Rich's lesson module checklist

Last updated 2/8/2017

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

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

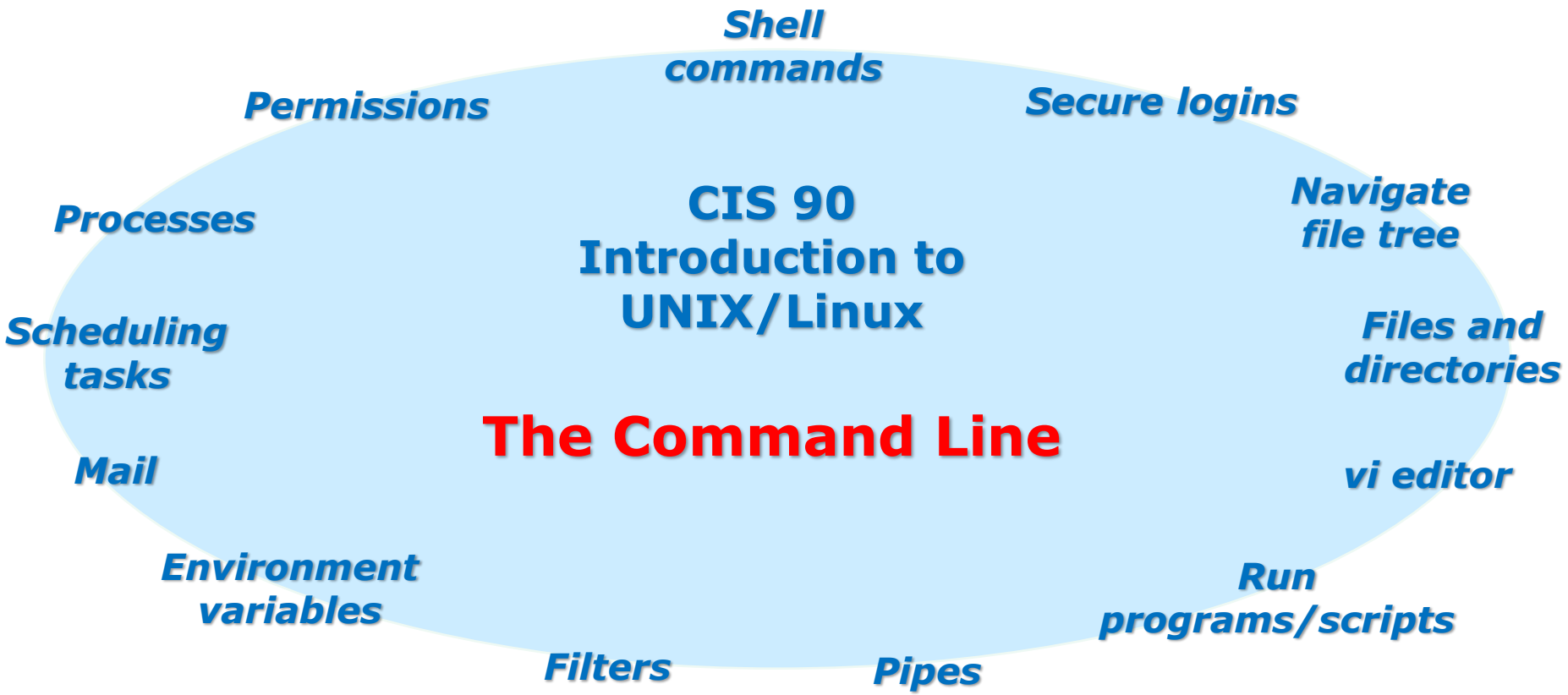
- ❑ Lab 3 tested
- ❑ Opus – set submit deadline

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

- ❑ Census done - Microsoft and VMware web store accounts made
- ❑ CIS Lab schedule published
- ❑ cis90-students alias in /etc/aliases + newaliases command
- ❑ Welcome ready for mailing
- ❑ Lab 3 Unix events ready for mailing
- ❑ sun-hwa-iii ice cream and accounts made
- ❑ rhea setup

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

- ❑ Update CCC Confer and 3C Media portals



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.

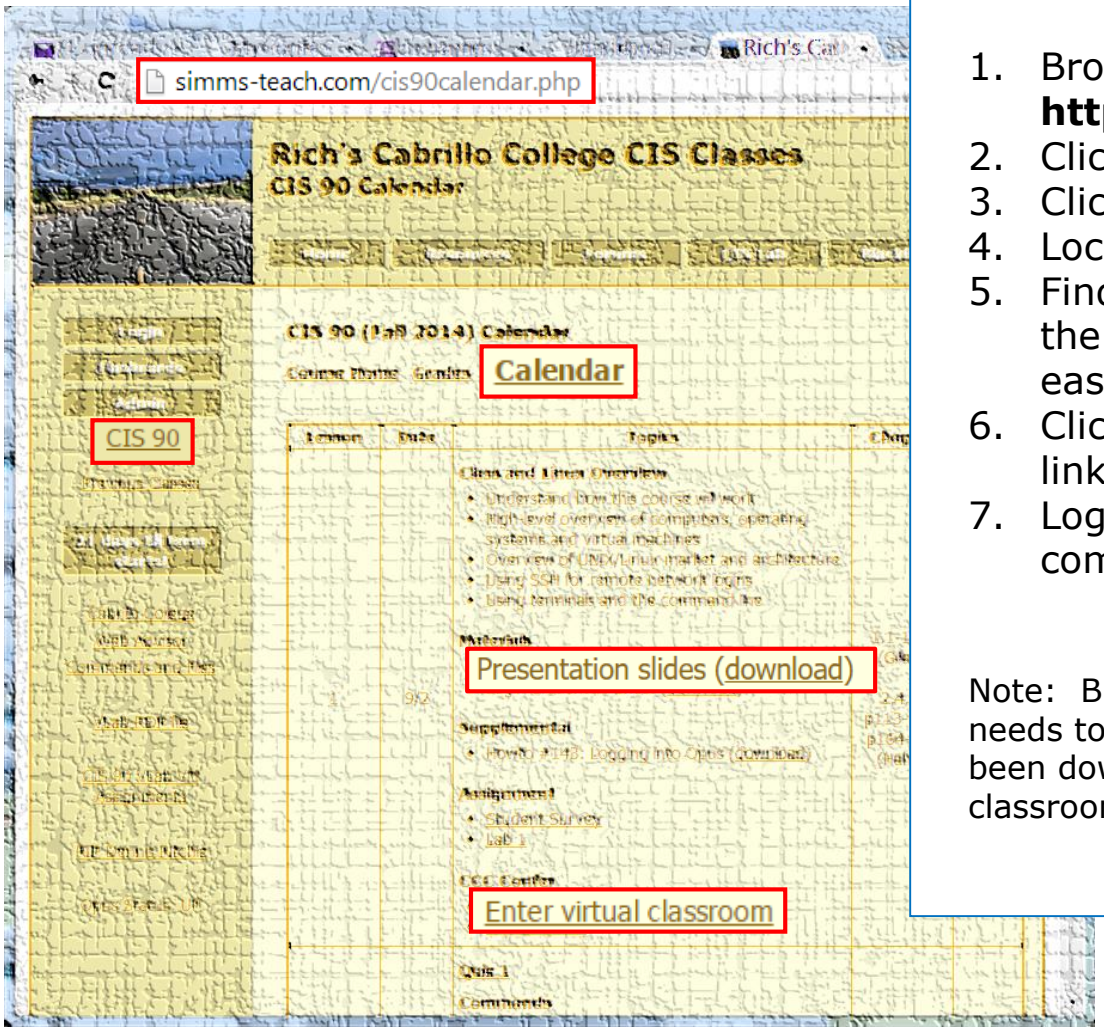
Introductions and Credits

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

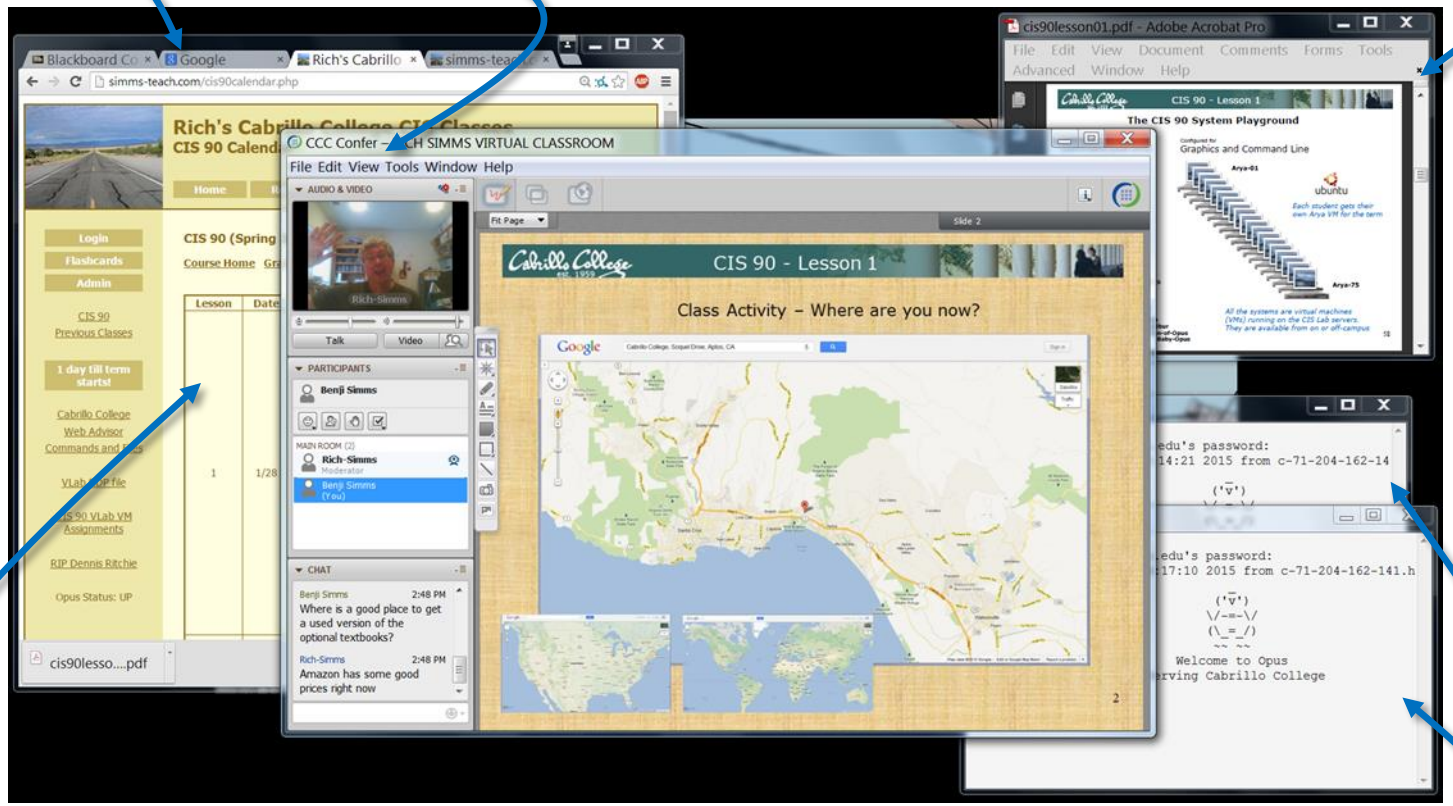


1. Browse to: **http://simms-teach.com**
2. Click the **CIS 90** link.
3. Click the **Calendar** link.
4. Locate today's lesson.
5. Find the **Presentation slides** for the lesson and **download** for easier viewing.
6. Click the **Enter virtual classroom** link to join CCC Confer.
7. Log into Opus with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

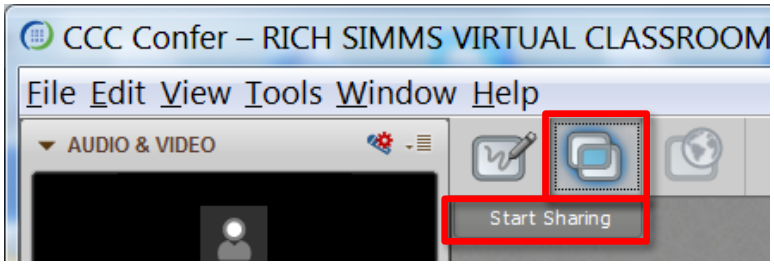
- ❑ *Google*
- ❑ *CCC Confer*
- ❑ *Downloaded PDF of Lesson Slides*



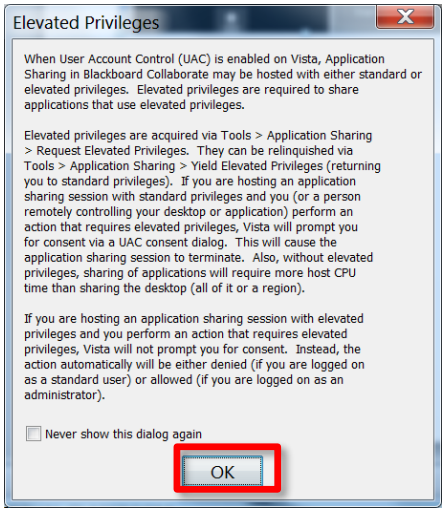
- ❑ *CIS 90 website Calendar page*
- ❑ *One or more login sessions to Opus*

Student checklist for sharing desktop with classmates

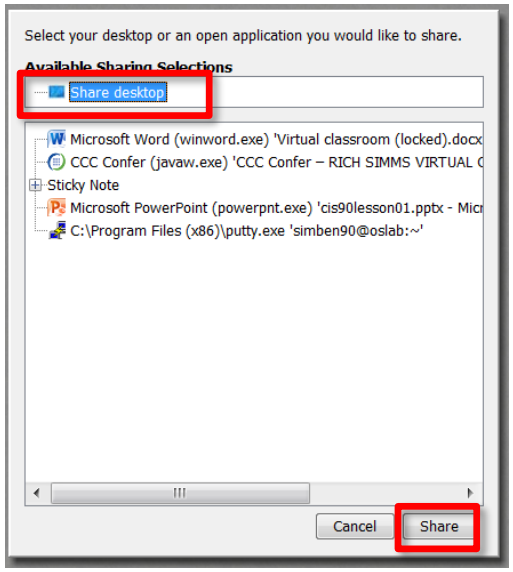
1) Instructor gives you sharing privileges



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



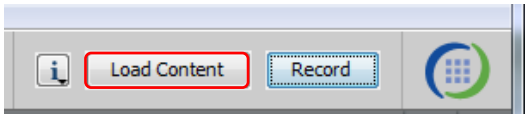
3) Click OK button.



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

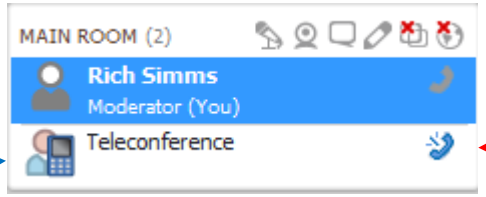
Rich's CCC Confer checklist - setup

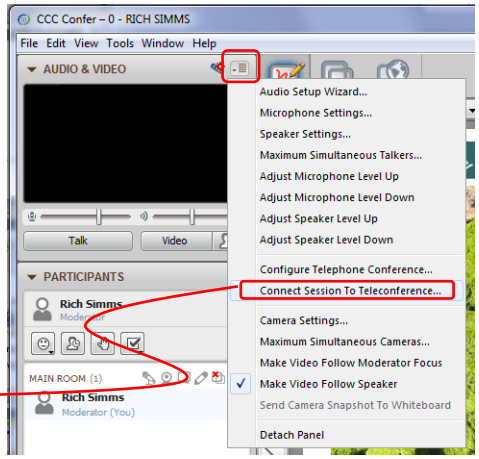
[ ] Preload White Board



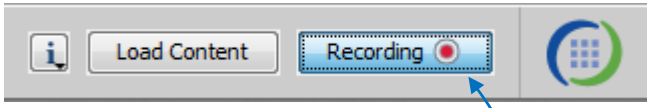
[ ] Connect session to Teleconference

Session now connected to teleconference





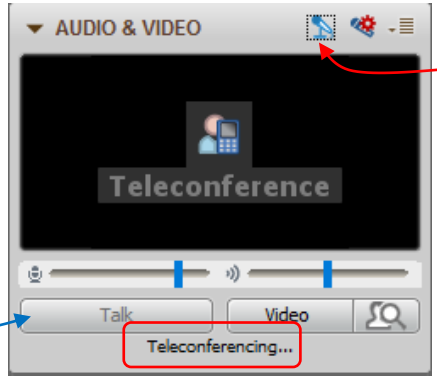
[ ] Is recording on?



Red dot means recording

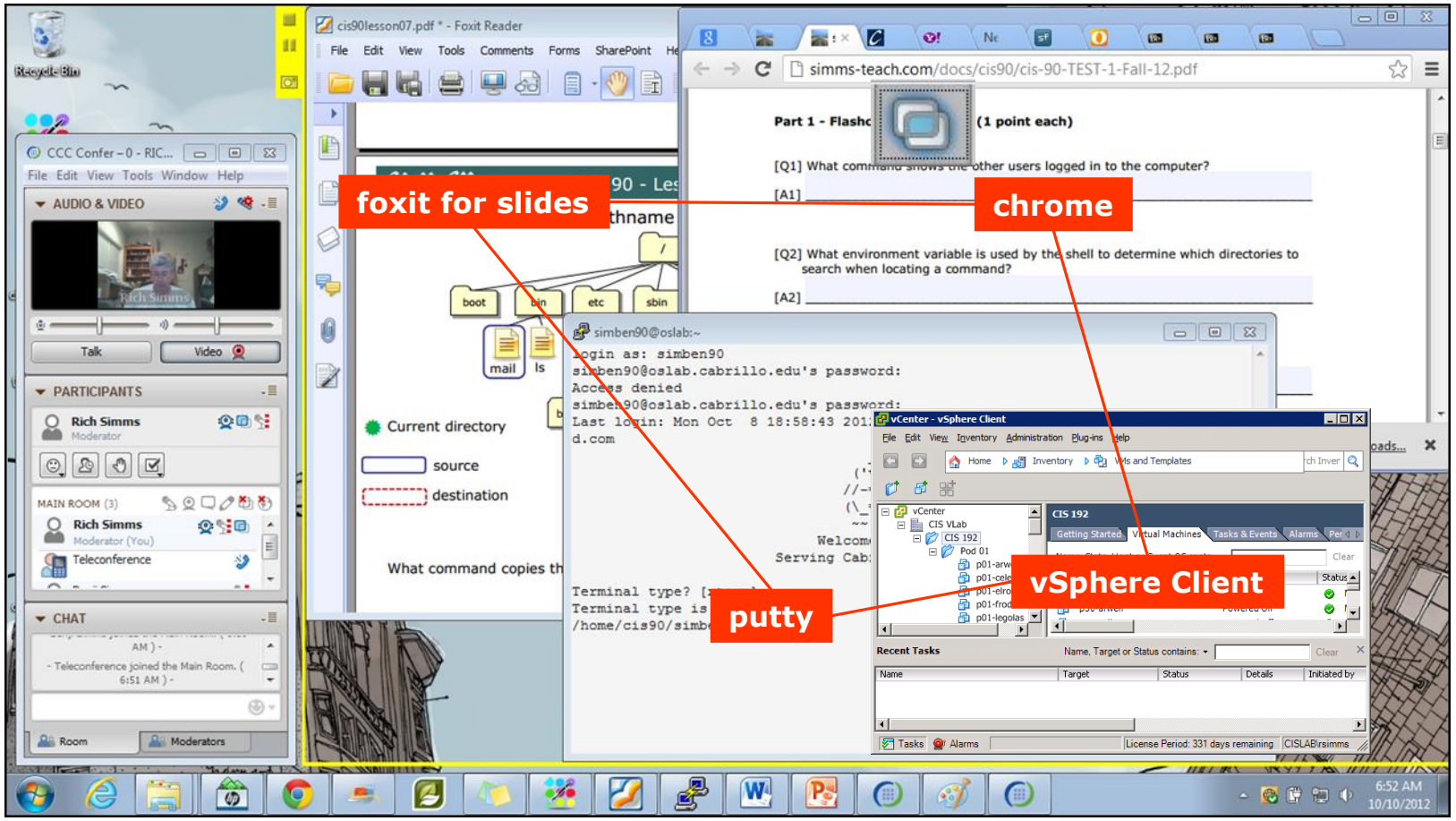
[ ] Use teleconferencing, not mic

Should be grayed out



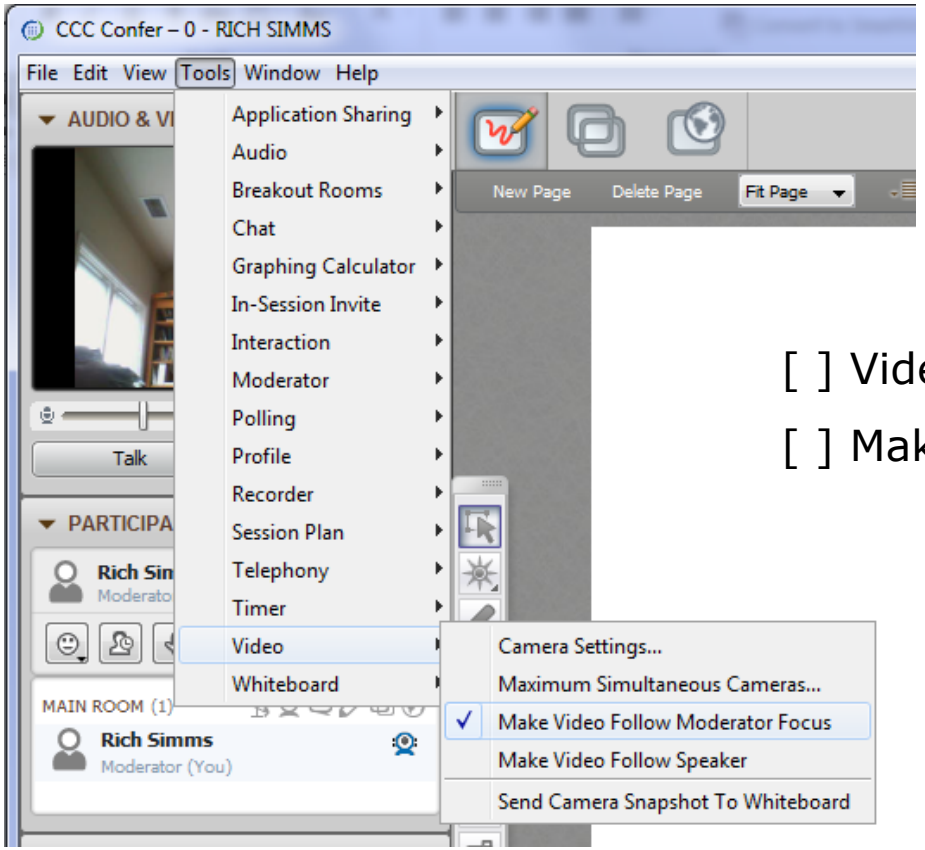
Should change from phone handset icon to little Microphone icon and the Teleconferencing … message displayed

Rich's CCC Confer checklist - screen layout



[ ] layout and share apps

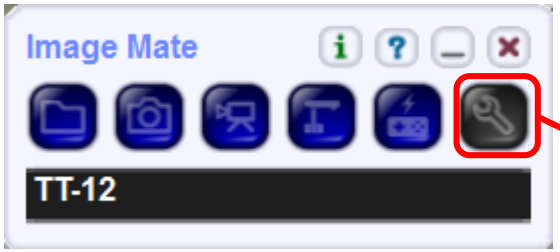
Rich's CCC Confer checklist - webcam setup

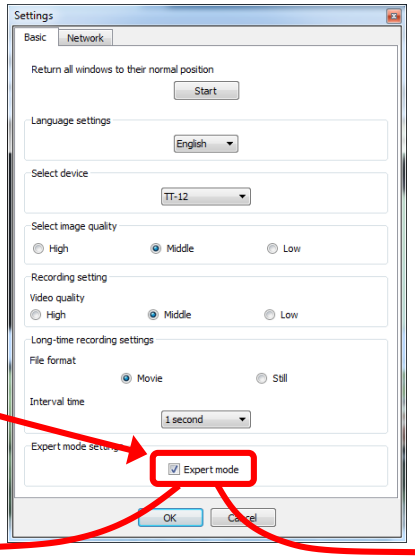


[ ] Video (webcam)

[ ] Make Video Follow Moderator Focus

Rich's CCC Confer checklist - Elmo



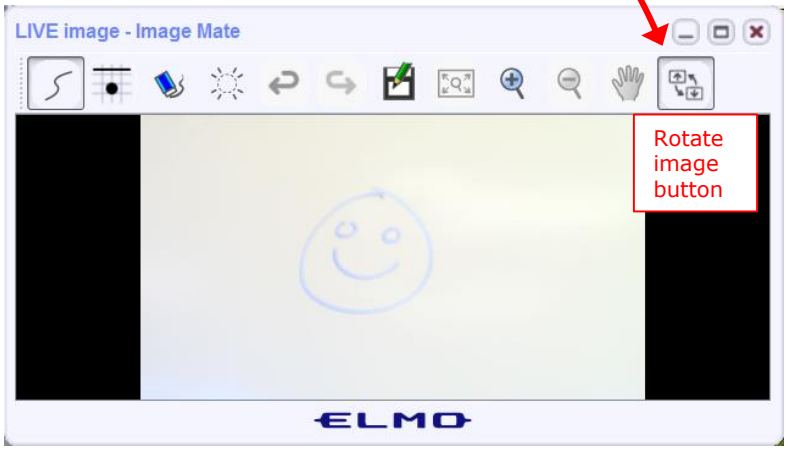


The "rotate image" button is necessary if you use both the side table and the white board.

