Rich's lesson module checklist

- ❑ Slides posted
- ❑ WB converted from PowerPoint
- ❑ Print out agenda slide and annotate page numbers

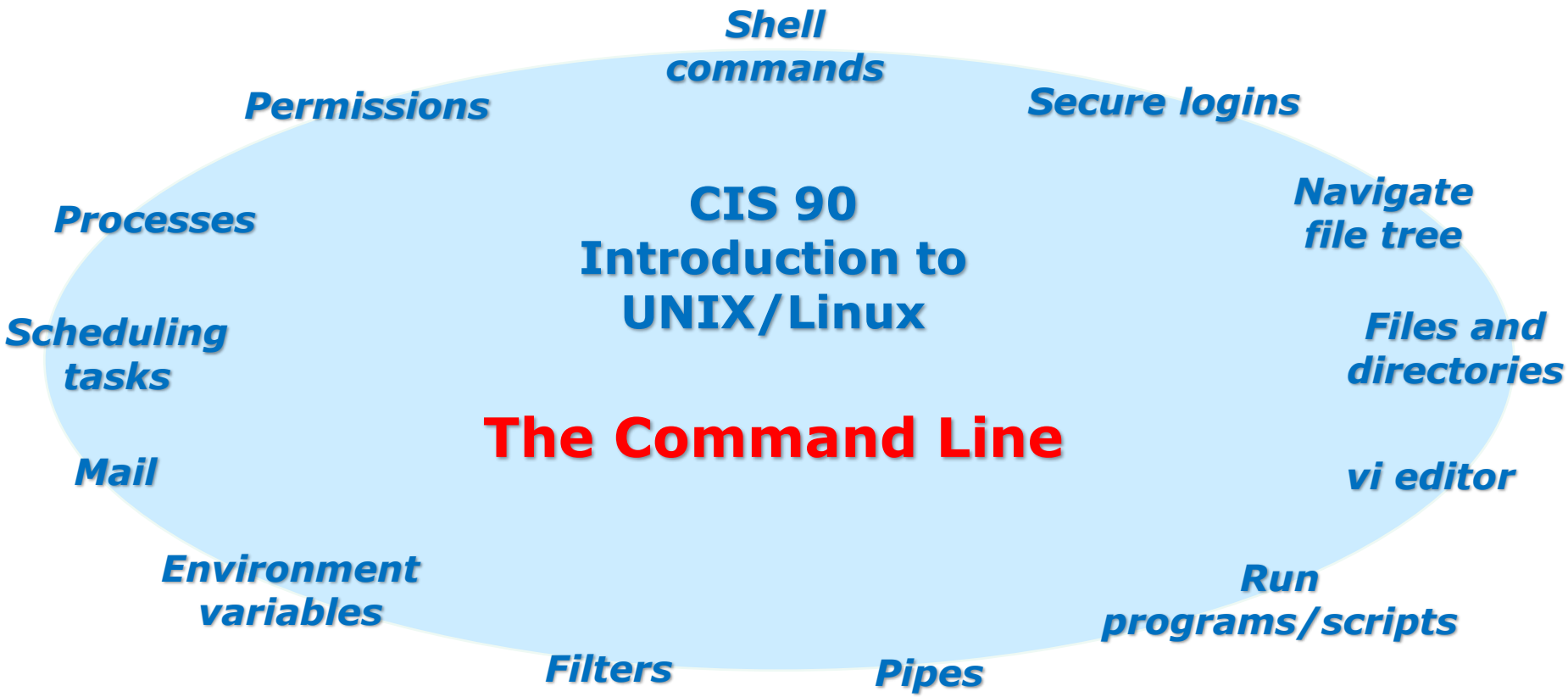
- ❑ Flash cards
- ❑ Page numbers
- ❑ 1st minute quiz
- ❑ Web Calendar summary
- ❑ Web book pages
- ❑ Commands

- ❑ Sun-Hwa-L5 ready with new accounts and plenty of trouble
- ❑ Practice test tested
- ❑ Canvas test replicated to both sections
- ❑ Primary and secondary practice test servers up and logins enabled
- ❑ Q29 email script tested and scheduled to send at end of Lesson 5
- ❑ Flash cards and timer script ready

- ❑ Schedule lock of turnin directory and submit

```
at 12:00 am Thursday                    at 9:00 am thursday
chmod 700 /home/cis90/bin/submit        chmod 750 /home/cis90/bin/submit
chmod 700 /home/turnin/cis90            chmod 755 /home/turnin/cis90
ctrl-d                                  ctrl-d
```

- ❑ 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.

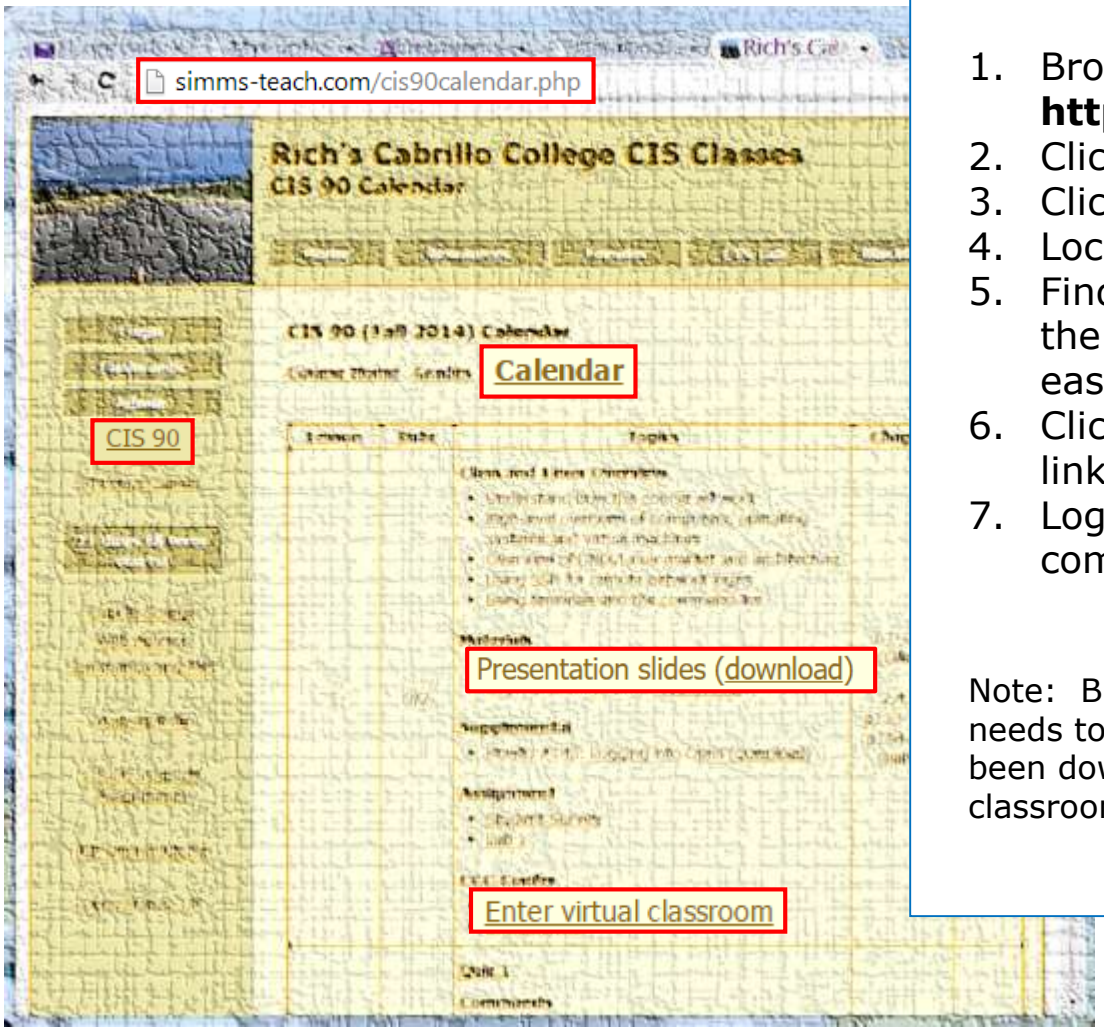
Introductions and Credits

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

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

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

Student checklist for attending class

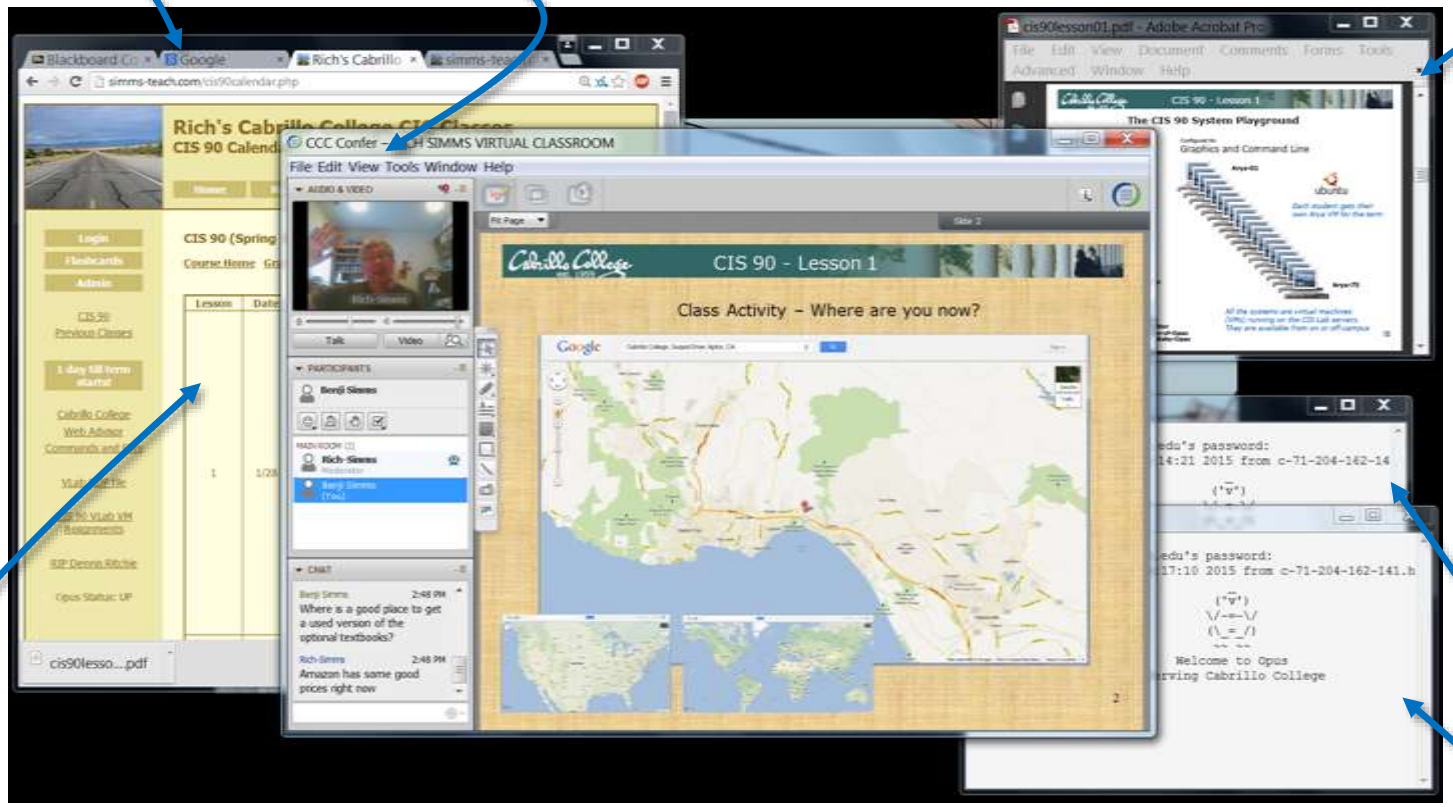


1. Browse to: **http://simms-teach.com**
2. Click the **CIS 90** link.
3. Click the **Calendar** link.
4. Locate today's lesson.
5. Find the **Presentation slides** for the lesson and **download** for easier viewing.
6. Click the **Enter virtual classroom** link to join CCC Confer.
7. Log into Opus with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

Note: Blackboard Collaborate Launcher only needs to be installed once. It has already been downloaded and installed on the classroom PC's.

Student checklist for suggested screen layout

- ❑ *Google*
- ❑ *CCC Confer*
- ❑ *Downloaded PDF of Lesson Slides*



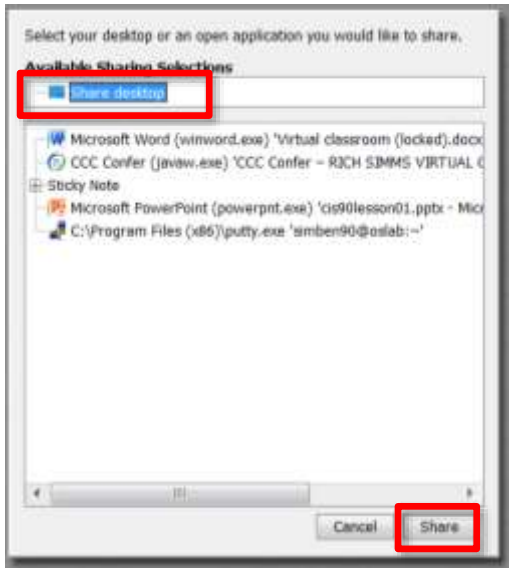
- ❑ *CIS 90 website Calendar page*
- ❑ *One or more login sessions to Opus*

Student checklist for sharing desktop with classmates

1) Instructor gives you sharing privileges

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

3) Click OK button.

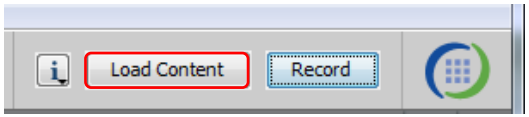


4) Select "Share desktop" and click Share button.

Rich's CCC Confer checklist - setup

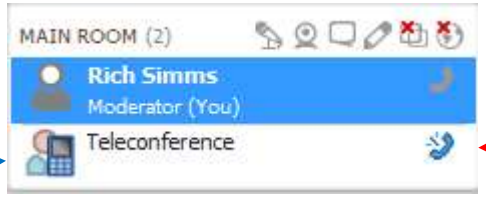
CCC Confer

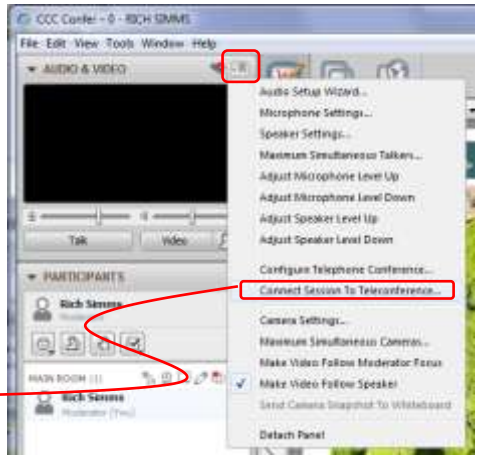
[ ] Preload White Board



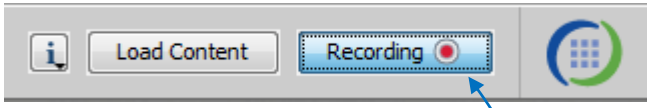
[ ] Connect session to Teleconference

Session now connected to teleconference





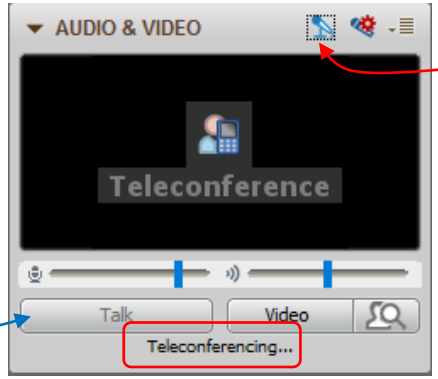
[ ] Is recording on?



Red dot means recording

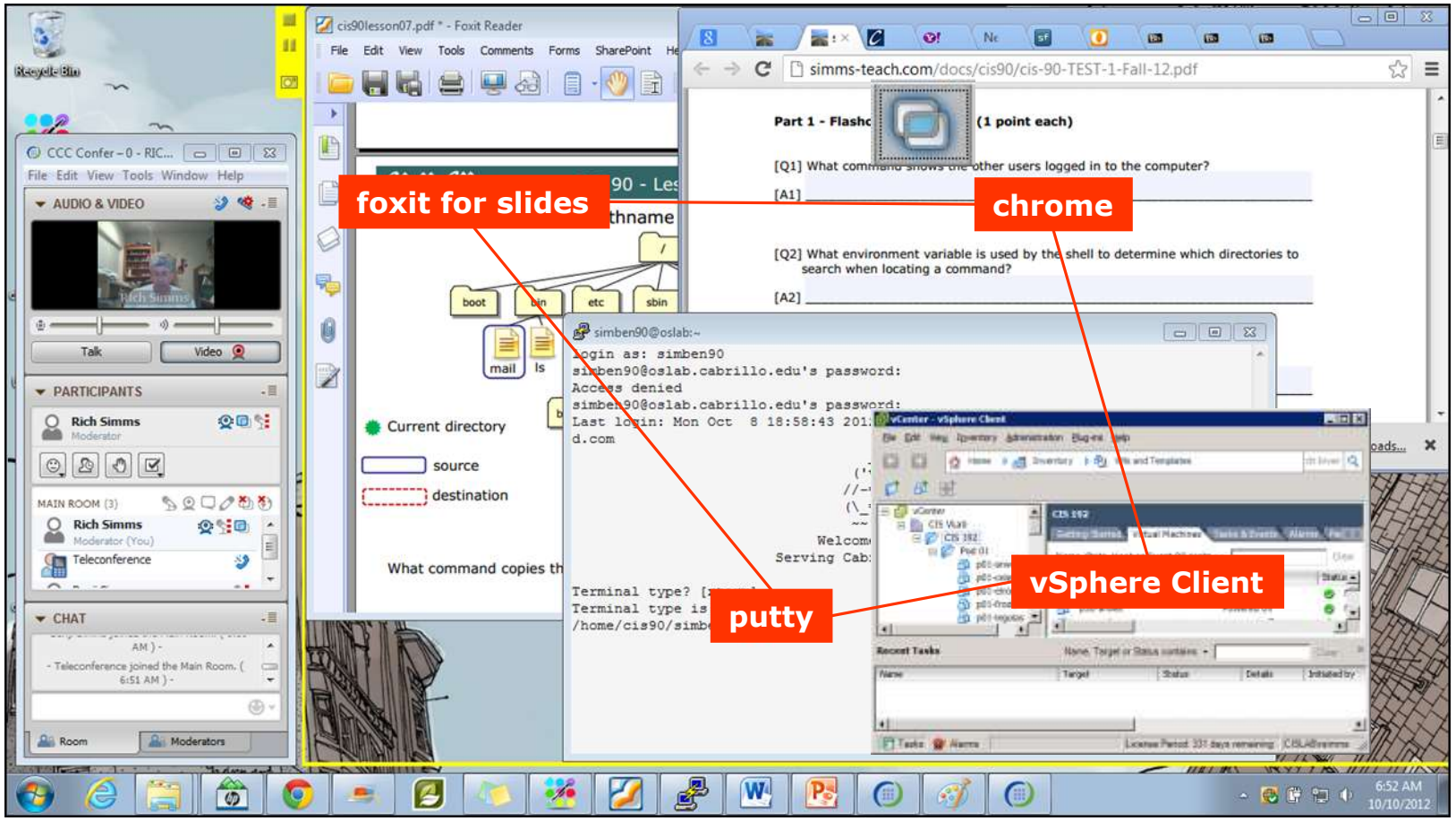
[ ] Use teleconferencing, not mic

Should be grayed out



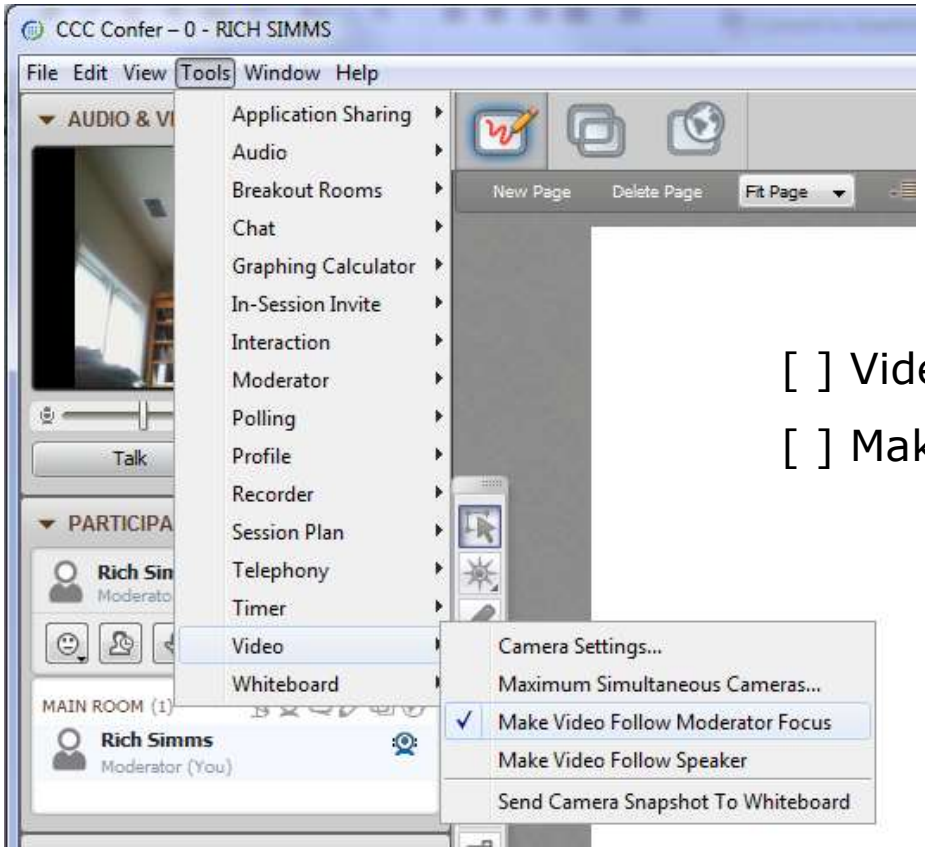
Should change from phone handset icon to little Microphone icon and the Teleconferencing … message displayed

Rich's CCC Confer checklist - screen layout



[ ] layout and share apps

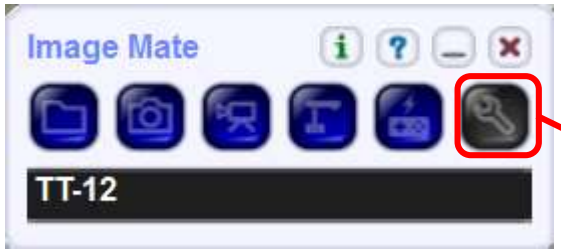
Rich's CCC Confer checklist - webcam setup

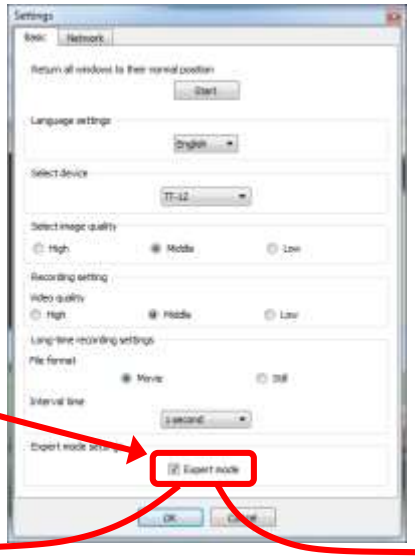


[ ] Video (webcam)

[ ] Make Video Follow Moderator Focus

Rich's CCC Confer checklist - Elmo





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

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

Elmo rotated down to view side table

Elmo rotated up to view white board

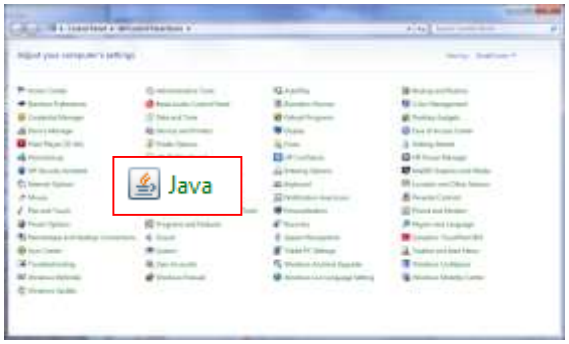
Run and share the Image Mate program just as you would any other app with CCC Confer

Rich's CCC Confer checklist - universal fixes

Universal Fix for CCC Confer:

1) Shrink (500 MB) and delete Java cache
2) Uninstall and reinstall latest Java runtime
3) http://www.cccconfer.org/support/technicalSupport.aspx

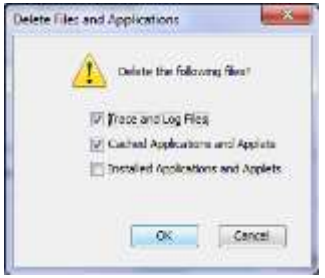
Control Panel (small icons)



General Tab > Settings…

500MB cache size

Delete these



Google Java download

Start

Sound Check

*Students that dial-in should mute their line using *6 to prevent unintended noises distracting the web conference.*

*Instructor can use *96 to mute all student lines.*

CIS 90 - Lesson 5

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


Jacob

Ethan

Amr


Becka


Brenda


Nikki


Brad

Tyler

Justin

Nick

Cody

Miles


Carrie

Danny

Steven


Wes


Jade


Brandon


Alan


Bryanda

Max


Nicole

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

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)

Review

Objectives	Agenda
• Review Lessons 1-4 • Practice skills • Learn about filename expansion characters	• Quiz • Questions • Six steps of shell (review) • Trouble on the island • Housekeeping • Everything is a file • Filename expansion (globbing) • Filename expansion practice • Command review • Command line syntax & parsing (review) • Command line syntax & parsing practice • Metacharacters (review) • Environment variables (review) • Inputs & outputs (continuing) • The kernel • File system (review) • CCC Confer • Flashcards • Test tips • Assignment • Wrap up

Questions

Questions

Lesson material?

