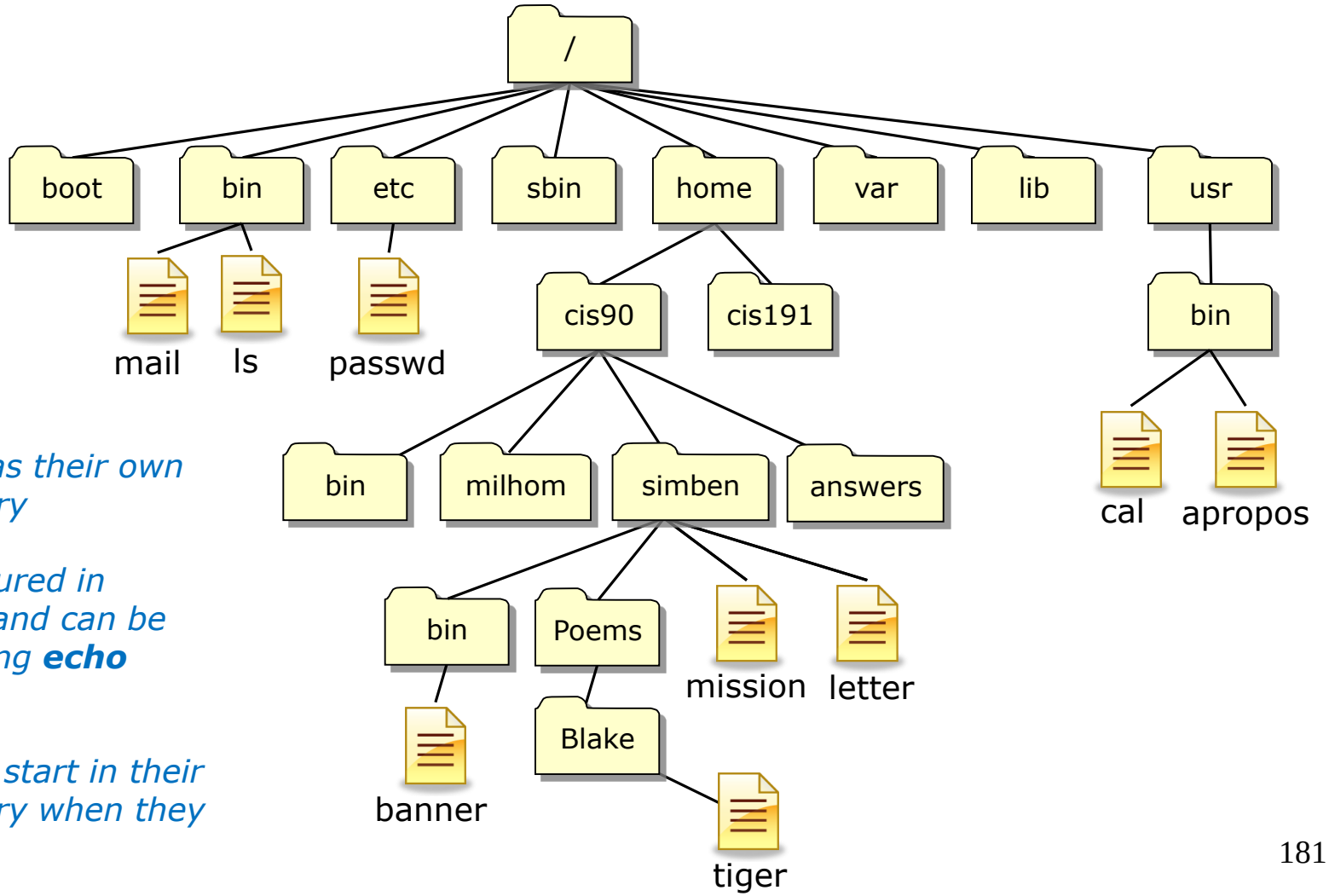
The directory contents are shown

The directory itself is shown with the -d option

Home directories

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

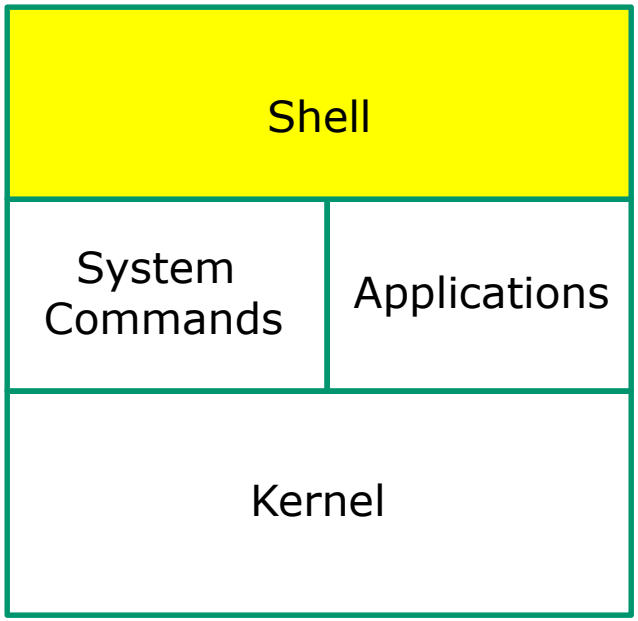
Filename expansion with *

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.*

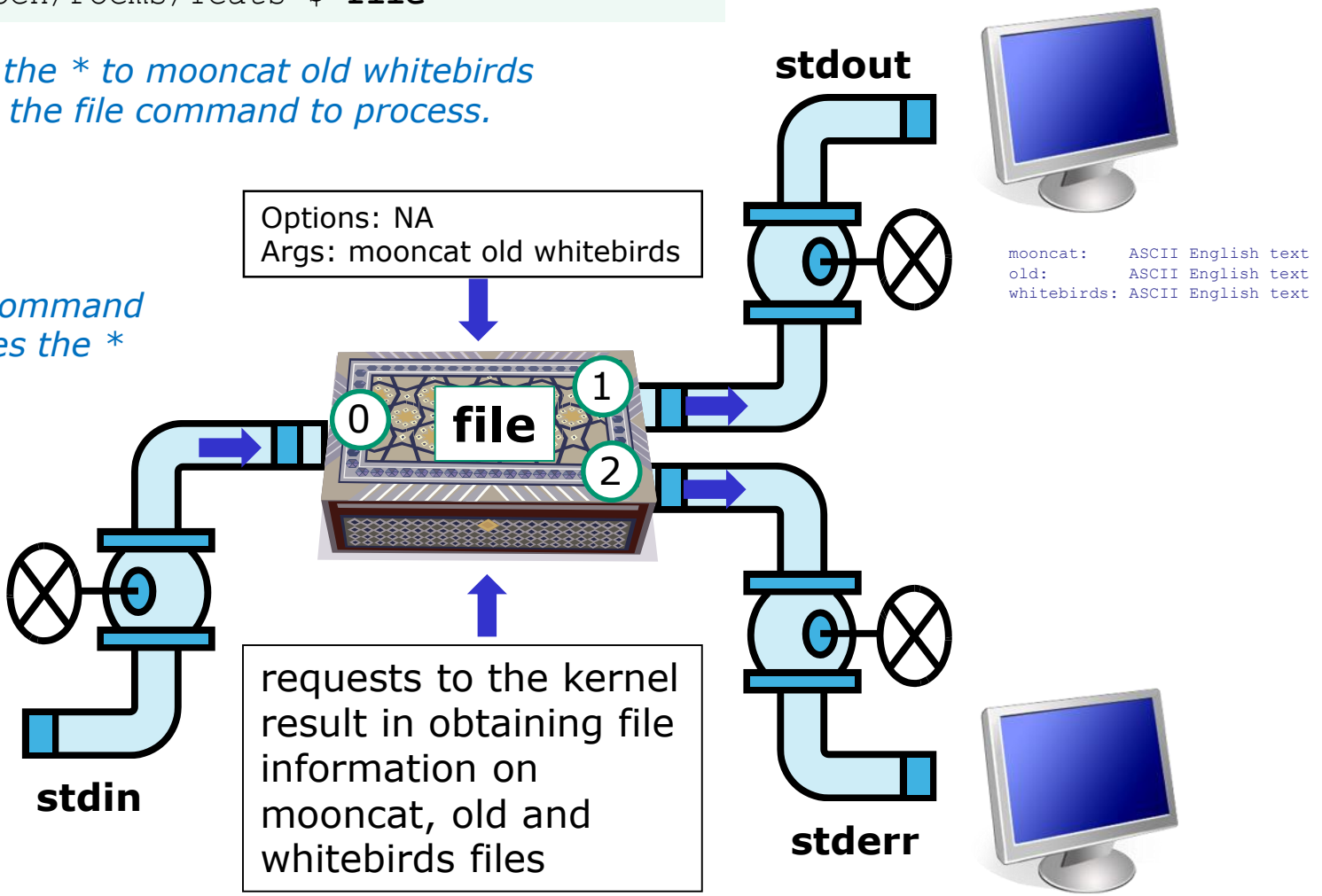
*The **file** command never sees the "*"*

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.


Assignment

Lab 4

If you get stuck, please ask questions on the forum or ask one of the lab assistants in the CIS Lab.


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:

/	"slash" directory, the root of the file tree
/home	User 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	The absolute pathname of the passwd file in the /etc/ directory

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?

End Meeting

Backup

Parsing & Command Syntax

Shell prints this to prompt user to enter a command

Shell parses this command line

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

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

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

Examples

```
/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.*