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



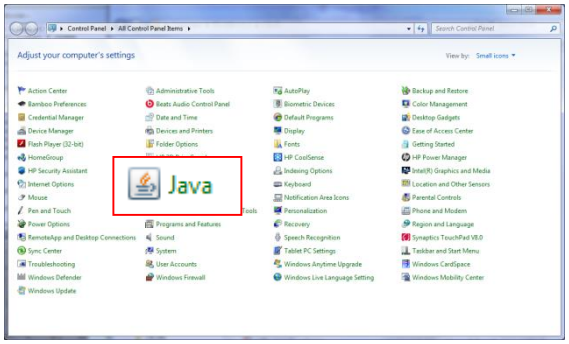
Run and share the Image Mate program just as you would any other app with CCC Confer

Rich's CCC Confer checklist - universal fixes

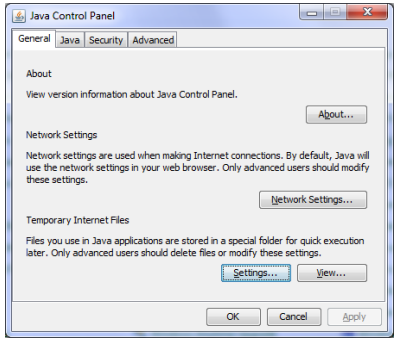
Universal Fix for CCC Confer:

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

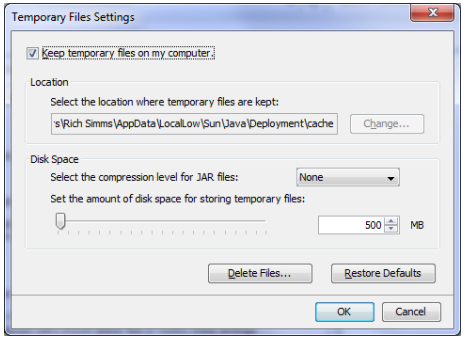
Control Panel (small icons)



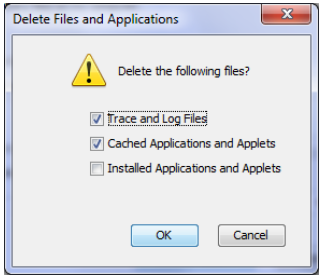
General Tab > Settings…



500MB cache size

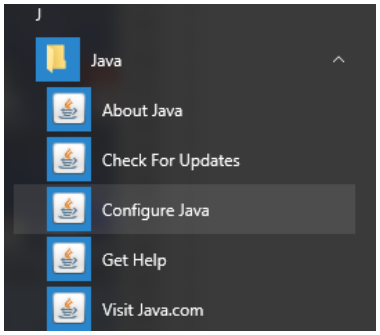


Delete these

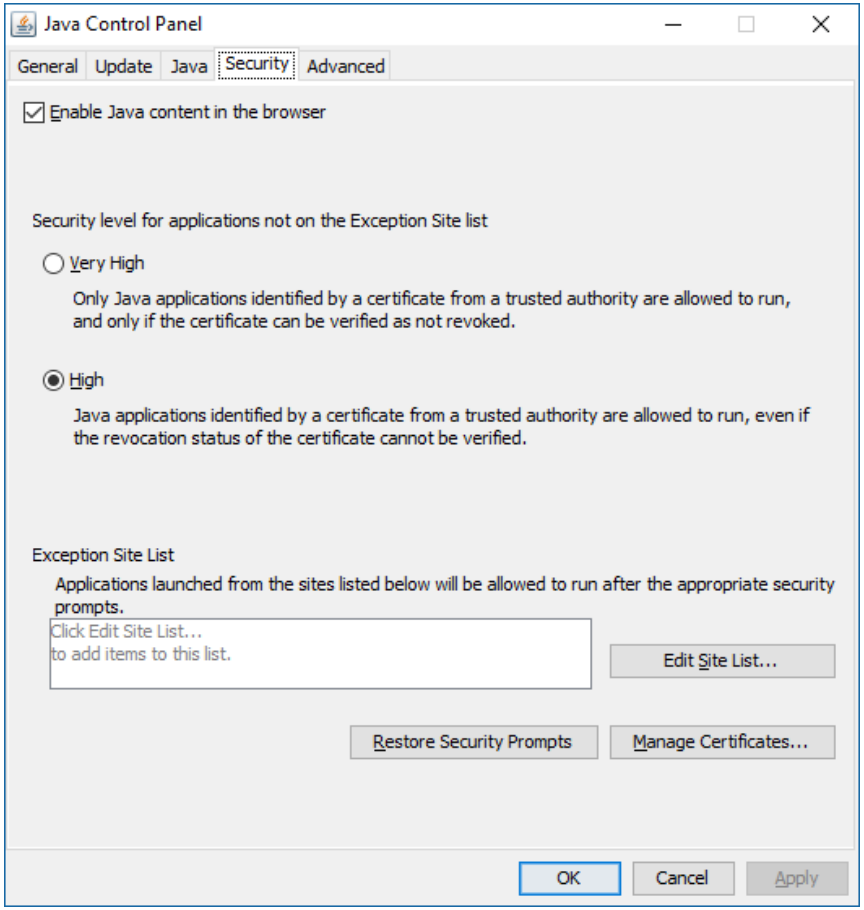


Google Java download

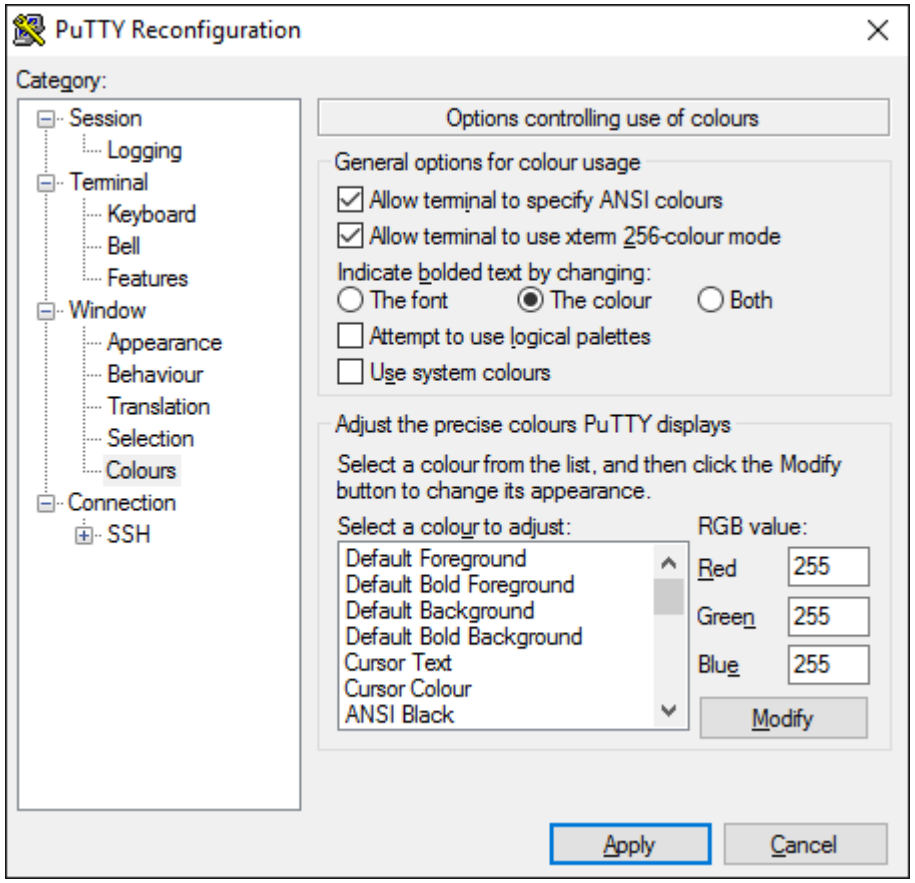
Rich's CCC Confer checklist - digital certificate work around



1. Open the Java Control Panel
2. Select the **Security** tab
3. Select **Edit Site List...**
4. Select **Add**
5. Click into the white box next to the red exclamation mark and type **https://na-downloads.elluminate.com**
6. Press OK
7. Press **Continue** on the pop-up message
8. Press OK
9. Access your session or recording once more



Rich's CCC Confer checklist - Putty Colors



http://looselytyped.blogspot.com/2013/02/zenburn-pleasant-color-scheme-for-putty.html

Putty Colors

Default Foreground 255 255 255
Default Bold Foreground 255 255 255
Default Background 51 51 51
Default Bold Background 255 2 85
Cursor Text 0 0 0
Cursor Color 0 255 0
ANSI Black 77 77 77
ANSI Black Bold 85 85 85
ANSI Red 187 0 0
ANSI Red Bold 255 85 85
ANSI Green 152 251 152
ANSI Green Bold 85 255 85
ANSI Yellow 240 230 140
ANSI Yellow Bold 255 255 85
ANSI Blue 205 133 63
ANSI Blue Bold 135 206 235
ANSI Magenta 255 222 173
ANSI Magenta Bold 255 85 255
ANSI Cyan 255 160 160
ANSI Cyan Bold 255 215 0
ANSI White 245 222 179
ANSI White Bold 255 255 255

Start

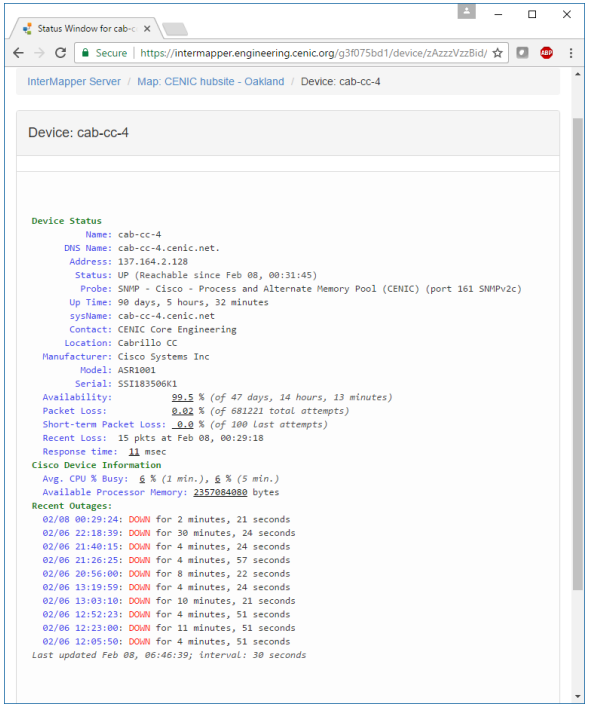
Sound Check

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

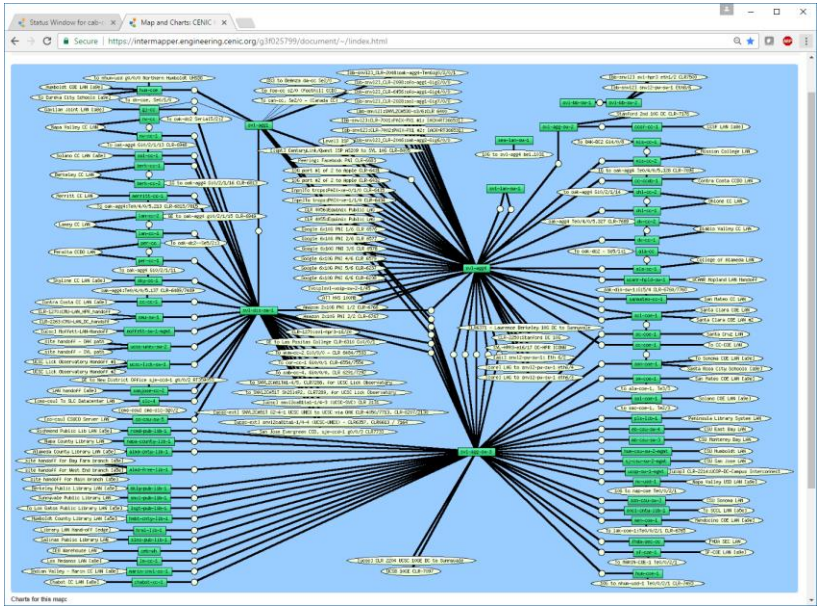
*Instructor can use *96 to mute all student lines.*

Volume
**4 - increase conference volume.*
**7 - decrease conference volume.*
**5 - increase your voice volume.*
**8 - decrease your voice volume.*

Network Check



https://intermapper.engineering.cenic.org/g3f075bd1/device/zAzzzVzzBid/!device.html



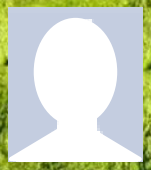
https://intermapper.engineering.cenic.org/g3f025799/document/~/!index.html

CIS 90 - Lesson 3

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

Melissa

Tess


Alex

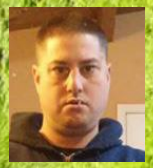
Daniel

Ian J.

Harold

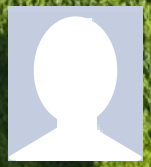
Victor

Jasen


Sam

Steven P.

Ryan


Roberto

Hans

Cristian

Nicholas

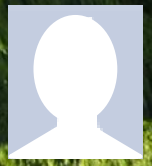
Fritz

Luis

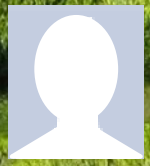
Nigel

Philip

Josh M.


Ian K.

Gracie

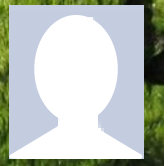

James

Julian

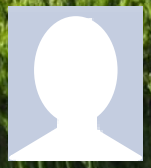
Ken

Joshua V.

Samantha

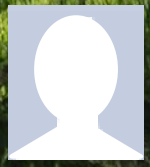

Justin

Ian C.


Venus

Stephen L.

Alison


Dillon

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

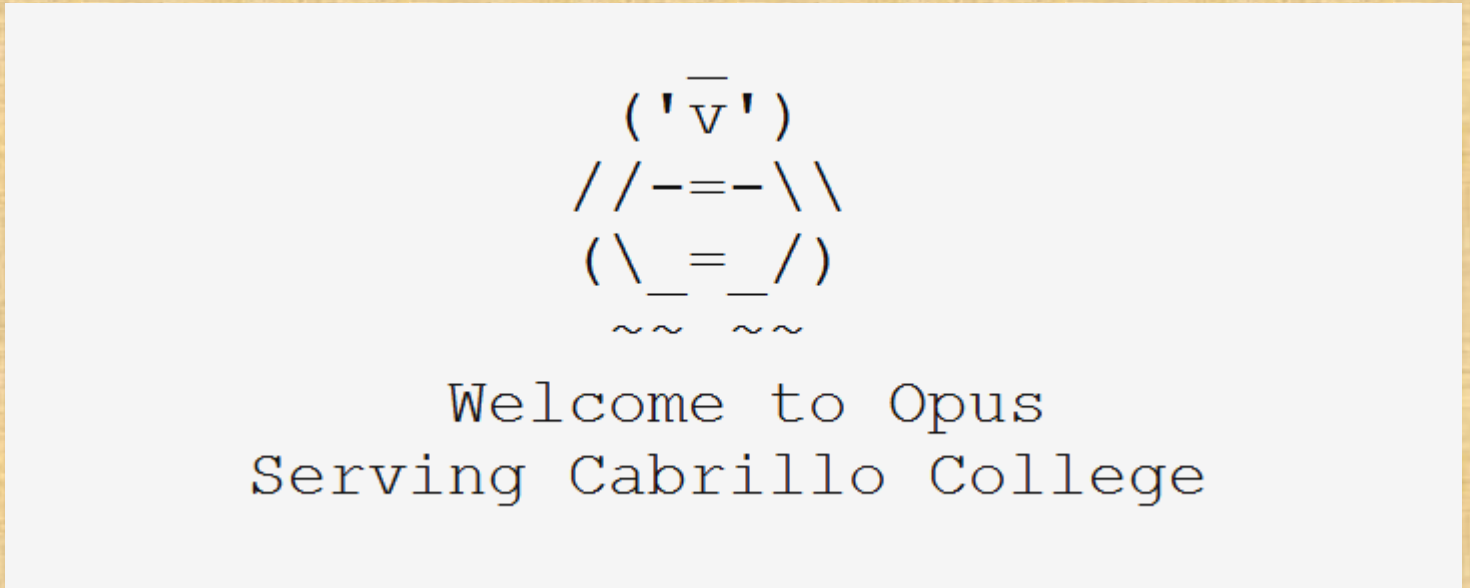
email answers to: risimms@cabrillo.edu

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

Electronic Mail

Objectives	Agenda
• Learn how to use the UNIX communication tools write and mail. • Overview on end-to-end email.	• Quiz • Questions • Subtle stuff • Mini review • Practice questions • Terminals • Housekeeping • Course expectations check • Write command • IRC • Mail basics (send, read, reply, save) • More on mail (forward, docs, headers, delete, folders) • End-to-end email • Other MUAs, MTAs, DA and AAs • Wrap up

Class Activity



If you haven't already, log into Opus

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.*

The slippery slope

1) If you didn't submit Lab 1 then contact me ASAP if you would like some extra help getting started in the course.

2) If you didn't submit Quiz 1 contact me if you are not sure how quizzes work.

3) If you didn't send me the student survey assigned in Lesson 1 then please send it to me or contact me if your are running into issues using the PDF form.

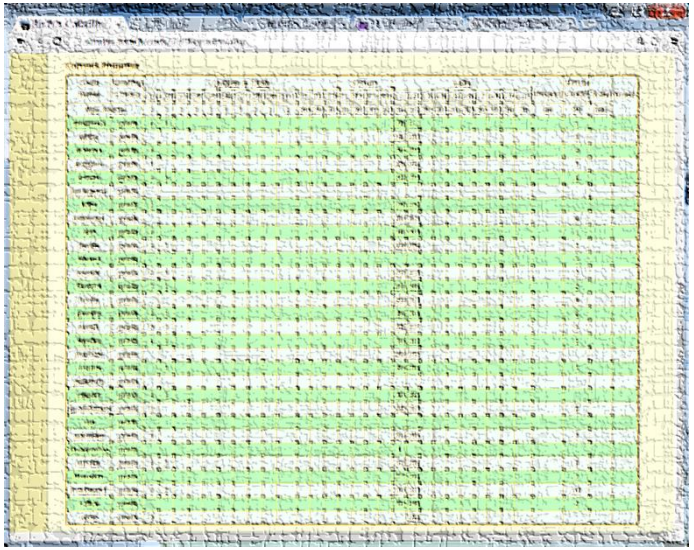
Please don't fall behind in the course

Email: risimms@cabrillo.edu

Monitoring your grades

Send me your survey to get your LOR code name.