Labs?

How this course works?

Are you enlightened yet?

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.*

Six Steps of the shell

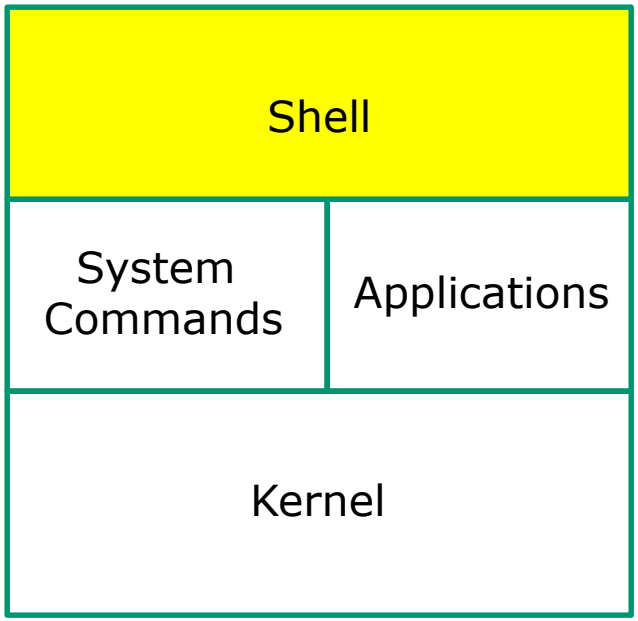
(review)

Which shell are you using?

```
/home/cis90/simben/Poems/Yeats $ ls /bin/*sh
/bin/bash  /bin/csh  /bin/dash  /bin/ksh  /bin/rbash  /bin/sh  /bin/tcsh

/home/cis90/simben/Poems/Yeats $ grep simben90 /etc/passwd
simben90:x:1201:190:Benji Simms:/home/cis90/simben:/bin/bash

/home/cis90/simben/Poems/Yeats $ ps
  PID TTY          TIME CMD
 4635 pts/0    00:00:00 bash
 4785 pts/0    00:00:00 ps

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

There are many shells on Opus. They can be found in the /bin directory. Your account entry in /etc/passwd determines which shell you will use.

Life of the Shell



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

An example of the shell and a command working together as a team to get things done

shell prompt *command*

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

output from command

Step	Bash shell /bin/bash	File command /usr/bin/file
Prompt	✓	
Parse	✓	
Search	✓	
Execute	✓	✓
Nap		✓
Repeat	✓	

This table indicates for each step whether bash and/or the command is running

1) Prompt - the shell prompts user for a command

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

Every time you hit the Enter key the shell will prompt you for another command

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

1) Prompt - the shell prompts user for a command

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

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

The shell uses the value of the PS1 variable to make the prompt.

```
/home/cis90/simben/Poems/Yeats $ echo $PWD $
/home/cis90/simben/Poems/Yeats $
```

You can manually do the same thing by echoing the value of the PS1 variable.

FYI, your PS1 variable on Opus gets set when you login via a login script containing this command: **`PS1='$PWD $ '`**

That makes your prompt string be the value of the PWD variable followed by a dollar sign followed by a space. The PWD variable always shows where you are in the UNIX file tree.

2) Parse - the shell parses what you entered

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

The shell parses what you entered and identifies the command, the options, the arguments and any redirection

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

2) Parse - the shell parses what you entered

Change to your Poems/Yeats directory and parse this command:

```
file *
```

Command:

Options:

Number of arguments:

Arguments:

Redirection:

Put your answers in the chat window

2) Parse - the shell parses what you entered

Change to your Poems/Yeats directory and parse this command:

```
file *
```

Command: `file`

Options: `na`

Number of arguments: `3`

Arguments: `mooncat old whitebirds`

Redirection: `na`

2) Parse - the shell parses what you entered

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

How many arguments is this?

```
file *
```

*Use the **echo** command to find out*

```
/home/cis90/simben/Poems/Yeats $ echo *
mooncat old whitebirds
```

There are actually three arguments!

3) Search - the shell searches the path for your command

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

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

The shell searches your path for the command you entered.

Where does the shell find the command?
You can do this yourself manually as follows:

```
/home/cis90/simben/Poems/Yeats $ type file
file is /usr/bin/file
```

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

1 2 3 4 5 6 7 8 9 10

*The **file** command is in the /usr/bin directory.*

Note that most if not all CIS 90 commands are in the /bin or /usr/bin directories!

The /usr/bin directory is the 4th directory on your path. Each directory is delimited by ":" characters.

4) Execute - the shell executes the command program file

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

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

*The next step is to load the **file** command that was found into memory. The program on the hard drive becomes a **process** in memory with a unique PID (Process ID).*

*Each new process is given three file descriptors **stdin**, **stdout** and **stderr** for input and output purposes.*

*These are sometimes referred to as the three **standard IO (Input/Output) streams**.*

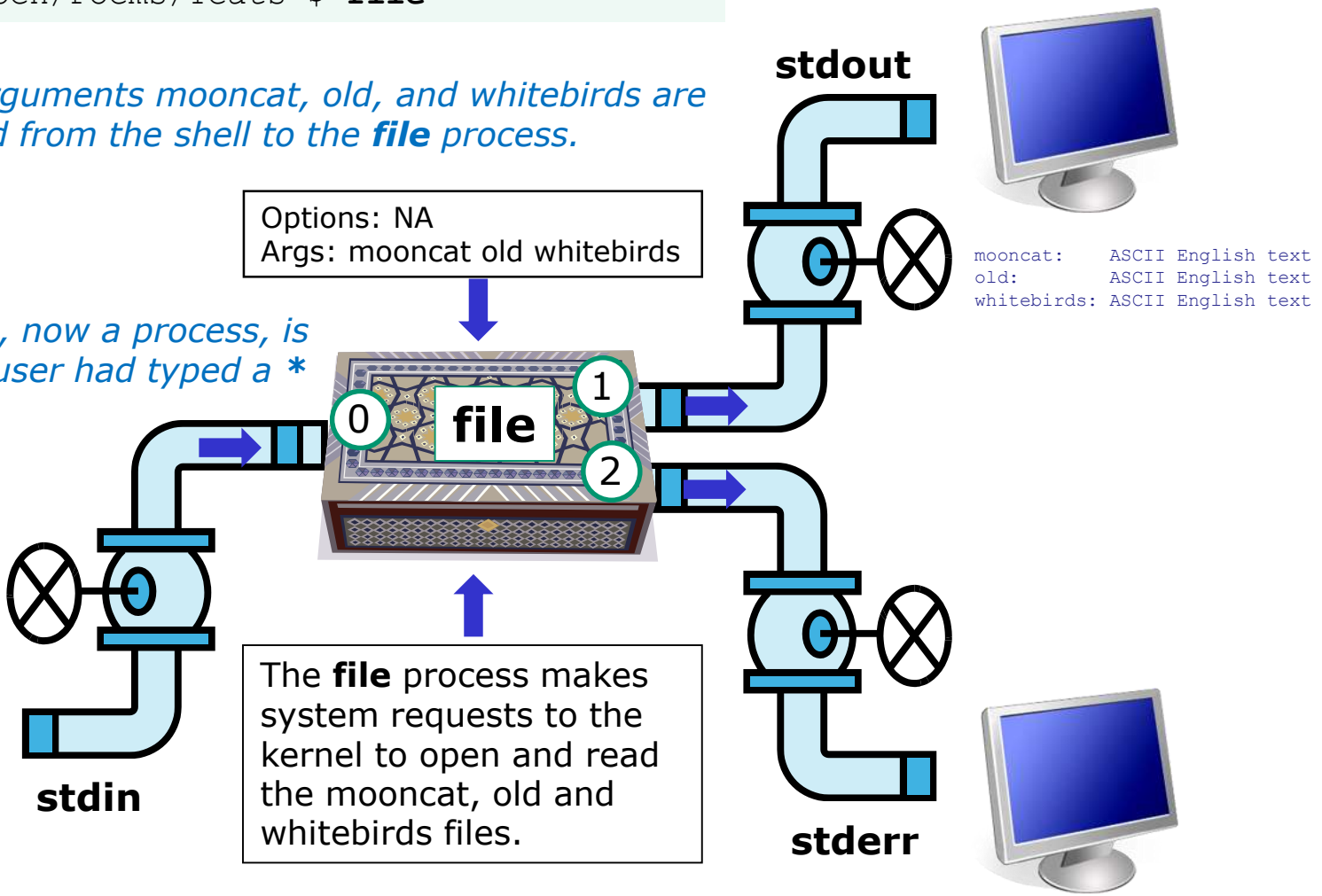
4) Execute - the command is run

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

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

*The arguments mooncat, old, and whitebirds are passed from the shell to the **file** process.*

*The **file** command, now a process, is unaware that the user had typed a *****.*



5) Nap - the shell sleeps while the command runs

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

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

Output from the file command

The shell's nap ends when the file command has finished

6) Repeat - the shell does it again

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

And then it does it all over again for the next command

Trouble on the island today

Reminder to instructor:
On Sun-Hwa-vi, run trouble-L5 as root, rm /etc/nologin

Now that you know how the shell works can you cat a file?

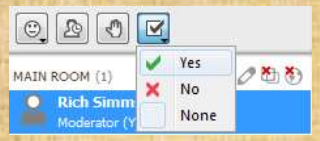
Warm-up Activity

From Opus, login to Sun-Hwa-L5 as follows:

ssh sun-hwa-L5
or **ssh $LOGNAME@sun-hwa-L5**
or **ssh $LOGNAME@sun-hwa-L5.cis.cabrillo.edu**

After logging in, try to **cat** this file: */etc/mensaje*

If successful:
then
click green "yes" check on CCC Confer
Help your neighbor
else
Start TROUBLESHOOTING!



Hint: Lesson 2

Housekeeping

- Lab 4 is due by 11:59PM tonight
- Use the **submit** command to turn in Lab 4
- There is a **check4** script available

Fine print

- Test 1 is next week!

Test #1 is next week

Practice test available now

Test #1 is next week

Practice test available now


Test #1 is next week
Practice test available now

Test next week

30 points, plus some extra credit:

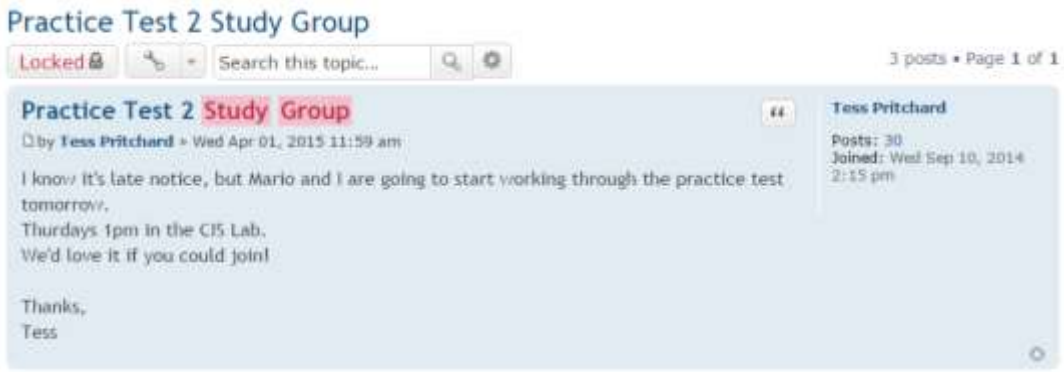
- Open book, open notes, open computer
- You must work alone and not help or receive help from others.
- Online timed 60 minute test using Canvas.
- To be taken during the last hour of class.
- Online "archive watching" students that work can take it later in the day but it must be completed by 11:59 PM.

Practice test systems shutdown before real test starts!

Use the forum to discuss practice test questions

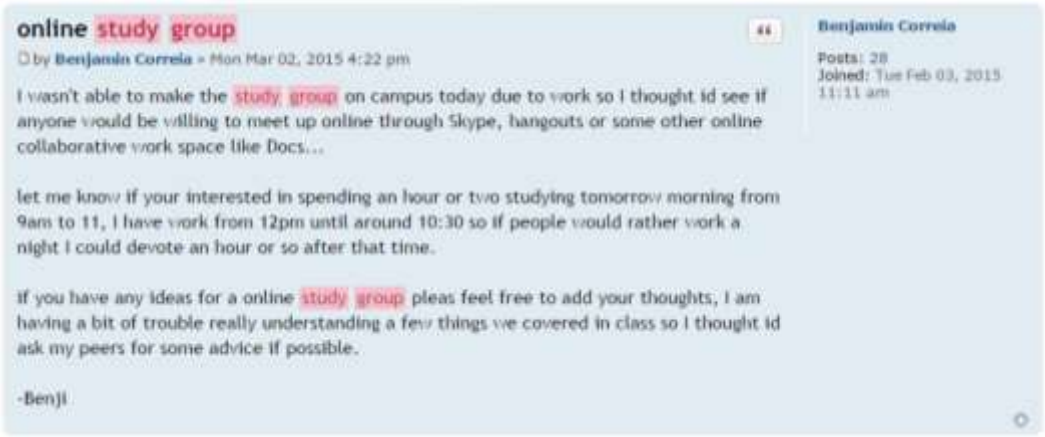
- Post if you get stuck on a question
- Post to share tips with others
- Post if you would like a clarification on a test question
- Post your answer to a question to discuss and get feedback from others

Use the forum to arrange study groups



Example Fall 2014 post to meet in the STEM center to study for a CIS 90 test

Example Fall 2014 post to meet online to study for a CIS 90 test



Don't miss replies to your forum posts

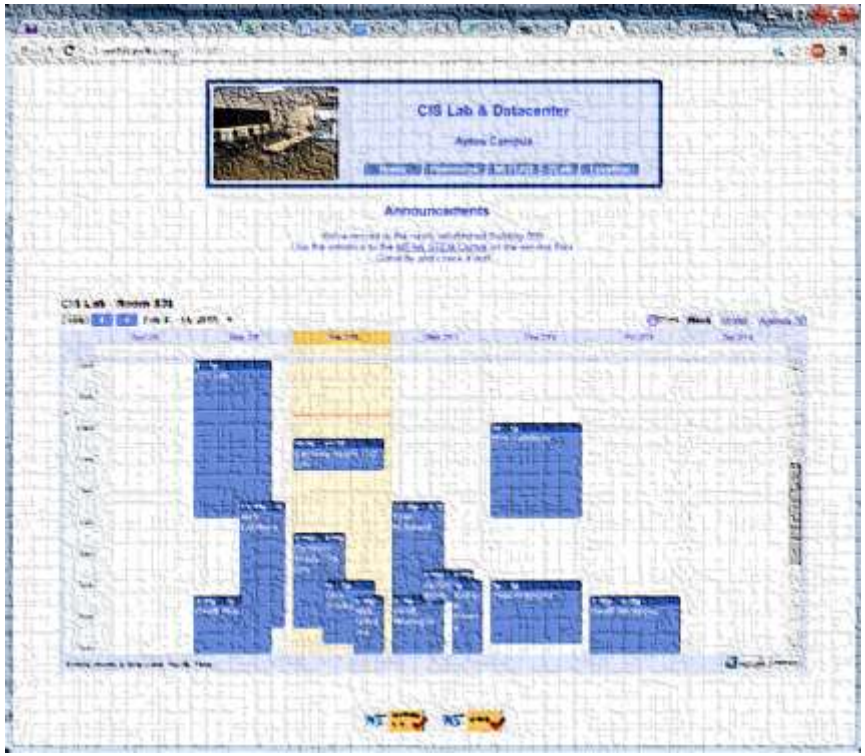
1) Login to the forum

2) Go to the CIS 90 forum

3) Click the "Subscribe" link at the bottom so that it changes to "Unsubscribe".

Got stuck or having trouble getting started in this course?

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

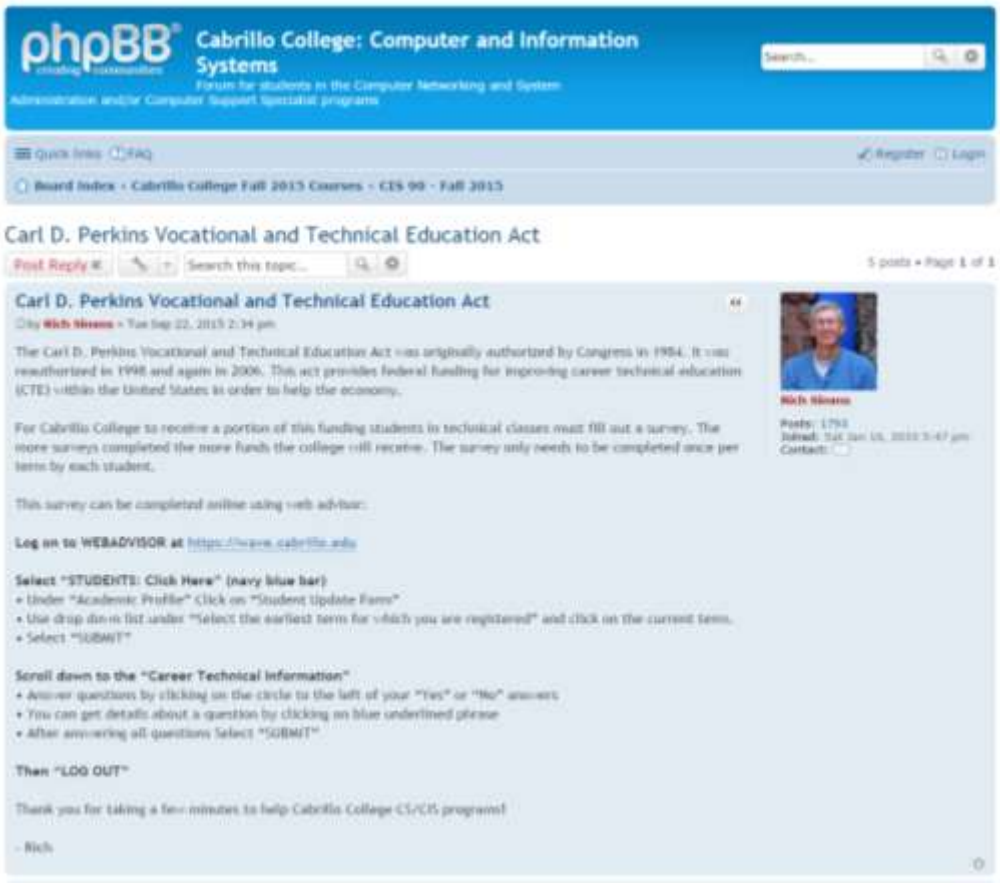


Takashi, Melissa, Sam and Andrew are CIS 90 Alumni.

Mike Matera is the other Linux instructor.

I'm in there Mondays 10:00-12:30.

Don't Forget -- Perkins/VTEA Survey

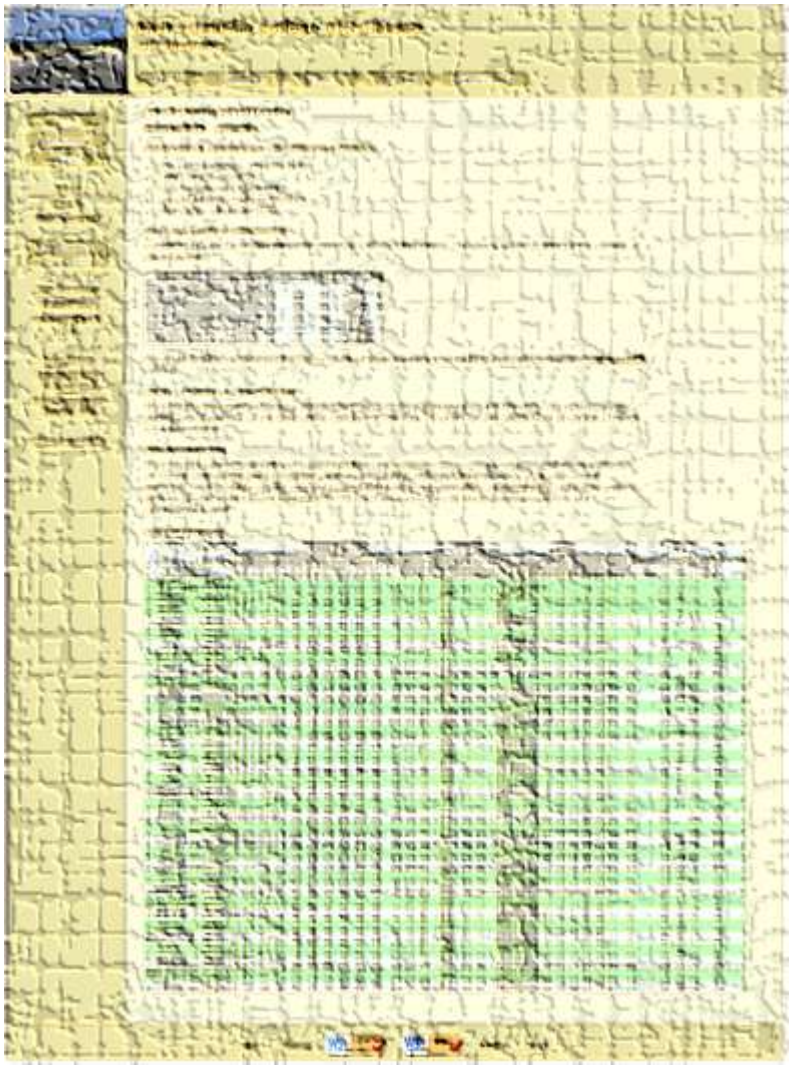


http://oslab.cis.cabrillo.edu/forum/viewtopic.php?f=118&t=3976

This is an important source of funding for Cabrillo College.

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

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



GRADES

Be sure and check your progress on the Grades page as the course continues on.

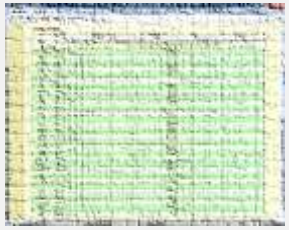
Send me a student survey if you haven't already to get your LOR secret code name.

Where to find your grades

Send me your survey to get your LOR code name.

The CIS 90 website Grades page

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



Points that could have been earned to date:

3 quizzes:	9 points
3 labs:	90 points
1 forum quarter:	20 points
Total:	**119 points**

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

Or check on Opus

checkgrades *codename*

(where codename is your LOR codename)

Written by Jesse Warren a past CIS 90 Alumnus

grades *codename*

(where codename is your LOR codename)

Written by Sam Tindell a past CIS 90 Alumnus. Try his tips, schedule and forums scripts as well!

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

The Urban Penguin

http://www.theurbanpenguin.com/lpi/le.html

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.

Everything is a file

Everything is a file in UNIX
(even a terminal)

- A terminal
- A file
- A directory
- A hard drive
- A hard drive partition
- A CD
- A partition on a USB flash drive
- Kernel run-time information

Implemented as files in UNIX

Everything is a file in UNIX
(even a terminal)

• A terminal	*e.g. /dev/pts/2*
• A file	*e.g. /home/cis90/simben/letter*
• A directory	*e.g /home/cis90/*
• A hard drive	*e.g. /dev/sda*
• A hard drive partition	*e.g. /dev/sda1*
• A CD	*e.g. /dev/cdrom*
• A partition on a USB flash drive	*e.g. /dev/sdb2*
• Kernel run-time information	*e.g. /proc/sys/kernel/hostname*

Everything is a file in UNIX
(even a terminal)

```
[rsimms@oslab ~]$ ls -l /dev/pts/3
crw--w----. 1 leebri90 tty 136, 3 Sep 30 16:33 /dev/pts/3
```
terminal

```
[rsimms@oslab ~]$ ls -l /home/cis90/simben/letter
-rw-r--r--. 1 simben90 cis90 1044 Jul 20  2001 /home/cis90/simben/letter
```
file

```
[rsimms@oslab ~]$ ls -ld /home/cis90/
drwxr-x---. 43 rsimms cis90 4096 Sep 16 15:00 /home/cis90/
```
directory

```
[rsimms@oslab ~]$ ls -l /dev/sda
brw-rw----. 1 root disk 8, 0 Sep 13 17:47 /dev/sda
```
hard drive

```
[rsimms@oslab ~]$ ls -l /dev/sda1
brw-rw----. 1 root disk 8, 1 Sep 13 17:47 /dev/sda1
```
partition

```
[rsimms@oslab ~]$ ls -l /dev/cdrom
lrwxrwxrwx. 1 root root 3 Sep 13 17:46 /dev/cdrom -> sr0
```

CD drive

```
[rsimms@oslab ~]$ ls -l /dev/sr0
brw-rw----. 1 root cdrom 11, 0 Sep 13 17:46 /dev/sr0
```

Kernel runtime info

```
[rsimms@oslab ~]$ ls -l /proc/sys/kernel/hostname
-rw-r--r-- 1 root root 0 Sep 24 15:45 /proc/sys/kernel/hostname
```

File Types

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

Common file types in a Linux ext*n* file system

Everything is a file in UNIX
(even a terminal)

Nice things about files

- you can write to them

```
[rsimms@opus ~]$ echo "Rich was here" > myfile
```

- and read from them

```
[rsimms@opus ~]$ cat myfile
Rich was here
```

Class Activity

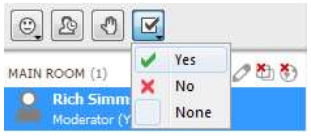
- Write to a file

```
echo "Rumpelstiltskin was here" > myfile
```

- Read the file

```
cat myfile
```

Did it work?
Click green "Yes" check or red "No" X on CCC Confer



Everything is a file
(even a terminal)

```
/home/cis90/simmsben $ tty
/dev/pts/1
```

*Use the **tty** command to identify the specific terminal device being used*

Note this device is identified using an absolute pathname

Everything is a file
(even a terminal)

```
/home/cis90/simmsben $ tty
/dev/pts/1
```

Show which terminal you are using

```
/home/cis90/simmsben $ who
simmsben pts/1        2010-09-29 07:38 (dsl-49-64-10-90.dhcp.cruzio.com)
srecklau pts/2        2010-09-29 06:06 (62.143.60.194)
rsimms   pts/4        2010-09-29 06:47 (dsl-49-64-10-90.dhcp.cruzio.com)
```

Use who to see who is logged in

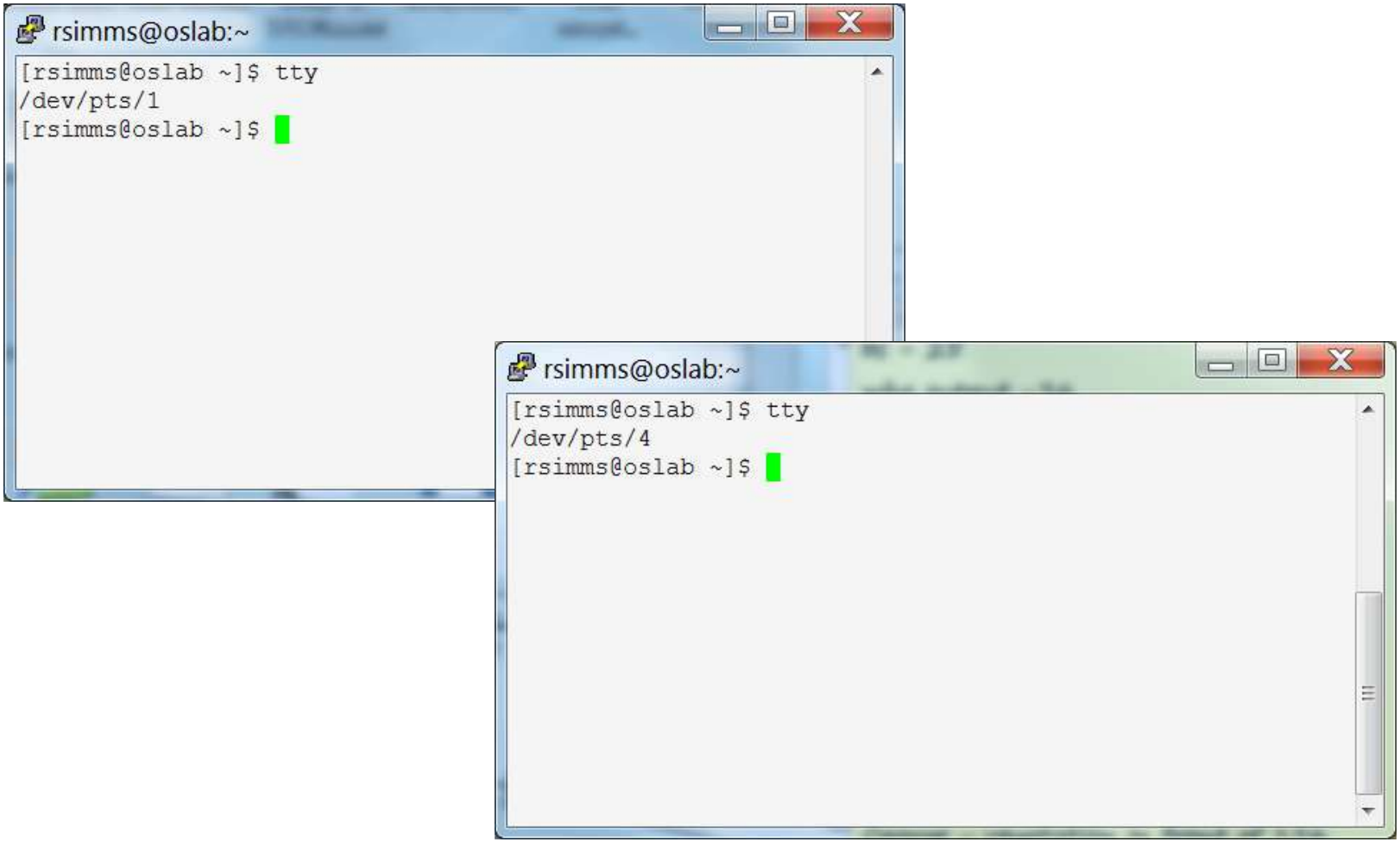
```
/home/cis90/simmsben $ ls -l /dev/pts/*
crw--w---- 1 simmsben tty 136, 1 Sep 29 07:45 /dev/pts/1
crw--w---- 1 srecklau tty 136, 2 Sep 29 07:44 /dev/pts/2
crw--w---- 1 rsimms   tty 136, 4 Sep 29 06:48 /dev/pts/4
```

Do a long listing to see all the terminal devices in use

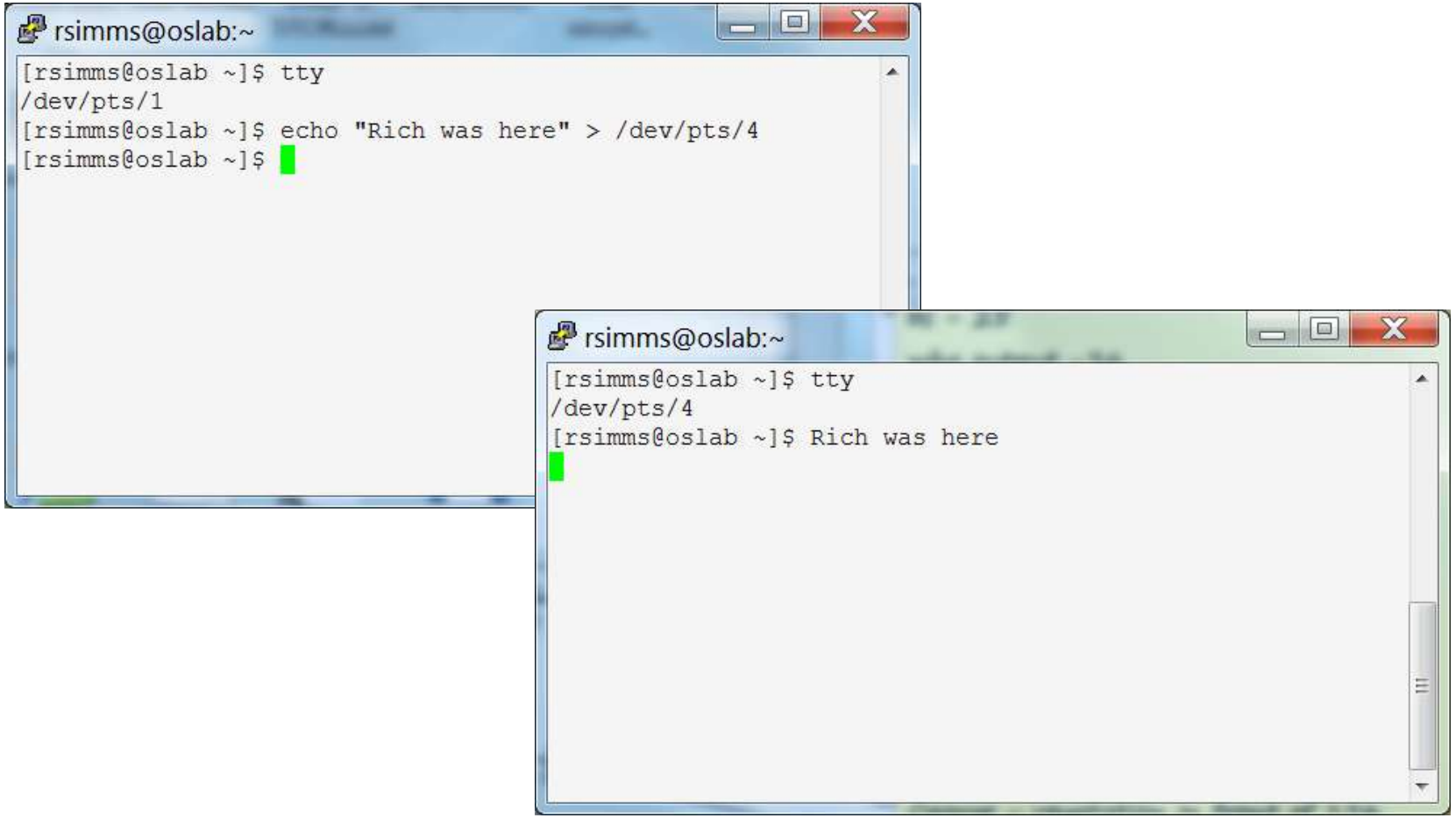
Notice the owner is someone who has logged in

Notice the file type is "c" which is a character device file

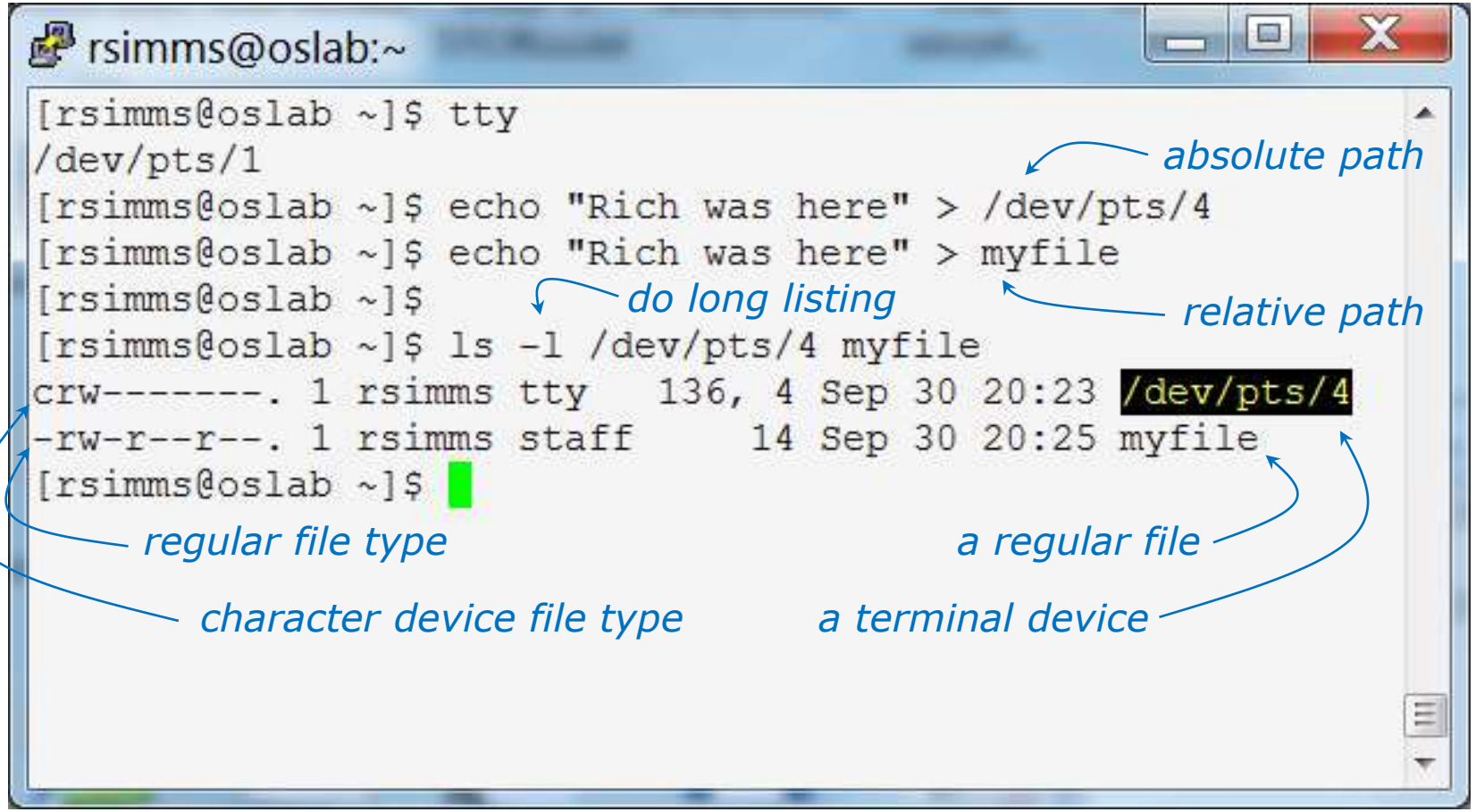
Everything is a file
(even a terminal)



Everything is a file
(even a terminal)



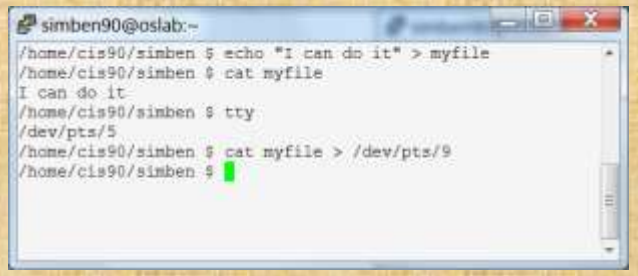
Everything is a file
(even a terminal)

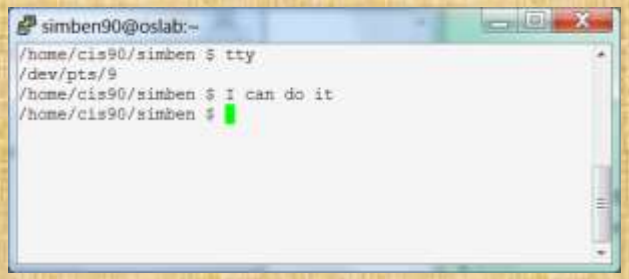


Class Activity

Part I

- Login into Opus
- Use **echo "I can do it" > myfile**
- Print your new file with **cat myfile**

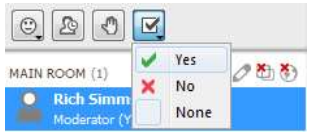




Part II

- Open a second session on Opus
- You should have two terminals now
- In both sessions use **tty** to identify the terminal devices being used
- In one terminal use **cat myfile > /dev/pts/***xx* where *xx* is your other terminal

Did it work?
Click green "Yes" check or red "No" X on CCC Confer



More File Name Expansion

(also known as *globbing*)

Filename Expansion Metacharacters

*****

matches all non-hidden filenames in the current directory when used alone or zero or more characters when used as a prefix, infix or postfix.

?

matches any single character in any of your current directory's filenames.

[]

matches any single character contained within the brackets.

You may also hear this process called "globbing"

Shell Parse Step

Filename expansion happens during the shell parsing step, before the command is even located or executed.

1) Prompt
2) Parse
3) Search for program (along the path)
4) Execute program
5) Nap (wait till process is done)
6) Repeat

*The commands never see *, ?, and [] expansion characters. These characters get replaced by the shell before the command is even located and executed.*

The * Filename Expansion Metacharacter

Example: **text.*** will be expanded by the shell to match any files that start with "text."

```
/home/cis90/simben $ echo text.*
text.err text.fxd

/home/cis90/simben $ ls -i text.*
19496 text.err  19497 text.fxd

/home/cis90/simben $ file text.*
text.err: ASCII text
text.fxd: ASCII text

/home/cis90/simben $ wc -l /home/cis90/mahtab/text.*
 11 /home/cis90/mahtab/text.err
 10 /home/cis90/mahtab/text.fxd
 21 total

/home/cis90/simben $ tail -n1 ../mahtab/text.*
==> ../mahtab/text.err <==
number10.

==> ../mahtab/text.fxd <==
This is line number 10.
```

The * Filename Expansion Metacharacter

Example: ***** is expanded to match all directories in /home/cis90 and **ti*** to match all files starting with "ti"

```
/home/cis90/simben $ ls -l ../*/Poems/Blake/ti*
-rw-r--r--. 1 beakie90 cis90 115 Jul 20  2001 ../beakie/Poems/Blake/tiger
-rw-r--r--. 1 calmic90 cis90 115 Jul 20  2001 ../calmic/Poems/Blake/tiger
-rw-r--r--. 1 casenr90 cis90 115 Jul 20  2001 ../casenr/Poems/Blake/tiger
-rw-r--r--. 1 casric90 cis90 115 Jul 20  2001 ../casric/Poems/Blake/tiger
-rw-r--r--. 1 cis90    cis90 115 Jul 20  2001 ../cis/Poems/Blake/tiger
-rw-r--r--. 1 daweli90 cis90 115 Jul 20  2001 ../daweli/Poems/Blake/tiger
-rw-r--r--. 1 fahmic90 cis90 115 Jul 20  2001 ../fahmic/Poems/Blake/tiger
-rw-r--r--. 1 fitcon90 cis90 115 Jul 20  2001 ../fitcon/Poems/Blake/tiger
< snipped >
-rw-r--r--. 1 simben90 cis90 115 Jul 20  2001 ../simben/Poems/Blake/tiger
-rw-r--r--. 1 specod90 cis90 115 Jul 20  2001 ../specod/Poems/Blake/tiger
-rw-r--r--. 1 thinic90 cis90 115 Jul 20  2001 ../thinic/Poems/Blake/tiger
-rw-r--r--. 1 tilbuz90 cis90 115 Jul 20  2001 ../tilbuz/Poems/Blake/tiger
-rw-r--r--. 1 vasjor90 cis90 115 Jul 20  2001 ../vasjor/Poems/Blake/tiger
-rw-r--r--. 1 vivrut90 cis90 115 Jul 20  2001 ../vivrut/Poems/Blake/tiger
-rw-r--r--. 1 weljon90 cis90 115 Jul 20  2001 ../weljon/Poems/Blake/tiger
-rw-r--r--. 1 weltim90 cis90 115 Jul 20  2001 ../weltim/Poems/Blake/tiger
/home/cis90/simben $
```

The * Filename Expansion Metacharacter

Note, DOS uses *.* to match all files.

BUT, this is NOT true in UNIX

```
/home/cis90/simmsben $ echo *.*
Lab2.0 Lab2.1 text.err text.fxd
```

*Instead, *.* is expanded to match all files in the current directory containing a "."*

The * Filename Expansion Metacharacter

*Note the * metacharacter by itself does not match any hidden files in your current working directory*

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

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

The ? Filename Expansion Metacharacter

Example: **???** will be match any three character file name

```
/home/cis90/simben $ echo ???
bin log

/home/cis90/simben $ ls bin/???
bin/app

/home/cis90/simben $ ls /bin/???
/bin/awk  /bin/csh  /bin/env  /bin/pwd  /bin/red  /bin/rvi  /bin/tar
/bin/cat  /bin/cut  /bin/ksh  /bin/raw  /bin/rpm  /bin/sed


/home/cis90/simben $ tail -n3 /home/cis90/grodav/bin/???
while :
do sleep 1
done

/home/cis90/simben $ file /home/cis90/grodav/Poems/*/???
/home/cis90/grodav/Poems/Yeats/old: ASCII English text
```

The [] Filename Expansion Metacharacter

Example: **[12]** will be match a "1" or a "2"

```
/home/cis90/simben $ head -n1 Poems/Shakespeare/sonnet[12]
==> Poems/Shakespeare/sonnet1 <==
From fairest creatures we desire increase,

==> Poems/Shakespeare/sonnet2 <==
When forty winters shall besiege thy brow,

/home/cis90/simben $ wc ../balcor/Poems/Shakespeare/sonnet[12]
  14  105  614 ../balcor/Poems/Shakespeare/sonnet1
  14  114  631 ../balcor/Poems/Shakespeare/sonnet2
  28  219 1245 total

/home/cis90/simben $ ls -d  /etc/*[12]*
/etc/dbus-1                /etc/iproute2      /etc/pnm2ppa.conf  /etc/rc2.d
/etc/DIR_COLORS.256color   /etc/mke2fs.conf   /etc/polkit-1      /etc/sasl2
/etc/gtk-2.0               /etc/pbm2ppa.conf  /etc/rc1.d         /etc/X11
```

File Name Expansion
(also known as globbing)

PRACTICE QUESTIONS

The * Filename Expansion Metacharacter

Your turn now

What command would classify all files in the parent directory that start with m?

Write your answer in the chat window

The * Filename Expansion Metacharacter

Answer

What command would classify all files in the parent directory that start with m?