The CIS 90 website



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

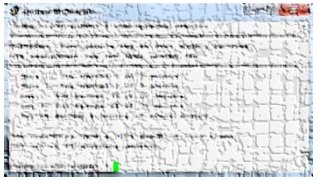
Percentage	Total Points	Letter Grade	Pass/No Pass
90% or higher	504 or higher	A	Pass
80% to 89.9%	448 to 503	B	Pass
70% to 79.9%	392 to 447	C	Pass
60% to 69.9%	336 to 391	D	No pass
0% to 59.9%	0 to 335	F	No pass

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

On Opus

checkgrades *codename*

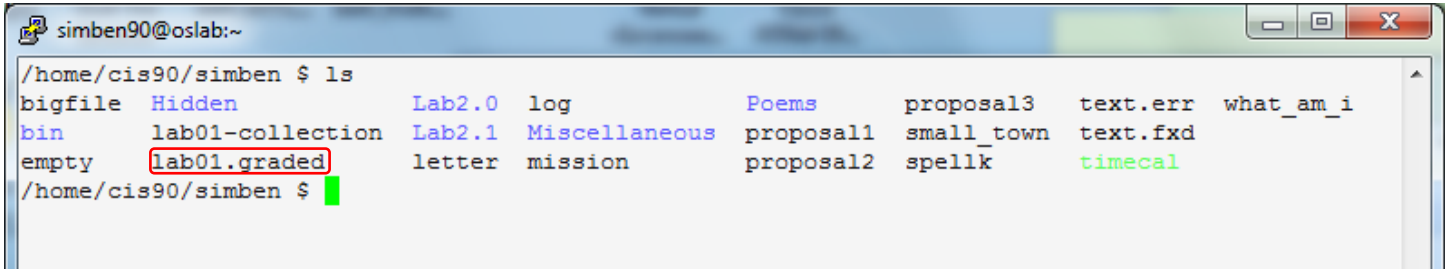
(where codename is your LOR codename)



Written by Jesse Warren a past CIS 90 Alumnus

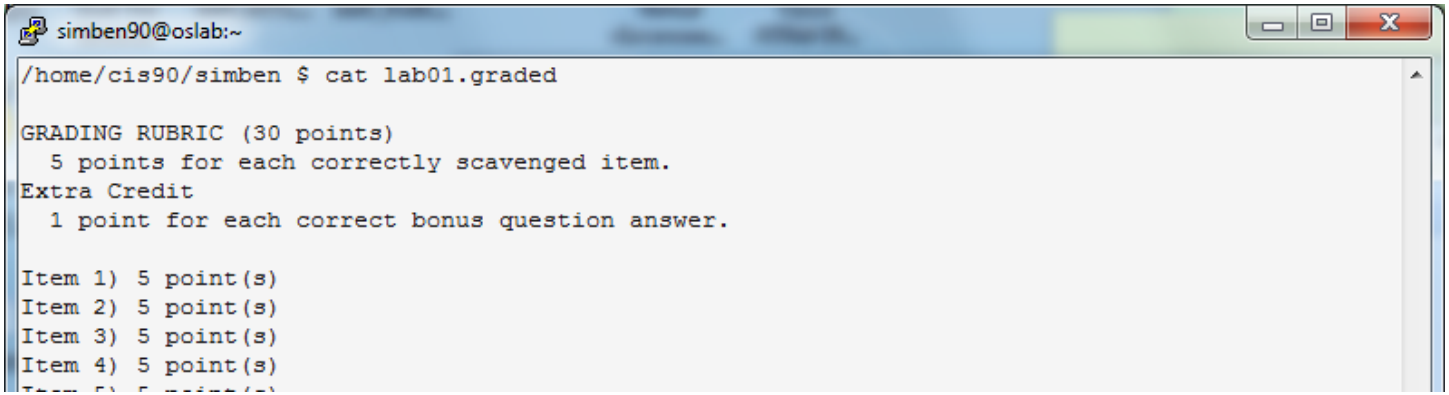
Graded work is copied to your home directories

ls



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

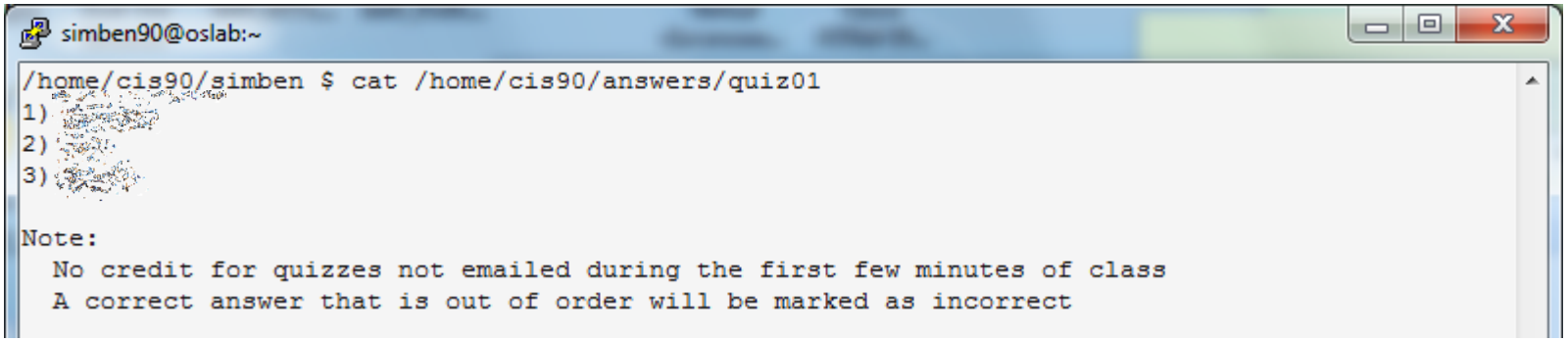
cat lab01.graded



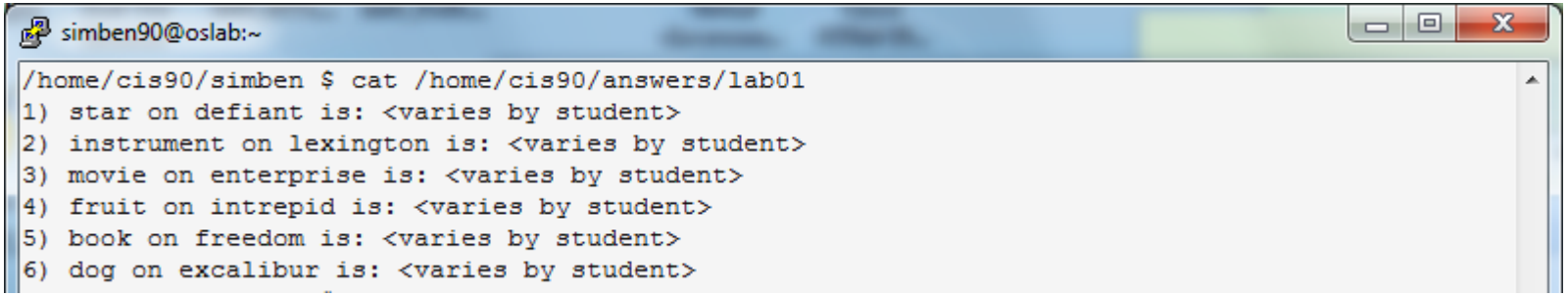
*Be sure to scroll back to the beginning of the **cat** output*

The answers/ directory on Opus

cat /home/cis90/answers/quiz01



cat /home/cis90/answers/lab01



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

Subtle Stuff

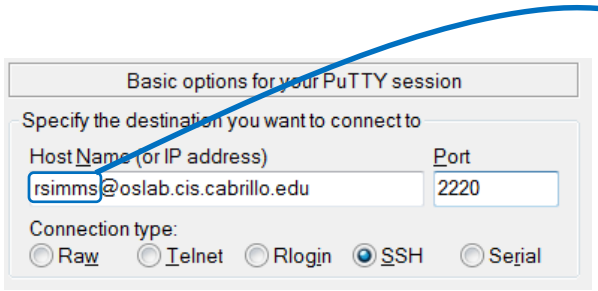
Who else is logged in?

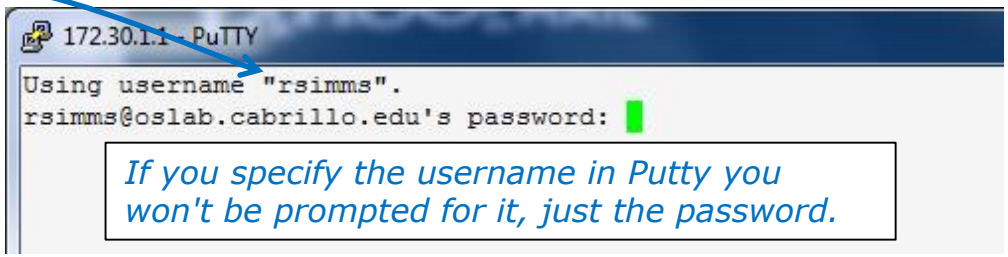
```
[rsimms@excalibur ~]$ who
simben90 :0           2015-09-16 08:36 (:0)
jadzia   pts/0        2015-09-16 08:41 (freedom.cis.cabrillo.edu)
rsimms   pts/1        2015-09-16 08:36 (opus.cis.cabrillo.edu)
worf     pts/3        2015-09-16 08:42 (2601:647:cb02:9eed:78d1:ef8f:7225:43e5)
simben90 pts/2        2015-09-16 08:38 (:0)
[rsimms@excalibur ~]$
```

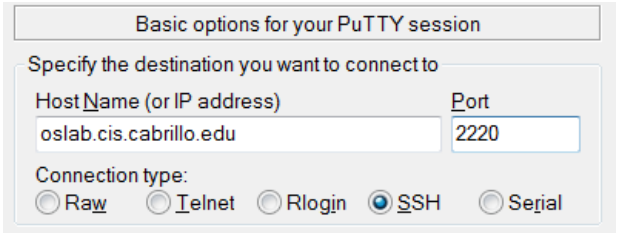
```
[rsimms@excalibur ~]$ who -Hu
NAME     LINE         TIME             IDLE          PID COMMENT
simben90 :0           2015-09-16 08:36   ?         13924 (:0)
jadzia   pts/0        2015-09-16 08:41 00:01       15092 (freedom.cis.cabrillo.edu)
rsimms   pts/1        2015-09-16 08:36   .         14270 (opus.cis.cabrillo.edu)
worf     pts/3        2015-09-16 08:42   .         15181 (2601:647:cb02:9eed:78d1:ef8f:7225:43e5)
simben90 pts/2        2015-09-16 08:38 00:02       14876 (:0)
[rsimms@excalibur ~]$
```

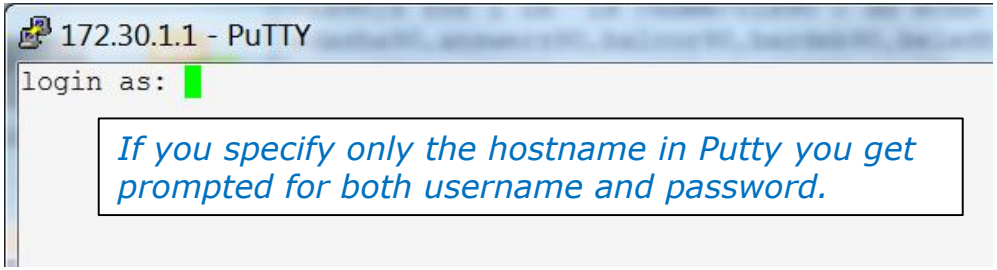
```
[rsimms@excalibur ~]$ w
 08:43:17 up 11 days, 10:10,  5 users,  load average: 0.02, 0.14, 0.13
USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
simben90 :0        08:36   ?xdm?  13:51   0.33s gdm-session-worker [pam/gdm-password]
jadzia   pts/0      08:41    1:44   0.03s  0.03s -bash
rsimms   pts/1      08:36    5.00s  0.04s  0.00s w
worf     pts/3      08:42    5.00s  0.02s  0.00s ping netlab.cis.cabrillo.edu
simben90 pts/2      08:38    2:53   0.35s  0.32s top
[rsimms@excalibur ~]$
```

Putty to:
rsimms@oslab.cis.cabrillo.edu
vs **oslab.cis.cabrillo.edu**









Tip: Use the Putty "Saved Sessions" for your Opus connection. Then you don't have to type in the username, hostname and port number each time you connect to Opus.

ssh arya-*xx* vs **ssh cis90@arya-*xx***

(your Opus accounts are NOT on the Arya systems)

simben90@oslab:~

```
/home/cis90/simben $ ssh arya-35
simben90@arya-35's password:
Permission denied, please try again.
simben90@arya-35's password:
Permission denied, please try again.
simben90@arya-35's password:
Permission denied (publick
/home/cis90/simben $
```

*Benji is logged in as simben90 on Opus tries and fails to **ssh** into Arya-35 as simben90*

cis90@Arya-35: ~

```
/home/cis90/simben $ ssh cis90@arya-35
cis90@arya-35's password:
Welcome to Ubuntu 14.04.1 LTS (GNU/Linux 3.13.0-35-generic x86_64)

 * Documentation:  https://help.ubuntu.com/
```

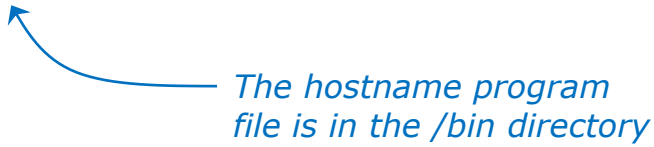
*Benji is logged in as simben90 on Opus tries and succeeds to uses **ssh** into Arya-35 as cis90*

*If you don't specify the username the **ssh** command will use the username you are currently logged in as. This account may not exist on the remote system!*

type and man caveats

Usually, to find the location of a command on your path, use the **type** command:

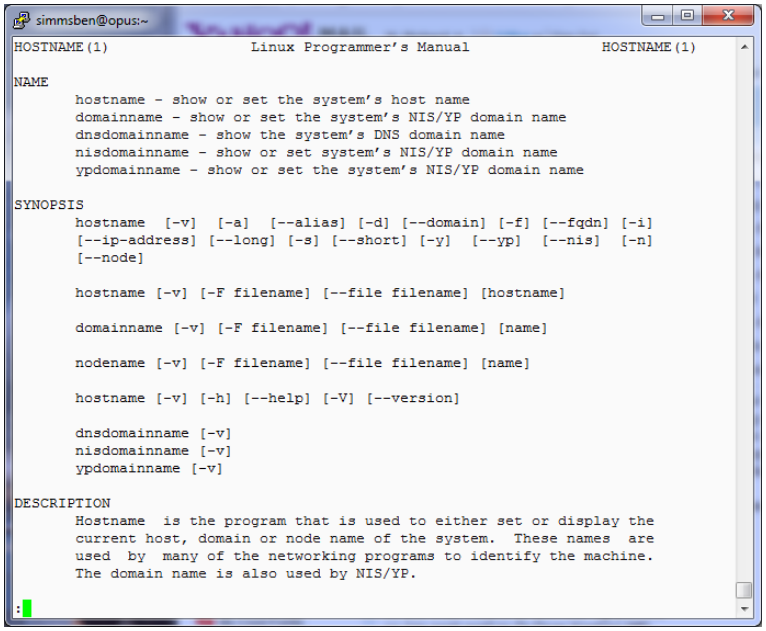
```
/home/cis90/simben $ type hostname
hostname is /bin/hostname
```



type and man caveats

Usually, to find the manual page for a command, use the **man** command:

```
/home/cis90/simben $ man hostname
```



Command Review

However,

Sometimes you may get something different than expected with the **type** and **man** commands

type and man caveats

```
/home/cis90/simmsben $ type ls
ls is aliased to `ls --color=tty'
```

If the command is an alias (which we will learn about later) the type command by default doesn't show where the command resides on the path

```
/home/cis90/simmsben $ type -a ls
ls is aliased to `ls --color=tty'
ls is /bin/ls
```

*To get around that use the **-a** option*

The ls program file resides in the /bin directory

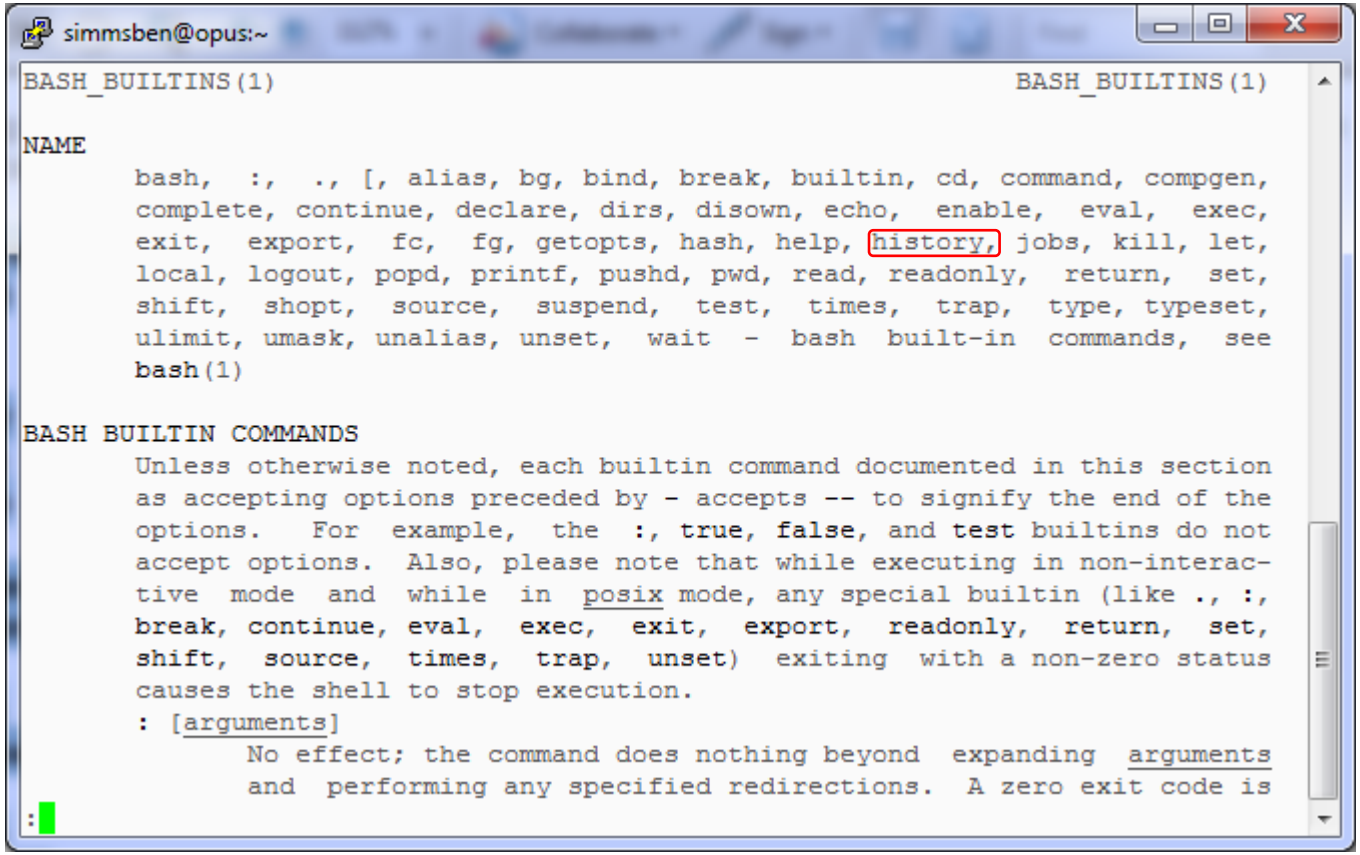
*The **ls** command is aliased, use the **-a** option on the **type** command to find where the command resides on the path*

type and man caveats

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

*The **history** command is built into the shell and does not have its own program file*

```
/home/cis90/simben $ man history
```



*The **history** command does not have its own man page either!*

… but it is included in the man page for bash builtins

Either scroll down or use /history

Path
(from Lesson 2)

Life without a path

https://simms-teach.com/docs/cis90/cis90-life-with-no-path.pdf

Mini Review

Expectation Check

Commands you should understand and be comfortable using

Lesson/Lab 1		Lesson/Lab 2	
Commands	**Files & Directories**	**Commands**	**Files & Directories**
cal clear date exit history hostname id ps ssh uname tty who who am i	/etc/issue /etc/*-release	apropos banner bash bc cat cd echo env file finger info file ls passwd set type man whatis	/bin /usr/bin /sbin /usr/sbin /etc/passwd /etc/shadow

If you have any questions on these commands, post a question on the forum!

Class Activity

In what file are all the encrypted passwords kept?

Put your answer in the chat window

ssh command

Syntax:

ssh -p *port username*@*hostname*

Examples:

```
ssh -p 2220 simben90@son-of-opus.simms-teach.com
ssh -p 22 cis90@rhea.cishawks.net
```

Syntax shortcuts:

- If the port is 22, then it does not need to be specified.
- If the username is the same on the remote system it can be left off.
- If domain suffixes are automatically added they can be left off.

For example Benji could use any of the commands below to log into daughter-of-opus from Opus:

```
ssh -p 22 simben90@daughter-of-opus.cis.cabrillo.edu
ssh simben90@daughter-of-opus.cis.cabrillo.edu
ssh daughter-of-opus.cis.cabrillo.edu
ssh daughter
```

The ssh command is used to log into a remote system

Class Activity

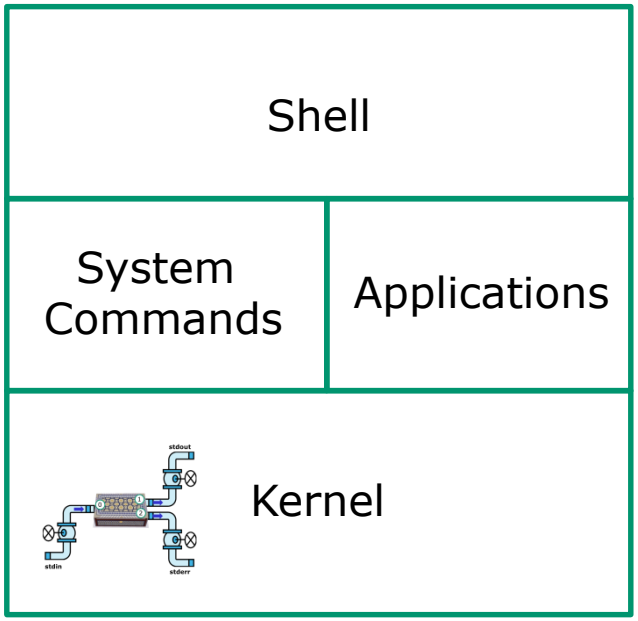
ssh to the Rhea system (port 22) and login as the cis90 user.

What terminal device are you using on Rhea?

Put your answer in the chat window

Key components of the Linux/UNIX architecture

Users interact with the shell to run commands



Commands such as ls, cal, date, tty, id, who, etc.

Web servers, databases, word processors, etc.

The kernel manages processes, memory, file system, and the network stack and interacts with all the hardware components

Class Activity

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

What kernel is running on Rhea?

Put your answer in the chat window

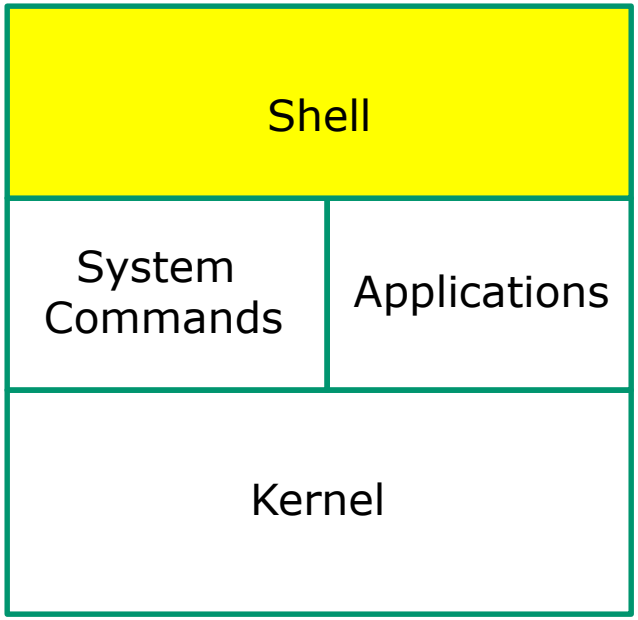
Class Activity

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

What shell is running on Rhea?

Put your answer in the chat window

Life of the Shell



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

Class Activity

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

As the cis90 user on Rhea enter this command:

```
ls -lt /usr/games
```

How many directories on the path did the shell have to search to locate the command used above?

Put your answer in the chat window?

Class Activity

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

As the cis90 user on Rhea enter this command:

```
ls -z /bin
```

Which program, ls or the shell, output the error message?

Put your answer in the chat window?