```
/home/cis90/simben $ file ../m*
../mcgcam: directory
../milhom: directory
/home/cis90/simben $
```

Note, the matches can change each term since it is based on student names.

The ? Filename Expansion Metacharacter

A ? matches exactly one character which could be anything

What command would list all 13 character filenames in /bin

Write your answer in the chat window

The ? Filename Expansion Metacharacter

What command would list all 13 character filenames in /bin

Answer

```
/home/cis90/simben $ ls /bin/?????????????
/bin/dnsdomainname  /bin/nisdomainname  /bin/unicode_start
```

The [] Filename Expansion Metacharacter

A [] will match any character between the brackets

From your home directory, what command would print the first line of all Shakespeare sonnets ending in a 2 or 5?

Write your answer in the chat window

The [] Filename Expansion Metacharacter

From your home directory, what command would print the first line of all Shakespeare sonnets ending in a 2 or 5?

Answer

```
/home/cis90/simben $ head -n 1 Poems/Shakespeare/*[25]
==> Poems/Shakespeare/sonnet15 <==
When I consider every thing that grows

==> Poems/Shakespeare/sonnet2 <==
When forty winters shall besiege thy brow,

==> Poems/Shakespeare/sonnet35 <==
Whoever hath her wish, thou hast thy Will,

==> Poems/Shakespeare/sonnet5 <==
Those hours that with gentle work did frame
/home/cis90/simben $
```

Filename Expansion Metacharacters
* ? []

What commands are there in /usr/bin that start with a “n” or “m”, are 5 letters long and end with a “p”?

Hint: Use a combination of filename expansion metacharacters

Write your answer in the chat window

Filename Expansion Metacharacters
* ? []

What commands are there in /usr/bin that start with a "n" or "m", are 5 letters long and end with a "p"?

Answer

```
/home/cis90/simben $ echo /usr/bin/[nm]???p
/usr/bin/nohup
```

Filename Expansion Metacharacters
* ? []

For the command:

`file /usr/share/man/*/[ap]??.8.gz`

What arguments are actually getting passed to the **file** command to process?

Filename Expansion Metacharacters
* ? []

For the command:

`file /usr/share/man/*/[ap]??.8.gz`

What arguments are actually getting passed to the **file** command to process?

```
/home/cis90/simben $ echo /usr/share/man/*/[ap]??.8.gz
/usr/share/man/man8/arp.8.gz /usr/share/man/man8/atd.8.gz
/usr/share/man/man8/pam.8.gz /usr/share/man/man8/pvs.8.gz
```

Tip: Use echo to expand complicated filenames containing multiple filename expansion characters

Command Review

*Use the **man** command or google for the details*

New commands:

cal	- show calendars
clear	- clear the terminal screen
exit	- terminate your shell and log off
history	- show previous commands
hostname	- show the name of the computer being accessed
id	- show user and group id information
ps	- show processes (loaded programs) being run
ssh	- secure login to a remote system
uname	- shows kernel information
tty	- show terminal information
who	- show who else is logged on
who am i	- Identifies which login session you are using
Ctrl-Alt-F1 to Ctrl-Alt-F7	- Change between terminals and X windows (graphics)

New Files and Directories:

VMware:

Ctrl-Alt	- to move mouse cursor out of VM

*Use the **man** command or google for the details*

New commands:

apropos	- search for string in whatis database
bc	- binary calculator
cat	- print file(s)
cd	- change directory
echo	- print text
env	- show shell environment variables
info	- online documentation with hot links
file	- show file information
ls	- show directory contents
passwd	- change password
set	- show (or set) shell variables
type	- show command location in path
man	- manual page for a command
whatis	- command summary

New Files and Directories:

/etc/passwd	- user accounts
/etc/shadow	- encrypted passwords
/bin	- directory of commands
/sbin	- directory of superuser commands
/usr/bin	- directory of commands, tools and utilities
/usr/sbin	- directory of superuser commands, tools and utilities

New commands:

mail	- UNIX mail
?	print these commands
p <message list>	print messages
n	goto and print next message
e <message list>	edit messages
d <message list>	delete messages
s <message list> file	save (append) messages to file
u <message list>	undelete messages
R <message list>	reply to sender(s)
r <message list>	reply to all
m <user list>	mail to specific users
q	quit, saving read messages to local mbox file
x	quit, mark all mail as unread and undeleted.
h	print out active message headers
mesg	- Enable or disable writes to your terminal
write	- Write message to another user

New Files and Directories:

/var/mail	- Message store for mail
/var/mail/*username*	- Incoming mailbox for *username*
mbox	- File in users home directory where read messages are archived to

*Use the **man** command or google for the details*

*Use the **man** command or google for the details*

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	View (hex dump) binary/data files

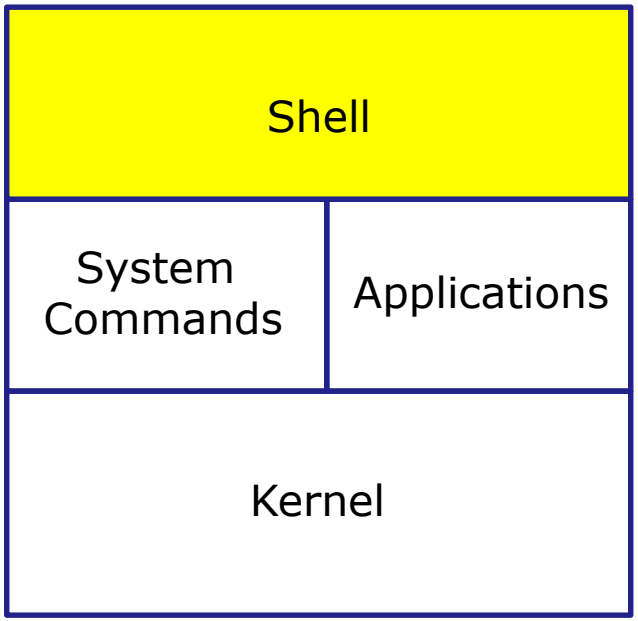
New Files and Directories:

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

Command line Syntax & Parsing

(review)

Life of the Shell



1) **Prompt** for a command
2) **Parse** (interpret metacharacters, expand file names and dissect command line into options, arguments and redirection)
3) **Search** for program (along the path)
4) **Execute** program by loading into memory (becomes a process), hookup input and outputs, and pass along command line options and arguments.
5) **Nap** (wait till process is done)
6) **Repeat**

Command Syntax

Command	Options	Arguments	Redirection

Command – is the name of an executable program file.
Options – various options which control how the program will operate.
Arguments – the objects the command is directed to work upon.
Redirection – The default input stream (stdin) is from the console keyboard, the default output (stdout) and error (stderr) streams go to the console screen. Redirection can modify these streams to other files or devices.

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*

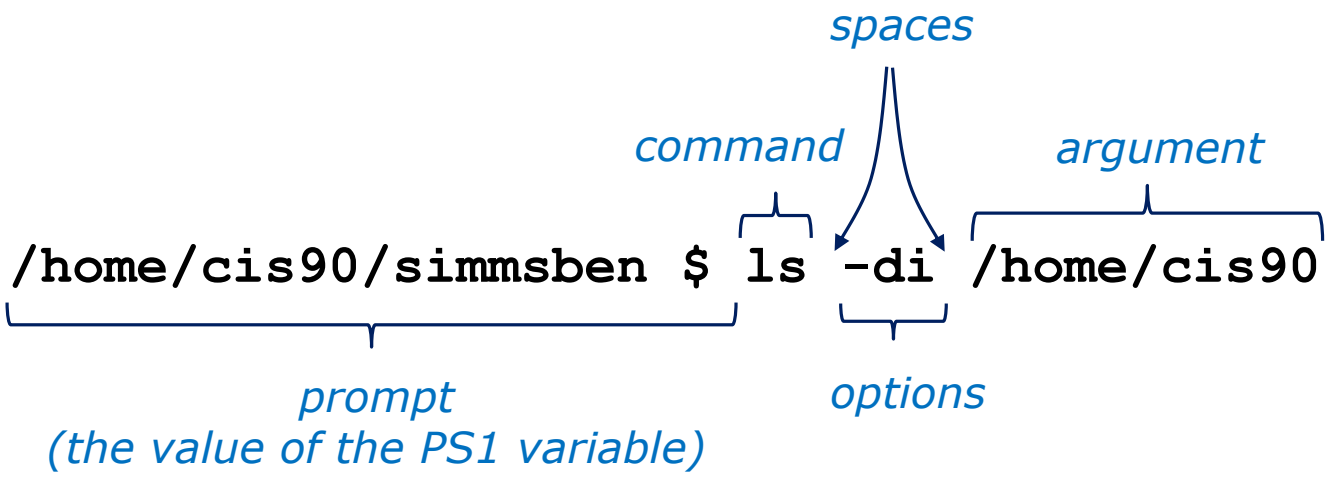
***Redirection** is covered later in the course*

Examples

```
/home/cis90/simmsben $
/home/cis90/simmsben $ ls
/home/cis90/simmsben $ ls -l
/home/cis90/simmsben $ ls -lt
/home/cis90/simmsben $ ls -lt Poems/
/home/cis90/simmsben $ ls -lt Poems/ bin/
/home/cis90/simmsben $ ls -lt Poems/ bin/ > mylist
```

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

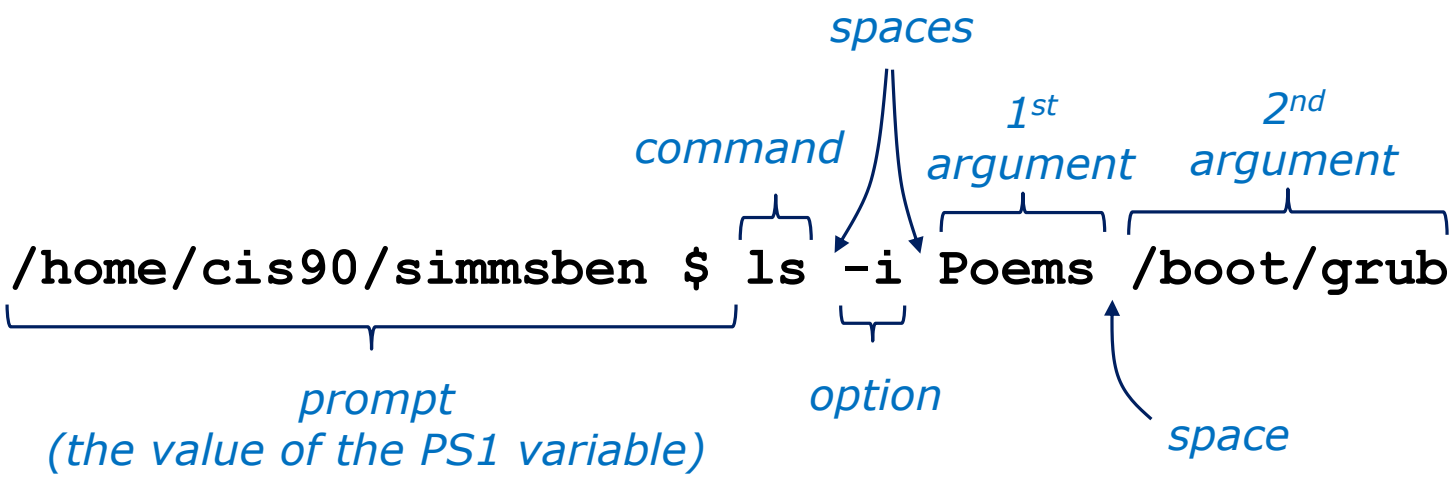
Command Line Syntax Review



Parsing the command line above yields:

One command: **ls**
Two options: **d** and **i**
One argument: **/home/cis90** (an absolute pathname to a directory)

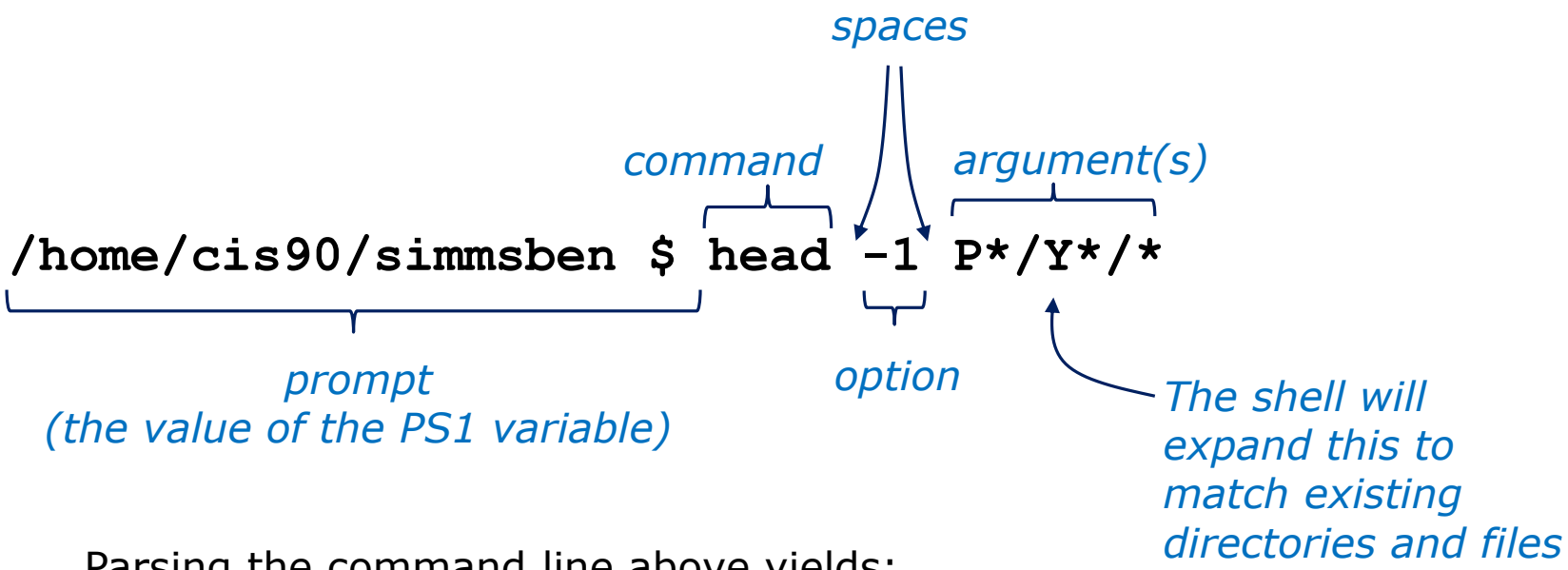
Command Line Syntax Review



Parsing the command line above yields:

One command: **ls**
One options: **i**
Two arguments:
Poems (a relative pathname to a directory)
/boot/grub (an absolute pathname to a directory)

Command Line Syntax Review



Parsing the command line above yields:

One command: **head**
One option: **1**
Three arguments:

Poems/Yeats/mooncat (a relative pathname to a file)
Poems/Yeats/old (a relative pathname to a file)
Poems/Yeats/whitebirds (a relative pathname to a file)

Command line Syntax & Parsing

PRACTICE QUESTIONS

Your turn now!

```
head -n1 /home/cis90/???t*/P*/Shake*/s????t[13]
```

Parse the command above and identify and see if you can identify:

1. The command
2. The options
3. The number of arguments:
4. The actual arguments:

Your turn now!

```
head -n1 /home/cis90/???t*/P*/Shake*/s????t[13]
```

Parse the command above and identify:

1. The command: **head**

The command is the head command

Your turn now!

```
head -n1 /home/cis90/???t*/P*/Shake*/s????t[13]
```

Parse the command above and identify:

1. The command: **head**
2. The options: **-n1**

The options are -n1 which the user added to instruct the head command to output only one line

Your turn now!

`head -n1 /home/cis90/???t*/P*/Shake*/s????t[13]`

Parse the command above and identify:

1. The command: **`head`**
2. The options: **`-n1`**
3. The number of arguments: 4

Note, the number of arguments can change each term since it is based on student names. How many are there today?

The number of arguments is not apparent without first processing all the filename expansion characters. You can use the echo command to see exactly how the expansion will be done.

```
/home/cis90/simben $ echo /home/cis90/???t*/P*/Shake*/s????t[13]
/home/cis90/juetay/Poems/Shakespeare/sonnet1 /home/cis90/juetay/Poems/Shakespeare/sonnet3
/home/cis90/prites/Poems/Shakespeare/sonnet1 /home/cis90/prites/Poems/Shakespeare/sonnet3
/home/cis90/simben $
```

Your turn now!

```
head -n1 /home/cis90/???t*/P*/Shake*/s????t[13]
```

Parse the command above and identify:

1. The command: **head**
2. The options: **-n1**
3. The number of arguments: 4
4. The actual arguments:

```
/home/cis90/juetay/Poems/Shakespeare/sonnet1
/home/cis90/juetay/Poems/Shakespeare/sonnet3
/home/cis90/prites/Poems/Shakespeare/sonnet1
/home/cis90/prites/Poems/Shakespeare/sonnet3
```

Output from the command

```
/home/cis90/simben $ head -n1 /home/cis90/???t*/P*/Shake*/s????t[13]
==> /home/cis90/juetay/Poems/Shakespeare/sonnet1 <==
From fairest creatures we desire increase,

==> /home/cis90/juetay/Poems/Shakespeare/sonnet3 <==
Look in thy glass and tell the face thou viewest,

==> /home/cis90/prites/Poems/Shakespeare/sonnet1 <==
From fairest creatures we desire increase,

==> /home/cis90/prites/Poems/Shakespeare/sonnet3 <==
Look in thy glass and tell the face thou viewest,
/home/cis90/simben $
```

Note: the shell expanded **/home/cis90/???t*/P*/Shake*/s????t[13]** *into four arguments which match the sonnet 1 and sonnet 3 files belonging to all students in the Spring 2015 class whose first name starts with a T*

Meta Characters (review)

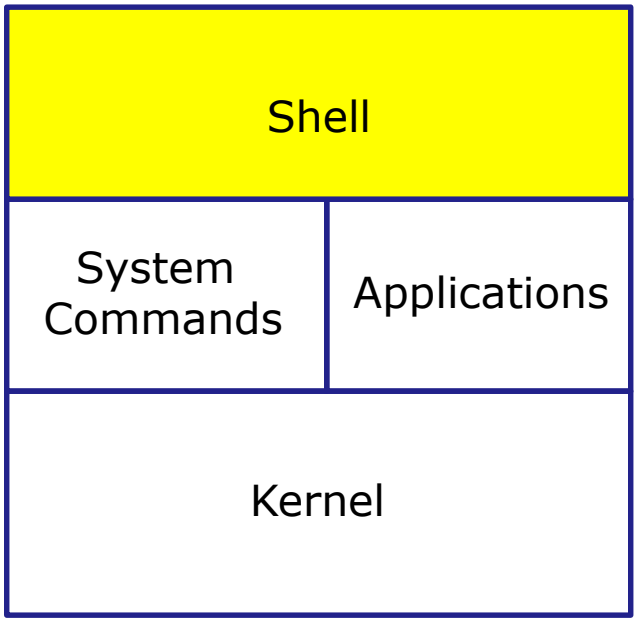
Metacharacters

Have special interpretation by the shell

Char	Description
\	Treat the following metacharacter as a plain character. Also called "escaping" the next character.
$	The following text is a shell (environment) variable and the value should be used.
<cr>	Carriage return marks the end of the command
;	Separates multiple commands on one line
'	used to enclose a string that the shell will not do further interpretation
"	Used to enclose a string that the shell will do further interpretation.
>	Redirects stdout *(more in Lesson 8)*
2>	Redirects stderr *(more in Lesson 8)*
*	Matches all non-hidden file names when used alone or zero or more characters when used as prefix, infix or postfix
?	Matches any single character of a file name
[]	Matches any single character contained within the brackets
#	Not an official metacharacter, but any text following the # is ignored by the shell

Life of the Shell

*The shell processes metacharacters during the **Parse** step*



1) **Prompt** for a command
2) **Parse** (interpret metacharacters, expand file names and dissect command line into options, arguments and redirection)
3) **Search** for program (along the path)
4) **Execute** program by loading into memory (becomes a process), hookup input and outputs, and pass along command line options and arguments.
5) **Nap** (wait till process is done)
6) **Repeat**

Metacharacters
#

 # has the ability to make everything that follows the # be ignored by the shell. Good for adding comments in scripts

```
/home/cis90/simmsben $ #OK lets escape the carriage return in next example
/home/cis90/simmsben $
```

Note there is no error message because everything after the # is ignored

Metacharacters
$

$ metacharacter has the ability to "show the value of"

```
/home/cis90/simmsben $ EYES=brown
/home/cis90/simmsben $ echo EYES
EYES
/home/cis90/simmsben $ echo $EYES
brown