Class Activity

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

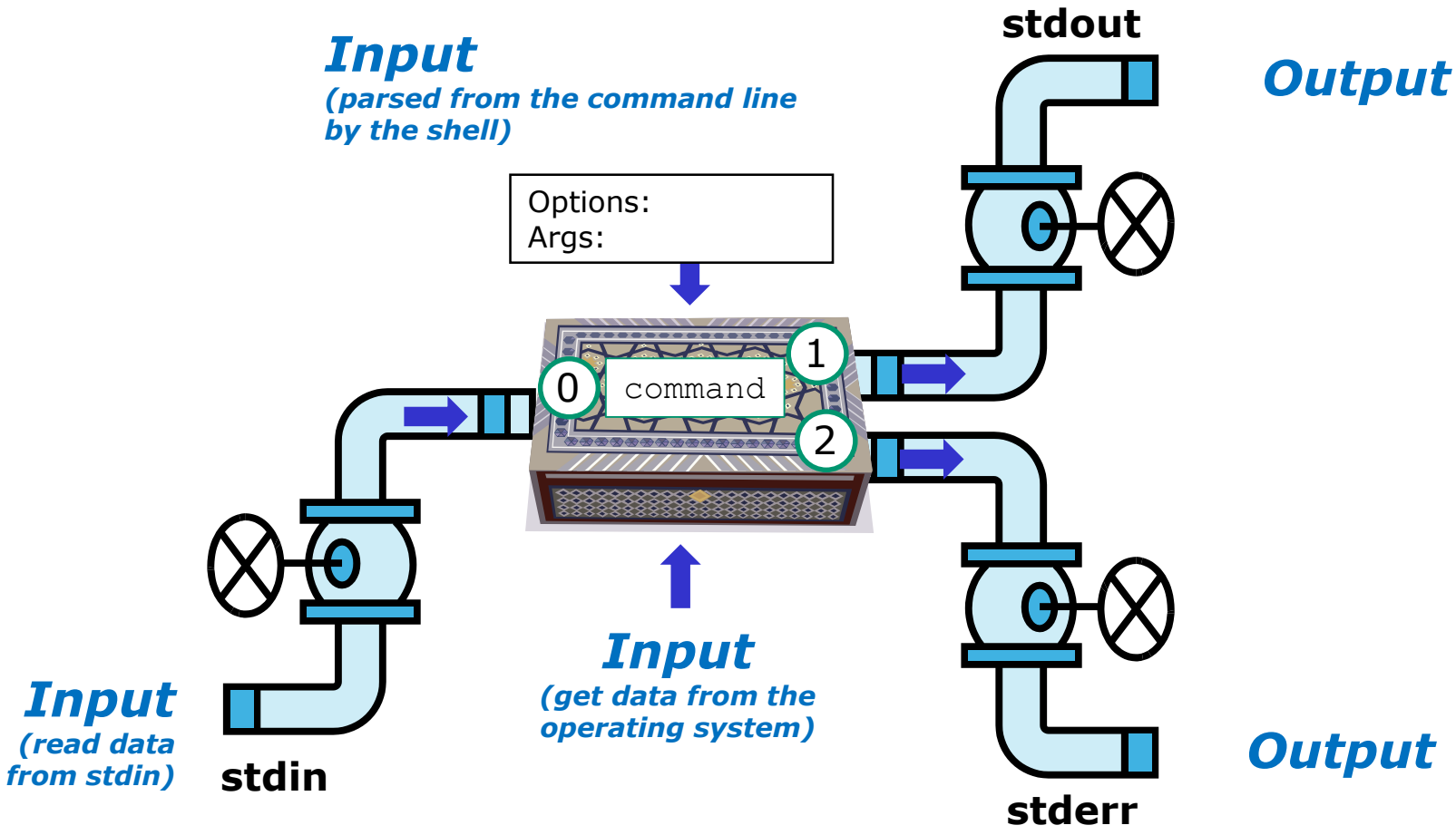
As the cis90 user on Rhea enter this command:

```
lls -z /bin
```

Which program, ls or the shell, output the error message?

Put your answer in the chat window?

Inputs and Outputs



NEW *The three file descriptors provided to every process are named **stdin**, **stdout** and **stderr***

Class Activity

As the cis90 user on Rhea enter this command:

```
banner Hola
```

Where does the **banner** command on Rhea get it's input from?

a) The command line (passed in by the shell)
b) The keyboard (read from stdin)
c) The operating system

Put your answer in the chat window

Answer

In what file are all the encrypted passwords kept?

/etc/shadow

Answer

ssh to the Rhea system (port 22) and login as the cis90 user.

What terminal device are you using on Rhea?

```
/home/cis90/simben $ ssh cis90@rhea
Password for cis90@rhea:
Last login: Tue Feb  9 15:32:36 2016 from opus.cis.cabrillo.edu
FreeBSD 10.0-RELEASE-p18 (GENERIC) #0: Wed Feb 25 01:08:00 UTC 2015

__________.__
\______   \  |__   ____ _____
 |       _/  |  \_/ __ \\__  \
 |    |   \   Y  \  ___/ / __ \_
 |____|_  /___|  /\___  >____  /
        \/     \/     \/     \/
< snipped >
$ tty
/dev/pts/0
```

Terminal device will vary by user

Answer

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

What kernel is running on Rhea?

```
/home/cis90/simben $ ssh cis90@rhea
Password for cis90@rhea:
Last login: Tue Feb  9 15:32:36 2016 from opus.cis.cabrillo.edu
FreeBSD 10.0-RELEASE-p18 (GENERIC) #0: Wed Feb 25 01:08:00 UTC 2015

__________.__
\______   \  |__   ____ _____
 |       _/  |  \_/ __ \\__  \
 |    |   \   Y  \  ___/ / __ \_
 |____|_  /___|  /\___  >____  /
        \/     \/     \/     \/
< snipped >
$ uname
FreeBSD
```

Free BSD kernel

Class Activity

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

What shell is running on Rhea?

```
/home/cis90/simben $ ssh cis90@rhea
Password for cis90@rhea:
Last login: Wed Feb  8 06:54:35 2017 from opus.cis.cabrillo.edu
FreeBSD 10.0-RELEASE-p18 (GENERIC) #0: Wed Feb 25 01:08:00 UTC 2015

__________.__
\______   \  |__   ____ _____
 |       _/  |  \_/ __ \\__  \
 |    |   \   Y  \  ___/ / __ \_
 |____|_  /___|  /\___  >____  /
        \/     \/     \/     \/

< snipped >
$ echo $SHELL
/bin/sh
$ ps
  PID TT  STAT    TIME COMMAND
 4999  0  Ss   0:00.00 -sh (sh)
 5001  0  R+   0:00.00 ps
$
```

The sh (Bourne shell) is running on Rhea

Answer

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

As the cis90 user on Rhea enter this command:

```
ls -lt /usr/games
```

How many directories on the path did the shell have to search to locate the command used above?

```
$ type ls
ls is /bin/ls
$ echo $PATH
/sbin:/bin:/usr/sbin:/usr/bin:/usr/games:/usr/local/sbin:/usr/local/bin:/home/cis90/bin
```

The shell had to search two directories. The first was /sbin and the second was /bin.

Class Activity

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

As the cis90 user on Rhea enter this command:

```
ls -z /bin
```

Which program, ls or the shell, output the error message?

```
$ ls -z /bin
ls: illegal option -- z
usage: ls [-ABCFGHILPRSTUWZabcdfghiklmnopqrstuwxy1,] [-D format] [file ...]
$
```

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

The ls command, during the execute step, output the error message.

Class Activity

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

As the cis90 user on Rhea enter this command:

```
lls -z /bin
```

Which program, ls or the shell, output the error message?

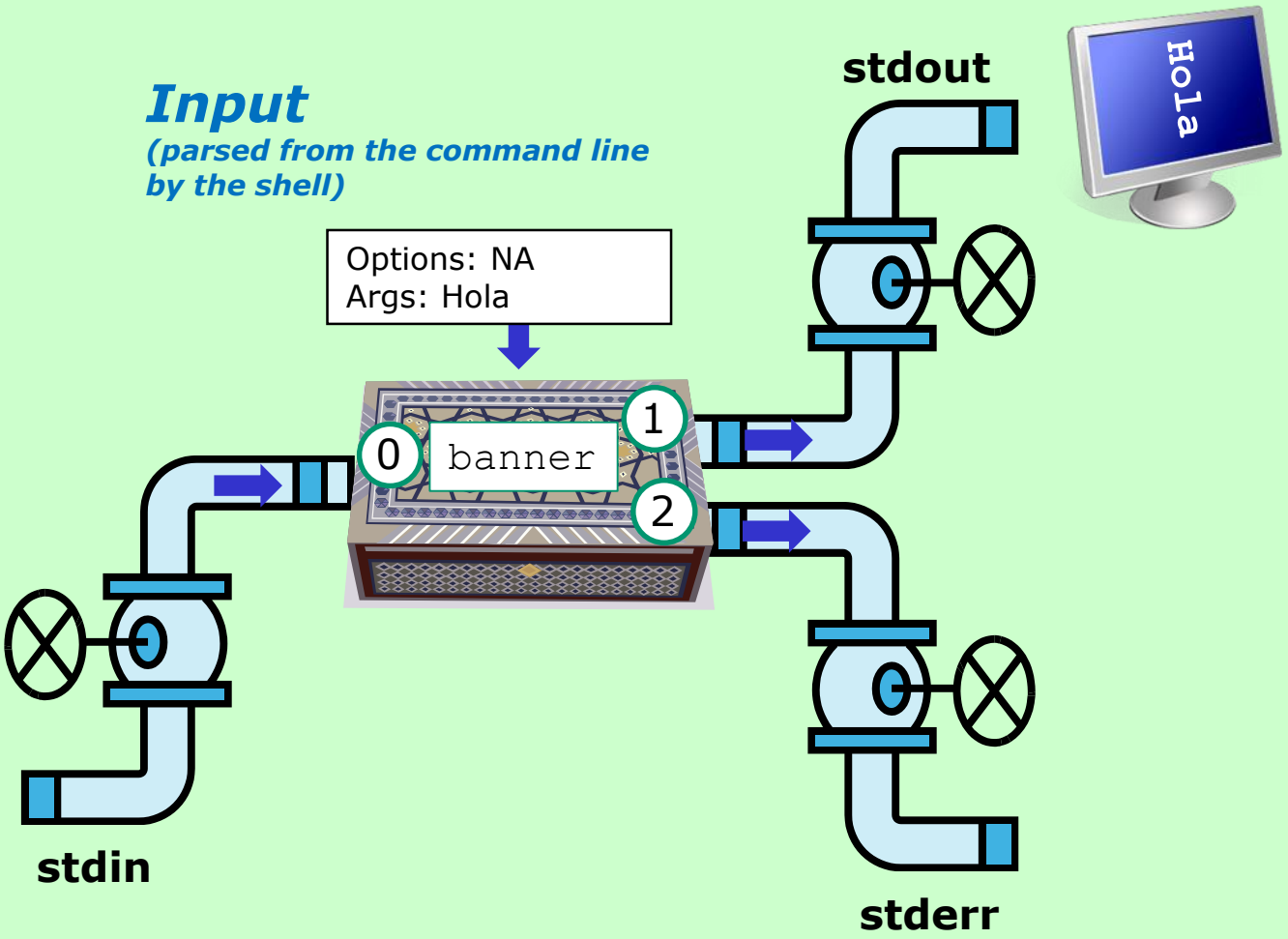
```
$ lls -z /bin
lls: not found
$
```

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

The shell, during the search step, output the error message.

Answer

$ **banner Hola**



*The **banner** command is an example of a command that gets its input from the command line*

Practice Questions sun-hwa-iii

My favorite ice cream shop

Source: http://attractions.uptake.com/blog/files/2008/10/dsc_0002.jpg

Practice Test Questions

Return back to Opus.

What command could be used on Opus to log into this remote system:

hostname: sun-hwa-iii.cis.cabrillo.edu

username: *same as your Opus username*

port: 22

Write your command in the chat window

Practice Test Questions

Log into sun-hwa-iii and run the **icecream** command.

Copy your ice cream flavor into the chat window.

Practice Test Questions

On Sun-Hwa-III, is the **icecream** command on your path?

Write your answer in the chat window

Practice Test Questions

On Sun-Hwa-III, what kind of a file is the **icecream** command?

Write your answer in the chat window

Practice Test Questions

On Sun-Hwa-III, how many directories does the shell have to search to locate the **icecream** command on your path?

Write your answer in the chat window

Practice Test Questions

Is **icecream** a standard UNIX command?

Write your answer in the chat window

Practice Test Questions

Is Sun-Hwa-iii a Linux or UNIX system?

Write your answer in the chat window

Practice Test Questions

What distro has been installed on Sun-Hwa-iii?

Write your answer in the chat window

Answer

1) What command could be used on Opus to log into this remote system:

hostname: sun-hwa-iii.cis.cabrillo.edu

username: *same as your Opus username*

port: 22

Answer: **ssh sun-hwa-iii**

Answer

On Sun-Hwa-III, is the **icecream** command on your path? If so what directory is it in?

If the shell can find it when you run it then it is on your path!

```
[simben90@sun-hwa-iii ~]$ icecream

  Welcome to Sun-Hwa-III Benji!
  You get 10-20 icecream today.
  Hope you like it. Have a great day!
```

*Use the **type** command to find the first directory on your path containing the command*

```
[simben90@sun-hwa-iii ~]$ type icecream
icecream is /usr/local/bin/icecream
[simben90@sun-hwa-iii ~]$
```

Answer: YES, the **icecream** command is in the */usr/local/bin* directory

Answer

On Sun-Hwa-III, what kind of file is the **icecream** command?

*Use the **file** command to probe and get extended file type information*

```
[simben90@sun-hwa-iii ~]$ file /usr/local/bin/icecream
/usr/local/sbin/icecream: Bourne-Again shell script, ASCII text
executable
[simben90@sun-hwa-iii ~]$
```

Answer: BASH shell script

Answer

On Sun-Hwa-III, how many directories does the shell have to search to locate the **icecream** command on your path?

Echo the PATH environment variable to see the order of the directories on the path

```
simben90@Sun-Hwa-III:~$ type icecream
icecream is hashed (/usr/local/bin/icecream)

simben90@Sun-Hwa-III:~$ echo $PATH
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/g
ames:/usr/local/games
```

*Note the colon character **:** is used to delimit one directory from the next*

Answer: Two

1) /usr/local/sbin
2) /usr/local/bin ⇦

Answer

On Sun-Hwa-III, is **icecream** a standard UNIX command?

*Use the **man** command to see if there is any documentation on **icecream***

```
[simben90@sun-hwa-iii ~]$ man icecream
No manual entry for icecream
See 'man 7 undocumented' for help when manual pages are not available.
```

Answer: NO

Answer

Is Sun-Hwa-iii a Linux or UNIX system?

*Use the **uname** command to show the name of the kernel*

```
[simben90@sun-hwa-iii ~]$ uname
Linux
```

Answer: Linux

Answer

What distro has been installed on Sun-Hwa-iii?

*Use **cat /etc/issue** or **cat /etc/*-release** to show the distro*

```
[simben90@sun-hwa-iii ~]$ cat /etc/issue
Ubuntu 14.04 LTS \n \l
[simben90@sun-hwa-iii ~]$
```

Answer: Ubuntu 14.04

Terminals

Hardware Terminals

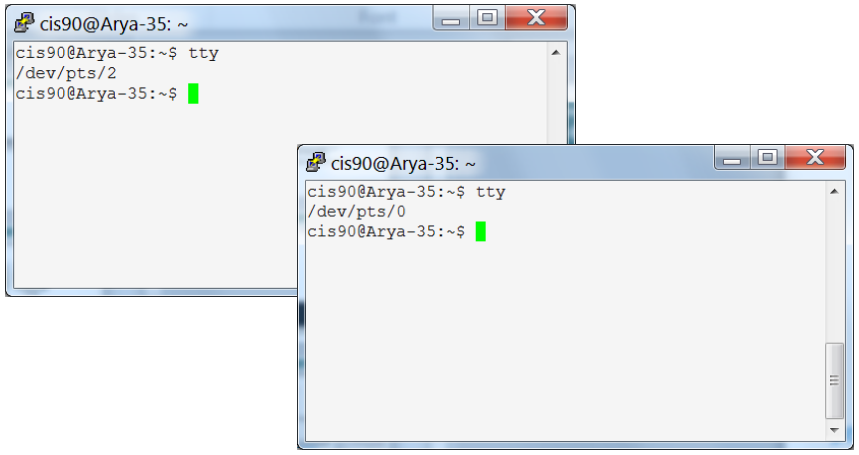
Teletype (TTY)

VT100

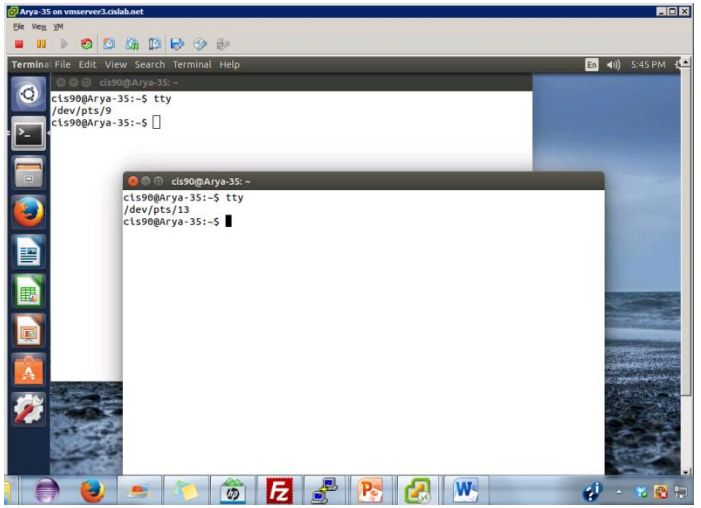
Terminals were used in the old days to interact with "minicomputers" and "mainframe" computers.

Today we use **terminal emulators** instead that are software programs.

Software Terminals

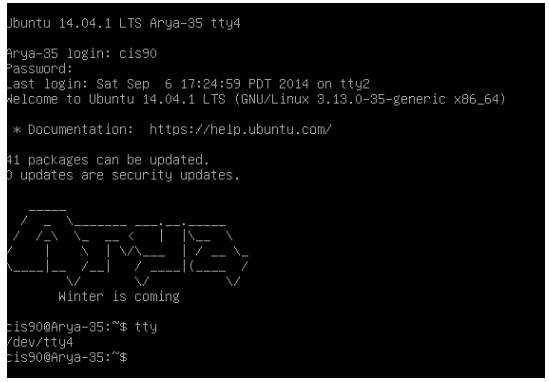


Terminal emulators like PuTTY (with scroll bars, colors, customizable backgrounds, fonts and sizes) for Windows



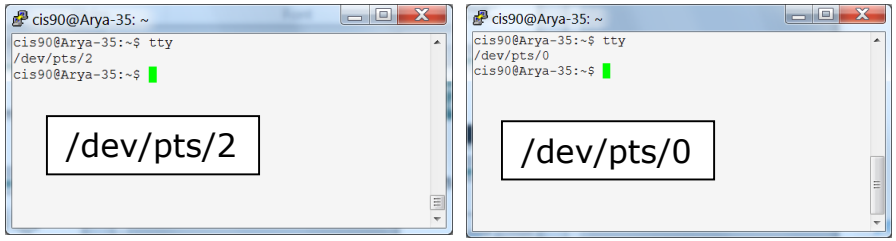
Graphical terminals (with scroll bars, colors, customizable backgrounds, fonts and sizes) built into Linux/Mac computers

Virtual terminals
(use ctrl-alt-fn)
Bare bones, no scroll bars, also called a console



Various terminal devices on an Arya VM

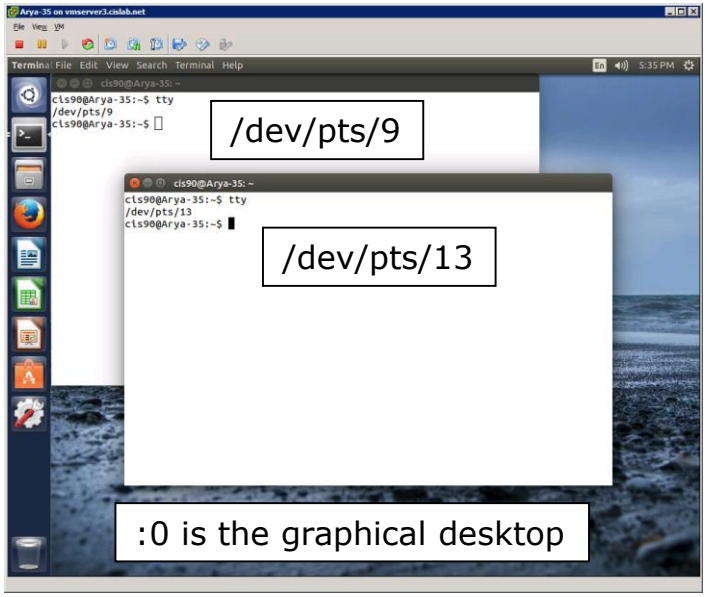
Terminal emulators (e.g. Putty)




```
cis90@Arya-35:~$ who
cis90    tty4         2014-09-06 17:25
cis90    tty2         2014-09-06 17:25
cis90    pts/2        2014-09-06 17:20 (enterprise.cis.cabrillo.edu)
cis90    :0           2014-09-06 17:20 (:0)
cis90    pts/0        2014-09-06 17:21 (2601:9:6680:53b:4d09:e2b6:e7fc:d999)
cis90    pts/9        2014-09-06 17:22 (:0)
cis90    pts/13       2014-09-06 17:23 (:0)
```

pts=pseudo terminal,
tty=teletype
:n=an X window display number

Graphical terminals on graphical desktop



Virtual terminals

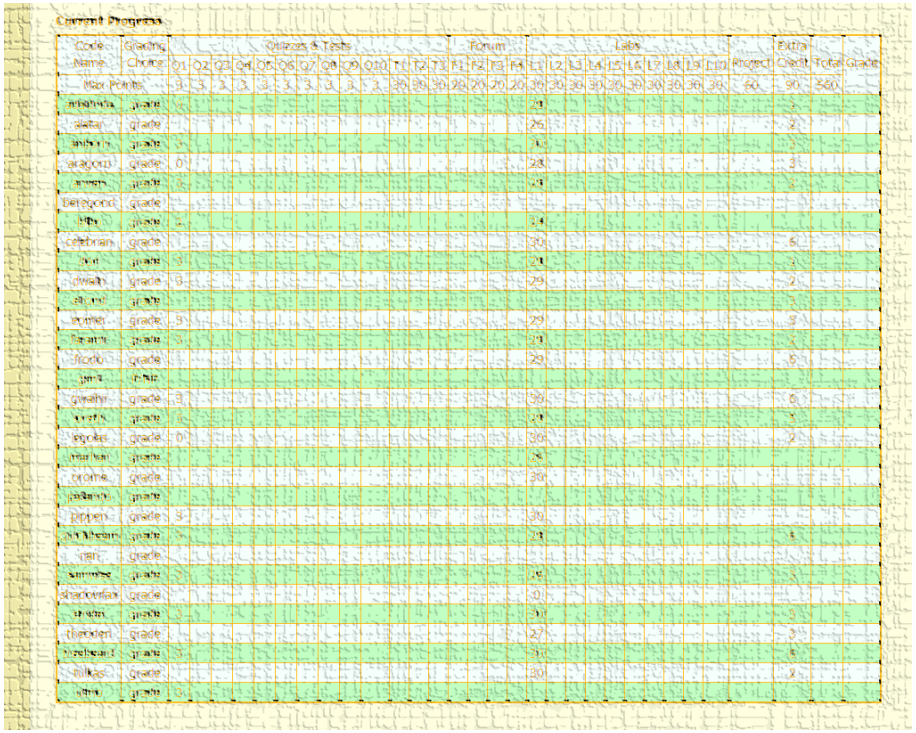
Housekeeping

Lab 2 due tonight

- Use **history -a** before every **submit.**
  - If you neglect to do this, the history snapshot you send me to grade will not have the latest commands you issued.
- Submit as many times as you wish up to 11:59PM Opus time. You must submit your work to get credit.
- No credit for late work. Submit what you have for partial credit if you run out of time.
- You can optionally use the **verify** command to see what you submitted for grading.
  - To grade, I will check your submitted history to see if you used all the commands asked for in Lab 2 as well as your answers to the three questions.

Grades posted on website

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



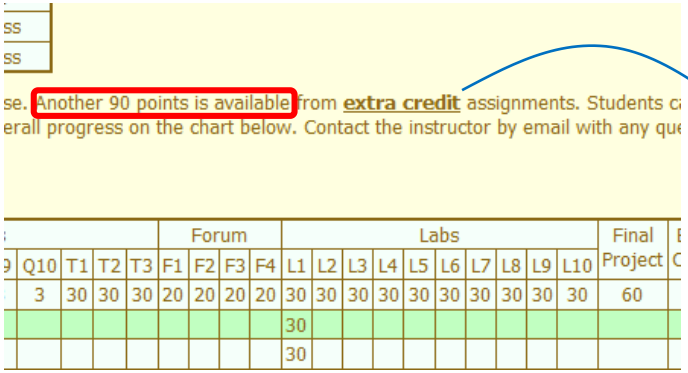
Please check your grades and grading option (grade are pass/nopass) is correct.

Send me your student survey from Lesson 1 to get your code name.

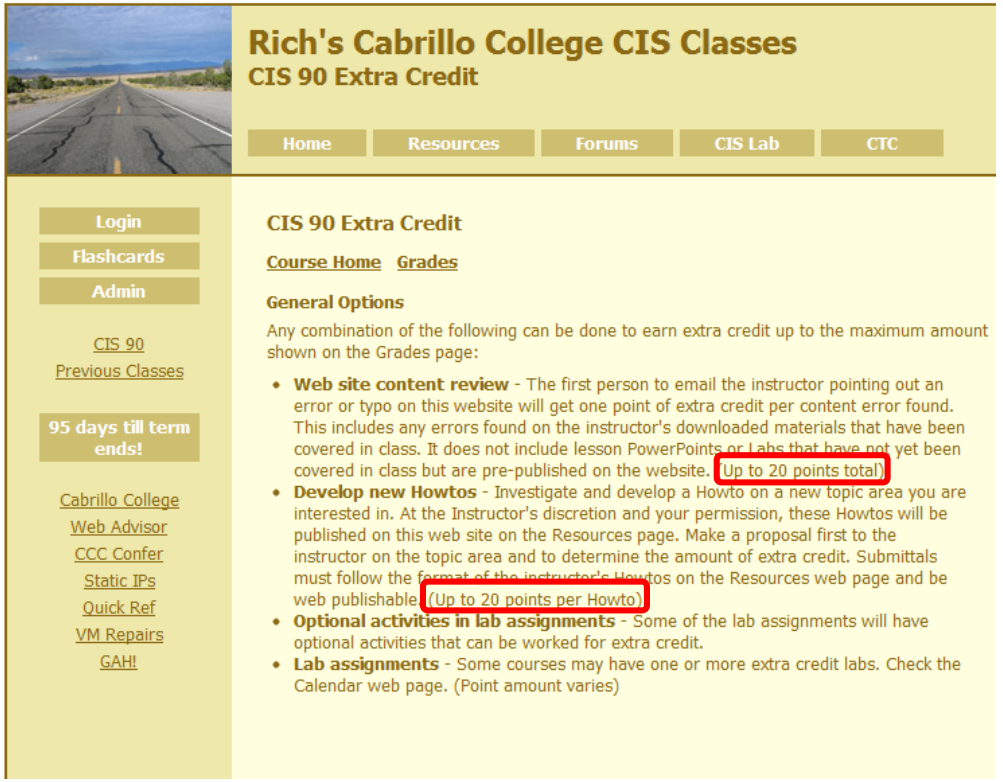
Percentage	Total Points	Letter Grade	Pass/No Pass
90% or higher	504 or higher	A	Pass
80% to 89.9%	448 to 503	B	Pass
70% to 79.9%	392 to 447	C	Pass
60% to 69.9%	336 to 391	D	No pass
0% to 59.9%	0 to 335	F	No pass

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

Extra Credit

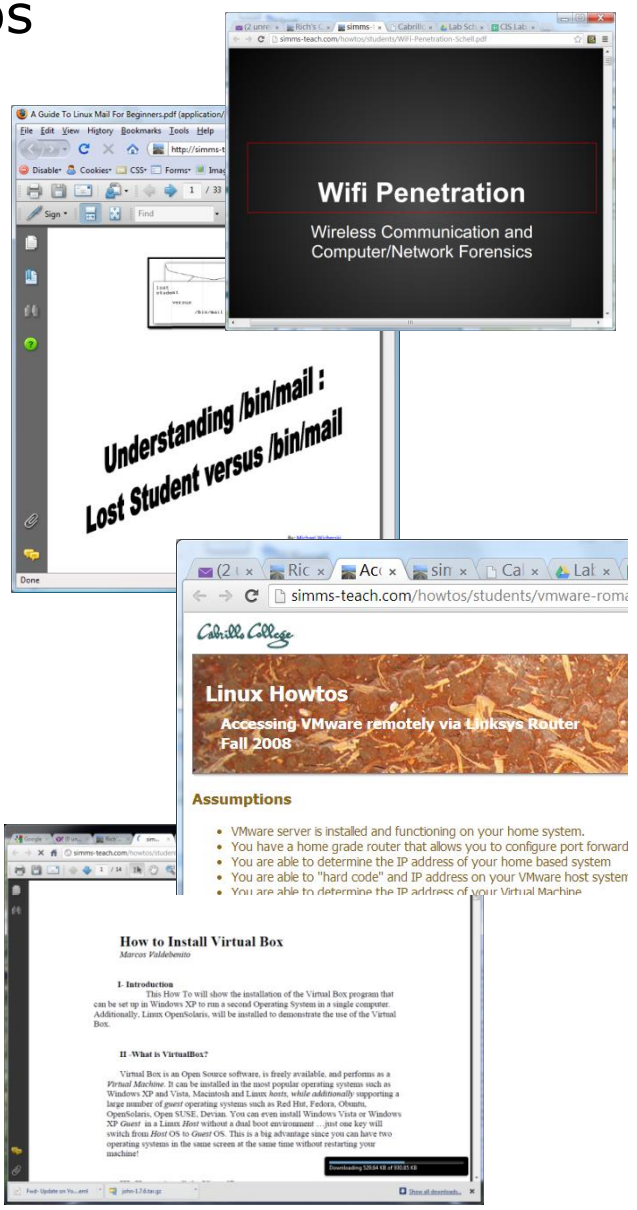


Typos and HowTo's



Note the caps on extra credit.

Extra Credit Howtos



If you have a strong interest in a topic write a Howto on it to share what you've learned and earn some extra credit at the same time

More Extra Credit

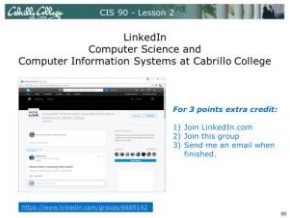
http://simms-teach.com/cis90grades.php

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

On the forum

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

In lesson slides



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
   ```

Help Available in the CIS Lab

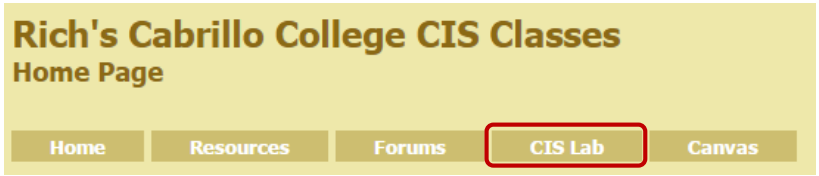
Instructors, lab assistants and equipment are available for CIS students to work on assignments.

CIS 90 Student Lab Assistants

Kevin
T/Th 1:30-4:30
W 12:30-4:30

Roberto
T/Th 3:30-7:30

Tess
T/F 2-6:30
W/Th 12-5



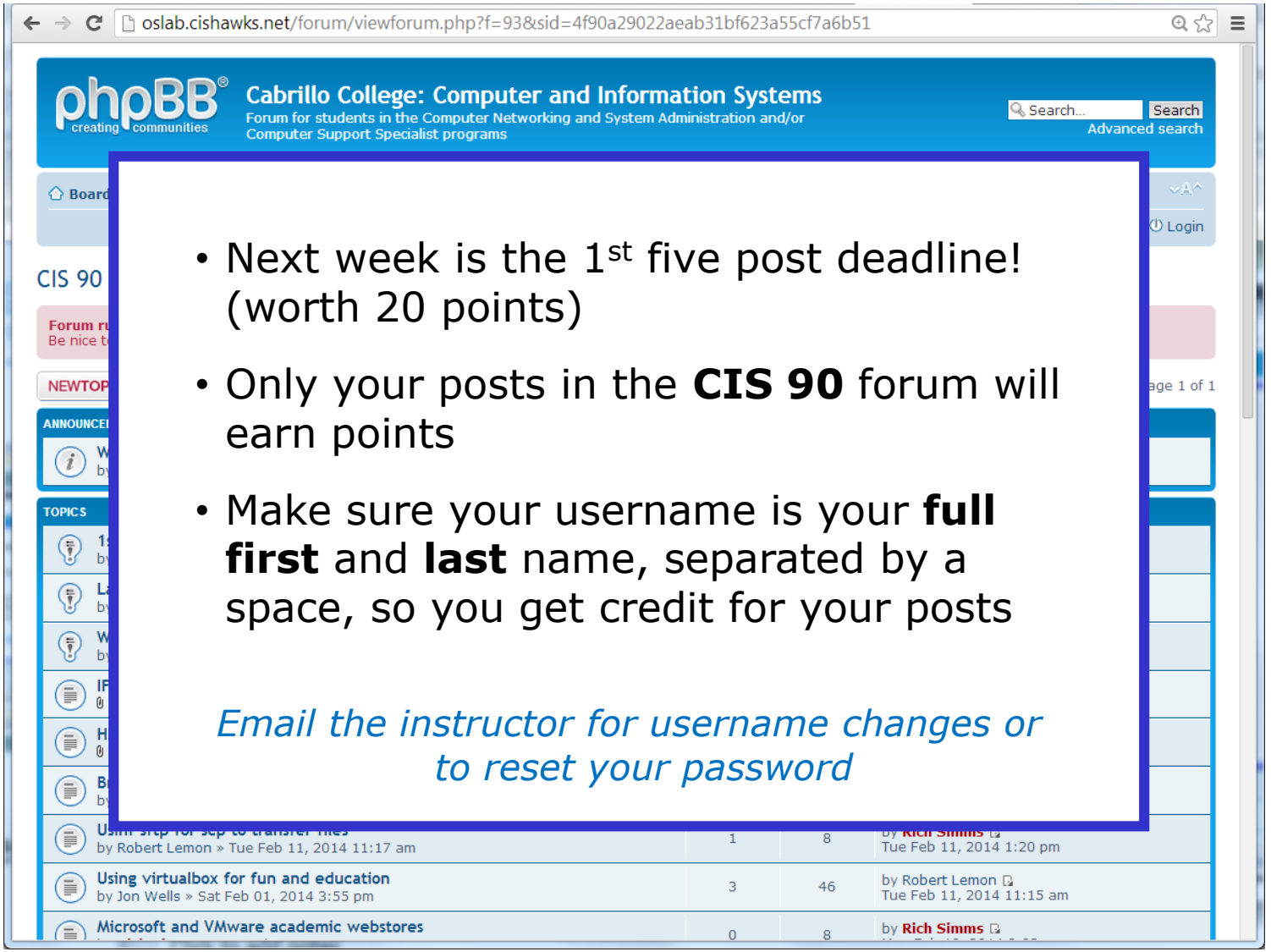
Note, Carter, a CIS 90 alumnus, is volunteering this term to help CIS 90 students with questions. His hours are on the white board in the CIS Lab.

Linux Instructors

Rich Simms
M 9-11:30

Mike Matera

Forum



- Next week is the 1st five post deadline! (worth 20 points)
- Only your posts in the **CIS 90** forum will earn points
- Make sure your username is your **full first** and **last** name, separated by a space, so you get credit for your posts

Email the instructor for username changes or to reset your password

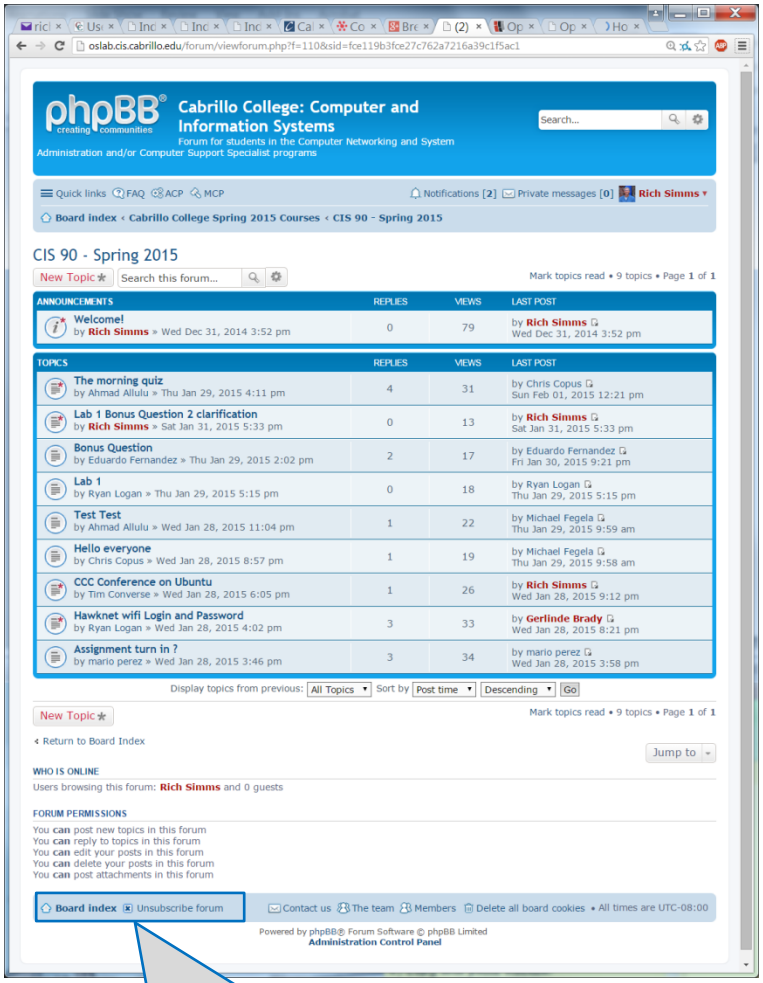
Subscribe to the CIS 90 forum to get notifications

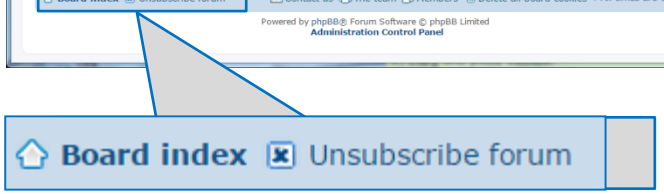
1) **Login to the forum**

2) **Go to the CIS 90 forum**

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

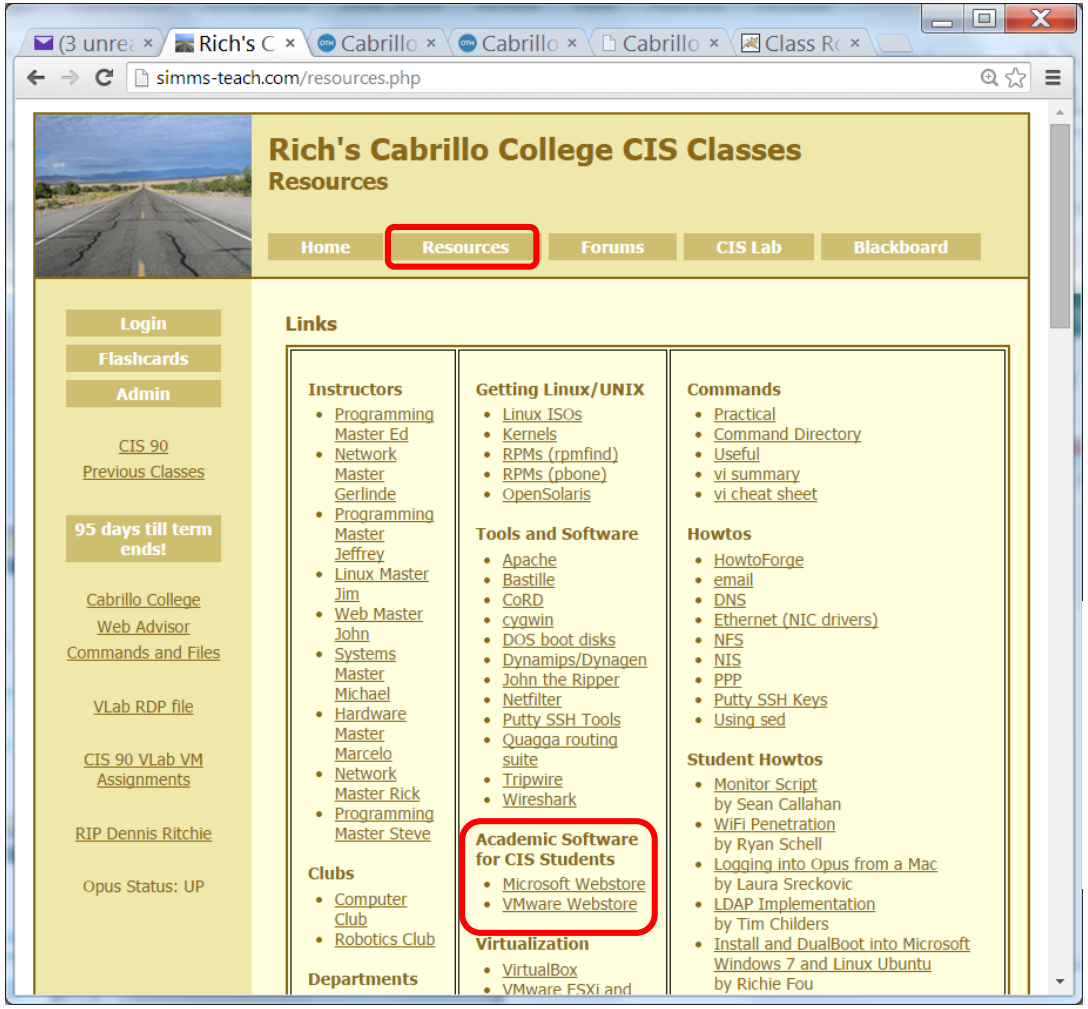
4) **Now you will get notified of replies and new posts by email**





It should look like this when you are subscribed

Software for eligible CIS students

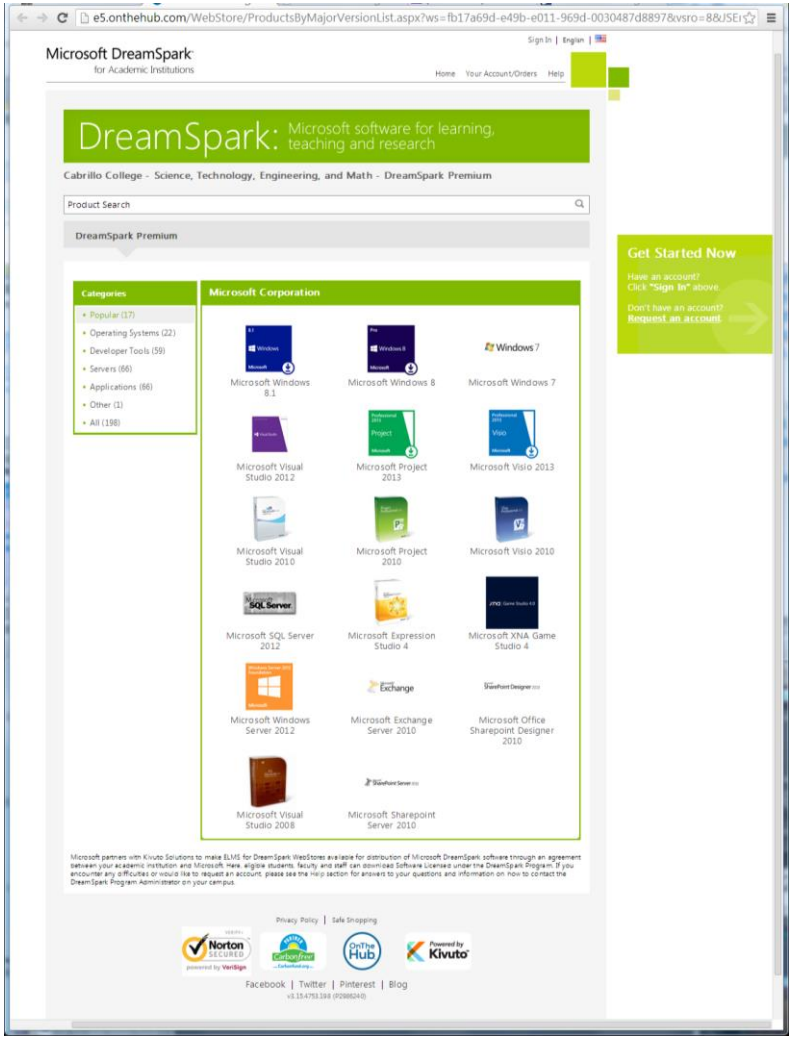


Microsoft

How to obtain Microsoft and VMware software for academic use

vmware

Microsoft products for CIS students



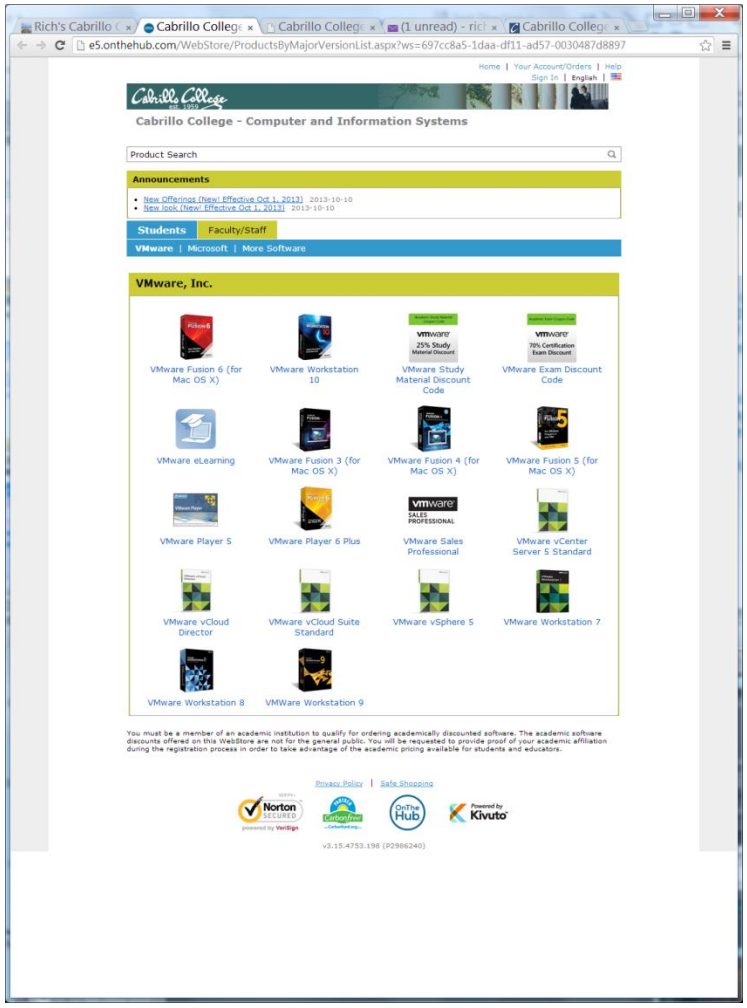
Accounts for students enrolled in CIS 90 have been created using your WebAdvisor email addresses.

Link is on website Resources page in Tools and Software section.

Licensed for educational use only.

Happy downloading!

VMware products for CIS students



Accounts for students enrolled in CIS 90 have been created using your WebAdvisor email addresses.

Link is on website Resources page in Tools and Software section

Licensed for educational use only.

Happy downloading!

Course Expectations Check

Expectation Check

Skills you should be comfortable performing

Navigating http://simms-teach.com

- Enter the CCC Confer Virtual Classroom
- Watch video recordings of previous lessons
- Download and search lessons PDFs
- Review your graded work and monitor your current grade status
- Find out when any assignment is due
- Find when any quiz and test will be held
- Find the answers for graded labs and quizzes
- Read and make forum posts
- Obtain Microsoft and VMware products at no cost for academic use
- Locate your personal Arya system

Navigating systems

- Log into Opus from home or school using SSH
- Log into Arya and other VMs from Opus using SSH
- Use Arya's graphical desktop via VLab
- Change Virtual (TTY) Terminals on your Arya

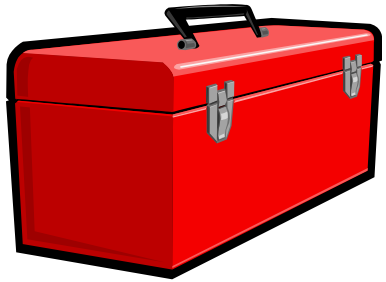
Using the shell

- Use any of the Lesson 1 and 2 commands
- Parse any shell command
- Get documentation on any command
- Identify the four key components of the UNIX/Linux architecture
- Identify the six steps the shell performs for every command
- Temporarily change your shell prompt
- Set and show values of shell variables like PATH, TERM and PS1

If you have any questions on these skills, post a question on the forum!

Notes to Rich

If there is enough time do some of the practice questions in the Backup section



More commands for your toolbox

Lesson 3 commands for your toolbox

write	- "chat" with another user by writing to their terminal
mesg	- enable/disable writes to your terminal
irssi	- Chat using IRC protocol
mail	- send and read email

Write Command

Use the write command to chat with another user

simben90@oslab:~

```
/home/cis90/simben $ write milhom90
What's up?