/home/cis90/simmsben $ echo $LOGNAME
simmsben
/home/cis90/simmsben $
```

echo the string EYES

echo the value of the variable EYES

echo the value of the predefined environment variable LOGNAME

Metacharacters
" and '

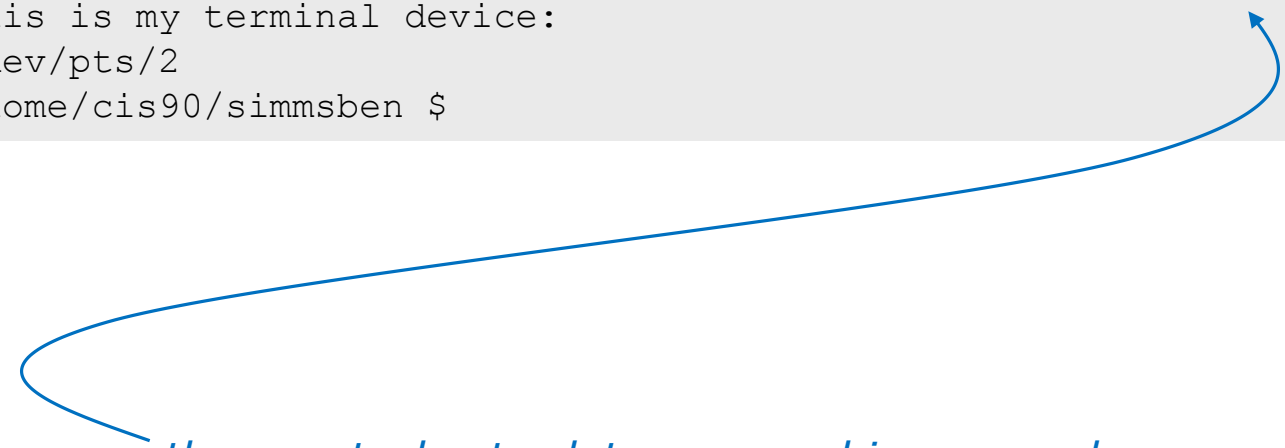
Weak "double" quotes allow the shell to process $ metacharacters inside the quoted string

```
/home/cis90/simmsben $ echo "I am in $PWD"
I am in /home/cis90/simmsben


/home/cis90/simmsben $ echo 'I am in $PWD'
I am in $PWD
/home/cis90/simmsben $
```

Strong "single" quotes block the shell from processing $ metacharacters inside the quoted string

Metacharacters
;

```
/home/cis90/simmsben $ #Lets put two commands on one line
/home/cis90/simmsben $ echo "This is my terminal device:"; tty
This is my terminal device:
/dev/pts/2
/home/cis90/simmsben $
```



the ; metachacter lets you combine several commands on one line

Metacharacters

\

```
/home/cis90/simmsben $ #OK lets escape the carriage return in next example
/home/cis90/simmsben $ echo Lets start line 1 here \
> and finish it here
Lets start line 1 here and finish it here
/home/cis90/simmsben $
```

The \ is used to escape the next character typed. Use an escape to disable the special abilities of a metacharacter.

Escaping a carriage return (the Enter key) tells the shell to keeping inputting more characters from the next line for the current command being entered.

Metacharacters

\

Escaping the # means it is no longer treated as comment

```
/home/cis90/simmsben $ \#OK lets put a comment here
-bash: #OK: command not found
/home/cis90/simmsben $
/home/cis90/simmsben $
/home/cis90/simmsben $ echo $PS1
$PWD $
/home/cis90/simmsben $ echo \$PS1
$PS1
/home/cis90/simmsben $
```

and you get an error when the shell processes your comment

Escaping the $ means $ is no longer treated "the value of"

Environment Variables

(review)

Shell (Environment) Variables

common environment variables

Shell Variable	Description
HOME	Users home directory (starts here after logging in and returns with a cd command (with no arguments)
LOGNAME	User's username for logging in with.
PATH	List of directories, separated by :'s, for the Shell to search for commands (which are program files) .
PS1	The prompt string.
PWD	Current working directory
SHELL	Name of the Shell program being used.
TERM	Type of terminal device , e.g. dumb, vt100, xterm, ansi, etc.

Shell (Environment) Variables

Show variable values

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

/home/cis90/simben $ echo $LOGNAME
simben90

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

/home/cis90/simben $ echo $PWD
/home/cis90/simben

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

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

Use echo to show the values of variables

Shell (Environment) Variables
PATH

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

These are the directories in Benji's PATH in the order they will be searched:

1st: /usr/lib/qt-3.3/bin
2nd: /usr/local/bin
3rd: /bin
4th: /usr/bin
5th: /usr/local/sbin
6th: /usr/sbin
7th: /sbin
8th: /home/cis90/simben/../bin
9th: /home/cis90/simben/bin
10th: .

The PATH variable is used by the shell to locate commands

Shell (Environment) Variables

Set variable values

Use an "=" with no spaces to set values of variables

```
/home/cis90/simben $  # Change the prompt variable
/home/cis90/simben $  PS1='[\u@\h \W]\$ '
[simben90@opus ~]$ echo $PS1
[\u@\h \W]\$
[simben90@opus ~]$


[simben90@opus ~]$ # Change it back again
[simben90@opus ~]$ PS1='$PWD $ '
/home/cis90/simben $ echo $PS1
$PWD $
/home/cis90/simben $
```

Shell Variables

Set variable values

If the variable has never been used before then it is created

```
/home/cis90/simben $ myfavoritedog="Benji"
/home/cis90/simben $ echo $myfavoritedog
Benji
```

Shell (Environment) Variables

env command – show all environment variables

```
/home/cis90/simmsben/Poems $ env
HOSTNAME=opus.cabrillo.edu
SHELL=/bin/bash
TERM=xterm
HISTSIZE=1000
USER=simmsben
LS_COLORS=no=00:fi=00:di=00;34:ln=00;36:pi=40;33:so=00;35:bd=40;33;01:cd=40;33;01:or=01;05;37;41:mi
=01;05;37;41:ex=00;32:*.cmd=00;32:*.exe=00;32:*.com=00;32:*.btm=00;32:*.bat=00;32:*.sh=00;32:*.csh=
00;32:*.tar=00;31:*.tgz=00;31:*.arj=00;31:*.taz=00;31:*.lzh=00;31:*.zip=00;31:*.z=00;31:*.Z=00;31:*
.gz=00;31:*.bz2=00;31:*.bz=00;31:*.tz=00;31:*.rpm=00;31:*.cpio=00;31:*.jpg=00;35:*.gif=00;35:*.bmp=
00;35:*.xbm=00;35:*.xpm=00;35:*.png=00;35:*.tif=00;35:
USERNAME=
MAIL=/var/spool/mail/simmsben
PATH=/usr/kerberos/bin:/usr/local/bin:/bin:/usr/bin:/home/cis90/simmsben/../bin:/home/cis90/simmsbe
n/bin:.
INPUTRC=/etc/inputrc
PWD=/home/cis90/simmsben/Poems
LANG=en_US.UTF-8
SSH_ASKPASS=/usr/libexec/openssh/gnome-ssh-askpass
SHLVL=1
HOME=/home/cis90/simmsben
BASH_ENV=/home/cis90/simmsben/.bashrc
LOGNAME=simmsben
CVS_RSH=ssh
LESSOPEN=|/usr/bin/lesspipe.sh %s
G_BROKEN_FILENAMES=1
_=/bin/env
OLDPWD=/home/cis90/simmsben
/home/cis90/simmsben/Poems $
```

*Use the **env** command to show all environment variables (a subset of the shell variables)*

Shell Variables

set command – show all shell variables

```
/home/cis90/simmsben/Poems $ set
BASH=/bin/bash
BASH_ARGC=()
BASH_ARGV=()
BASH_ENV=/home/cis90/simmsben/.bashrc
BASH_LINENO=()
BASH_SOURCE=()
BASH_VERSINFO=([0]="3" [1]="2" [2]="25" [3]="1"
[4]="release" [5]="i686-redhat-linux-gnu")
BASH_VERSION='3.2.25(1)-release'
COLORS=/etc/DIR_COLORS.xterm
COLUMNS=80
CVS_RSH=ssh
DIRSTACK=()
EUID=1160
GROUPS=()
G_BROKEN_FILENAMES=1
HISTFILE=/home/cis90/simmsben/.bash_history
HISTFILESIZE=1000
HISTSIZE=1000
HOME=/home/cis90/simmsben
HOSTNAME=opus.cabrillo.edu
HOSTTYPE=i686
IFS=$' \t\n'
IGNOREEOF=10
INPUTRC=/etc/inputrc
LANG=en_US.UTF-8
LESSOPEN='|/usr/bin/lesspipe.sh %s'
LINES=24
LOGNAME=simmsben
```

*Use the **set** command to show all shell variables (which includes the environment variables)*

```
LS_COLORS='no=00:fi=00:di=00;34:ln=00;36:pi=40;33:so=00;35
:bd=40;33;01:cd=40;33;01:or=01;05;37;41:mi=01;05;37;41:ex=
00;32:*.cmd=00;32:*.exe=00;32:*.com=00;32:*.btm=00;32:*.ba
t=00;32:*.sh=00;32:*.csh=00;32:*.tar=00;31:*.tgz=00;31:*.a
rj=00;31:*.taz=00;31:*.lzh=00;31:*.zip=00;31:*.z=00;31:*.Z
=00;31:*.gz=00;31:*.bz2=00;31:*.bz=00;31:*.tz=00;31:*.rpm=
00;31:*.cpio=00;31:*.jpg=00;35:*.gif=00;35:*.bmp=00;35:*.x
bm=00;35:*.xpm=00;35:*.png=00;35:*.tif=00;35:'
MACHTYPE=i686-redhat-linux-gnu
MAIL=/var/spool/mail/simmsben
MAILCHECK=60
OLDPWD=/home/cis90/simmsben
OPTERR=1
OPTIND=1
OSTYPE=linux-gnu
PATH=/usr/kerberos/bin:/usr/local/bin:/bin:/usr/bin:/home/
cis90/simmsben/../bin:/home/cis90/simmsben/bin:.
PIPESTATUS=([0]="0")
PPID=26514
PROMPT_COMMAND='echo -ne
"\033]0;${USER}@${HOSTNAME%%.*}:${PWD/#$HOME/~}"; echo -ne
"\007"'
PS1='$PWD $'
PS2='> '
PS4='+ '
PWD=/home/cis90/simmsben/Poems
SHELL=/bin/bash
SHELLOPTS=braceexpand:emacs:hashall:histexpand:ignoreeof:i
nteractive-comments:monitor
SHLVL=1
SSH_ASKPASS=/usr/libexec/openssh/gnome-ssh-askpass
TERM=xterm
UID=1160
USER=simmsben
USERNAME=
_=env
consoletype=pty
```

Class Exercise

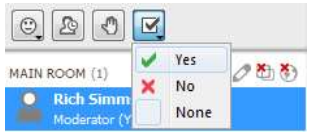
- Change your prompt with:
  PS1='$LOGNAME, command please: '

- Change your prompt with:
  PS1='[\u@\h \W]\$ '

- Change your prompt with:
  PS1="$PWD $ "
  Now change directories using **cd**, what happenned?

- Restore original prompt with:
  PS1='$PWD $ '

Did it work?
Click green "Yes" check or red "No" X on CCC Confer

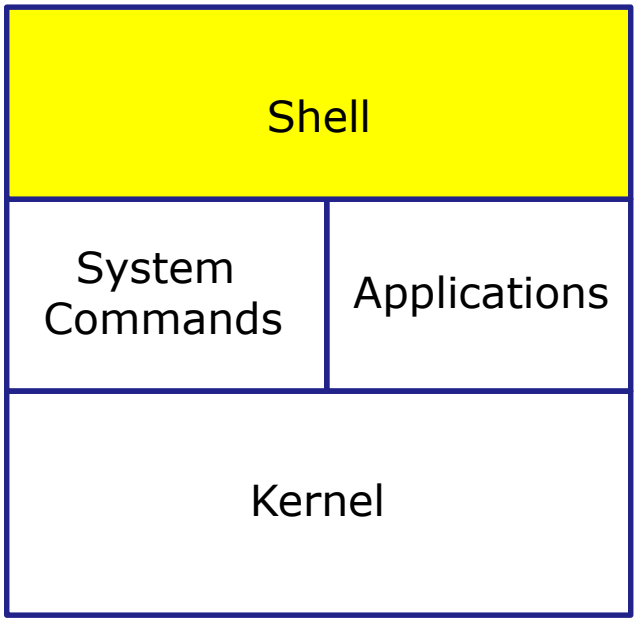


Inputs & Outputs

(continuing)

Life of the Shell

Execution begins only if the command is found



1) **Prompt** for a command
2) **Parse** (interpret metacharacters, expand file names and dissect command line into options and arguments)
3) **Search** for program (along the path)
4) **Execute** program by loading into memory (becomes a process), hookup input and outputs, and pass along command line options and arguments.
5) **Nap** (wait till process is done)
6) **Repeat**

Step 4 - the shell executes the command program file

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

*The next step is to load the **file** command that was found into memory. The program on the hard drive becomes a **process** in memory with a unique PID (Process ID).*

*Each new process is given three file descriptors **stdin**, **stdout** and **stderr** for input and output purposes.*

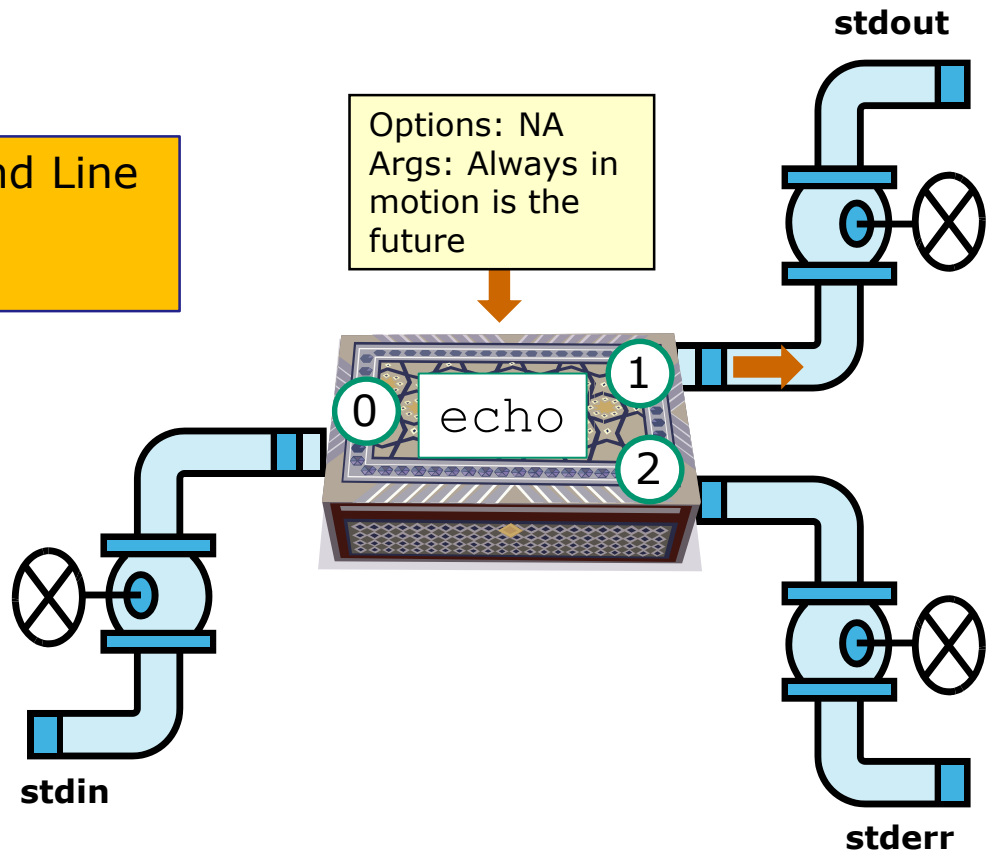
*These are sometimes referred to as the three **standard IO (Input/Output) streams**.*

Example program to process: echo command

```
[rsimms@opus ~]$ echo Always in motion is the future
Always in motion is the future
[rsimms@opus ~]$
```

Inputs: Command Line

Outputs: stdout



/dev/pts/1

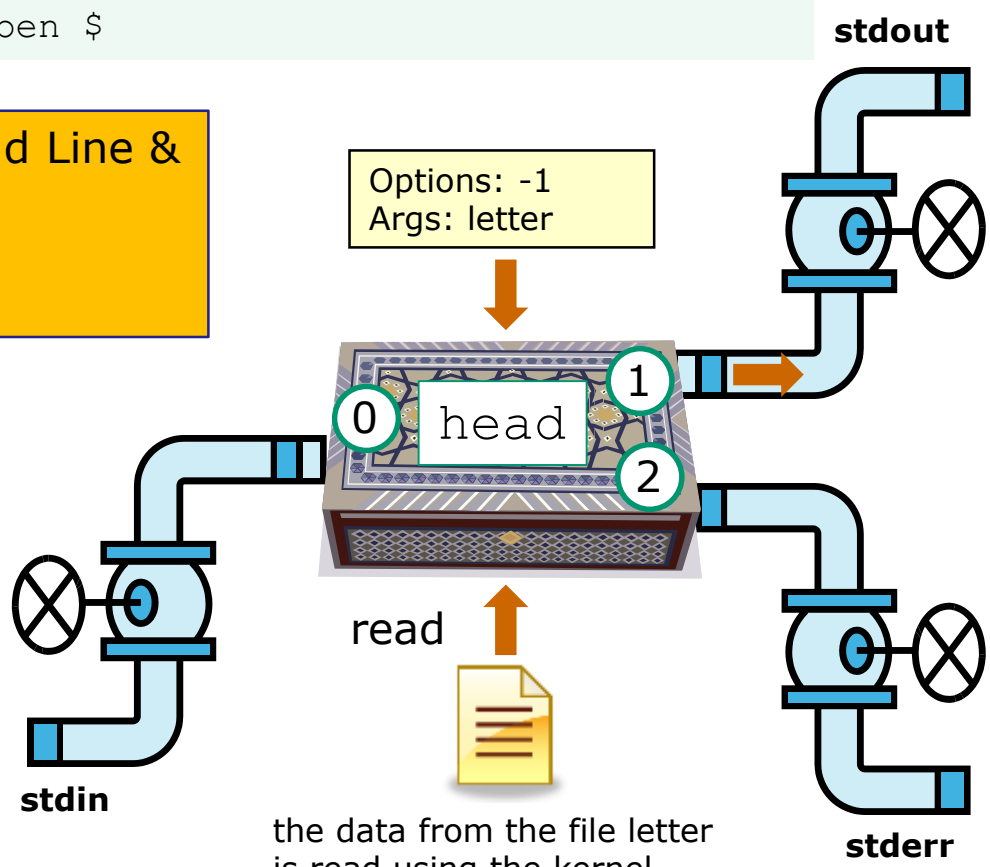
```
Always in
motion is
the future
```

Example program to process: head command

```
/home/cis90/simmsben $ head -1 letter
Hello Mother!  Hello Father!
/home/cis90/simmsben $
```

Inputs: Command Line & Operating System

Outputs: stdout



/dev/pts/1

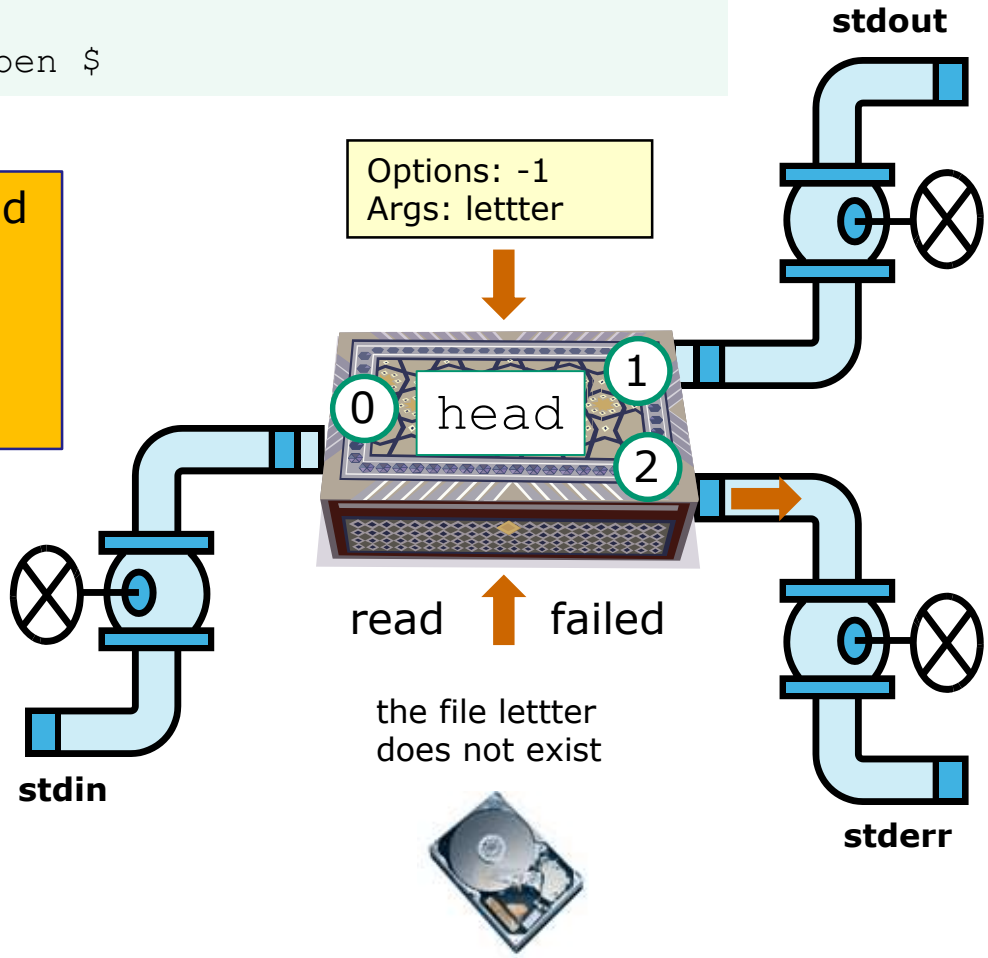
```
Hello Mother!
Hello Father!
```

Example program to process: head command

```
/home/cis90/simmsben $ head -1 lettter
head: cannot open `lettter' for reading: No such
file or directory
/home/cis90/simmsben $
```

Inputs: Command Line & Operating System

Outputs: stderr

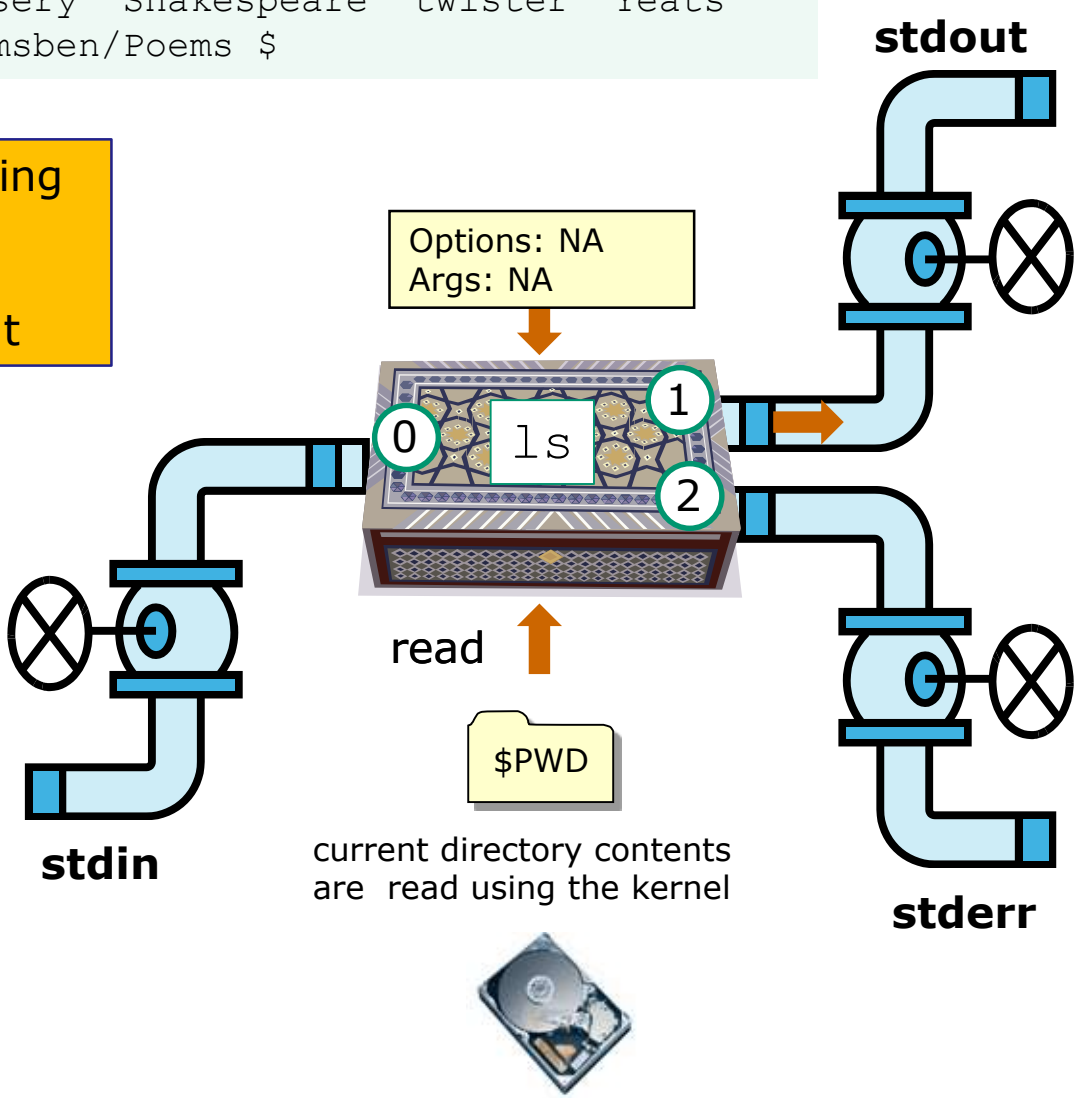


Example program to process: ls command

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

Inputs: Operating System

Outputs: stdout

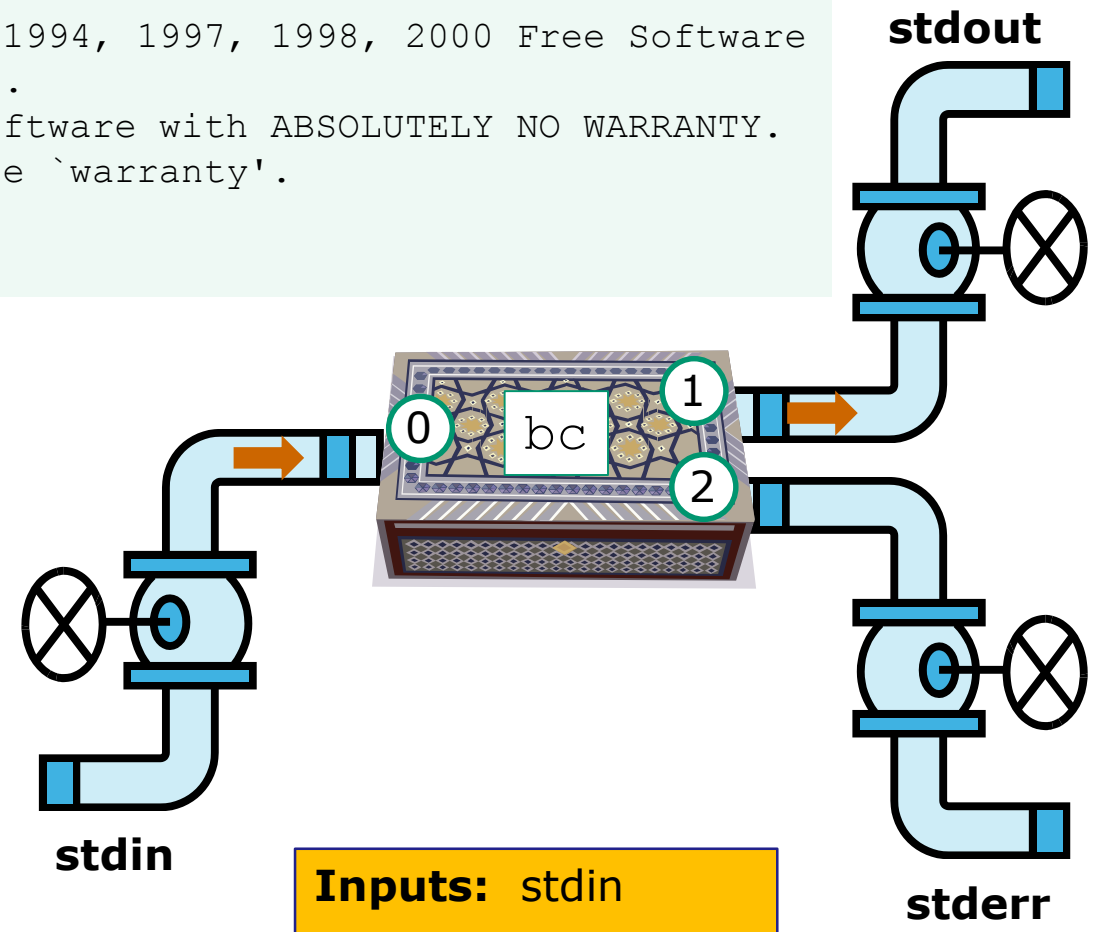


Example program to process: bc command

```
/home/cis90/simmsben $ bc
bc 1.06
Copyright 1991-1994, 1997, 1998, 2000 Free Software
Foundation, Inc.
This is free software with ABSOLUTELY NO WARRANTY.
For details type `warranty'.
2+2
4
```

/dev/pts/1

```
bc 1.06
Copyright 1991-
1994, 1997,
1998, 2000 Free
Software
Foundation, Inc.
This is free
software with
ABSOLUTELY NO
WARRANTY.
For details type
`warranty'.
4
```



/dev/pts/1

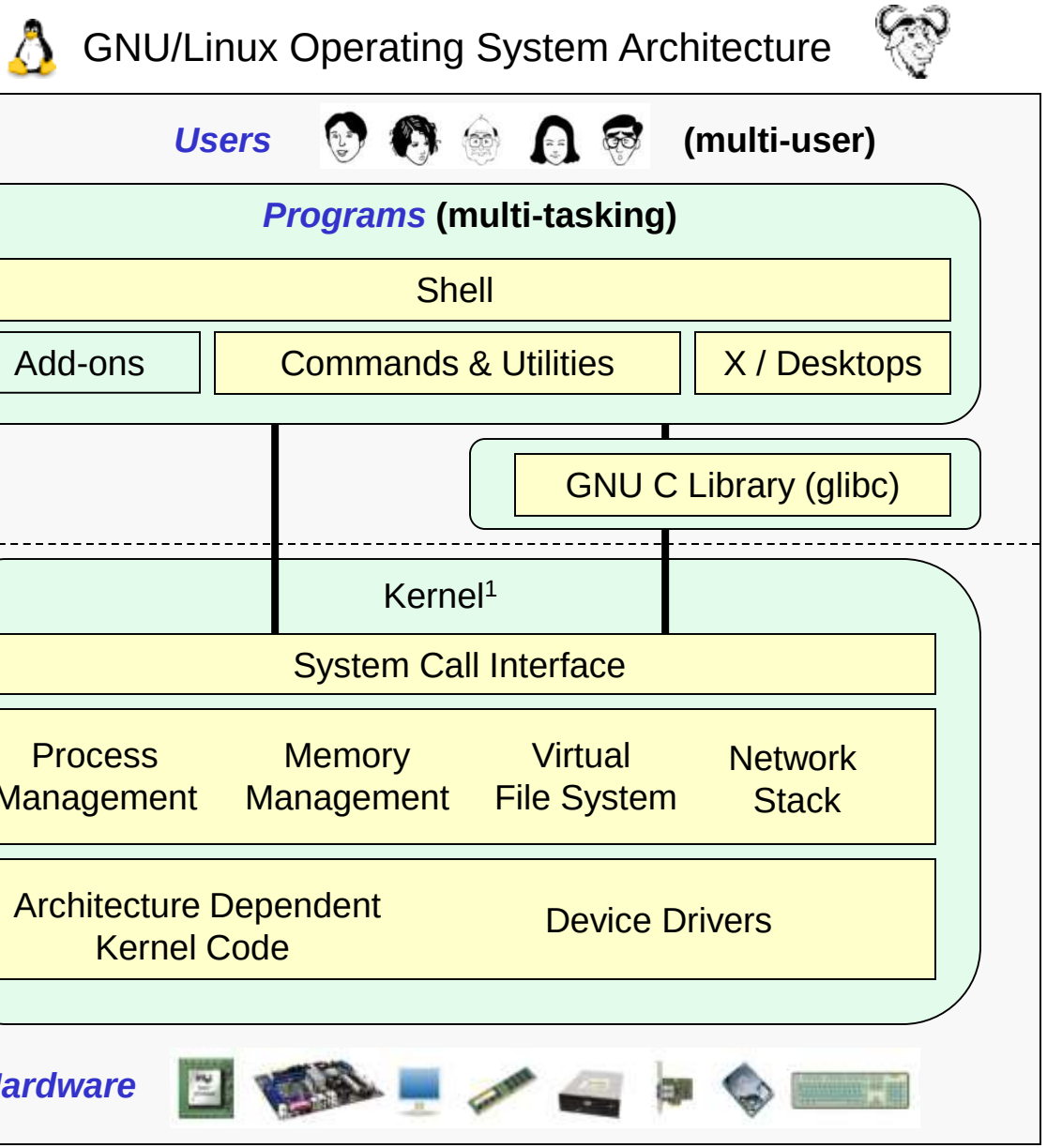
2+2

Inputs: stdin

Outputs: stdout

The Kernel

GNU/Linux Operating System Architecture



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

Linus Torvalds, as a student, initially conceived and assembled the Linux kernel in 1991. The kernel was later re-licensed under the GNU General Public License in 1992.

[1]See "Anatomy of the Linux kernel" by M. Tim Jones at http://www-128.ibm.com/developerworks/linux/library/l-linux-kernel/

The Source for Linux Kernels

https://www.kernel.org/

*Use the **-r** option on **uname** to see which release of the kernel is running on your system*

The first three numbers x.y.z indicate which kernel is being used from kernel.org.

x is the kernel version
y is the major revision number
z is the minor revision number

Anything after the dash was added by the distribution to indicate a modified kernel used by that distribution.

```
/home/cis90/simben $ uname -r
2.6.32-573.12.1.el6.i686
```

```
cis90@Arya-02:~$ uname -r
3.13.0-44-generic
```

The 3.13.0 kernel on Arya is newer than the older 2.6.32 kernel on Opus

The kernel files are stored in the /boot directory

```
/home/cis90/simben $ uname -r
2.6.32-573.12.1.el6.i686
```

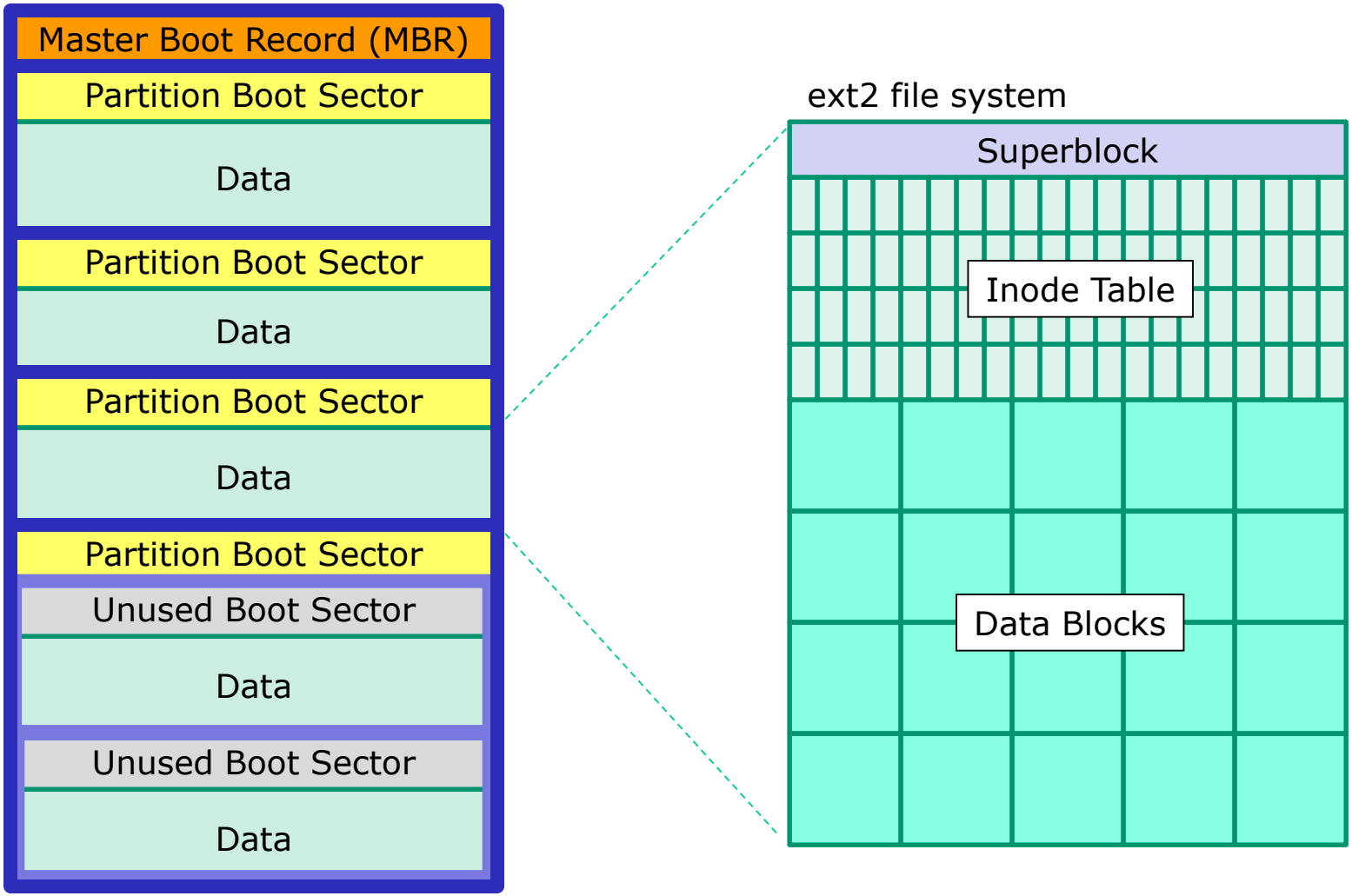
```
/home/cis90/simben $ ls /boot/vm*
/boot/vmlinuz-2.6.32-504.16.2.el6.i686  /boot/vmlinuz-2.6.32-573.12.1.el6.i686
/boot/vmlinuz-2.6.32-504.3.3.el6.i686   /boot/vmlinuz-2.6.32-573.7.1.el6.i686
/boot/vmlinuz-2.6.32-504.8.1.el6.i686
```

The uname -r command indicates the release of eh kernel that is running. This will correspond to one of the kernel files in the boot directory.

File System (review)

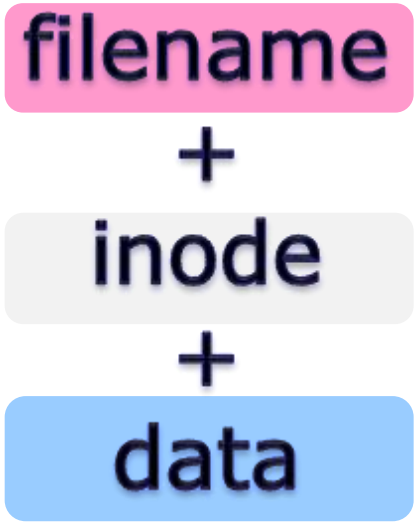
File Systems

Linux

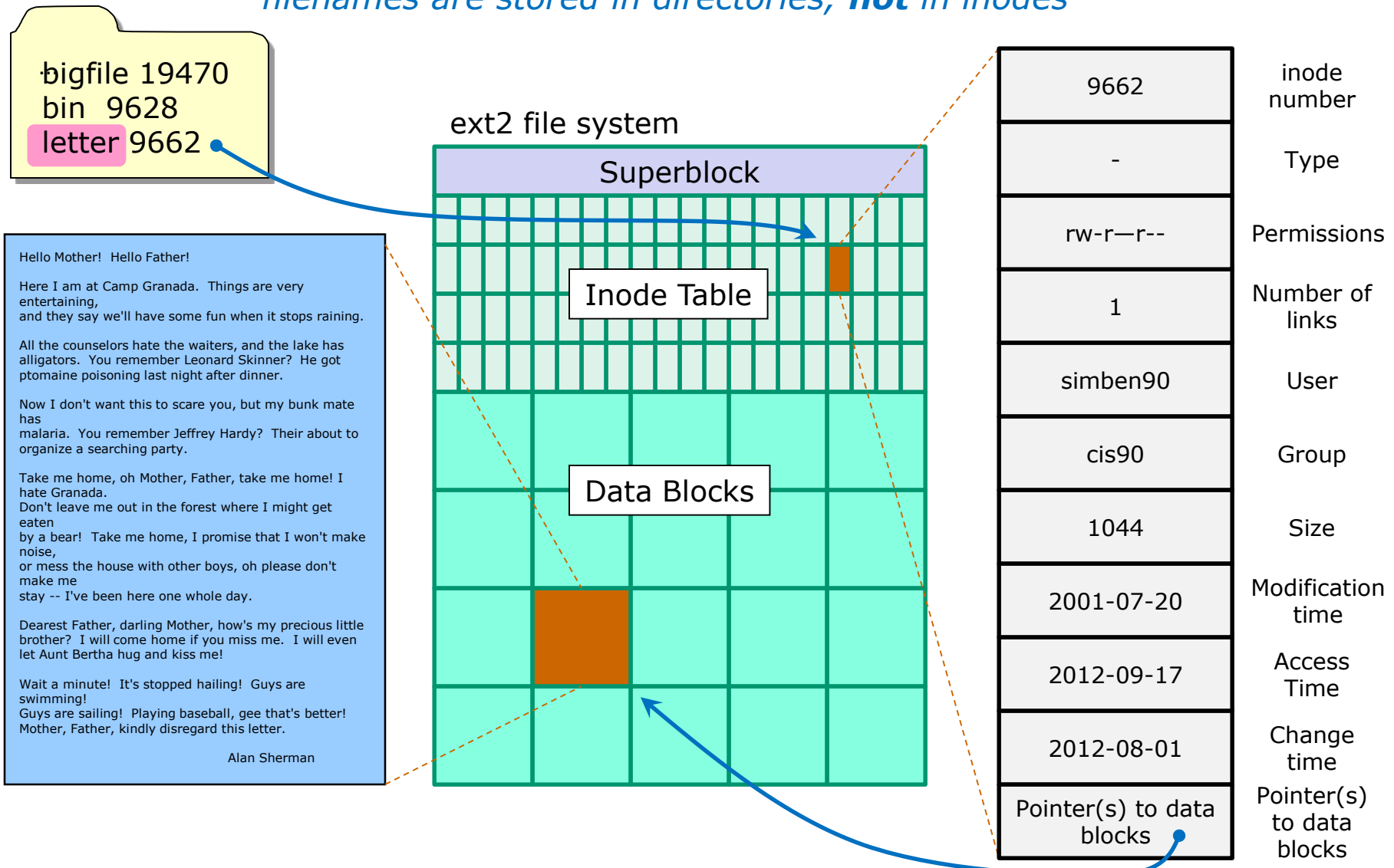


The three elements of a UNIX file

```
/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?"
```



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




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

Basic File Types and Commands

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

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

Interpreting a long listing file types

```
simmsben@opus:~
/home/cis90/simmsben $ls -la
total 320
drwx------ 9 simmsben cis90  4096 Aug  8 11:51 .
drwxr-x--- 9 rsimms   cis90  4096 Jun 30 14:57 ..
-rw------- 1 simmsben cis90 11409 Aug  7 19:20 .bash_history
-rw------- 1 simmsben cis90    24 Jul 20  2001 .bash_logout
-rw------- 1 simmsben cis90   354 Sep 17  2003 .bash_profile
-rw------- 1 simmsben cis90   146 Jan 18  2004 .bashrc
-rw-rw-r-- 1 simmsben cis90    56 Jul  8 17:22 bcommands
-rw-r--r-- 2 simmsben cis90 10576 Jul 20  2001 bigfile
drwxr-xr-x 2 simmsben cis90  4096 Sep 11  2005 bin
-rw-rw-r-- 1 simmsben cis90  1044 Aug  8 11:52 deleteme
-rw-r--r-- 1 simmsben cis90   515 Jun 30 14:57 .emacs
-rw-r--r-- 1 simmsben cis90     0 Jul 20  2001 empty
d--------- 2 simmsben cis90  4096 Feb  1  2002 Hidden
drwxr-xr-x 2 simmsben cis90  4096 Feb 17  2001 Lab2.0
drwxr-xr-x 3 simmsben cis90  4096 Feb 17  2001 Lab2.1
-rw------- 1 simmsben cis90    35 Aug  8 13:58 .lesshst
-rw-r--r-- 1 simmsben cis90  1044 Jul 20  2001 letter
-rw------- 1 simmsben cis90  5799 Jul 24 21:08 mbox
drwxr-xr-x 2 simmsben cis90  4096 Sep 11  2005 Miscellaneous
-rw-r--r-- 1 simmsben cis90   759 Jun  6  2002 mission
drwxr-xr-x 4 simmsben cis90  4096 Jun 30 14:57 .mozilla
-rw-r--r-- 1 simmsben cis90    40 Jul 20  2001 .plan
drwxr-xr-x 5 simmsben cis90  4096 Jul  9 14:24 Poems
-rw-r--r-- 1 simmsben cis90  1074 Aug 26  2003 proposal1
-rw-r--r-- 1 simmsben cis90  2175 Jul 20  2001 proposal2
-rw-r--r-- 1 simmsben cis90  2054 Sep 14  2003 proposal3
-rw-r--r-- 1 simmsben cis90  5467 Jul  6 13:41 results-e1
-rw-r--r-- 1 simmsben cis90  1286 Jul  6 12:20 results-e1a
-rw-rw-r-- 1 simmsben cis90   688 Jul 24 15:35 salsa
-rw-r--r-- 1 simmsben cis90  1580 Nov 16  2004 small_town
-rw-r--r-- 1 simmsben cis90   485 Aug 26  2003 spellk
-rw-r--r-- 1 simmsben cis90   250 Jul 20  2001 text.err
-rw-r--r-- 1 simmsben cis90   231 Jul 20  2001 text.fxd
-rwxr-xr-x 1 simmsben cis90   509 Jun  6  2002 timecal
-rw------- 1 simmsben cis90   661 Jul 24 13:59 .viminfo
-rw-r--r-- 1 simmsben cis90   352 Jul 20  2001 what_am_i
-rw------- 1 simmsben cis90   126 Aug  7 14:23 .Xauthority
-rw-r--r-- 1 simmsben cis90   658 Jun 30 14:57 .zshrc
/home/cis90/simmsben $
```

All directories in the UNIX file tree contain these two hidden . and .. directories (d in column 1)

A regular file (- in column 1) Its hidden because it starts with a .

A directory (d in column 1) Color is blue because it's a directory

A hidden directory (d in column 1, name starts with .

Regular file (- in column 1)

regular file (- in column 1) Color is green because with execute bits are set

*Use the **file** command to get additional information about a file*

Symbolic links

A symbolic link file (l in column 1)