Message from milhom90@oslab.cishawks.net on pts/1 at 09:30 ...
Not much ... want to run around and bark for awhile?
Sure, meet you in the park in 5 mins
Ok
EOF
/home/cis90/simben $ ^C
/home/cis90/simben $
```

milhom90@oslab:~

```
Message from simben90@oslab.cishawks.net on pts/0 at 09:30 ...
What's up?
write simben90
Not much ... want to run around and bark for awhile?
Sure, meet you in the park in 5 mins
Ok
/home/cis90/milhom $ EOF
/home/cis90/milhom $
```

write milhom90
What's up?

Sure, meet you in the park in 5 mins

<Ctrl-D>

write simben90
Not much … want to run around and bark for awhile?

OK

<Ctrl-D>

write command

send a message to another user

Syntax:

write *username [ttyname]*

- Use *ttyname* if there are multiple logins by the target username
- The receiver sees:

  `Message from` *`yourname@yourhost`* `on` *`yourtty`* `at` *`hh:mm`* `…`

- Each line you type gets sent to the other user's terminal
- To end sending message type Ctrl-D (Hold down Ctrl and tap D key)
  - The receiver will see an `EOF` (end of file) at the end
- If the receiver wants to reply then they must use the **write** command as well
- Use **mesg n** (to block incoming messages)
- Use **mesg y** (to allow incoming messages)

write command

send a message to another user

Where is the write command?

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

Answer: It's in the /usr/bin directory

What kind of file is the write command?

```
/home/cis90/simben $ file /usr/bin/write
/usr/bin/write: setgid ELF 32-bit LSB shared object, Intel
80386, version 1 (SYSV), dynamically linked (uses shared
libs), for GNU/Linux 2.6.18, stripped
```

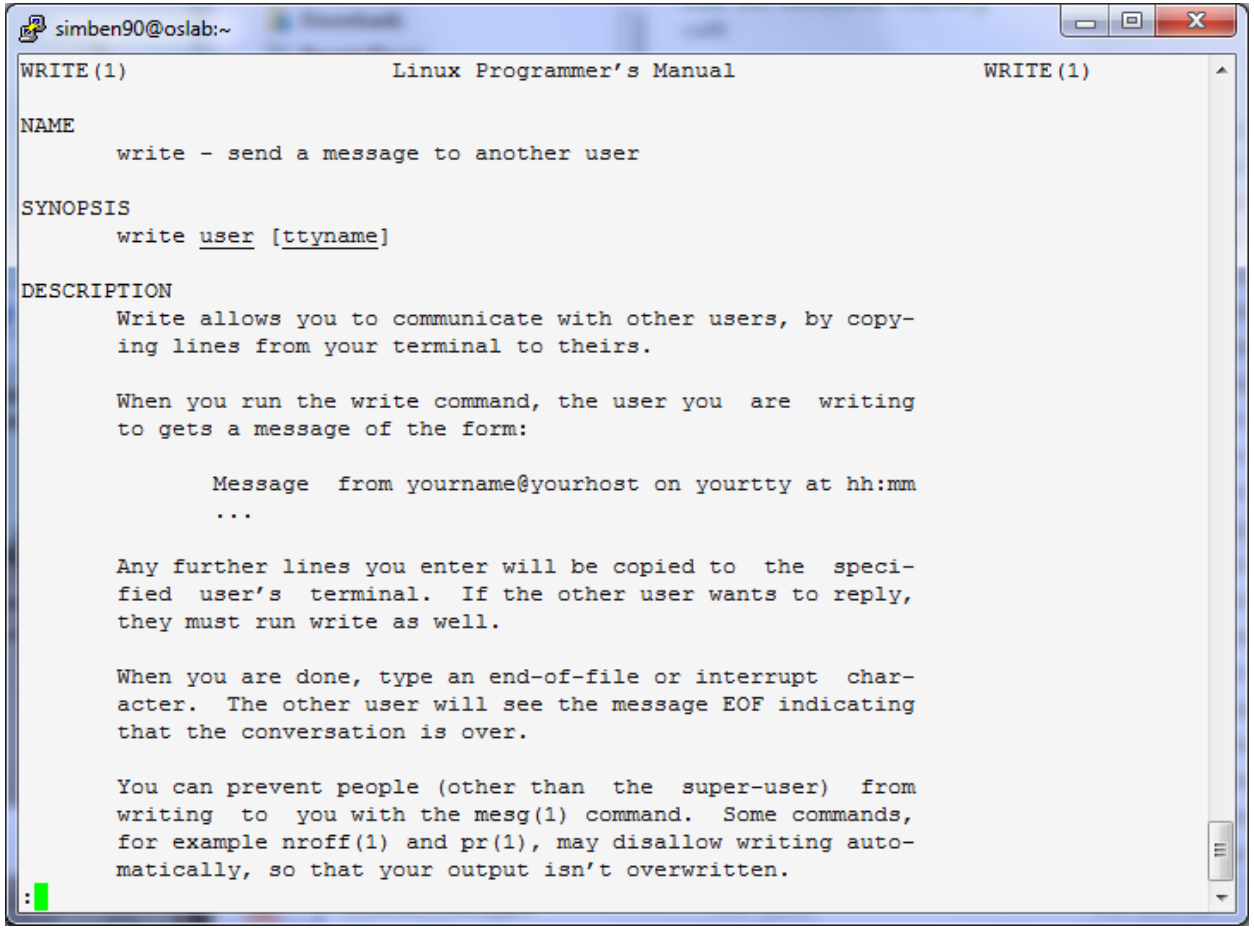
Answer: It's a binary executable

ELF = Executable and Linkable Format
LSB=Least Significant Bit type of bit order

write command

send a message to another user

```
/home/cis90/simben $ man write
```



*Use the **man** command to review how the write command works.*

write command

simben90 writes to milhom90

*Benji, uses the **who** command to see the current users logged into Opus. He sees his friend Homer is logged in twice.*

```
/home/cis90/simben $ who
srelau98 pts/0        2012-09-11 06:36 (anice-34-27-241-136.wanadoo.fr)
simben90 pts/1        2012-09-11 06:47 (42-15-94-107.dsl.com)
alvdes98 pts/2        2012-09-11 07:49 (c-25-14-136-111.comcast.net)
milhom90 pts/3        2012-09-11 08:03 (42-15-94-107.dsl.com)
milhom90 pts/4        2012-09-11 08:09 (42-15-94-107.dsl.com)
```

*Homer, ever curious, uses the **tty** command to see what terminal device he is currently using*

```
/home/cis90/milhom $ tty
/dev/pts/4
/home/cis90/milhom $
```

write command

simben90 writes to milhom90

```
/home/cis90/simben $ write milhom90
write: milhom90 is logged in more than once; writing to pts/4
```

1) Benji enters this

```
/home/cis90/milhom $
Message from simben90@oslab.cabrillo.edu on pts/1 at 09:52 ...
```

2) Homer sees this appear on his terminal

write command

simben90 writes to milhom90

```
/home/cis90/simben $ write milhom90
write: milhom90 is logged in more than once; writing to pts/4
What do you think of the new CentOS distro?
```

1) Benji enters this

```
/home/cis90/milhom $
Message from simben90@oslab.cabrillo.edu on pts/1 at 09:52 ...
What do you think of the new CentOS distro?
```

2) Homer sees this appear on his terminal

write command

simben90 writes to milhom90

```
/home/cis90/milhom $
Message from simben90@oslab.cabrillo.edu on pts/1 at 09:52 ...
What do you think of the new CentOS distro?
write simben90
```

1) Homer enters this

```
/home/cis90/simben $ write milhom90
write: milhom90 is logged in more than once; writing to pts/4
What do you think of the new CentOS distro?

Message from milhom90@oslab.cabrillo.edu on pts/4 at 09:55 ...
```

2) and Benji sees this appear on his terminal

write command

simben90 writes to milhom90

```
/home/cis90/milhom $
Message from simben90@oslab.cabrillo.edu on pts/1 at 09:52 ...
What do you think of the new CentOS distro?
write simben90
What's with the periods on the long listing permissions?
```

1) Homer enters this

```
/home/cis90/simben $ write milhom90
write: milhom90 is logged in more than once; writing to pts/4
What do you think of the new CentOS distro?

Message from milhom90@oslab.cabrillo.edu on pts/4 at 09:55 ...
What's with the periods on the long listing permissions?
```

2) and Benji sees this appear on his terminal

write command

simben90 writes to milhom90

```
/home/cis90/simben $ write milhom90
write: milhom90 is logged in more than once; writing to pts/4
What do you think of the new CentOS distro?

Message from milhom90@oslab.cabrillo.edu on pts/4 at 09:55 ...
What's with the periods on the long listing permissions?
I think it's SELinux
```

1) Benji enters this

```
/home/cis90/milhom $
Message from simben90@oslab.cabrillo.edu on pts/1 at 09:52 ...
What do you think of the new CentOS distro?
write simben90
What's with the periods on the long listing permissions?
I think it's SELinux
```

2) Homer sees this appear on his terminal

write command

simben90 writes to milhom90

```
/home/cis90/milhom $
Message from simben90@oslab.cabrillo.edu on pts/1 at 09:52 ...
What do you think of the new CentOS distro?
write simben90
What's with the periods on the long listing permissions?
I think it's SELinux
Talk to you later, I'm going to bark a little and take a nap
```

1) Homer enters this

```
/home/cis90/simben $ write milhom90
write: milhom90 is logged in more than once; writing to pts/4
What do you think of the new CentOS distro?

Message from milhom90@oslab.cabrillo.edu on pts/4 at 09:55 ...
What's with the periods on the long listing permissions?
I think it's SELinux
Talk to you later, I'm going to bark a little and take a nap
```

2) and Benji sees this appear on his terminal

write command

simben90 writes to milhom90

```
/home/cis90/milhom $
Message from simben90@oslab.cabrillo.edu on pts/1 at 09:52 ...
What do you think of the new CentOS distro?
write simben90
What's with the periods on the long listing permissions?
I think it's SELinux
Talk to you later, I'm going to bark a little and take a nap
Ctrl-D
/home/cis90/milhom $
```

1) Homer issues a Ctrl-D (holds down Ctrl key, then taps D key)

```
/home/cis90/simben $ write milhom90
write: milhom90 is logged in more than once; writing to pts/4
What do you think of the new CentOS distro?

Message from milhom90@oslab.cabrillo.edu on pts/4 at 09:55 ...
What's with the periods on the long listing permissions?
I think it's SELinux
Talk to you later, I'm going to bark a little and take a nap
EOF
```

2) and Benji sees this appear on his terminal

write command

simben90 writes to milhom90

```
/home/cis90/simben $ write milhom90
write: milhom90 is logged in more than once; writing to pts/4
What do you think of the new CentOS distro?

Message from milhom90@oslab.cabrillo.edu on pts/4 at 09:55 ...
What's with the periods on the long listing permissions?
I think it's SELinux
Talk to you later, I'm going to bark a little and take a nap
EOF
bye
```

1) Benji enters this

```
/home/cis90/milhom $
Message from simben90@oslab.cabrillo.edu on pts/1 at 09:52 ...
What do you think of the new CentOS distro?
write simben90
What's with the periods on the long listing permissions?
I think it's SELinux
Talk to you later, I'm going to bark a little and take a nap
/home/cis90/milhom $ bye
```

2) Homer sees this written to his terminal

write command

simben90 writes to milhom90

```
/home/cis90/simben $ write milhom90
write: milhom90 is logged in more than once; writing to pts/4
What do you think of the new CentOS distro?

Message from milhom90@oslab.cabrillo.edu on pts/4 at 09:55 ...
What's with the periods on the long listing permissions?
I think it's SELinux
Talk to you later, I'm going to bark a little and take a nap
EOF
bye
Ctrl-D
/home/cis90/simben $
```

1) Benji issues a Ctrl-D (holds down Ctrl key, then taps D key)

```
/home/cis90/milhom $
Message from simben90@oslab.cabrillo.edu on pts/1 at 09:52 ...
What do you think of the new CentOS distro?
write simben90
What's with the periods on the long listing permissions?
I think it's SELinux
Talk to you later, I'm going to bark a little and take a nap
/home/cis90/milhom $ bye
EOF
```

2) and Homer sees this appear on his terminal

mesg command

mesg y enables and **mesg n** disables writes to your terminal

```
/home/cis90/milhom $ mesg n
```

1) Homer disables writes to his terminal so he can take his nap

---

```
/home/cis90/simben $ write milhom90
write: milhom90 has messages disabled
```

2) Benji discovers that Homer is no longer accepting messages

who command

The -T option shows who is writeable

The -T option shows users messages status

```
/home/cis90/simben $ who -T
srelau98 + pts/0        2012-09-11 06:36 (anice-34-27-241-136.wanadoo.fr)
simben90 + pts/1        2012-09-11 06:47 (42-15-94-107.dsl.com)
alvdes98 + pts/2        2012-09-11 07:49 (c-25-14-136-111.comcast.net)
milhom90 - pts/3        2012-09-11 08:03 (42-15-94-107.dsl.com)
milhom90 - pts/4        2012-09-11 08:09 (42-15-94-107.dsl.com)
```

+ indicate writes to this user are enabled and - indicates writes to this user are blocked

```
/home/cis90/simben $ ls -l /dev/pts*
total 0
crw--w----. 1 srelau98 tty  136, 0 Sep 11 08:15 0
crw--w----. 1 simben90 tty  136, 1 Sep 11 08:25 1
crw--w----. 1 alvdes98 tty  136, 2 Sep 11 08:25 2
crw-------. 1 milhom90 tty  136, 3 Sep 11 08:19 3
crw-------. 1 milhom90 tty  136, 4 Sep 11 08:19 4
c---------. 1 root     root   5, 2 Jul 30 21:25 ptmx
```

We will learn about file wildcards and permissions later.

This is a just a preview showing that write permission is removed from /dev/pts/3 and /dev/pts/4 for the tty group.

Class Activity

Students, login to Opus if you haven't already

- Use the write command to "chat" with your pair mate. e.g. **write** *username*
- Ask your pair mate for their real first name and put that in the chat window.
- End the chat session with Ctrl-D

Note to Rich:
Run **pairs** alias (script in /home/rsimms/cis90/lab03/scripts directory)

IRC

irssi

Chat with multiple users via IRC server

Syntax:

irssi

/connect *hostname*	*Connect to IRC server*
/join #*channel*	*Join channel*
/part	*Leave channel*
/nick *your-nickname*	*Set your display name*
/names	*See others in channel*
message	*Public chat message*
/msg *nickname message*	*Private chat message*
alt **1**	*Main window*
alt **2**	*Public chat window*
alt **3**	*Private chat window*
/disconnect	*Disconnect from IRC server*
/exit	*Exit irrsi*

http://www.ircbeginner.com/ircinfo/ircc-commands.html

Follow me

Students, login to Opus if you haven't already

```
irssi
/connect eh-irc
/join #cis90
/nick Benji
Hello world
/names
/msg Benji Hey Benji
```

alt 1
alt 2
alt 3

```
/exit
```

Use your own name here

Basic Mail

Sending Mail

UNIX mail
Sending messages

mail *recipient1 recipient2 … recipientN*

The mail command can be used to send an email to one or more recipients. Each argument designates a recipient specified by a username (in /etc/passwd), a normal email address, or an alias (in /etc/aliases).

Examples:

```
mail rsimms
```
username as argument

```
mail simben90 prites90 mcgmon90
```
multiple usernames as arguments

```
mail richsimms@yahoo.com feredu90
```
regular email address and username as arguments

```
mail $LOGNAME
```
your username, specified using a variable, as argument

```
mail cis90-students
```
an alias (used as a distribution list) for all CIS 90 students

UNIX mail

Sending messages

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

The mail program is on the path and in the /bin directory.

```
/home/cis90/simben $ file /bin/mail
/bin/mail: symbolic link to `mailx'
```

It is a "symbolic link" (we learn about these later) to the mailx program.

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

The mailx program file is also in the /bin directory.

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

The mailx program is a binary executable.

UNIX mail

Sending messages

As an example, Benji sends an email to Homer (a user on Opus) and Rich (using his Yahoo email address)

Homer
(milhom90)

Rich
(richsimms@yahoo.com)

Benji
(simben90)

```
/home/cis90/simben $ mail milhom90 richsimms@yahoo.com
Subject: Where is the old bone
I can't find my old bone.  Let me know if you see it.
Thanks,
Benji
.
EOT
/home/cis90/simben $
```

Use Ctrl-D or a single period to end the message (End Of Text)

Recipients can be Opus users (just specify their username) or regular email addresses.

Class Exercise
UNIX mail

- Login to Opus
- Send me a message

```
/home/cis90/simben $ mail rsimms
Subject: Hello
This mail program is pretty crazy!
.
/home/cis90/simben $
```

Notes to Rich

[ ] - Send out Welcome letter

use **welcome** alias or

~rsimms/cis90/lab03/scripts/uhist/mail-welcome

[ ] - Test cis90-students alias

Reading Mail

UNIX mail

Reading messages

Syntax:

mail

To read mail, enter the mail command with no arguments. The mail command has its own mini-shell with its own set of mail oriented commands.

UNIX Mail

Reading messages

Homer
(milhom90)

Homer notices he has received new mail and runs the mail command to see what has arrived

The N signifies a new message

He types 1 to read message 1

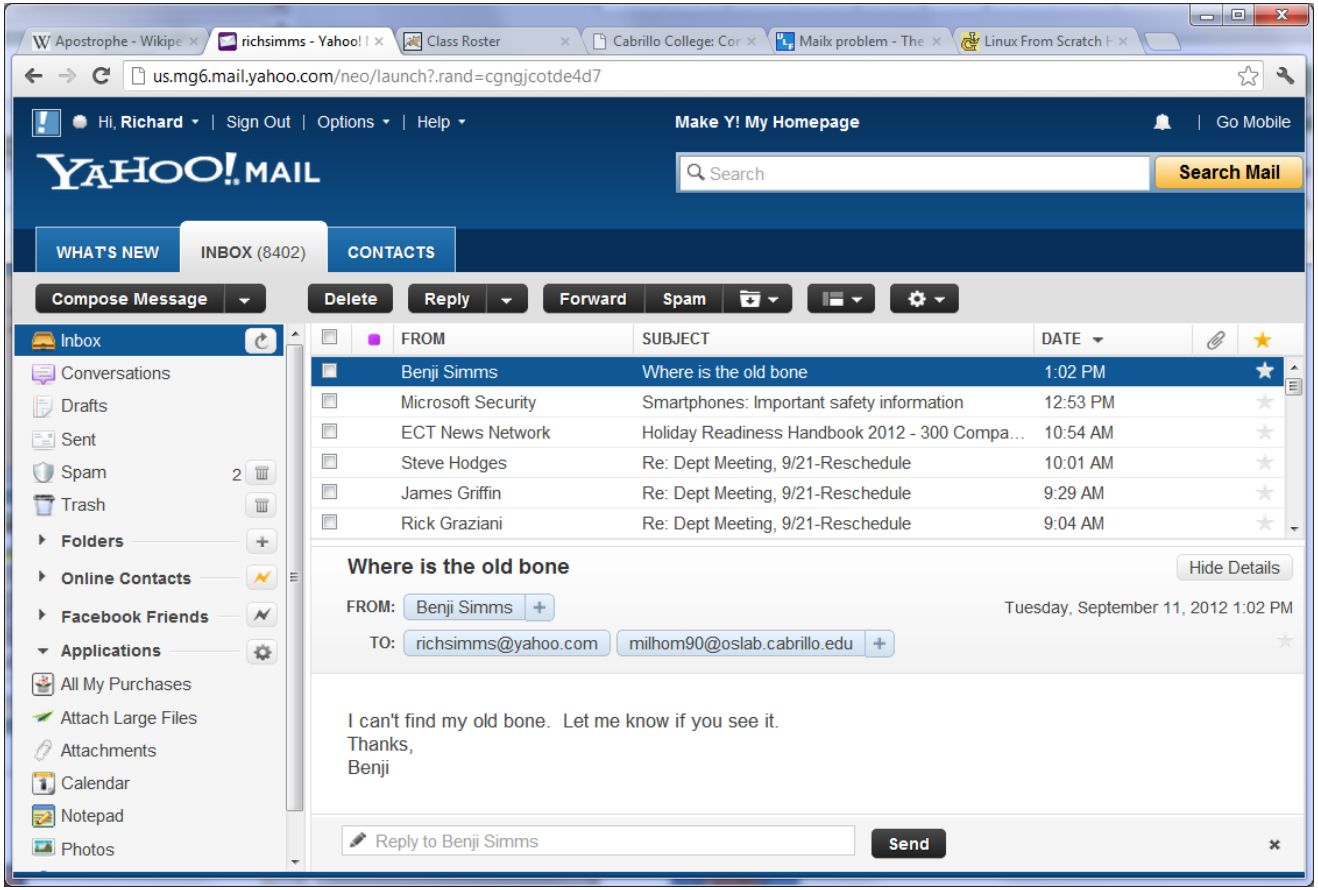
The & is the mail prompt