```
/home/cis90/simben $ ls -l accounts /etc/passwd
lrwxrwxrwx 1 simben90 cis90   11 Mar  7 08:52 accounts -> /etc/passwd
-rw-r--r-- 1 root     root  7183 Mar  6 08:17 /etc/passwd
/home/cis90/simben $
```

```
/home/cis90/simben $ head -5 /etc/passwd
root:x:0:0:root:/root:/bin/bash
bin:x:1:1:bin:/bin:/sbin/nologin
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin

/home/cis90/simben $ head -5 accounts
root:x:0:0:root:/root:/bin/bash
bin:x:1:1:bin:/bin:/sbin/nologin
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin
```

The accounts file in Benji's directory is a symbolic link to the /etc/passwd file.

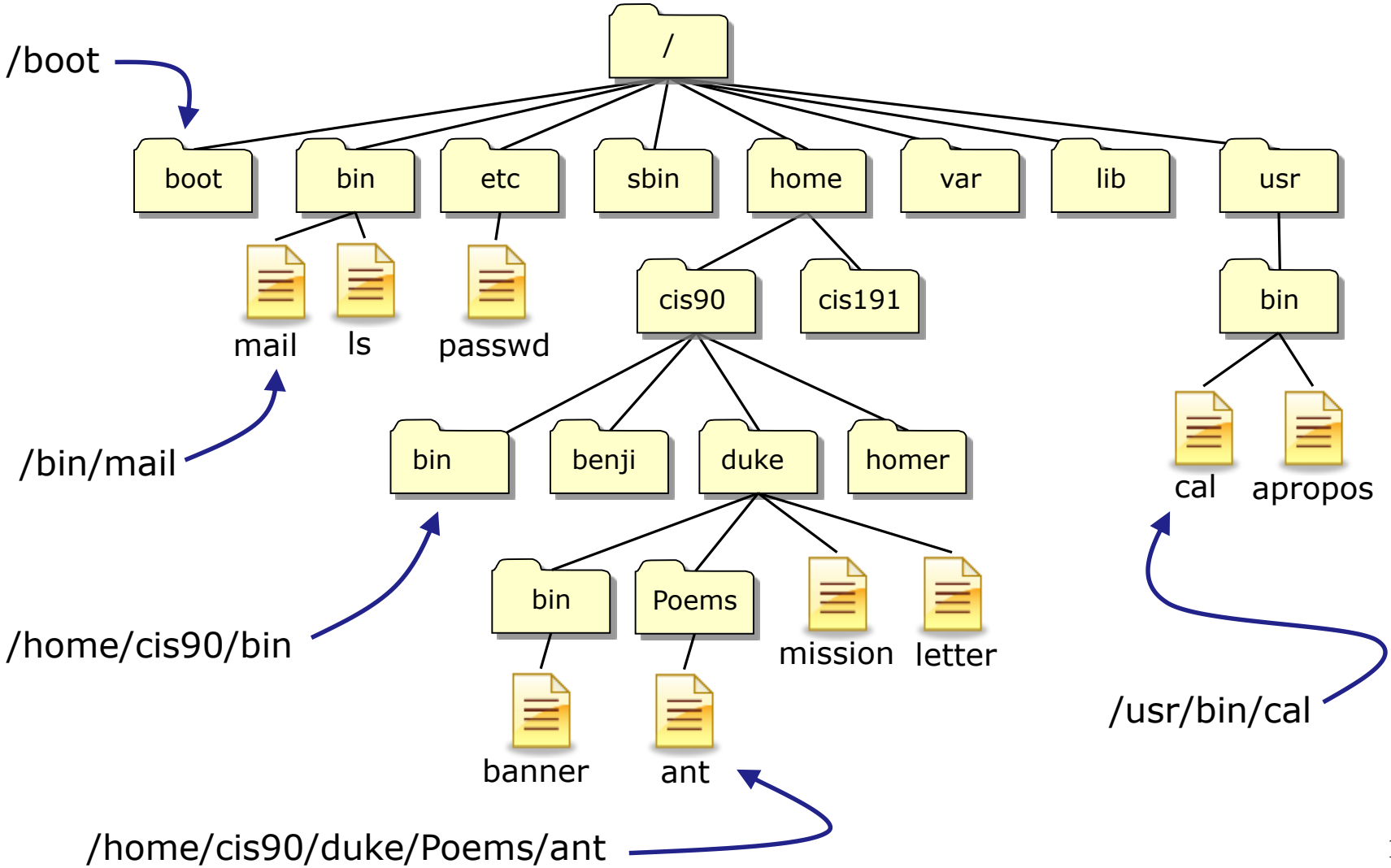
These "shortcuts" can be used for convenience

```
/home/cis90/simben $ ls -i accounts /etc/passwd
  99983 accounts  1280173 /etc/passwd
/home/cis90/simben $
```

Note they have different inodes

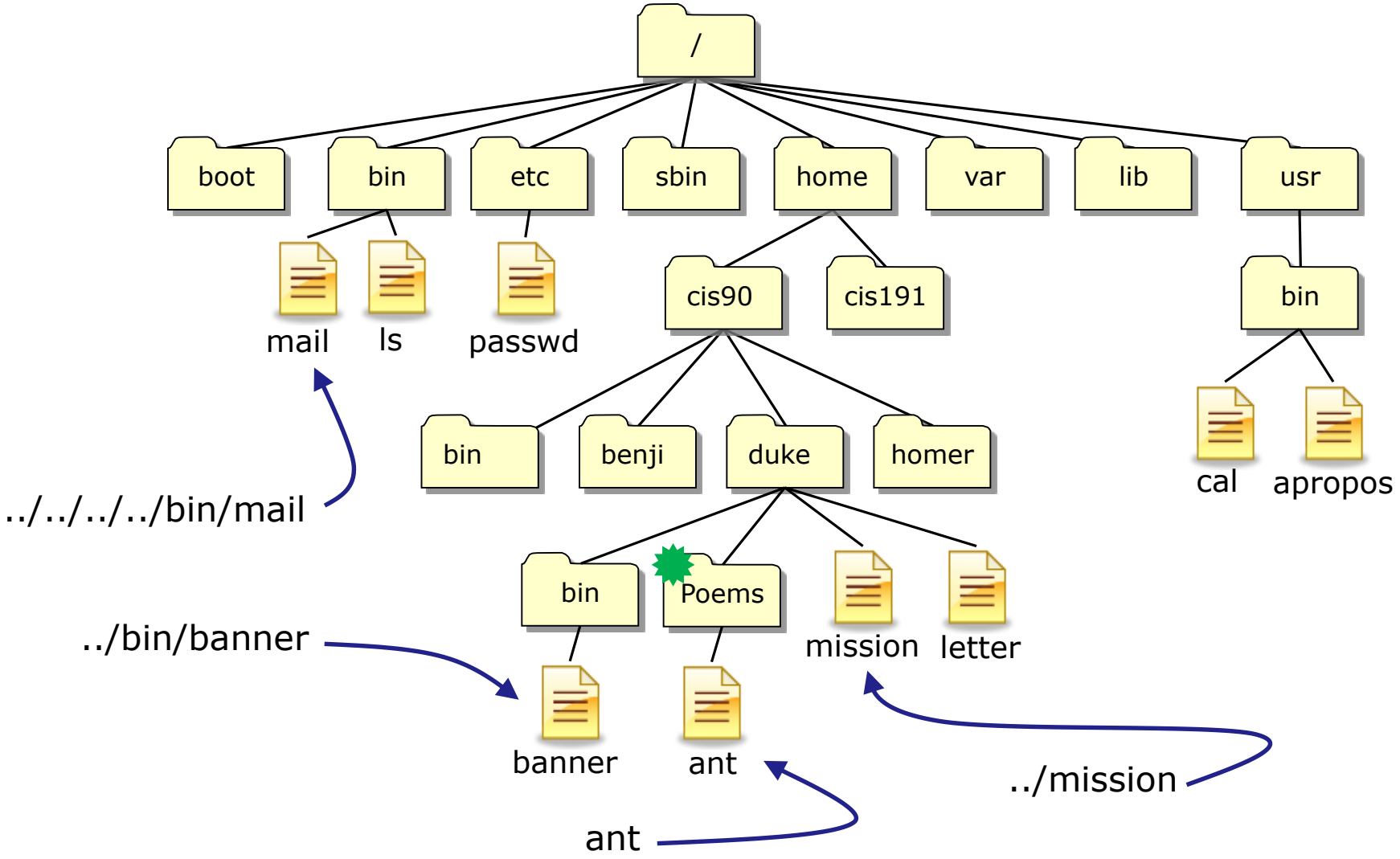
Absolute Pathnames

Start with from /



Relative Pathnames

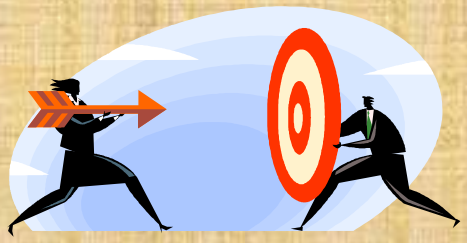
Stat from your current location in the tree



Top Level Directories

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

Absolute Pathname Target Practice



Analyze the absolute pathname

What directory is the file in?

What is the name of the file in that directory?

Type your answers in the chat window

Instructor run: /home/cis90/bin/randomFile

CCC Confer

CCC Confer Breakout Rooms Test

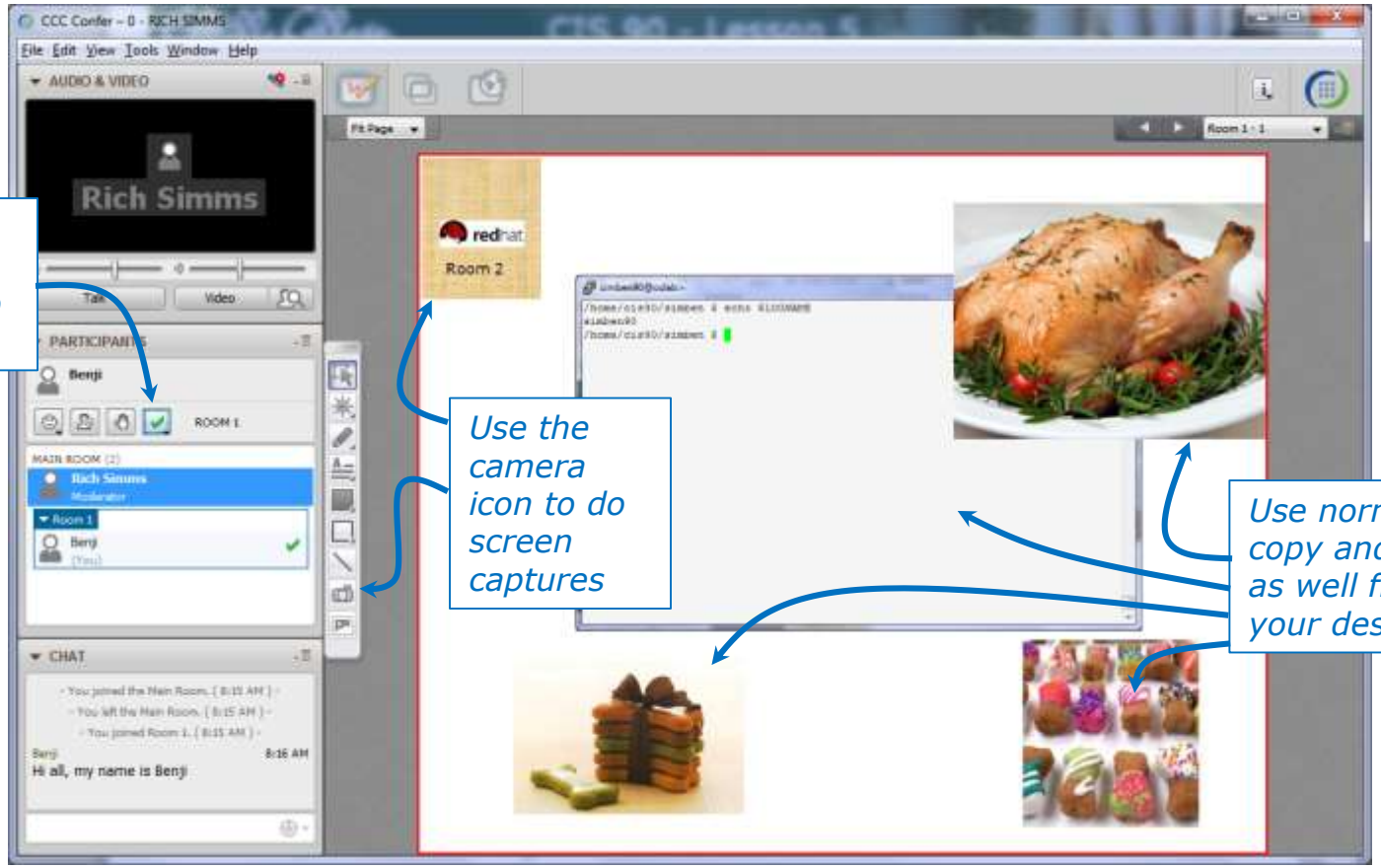
Room 1

Room 2

Room 3

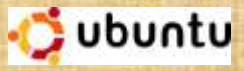
Room 4

Everyone needs to be on CCC Confer today, please use your Opus username.



I'll be sending you into virtual breakout rooms today so you can work together on various activities

CCC Confer Activity



Room 1 Room 2 Room 3 Room 4

1. Download the presentation slides for Lesson 5 from the Calendar page of the web site.

2. Locate this slide.

3. Put a green check next to your name when you have done steps 1-2.

When I see the green checks I'll distribute you the different rooms

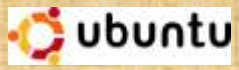
1. In your breakout room, see if you can do the following:
   - Introduce yourselves using room chat window.
   - Use whiteboard camera icon to copy your Linux logo above. Note you can resize the screen rectangle that is copied.
   - Each student use the **echo $LOGNAME** command in a Putty/MAC terminal and then paste a copy of their ssh session on the whiteboard.
   - Decorate your room with anything else so you will recognize it when you return.
   - Return to the main room when finished (drag your name from the breakout room back to the main room)

Flashcards

Lessons L1-L5 random

Room 1

Room 2



Room 3

Room 4

Flashcards
Deck size " "
L1-L5
All categories
L1=18
L2=22
L3=5
L4=26
L5=4
Total=75

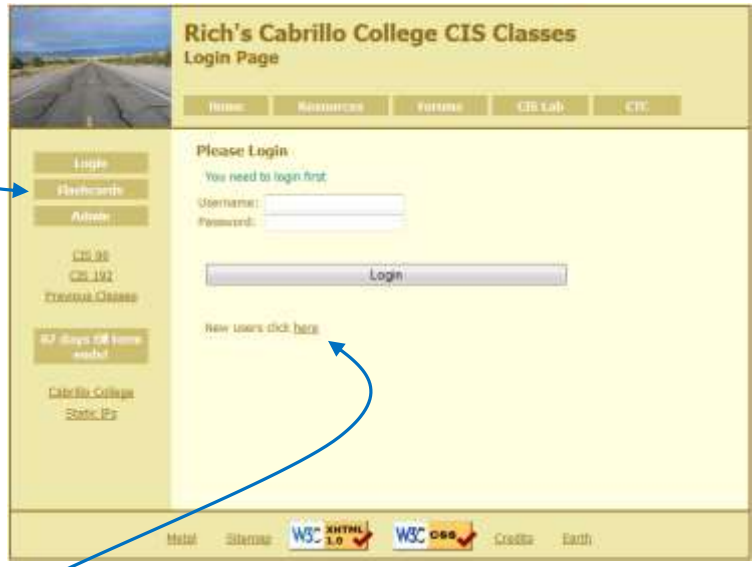
Rules

- Chat window belongs to team that is up (no one else can use)
- "Final Answer" must be from someone on team that hasn't answered yet
- All team members can help each other and suggest answers

Instructor timer: /home/rsimms/scripts/countdown
i=15; while [$i -gt 0]; do clear; banner $i; let i=i-1; sleep 1; done; clear; banner done

Flash Cards

Click on Flashcards in left panel

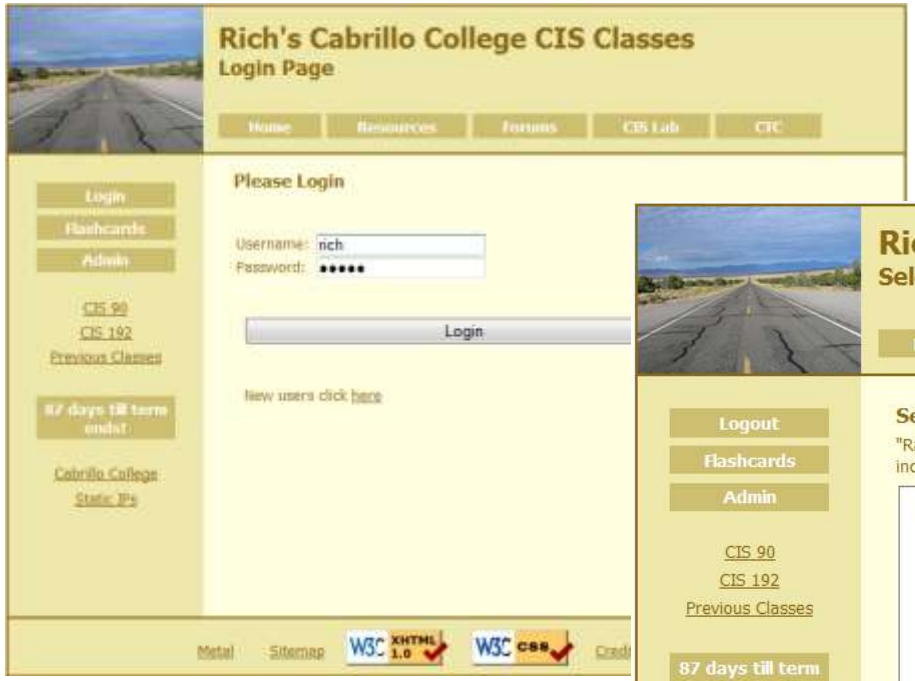


Register if this is the first time using Flashcards

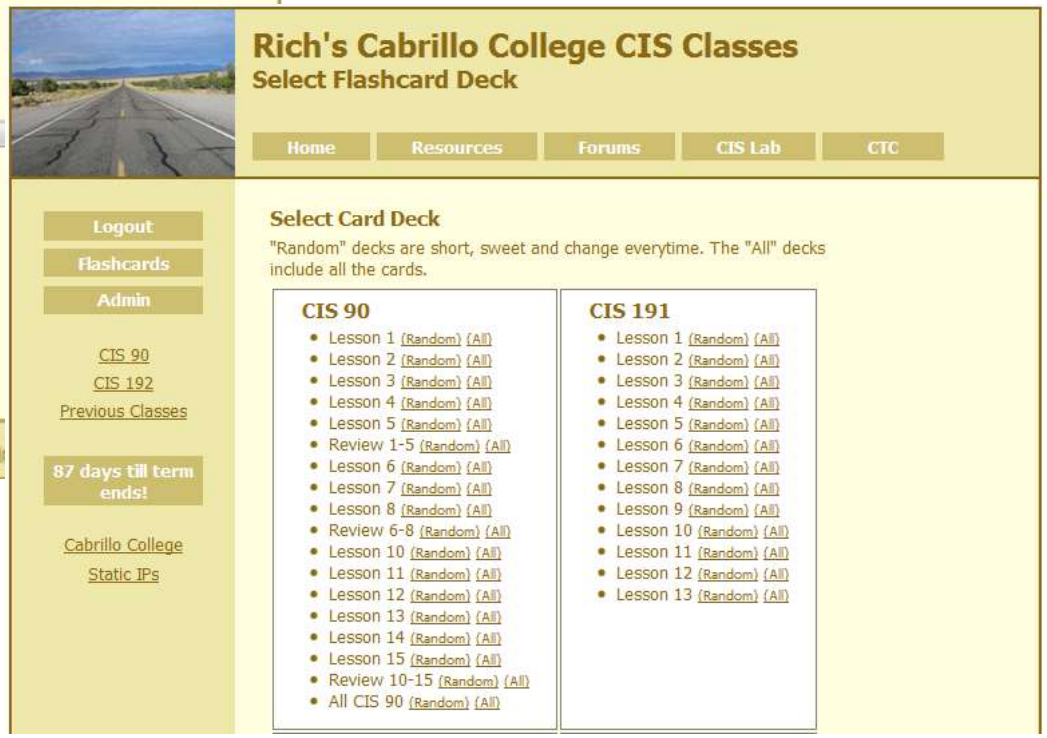
Register and choose a username and password of your choice

Logging in and using Flashcards

Login with your username and password



Select deck of cards



Class Exercise
Flashcards

- Browse to simms-teach.com
- Register with a username and password of your choice
- Verify you can login and use the flash cards.

Test Tips

What command … ?

Tips on how to answer questions on lab assignments and tests

What command will do "blah, blah, blah" questions:

Examples:

- What **ls** command allows you to see the permissions of your home directory while you are in your home directory?
- What command will give you a prompt showing your current working directory path and a $?
- What command allows you to see hidden files in your current directory?

Tip: Always use Opus (or the appropriate VM) to test your answers for these kinds of questions. ***I will!*** *If your command doesn't work it won't be the right answer!*

Practice Question

What **ls** command allows you to see the permissions of your home directory while you are in your home directory?

Practice Question

What **ls** command allows you to see the permissions of your home directory while you are in your home directory?