```
/home/cis90/milhom $
You have new mail in /var/spool/mail/milhom90

/home/cis90/milhom $ mail
Heirloom Mail version 12.4 7/29/08.  Type ? for help.
"/var/spool/mail/milhom90": 1 message 1 new
>N  1 Benji Simms           Tue Sep 11 12:59  22/830   "Where is the old bone"
& 1
Message  1:
From simben90@oslab.cabrillo.edu  Tue Sep 11 12:59:27 2012
Return-Path: <simben90@oslab.cabrillo.edu>
From: Benji Simms <simben90@oslab.cabrillo.edu>
Date: Tue, 11 Sep 2012 12:59:27 -0700
To: richsimms@yahoo.com, milhom90@oslab.cabrillo.edu
Subject: Where is the old bone
User-Agent: Heirloom mailx 12.4 7/29/08
Content-Type: text/plain; charset=us-ascii
Status: R

I can't find my old bone.  Let me know if you see it.
Thanks,
Benji
```

UNIX mail

Reading messages sent from UNIX mail

Rich
(richsimms@yahoo.com)



Rich reads the email from Benji using Yahoo mail (a mail user agent)

Class Exercise
UNIX mail

- Read your own mail by typing the **mail** command by itself
- Enter the number of the message to print a message.
  1
  2
- Use the **q** command to exit

Tip: You can just hit the Enter key by itself to read the next unread message.

Replying to Mail

UNIX Mail

Replying to messages

Homer
(milhom90)

< continued from above >

```
I can't find my old bone.  Let me know if you see it.
Thanks,
Benji

& r 1
To: milhom90@oslab.cabrillo.edu richsimms@yahoo.com
 simben90@oslab.cabrillo.edu
Subject: Re: Where is the old bone

Benji Simms <simben90@oslab.cabrillo.edu> wrote:

> I can't find my old bone.  Let me know if you see it.
> Thanks,
> Benji
I think its under the sink
- Homer
.
EOT
&
```

*After reading the message from Benji, Homer replies with the mail **r** command (for reply to all).*

UNIX Mail

Benji gets the reply from Homer

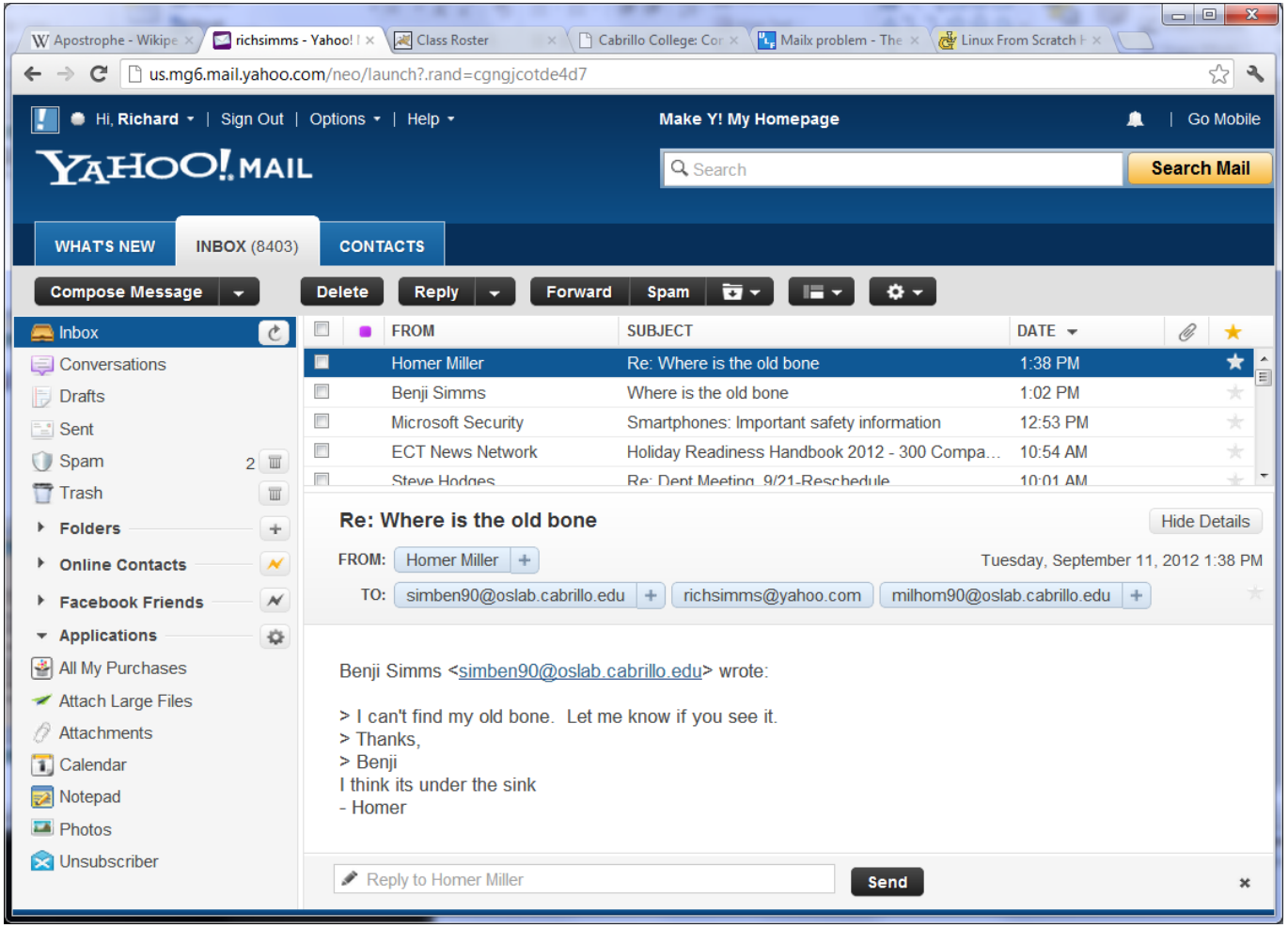
Benji
(simben90)

```
You have mail in /var/spool/mail/simben90
/home/cis90/simben $ mail
Heirloom Mail version 12.4 7/29/08.  Type ? for help.
"/var/spool/mail/simben90": 1 message 1 unread
>U  1 Homer Miller          Tue Sep 11 13:35  30/1096  "Re: Where is the old bone"
& 1
Message  1:
From milhom90@oslab.cabrillo.edu  Tue Sep 11 13:35:30 2012
Return-Path: <milhom90@oslab.cabrillo.edu>
From: Homer Miller <milhom90@oslab.cabrillo.edu>
Date: Tue, 11 Sep 2012 13:35:30 -0700
To: simben90@oslab.cabrillo.edu, richsimms@yahoo.com,
        milhom90@oslab.cabrillo.edu
Subject: Re: Where is the old bone
User-Agent: Heirloom mailx 12.4 7/29/08
Content-Type: text/plain; charset=us-ascii
Status: RO

Benji Simms <simben90@oslab.cabrillo.edu> wrote:

> I can't find my old bone.  Let me know if you see it.
> Thanks,
> Benji
I think its under the sink
- Homer

&
```

Benji notices he has new mail which he reads using the mail command (with no arguments) and then typing the message number he wants to read

Rich
(richsimms@yahoo.com)

UNIX Mail



Since Homer replied to all, Rich also gets a copy

Class Exercise
UNIX mail

- Use **ls /home/cis90** to see all CIS 90 home directories (add "90" to get the usernames) or the **who** command and send an email to three other CIS 90 students (your choice) in one message.

  Hint: use **mail** *user1 user2 user3*

- Reply to any emails you get (run **mail** and use the **r** command)

Saving Mail to a Folder

UNIX Mail

Saving messages

```
/home/cis90/simben $ mail
Heirloom Mail version 12.4 7/29/08.  Type ? for help.
"/var/spool/mail/simben90": 1 message 1 new
>N  1 Homer Miller          Tue Sep 11 21:04  21/830   "Salsa"
& 1
Message  1:
From milhom90@oslab.cabrillo.edu  Tue Sep 11 21:04:16 2012
Return-Path: <milhom90@oslab.cabrillo.edu>
From: Homer Miller <milhom90@oslab.cabrillo.edu>
Date: Tue, 11 Sep 2012 21:04:16 -0700
To: simben90@oslab.cabrillo.edu
Subject: Salsa
User-Agent: Heirloom mailx 12.4 7/29/08
Content-Type: text/plain; charset=us-ascii
Status: R

Don't forget, salsa class tonight at the Palomar
- Homer

& s 1 archives
"archives" [New file] 23/851
& q
```

Benji checks for new mail

Prints the first (and only) message

Saves this message to a folder named "archives"

Browsing a mailbox file (folder)

UNIX mail

Browse mailbox files using the -f option

use the f option to specify a mailbox file (folder)

```
/home/cis90/simben $ mail -f archives
Heirloom Mail version 12.4 7/29/08.  Type ? for help.
"archives": 5 messages 4 new
    1 Homer Miller          Tue Sep 11 21:04  22/841   "Salsa"
>N  2 Homer Miller          Tue Sep 11 21:25  20/790   "Hola"
 N  3 Rich Simms            Tue Sep 11 21:58  20/752   "Treasure"
    4 Rich Simms            Tue Sep 11 22:01  21/798   "Lab Hours on Monday"
 N  5 Rich Simms            Tue Sep 11 22:01  20/796   "Where were you last
summer?"
&
```

Opening a mailbox file named archives which has multiple messages

More on Mail

Forwarding Mail

mail commands

Forwarding a message with ~m

rsimms@opus:~

```
[rsimms@opus ~]$ mail
Mail version 8.1 6/6/93.  Type ? for help.
"/var/spool/mail/rsimms": 5 messages 1 unread
>U  1 jimg@opus.cabrillo.e  Sun Jun 22 13:53  22/836   "Hot days and servers"
    2 simmsmar@opus.cabril  Thu Jul 24 12:28  19/739   "Don't forget to bring"
    3 simmsben@opus.cabril  Thu Jul 24 12:27  17/708   "Nisene Hike"
    4 rsimms@opus.cabrillo  Thu Jul 24 12:33  21/819   "Re: Hot days and serv"
    5 roddyduk@opus.cabril  Thu Jul 24 15:41  19/702   "Salsa"
& m simmsben
Subject: re: Salsa
Hi Benji,

Did you see this:

~m5
Interpolating: 5
(continue)

Later,

- Rich
.
Cc:
&
```

This is how you forward message 5

simmsben@opus:~

```
/home/cis90/simmsben $ mail
Mail version 8.1 6/6/93.  Type ? for help.
"/var/spool/mail/simmsben": 1 message 1 new
>N  1 rsimms@opus.cabrillo  Thu Jul 24 18:51  33/935   "re: Salsa"
& p 1
Message 1:
From rsimms@opus.cabrillo.edu  Thu Jul 24 18:51:55 2008
Date: Thu, 24 Jul 2008 18:51:55 -0700
From: Rich Simms <rsimms@opus.cabrillo.edu>
To: simmsben@opus.cabrillo.edu
Subject: re: Salsa

Hi Benji,

Did you see this:

        From roddyduk@opus.cabrillo.edu  Thu Jul 24 15:41:35 2008
        Date: Thu, 24 Jul 2008 15:41:35 -0700
        From: Duke Roddy <roddyduk@opus.cabrillo.edu>
        To: rsimms@opus.cabrillo.edu
        Subject: Salsa

        You and Elizabeth coming to the Palomar this Friday?
        Let me know,
        - Duke


Later,

- Rich

&
```

mail commands

Alternate ways to forward a message

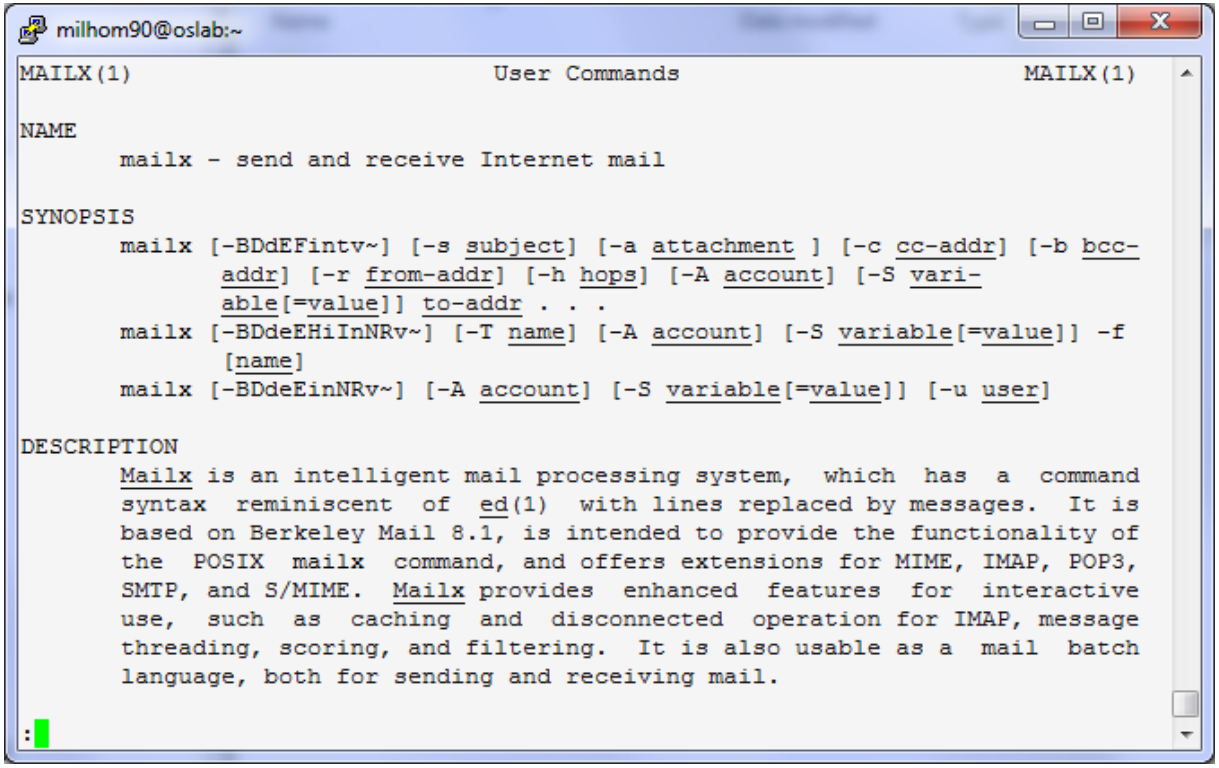
There is an easier way to forward a message with the latest version of mailx!

I wonder who will be the first person to find out how its done and post the solution to the forum?

Mail Documentation

man page for mail

```
/home/cis90/milhom $ man mail
```



In the bash shell, use the man command for extensive documentation on mail

Mail ? command

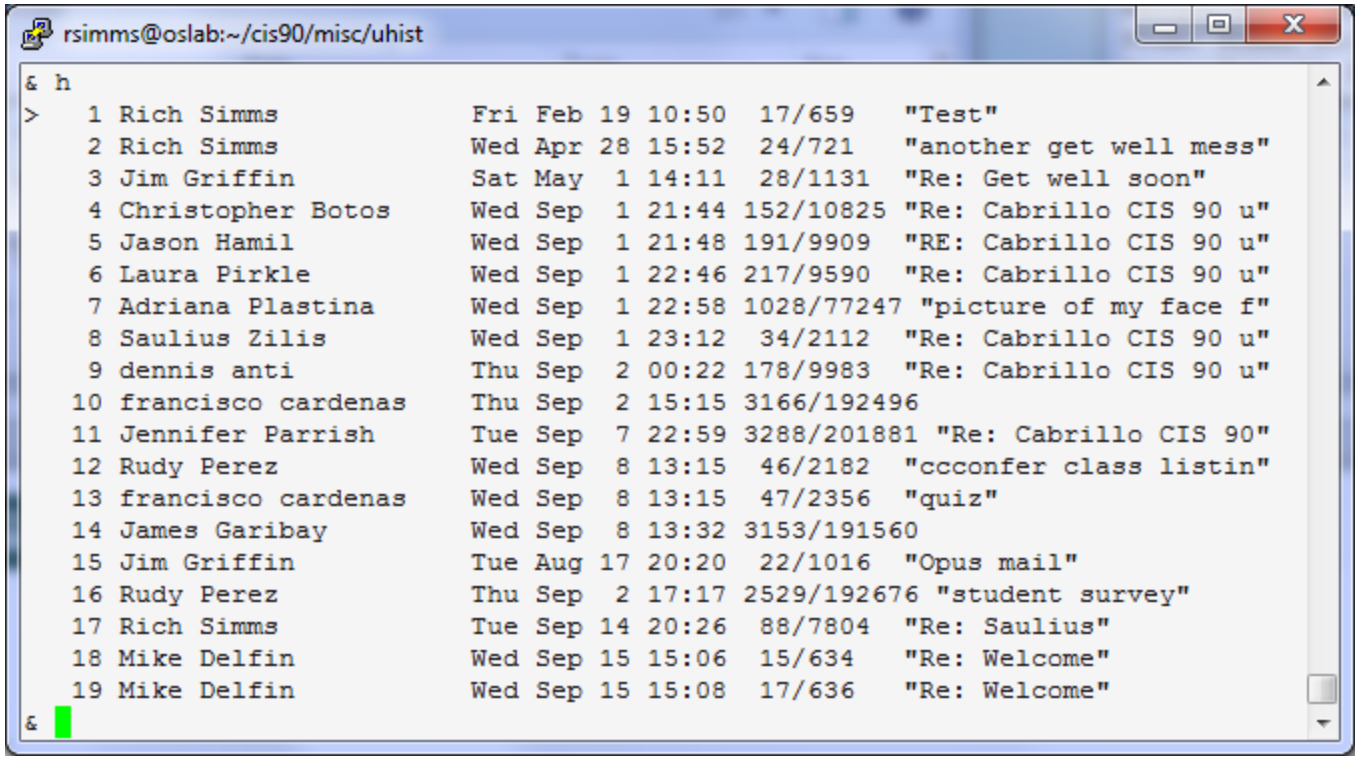
```
& ?
                mail commands
type <message list>             type messages
next                            goto and type next message
from <message list>             give head lines of messages
headers                         print out active message headers
delete <message list>           delete messages
undelete <message list>         undelete messages
save <message list> folder      append messages to folder and mark as saved
copy <message list> folder      append messages to folder without marking them
write <message list> file       append message texts to file, save attachments
preserve <message list>         keep incoming messages in mailbox even if saved
Reply <message list>            reply to message senders
reply <message list>            reply to message senders and all recipients
mail addresses                  mail to specific recipients
file folder                     change to another folder
quit                            quit and apply changes to folder
xit                             quit and discard changes made to folder
!                               shell escape
cd <directory>                  chdir to directory or home if none given
list                            list names of all available commands

A <message list> consists of integers, ranges of same, or other criteria
separated by spaces.  If omitted, mail uses the last message typed.
&
```

*Use the **?** command to see a short list of common mail commands*

Listing messages (headers)

mail h (headers) command

e.g. list my current folder)

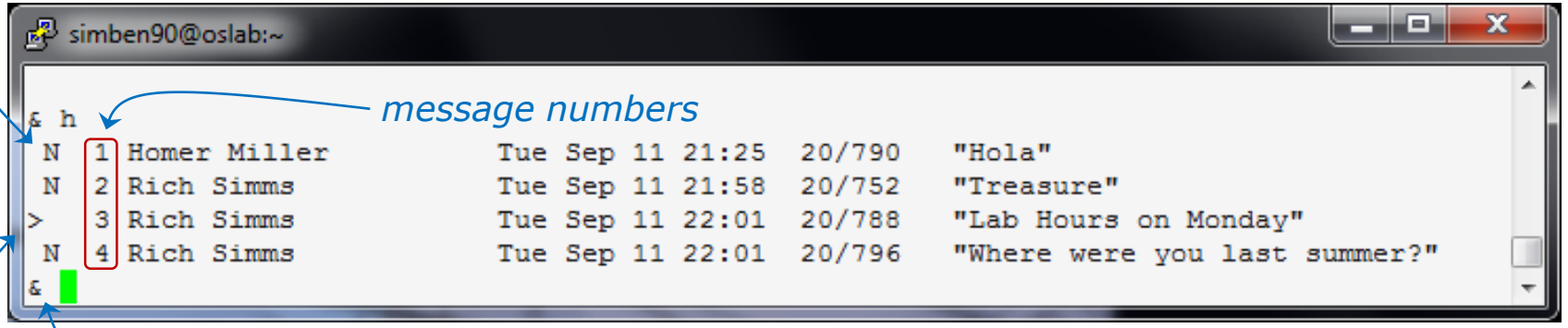


*Use the **h** command to show messages the current folder*

mail h (headers) command

e.g. list my current folder)

N = New message, a U = Unread message



message numbers

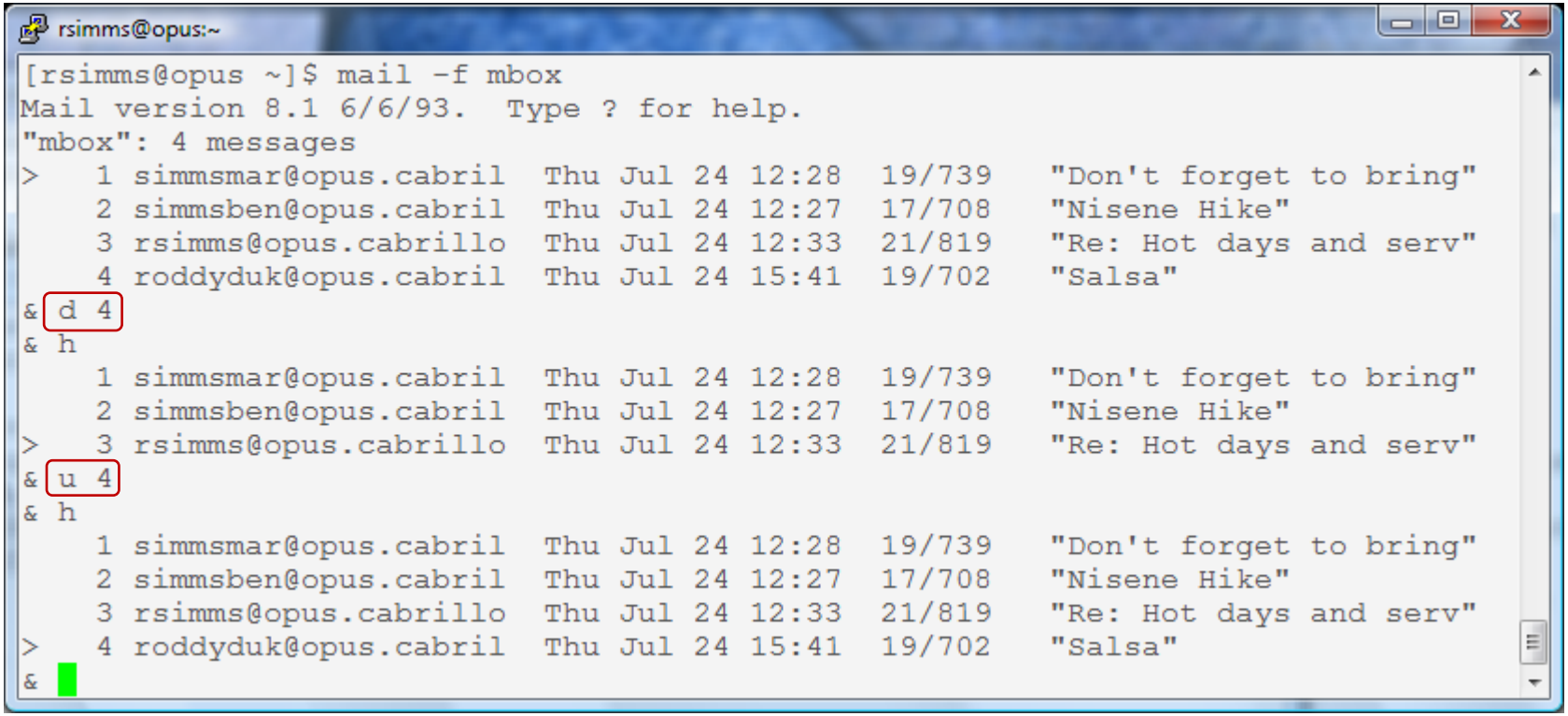
& is mail prompt for next command

> points to the current message (last one printed)

Deleting Messages

mail commands

(d)elete and (u)ndelete



*Messages can be deleted (and undeleted) with **d** and **u** commands*

Mailbox files (folders)

UNIX mail

The dead.letter mail file