```
/home/cis90/simben $ ls -l
total 392
-rw-r--r-- 2 simben90 cis90  10576 Jul 20  2001 bigfile
drwxr-xr-x 2 simben90 cis90   4096 Feb 12 16:07 bin
-rw------- 1 simben90 cis90    606 Feb 29 22:17 dead.letter
-rw-r--r-- 1 simben90 cis90      0 Jul 20  2001 empty
d--------- 2 simben90 cis90   4096 Feb  1  2002 Hidden
< snipped >
-rw-r--r-- 1 simben90 cis90    250 Jul 20  2001 text.err
-rw-r--r-- 1 simben90 cis90    231 Jul 20  2001 text.fxd
-rwxr-xr-x 1 simben90 cis90    509 Jun  6  2002 timecal
-rw-rw-r-- 1 simben90 cis90  25390 Feb 29 22:18 uhistory

-rw-r--r-- 1 simben90 cis90    352 Mar  5 08:24 what_am_i
/home/cis90/simben $
```

Nope, that didn't work. *We got permissions of all the files in the directory but we didn't get the permissions of the directory itself!*

Practice Question

What **ls** command allows you to see the permissions of your home directory while you are in your home directory?

```
/home/cis90/simben $ ls -dl /home/cis90/simben
drwxr-xr-x 10 simben90 cis90 4096 Mar  1 10:15

/home/cis90/simben $ ls -dl ~
drwxr-xr-x 10 simben90 cis90 4096 Mar  1 10:15

/home/cis90/simben $ ls -dl .
drwxr-xr-x 10 simben90 cis90 4096 Mar  1 10:15 .

/home/cis90/simben $ ls -dl $HOME
drwxr-xr-x 10 simben90 cis90 4096 Mar  1 10:15

/home/cis90/simben $ ls -dl
drwxr-xr-x 10 simben90 cis90 4096 Mar  1 10:15 .
```

Yep, they all worked! *The -d option instructs the ls command not to descend into the directory. Any of the commands above would be correct.*

Practice Question

What command will give you a prompt showing your current working directory path and a $?

Practice Question

What command will give you a prompt showing your current working directory path and a $?

```
/home/cis90/simben $ PS1=blah
blah
blahPS1="/home/cis90/simben $ "
/home/cis90/simben $
/home/cis90/simben $ cd ..
/home/cis90/simben $ cd
/home/cis90/simben $
/home/cis90/simben $ echo $PS1
/home/cis90/simben $
```

***Nope, that didn't work**. The prompt doesn't change after changing to another directory*

Practice Question

What command will give you a prompt showing your current working directory path and a $?

```
/home/cis90/simben $ PS1=blah
blah
blahPS1="PWD $ "
PWD $
PWD $ echo $PS1
PWD $
```

***Nope, that didn't work either**. A $ in front of the variable name is required to use its value.*

Practice Question

What command will give you a prompt showing your current working directory path and a $?

```
PWD $ PS1=blah
blah
blahPS1="$PWD $ "
/home/cis90/simben $ cd ..
/home/cis90/simben $ cd
/home/cis90/simben $
/home/cis90/simben $ echo $PS1
/home/cis90/simben $
```

***Better, but still didn't work**. The prompt is still not changing after cd'ing to another directory.*

We need to block bash from expanding the $PWD variable when it's being set.

Practice Question

What command will give you a prompt showing your current working directory path and a $?

```
/home/cis90/simben $ PS1=blah
blah
blahPS1='$PWD $ '
/home/cis90/simben $ cd ..
/home/cis90 $ cd
/home/cis90/simben $
/home/cis90/simben $ echo $PS1
$PWD $
```

Touchdown! That worked!

The single quotes prevent bash from expanding $PWD when setting the PS1 variable.

It is not expanded till the prompt is actually generated for the next command.

Practice Question

What command allows you to see hidden files in your current directory?

Practice Question

What command allows you to see hidden files in your current directory?

```
/home/cis90/simben $ ls
bigfile       lab01.graded     Lab2.1          mission    small_town  uhistory
bin           lab01-submitted  letter          Poems      spellk      what_am_i
dead.letter   lab02.graded     log             proposal1  text.err
empty         lab03.graded     mbox            proposal2  text.fxd
Hidden        Lab2.0           Miscellaneous   proposal3  timecal
```

Nope, that didn't work! *Hidden files start with a "." and note of these start with a "." (period)*

Practice Question

What command allows you to see hidden files in your current directory?

```
/home/cis90/simben $ ls -a
.                dead.letter      Lab2.0           .mozilla     .ssh
..               .emacs           Lab2.1           .plan        text.err
.bash_history    empty            .lesshst         Poems        text.fxd
.bash_logout     Hidden           letter           proposal1    timecal
.bash_profile    lab01.graded     log              proposal2    uhistory
.bashrc          lab01-submitted  mbox             proposal3    .viminfo
bigfile          lab02.graded     Miscellaneous    small_town   what_am_i
bin              lab03.graded     mission          spellk
```

Bingo, that worked! *Hidden files and directories start with a "." (period)*

How many arguments or “parse this command” questions

Tips on how to answer questions on lab assignments and tests

How many arguments or "parse this command" questions

Example: The shell performs file name expansion during the Parse step. When a user types the command: **file /v*/l??/*o*.[14]** on Opus, how many arguments get passed to the **file** command? What specifically are those arguments?

Tip: Use the echo command to preview how the shell will expand arguments containing metacharacters.

***Tip**: Use the echo command to preview how the shell will expand arguments containing metacharacters.*

***TIP**: Use the echo command to preview how the shell will expand arguments containing metacharacters.*

TIP: Use the echo command to preview how the shell will expand arguments containing metacharacters.

Practice Question

The shell performs file name expansion during the Parse step. When a user types the command: **file /v*/l??/*o*[14]** on Opus, how many arguments get passed to the **file** command? What specifically are those arguments?

```
/home/cis90/simben $ echo /v*/l??/*o*[14]
/var/lib/polkit-1 /var/log/dracut.log-20130101 /var/log/yum.log-20130101
```

*Answer: The shell will expand **/v*/l??/*o*[14]** into the 3 arguments shown above*

Practice Question

Parse the following command on Opus:

```
wc -wl /home/cis90/d*t/*w*
```

what is the second argument passed to the **wc** command?

Practice Question

Parse the following command on Opus:

```
wc -wl /home/cis90/d*t/*w*
```

what is the second argument passed to the **wc** command?

command: **wc**
options: **w** and **l**
arguments:

```
[rsimms@oslab ~]$ echo /home/cis90/d*t/*w*
/home/cis90/depot/network /home/cis90/depot/newfile /home/cis90/depot/randomwords
```

3 arguments, the second argument is

Answer: /home/cis90/depot/newfile

Practice Question

Parse the following command on Opus:

```
wc -wl /home/cis90/d*t/*w*
```

Regarding the options passed to the wc command, how many and what are they?

Practice Question

Parse the following command on Opus:

```
wc -wl /home/cis90/d*t/*w*
```

Regarding the options passed to the wc command, how many and what are they?

command: `wc`
options: `w` and `l`
arguments:
`/home/cis90/depot/network`
`/home/cis90/depot/newfile`
`/home/cis90/depot/randomwords`

Answer: there are two options, w and l

Absolute/relative pathname questions:

Tips on how to answer questions on lab assignments and tests

Absolute/relative pathname questions:

Examples:

- What is the relative pathname from your home directory to the **date** command?

- What is the absolute path to the sonnet1 file in your Shakespeare directory?

*Tip: Use the **ls** command with tab completion to verify your absolute or relative pathnames*

*Tip: Use the **ls** command with tab completion to verify your absolute or relative pathnames*

*Tip: Use the **ls** command with tab completion to verify your absolute or relative pathnames*

Tip: Use the ls command with tab completion to verify your absolute or relative pathnames

Practice

What is the relative pathname from your home directory to the **date** command?

Practice

What is the relative pathname from your home directory to the **date** command?

First, use the type command to find where the date command is

```
/home/cis90/simmsben $ type date
date is /bin/date

/home/cis90/simben $ ls ../
ahrmat/         colabd/         huljef/         olscam/         rodduk/
answers/        deltas/         jimmel/         pacnan/         shidev/
.bash_profile   depot/          lowmic/         phacha/         simben/
bin/            doucor/         macrya/         plajos/         varana/
blerav/         flamat/         maxsco/         plajua/         veleli/
bodian/         gueous/         mcidar/         porjon/
bunsol/         guest/          milhen/         pummas/
cheken/         helrog/         milhom/         rafdav/
cofcol/         hovdav/         milmic/         reedie/
/home/cis90/simben $ ls ../../
backup/       cis191/       cis90/        guest/        rick/         turnin/
cis164/       cis192/       cis98/        jimg/         rsimms/       .Xauthority
cis172/       cis193/       gerlinde/     mikki/        ryan/
/home/cis90/simben $ ls ../../../
.autofsck   etc/         media/      opt/        selinux/    tmp/
bin/        home/        misc/       proc/       srv/        u/
boot/       lib/         mnt/        root/       sys/        usr/
dev/        lost+found/  net/        sbin/       tftpboot/   var/
/home/cis90/simben $ ls ../../../bin/date
../../../bin/date
/home/cis90/simben $
```

Tap tab key twice to see what is in that directory

No errors so this relative pathname is GOOD!

Answer: ../../../bin/date

Example

What is the absolute path to the sonnet1 file in your Shakespeare directory?

Practice

What is the absolute path to the sonnet1 file in your Shakespeare directory?

```
/home/cis90/simben $ ls /
.autofsck   etc/        media/      opt/        selinux/    tmp/
bin/        home/       misc/       proc/       srv/        u/
< snipped >
/home/cis90/simben $ ls /home/
backup/      cis191/      cis90/       guest/       rick/        turnin/
< snipped >
/home/cis90/simben $ ls /home/cis90/
ahrmat/        colabd/        huljef/        olscam/        rodduk/
answers/       deltas/        jimmel/        pacnan/        shidev/
.bash_profile  depot/         lowmic/        phacha/        simben/
< snipped >
cofcol/        hovdav/        milmic/        reedie/
/home/cis90/simben $ ls /home/cis90/simben/
.bash_history    lab01.graded     Miscellaneous/    .ssh/
< snipped >
.bashrc          lab03.graded     .plan             timecal
bigfile          Lab2.0/          Poems/            uhistory
< smipped >
Hidden/          mbox             spellk
/home/cis90/simben $ ls /home/cis90/simben/Poems/
ant          Blake/       nursery      Shakespeare/ twister      Yeats/
/home/cis90/simben $ ls /home/cis90/simben/Poems/Shakespeare/sonnet
sonnet1   sonnet11  sonnet17  sonnet26  sonnet35  sonnet5   sonnet9
sonnet10  sonnet15  sonnet2   sonnet3   sonnet4   sonnet7
/home/cis90/simben $ ls /home/cis90/simben/Poems/Shakespeare/sonnet1
/home/cis90/simben/Poems/Shakespeare/sonnet1
```

Tap tab key twice to see what is in that directory

No errors so this absolute pathname is GOOD!


Assignment

How to prepare for the test:

- Review slides for Lessons 1-5 (download and make sure you know how to electronically search PDFs)
- DO THE PRACTICE TEST
- Compare your practice test answers with others and discuss on the forum
- DO THE PRACTICE TEST AGAIN
- Note the steps you take to answer each question so you can use them again on the real test
- DO THE PRACTICE TEST AGAIN
- Go through the Lesson 1-5 flashcards till you feel comfortable with the material
- DO THE PRACTICE TEST AGAIN
- Practice, practice, practice ... repeating Labs 1-4 never hurts!

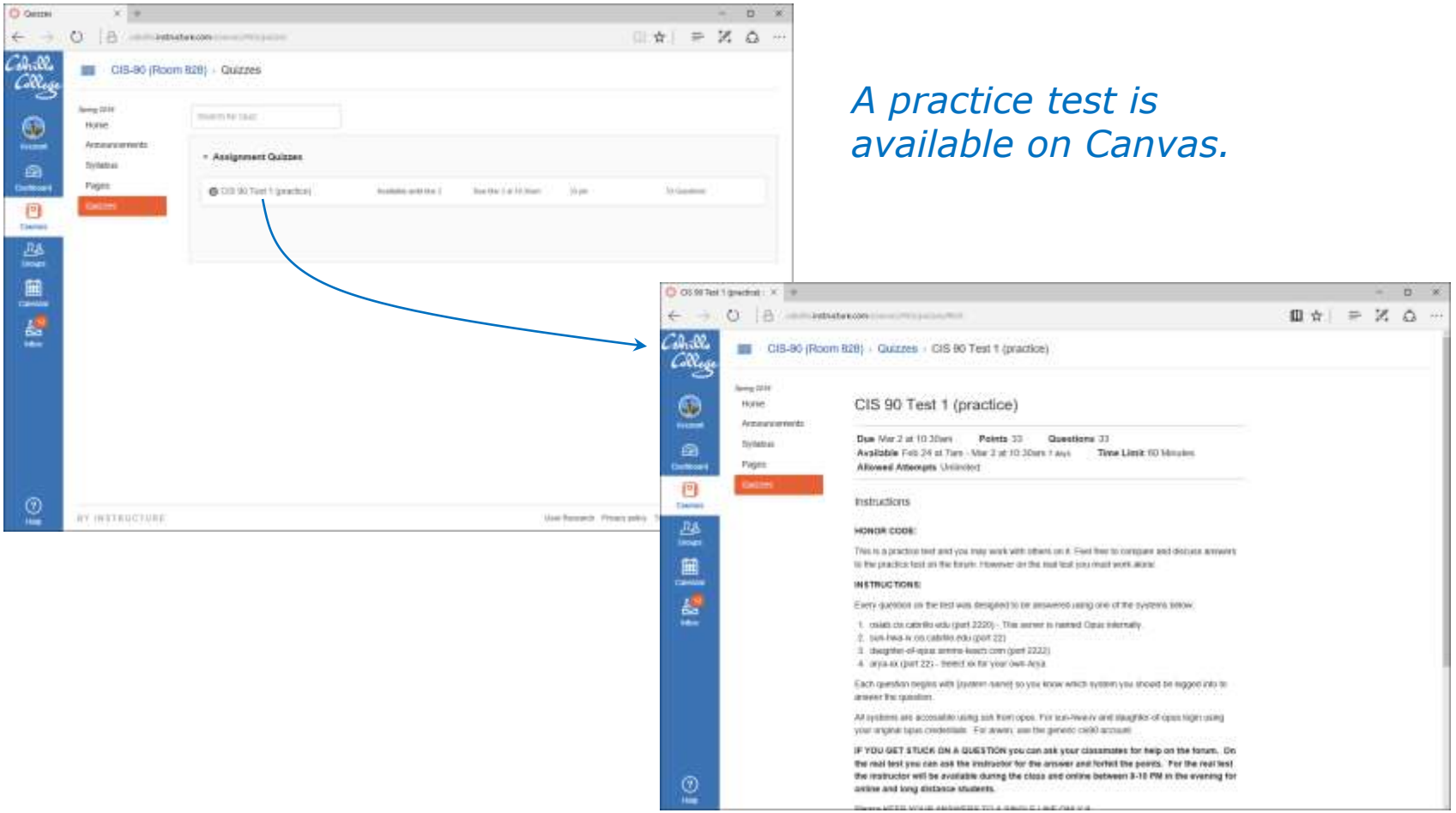
The practice test systems will be shutdown shortly before the real test starts. You can take the practice test and many times as you want until then. Try to get your time down to no more than 30 seconds per question.

Reminder to instructor:

On Practice Test system
- create accounts
- run setup scripts (trouble-p1, setup-shakespeare)
- rm /etc/nologin

On Opus
- /home/rsimms/cis90/test01/q29/mail-q29-P1

Practice Test



A practice test is available on Canvas.


Wrap up

New commands:

NA	NA

New metacharacters:

?	Matches any single character
[]	Matches any character in the brackets

New Files and Directories:

NA	NA

Next Class

Assignment: Check Calendar Page on web site to see what is coming up.

No Quiz
No Lab due
Test !

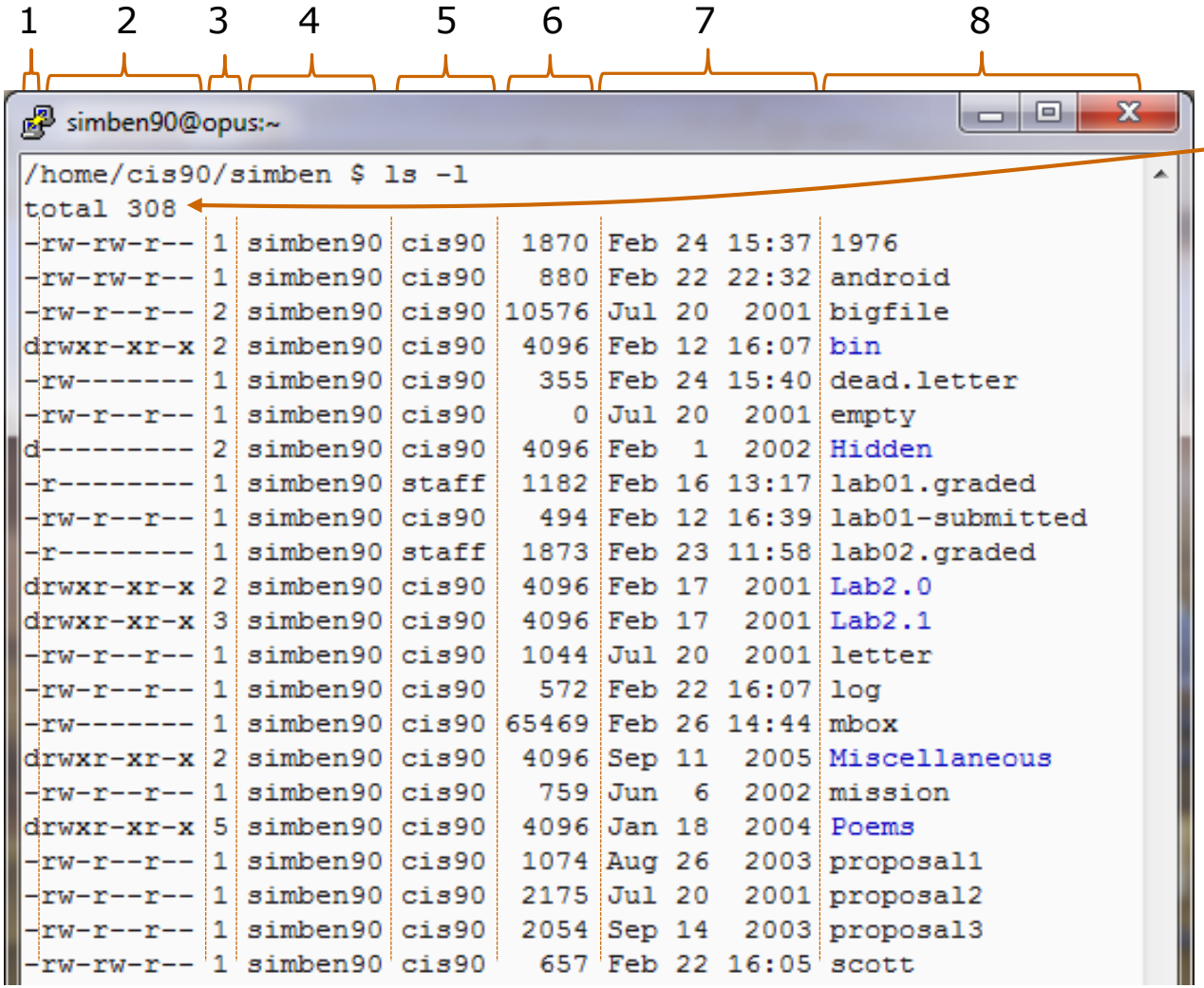
Backup

ls command

review

ls command

Use the -l option for a "long listing"



total size of all files in blocks

On Opus, 1 block = 1024 bytes

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

ls command

Using files vs directories as arguments

*Case 1: **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
```

*Case 2: With a **filename** specified as an argument, just that file will be listed*

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

*Case 3: With a **directory** specified as an argument, the contents of the directory will be listed*

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

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 example

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

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

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

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

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

Miscellaneous:
better_town  file.dos  fruit  manpage  mystery  salad

Poems:
ant  Blake  nursery  Shakespeare  twister  Yeats
```

Files listed first

Then the contents of each directory are listed

Do you see the error message? ... permission issue (more in future lessons)
Do you see the symbolic link? ... in light blue (more in future lessons)

ls command

How to override showing directory contents

The contents of the directory are shown

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

The directory itself is shown with the -d option

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

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

ls command

How to override showing directory contents

The directory contents are shown

```
/home/cis90/simben $ ls -i bin
9634 app  9635 banner  9636 enlightenment  9630 hi  9632 I
9631 treed  9633 tryme  9629 zoom
```

The directory itself is shown with the -d option

```
/home/cis90/simben $ ls -id bin
9628 bin
```

*Use the **d** option to list the directory itself.*

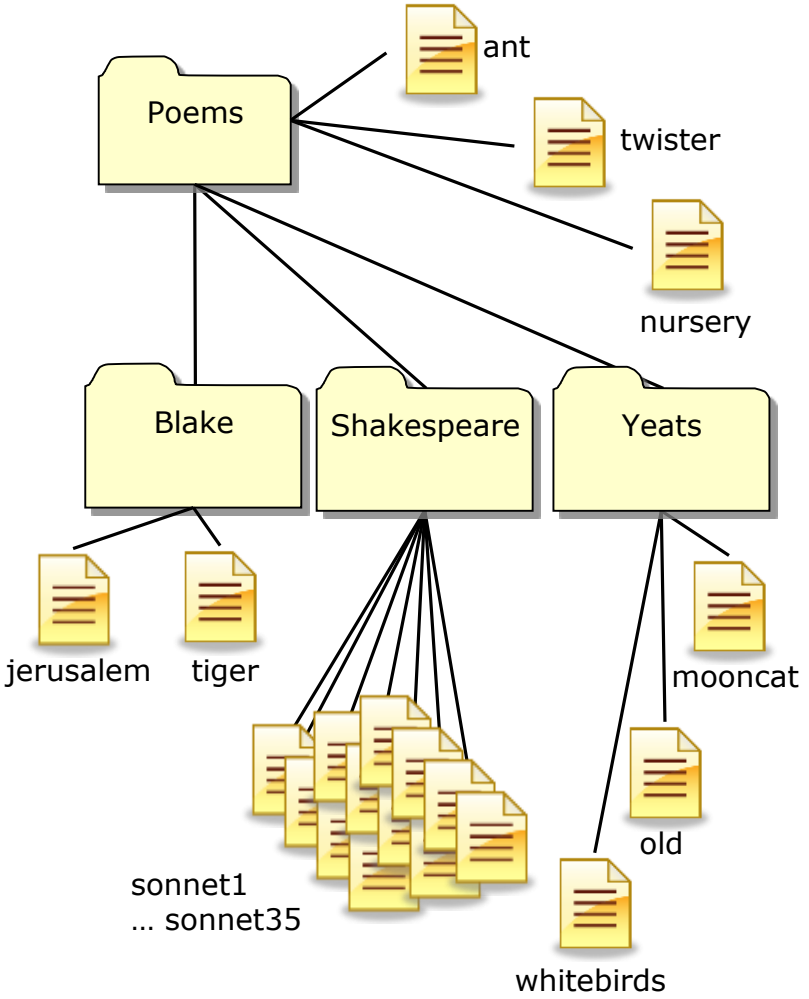
ls command

Recursively list subdirectories (-R)

`ls -lR`

simmsben@opus:~/Poems

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

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

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

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



Class Exercise

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

ls -l Miscellaneous/

ls -ld Miscellaneous/

ls -ilR