```
/home/cis90/simben $ mail bogus
Subject: Dead stuff
I doubt you will get this because you don't exist!
.
EOT
You have mail in /var/spool/mail/simben90
/home/cis90/simben $ /home/cis90/simben/dead.letter... Saved message in
/home/cis90/simben/dead.letter

/home/cis90/simben $ mail -f dead.letter
Heirloom Mail version 12.4 7/29/08.  Type ? for help.
"dead.letter": 1 message
>   1 To bogus              Tue Sep 17 10:04  18/562   "Dead s"
& d 1
& q
"dead.letter" complete
/home/cis90/simben $
```

Undeliverable mail is placed in your dead.letter file. You can cat this file or open it with the mail command

UNIX mail

The mail folders are ascii text files

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

/home/cis90/simben $ ls /var/mail/simben90
/var/mail/simben90
```

1 & 4: User's can create there own mail folder files, giving them any name they like, such as archives and mbox

```
/home/cis90/simben $ file archives dead.letter mbox /var/spool/mail/simben90
1) archives:                ASCII mail text
2) dead.letter:             ASCII mail text
3) mbox:                    ASCII mail text
4) /var/spool/mail/simben90: ASCII mail text
```

*Mail files are text files that you can **cat** or open with **mail -f***

2) All undeliverable messages go into a user's dead.letter file

3) All incoming new messages are initially placed in the /var/mail/<username> file

UNIX mail

The mail folders are ascii text files

Mail files are ASCII text files. You can cat them out or open them with the mail command.

```
/home/cis90/simben $ cat archives
From milhom90@oslab.cishawks.net  Mon Sep 16 18:52:53 2013
Return-Path: <milhom90@oslab.cishawks.net>
Received: from oslab.cishawks.net (localhost [127.0.0.1])
        by oslab.cabrillo.edu (8.14.4/8.14.4) with ESMTP id r8H1q rmw008499
        for <simben90@oslab.cishawks.net>; Mon, 16 Sep 2013 18:52:53 -0700
Received: (from milhom90@localhost)
        by oslab.cishawks.net (8.14.4/8.14.4/Submit) id
        for simben90; Mon, 16 Sep 2013 18:52:53 -0700
From: Homer Miller <milhom90@oslab.cishawks.net>
Message-Id: <201309170152.r8H1qrJZ008497@oslab.cishawks
Date: Mon, 16 Sep 2013 18:52:53 -0700
To: simben90@oslab.cishawks.net
Subject: Fwd: Hot Potato
User-Agent: Heirloom mailx 12.4 7/29/08
MIME-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
Status: O

-------- Original Message --------
From: Rich Simms <rsimms@oslab.cishawks.net>
Date: Sun, 15 Sep 2013 15:41:49 -0700
To: milhom90@oslab.cishawks.net
Subject: Hot Potato


You got it ... forward it on! - Rich

/home/cis90/simben $
```

```
/home/cis90/simben $ mail -f archives
Heirloom Mail version 12.4 7/29/08.  Type ? for help.
"archives": 1 message 1 unread
>U  1 Homer Miller          Mon Sep 16 18:52  28/1002  "Fwd: H"
& 1
Message  1:
From milhom90@oslab.cishawks.net  Mon Sep 16 18:52:53 2013
Return-Path: <milhom90@oslab.cishawks.net>
From: Homer Miller <milhom90@oslab.cishawks.net>
Date: Mon, 16 Sep 2013 18:52:53 -0700
To: simben90@oslab.cishawks.net
Subject: Fwd: Hot Potato
User-Agent: Heirloom mailx 12.4 7/29/08
Content-Type: text/plain; charset=us-ascii
Status: RO

-------- Original Message --------
From: Rich Simms <rsimms@oslab.cishawks.net>
Date: Sun, 15 Sep 2013 15:41:49 -0700
To: milhom90@oslab.cishawks.net
Subject: Hot Potato


You got it ... forward it on! - Rich

& q
"archives" complete
/home/cis90/simben $
```

Class Exercise
UNIX mail

- Send yourself several test messages with different subjects:

  mail $LOGNAME

  mail $LOGNAME

- Now read your mail

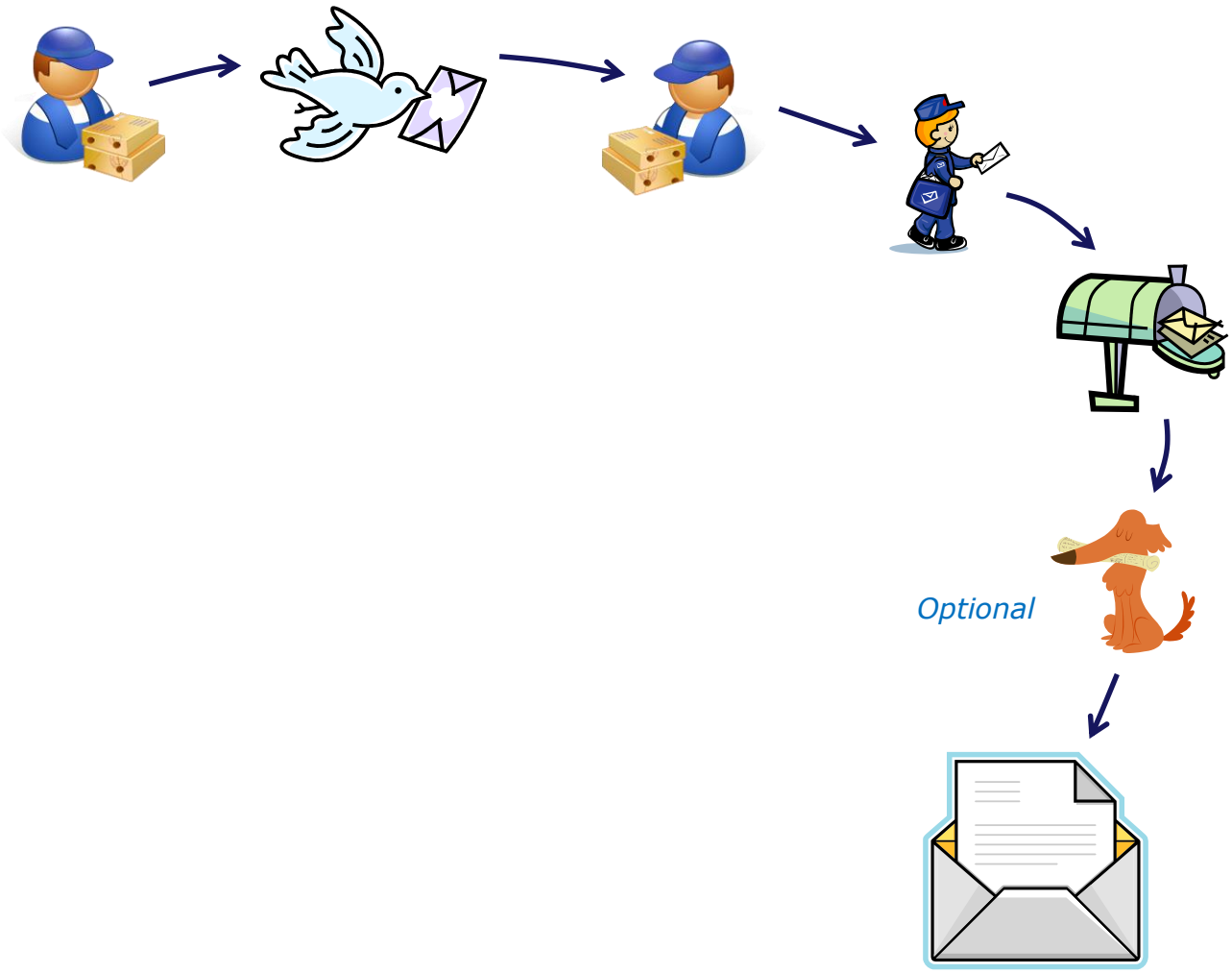
  mail

- Use the **h** command to list the message headers
- Read all your messages by entering each message number
- Use the **d** command to delete one of the messages
- Use the **s** command to save one message to a folder named archives
- Use **q** to quit mail
- Read the mail in your archives with **mail -f archives**
- Use **q** to quit mail

end-to-end email (if time)

FYI only

end-to-end email

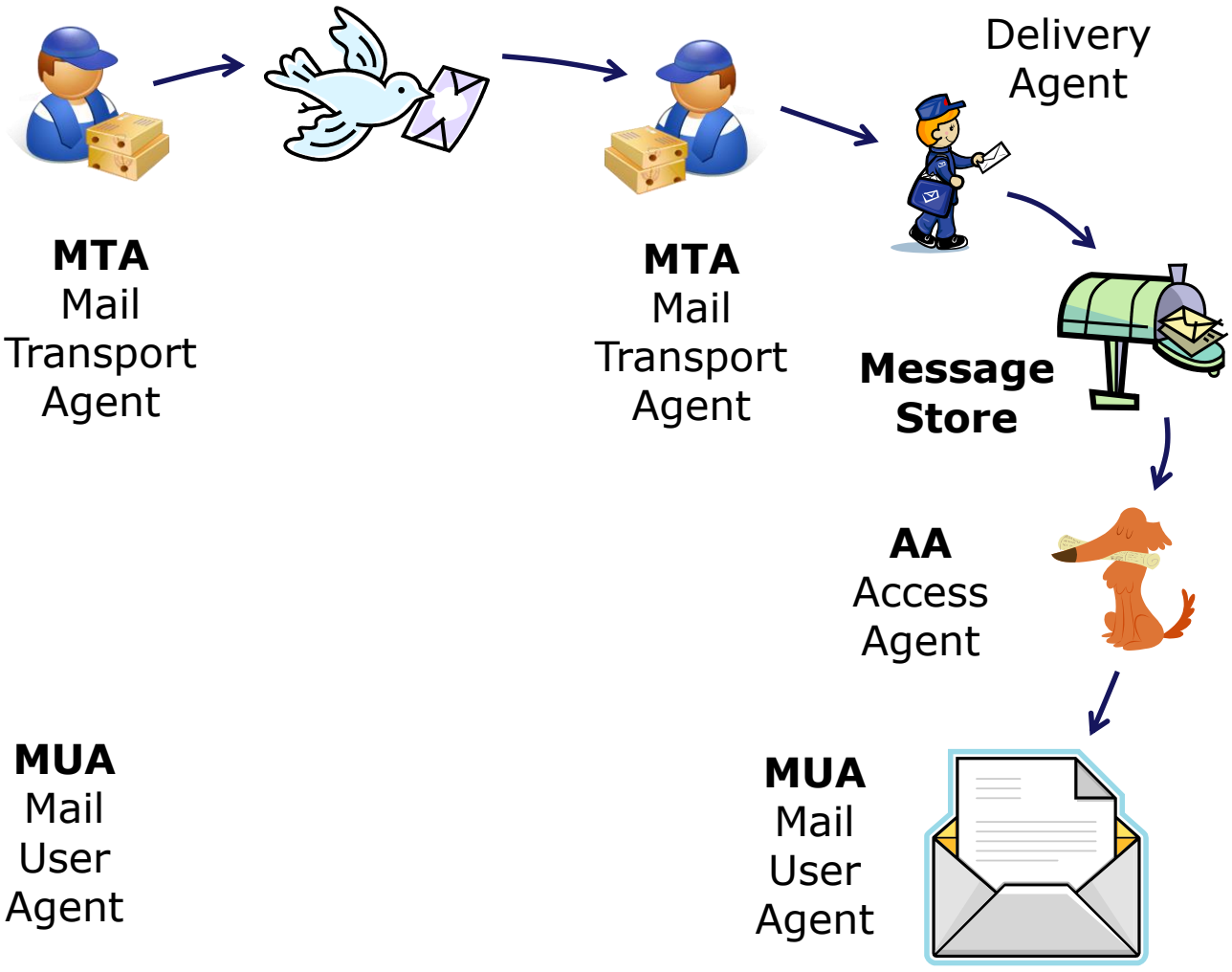


compose and send message

open and read message

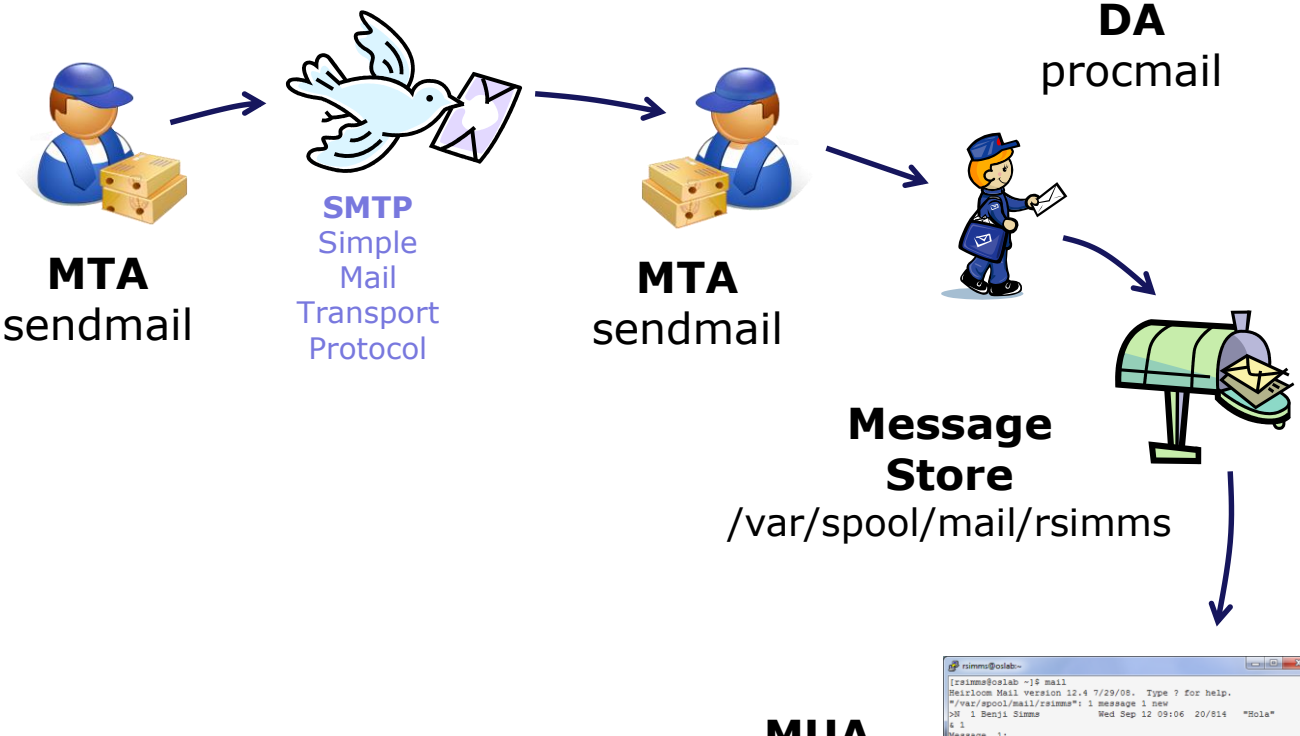
FYI only

end-to-end email



FYI only

end-to-end email: example Implementation



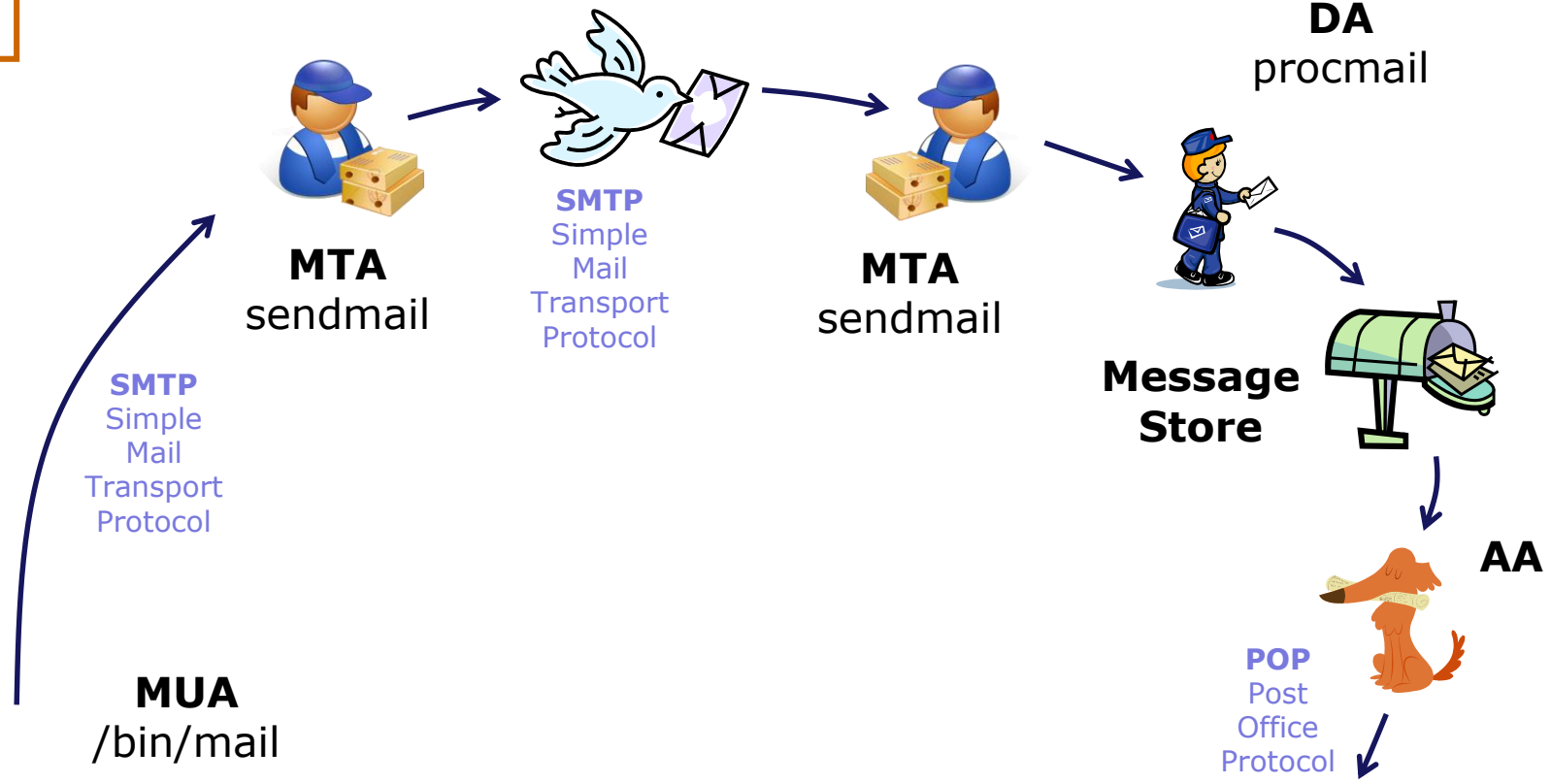
compose and send message

open, read and save messages to folders

uhistory archives

FYI only

end-to-end email: example Implementation




```
simmsben@opus:~
/home/cis90/simmsben $ mail simmsmar richsimms@yahoo.com
Subject: Salsa on Friday
See you at the Palomar dance floor.  Bring
your dancing shoes!

- Benji
.
Cc:
/home/cis90/simmsben $
```

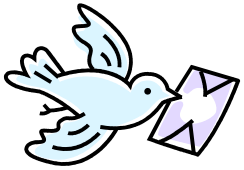
compose and send message

open and read message

end-to-end email: configuring your MUA (Mail User Agent)

FYI only

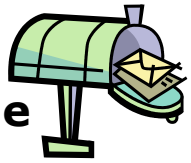
MTA
Mail
Transport
Agent



SMTP
Simple
Mail
Transport
Protocol

MTA
Mail
Transport
Agent

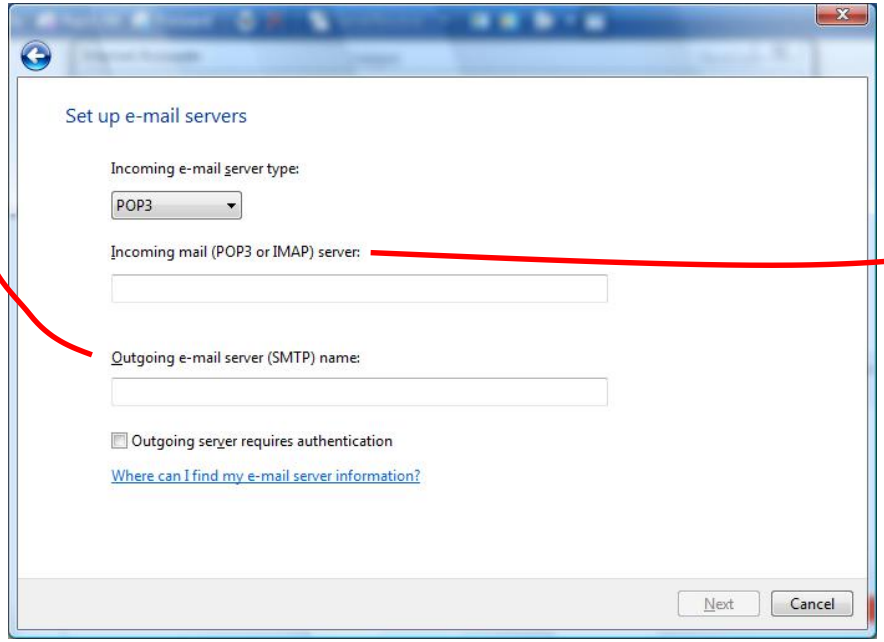
DA
Delivery
Agent



Message Store

SMTP
Simple
Mail
Transport
Protocol

Example MUA: Windows Mail



AA
Access
Agent

POP
Post
Office
Protocol

This is why you get asked for the SMTP server and the POP3/IMAP server when you set up email on your PC.

Your MUA needs to know this to send and receive messages.

How does one MTA get the IP address of the other MTA?

```
[rsimms@oslab ~]$ dig +short mx gmail.com
10 alt1.gmail-smtp-in.l.google.com.
30 alt3.gmail-smtp-in.l.google.com.
20 alt2.gmail-smtp-in.l.google.com.
40 alt4.gmail-smtp-in.l.google.com.
5 gmail-smtp-in.l.google.com.
[rsimms@oslab ~]$


[rsimms@oslab ~]$ dig +short gmail-smtp-in.l.google.com.
74.125.25.26
[rsimms@oslab ~]$
```

```
[rsimms@oslab ~]$ dig +short mx hp.com
10 smtp.hp.com.
[rsimms@oslab ~]$ dig +short smtp.hp.com.
15.73.96.120
15.73.212.90
15.73.212.88
15.73.212.87
[rsimms@oslab ~]$
```

Other MUAs MTAs, DAs, AAs

end-to-end email

some of the many players

FYI only

MTA sendmail, Exim, Microsoft Exchange, Postfix

DA /bin/mail, procmail, smrsh

AA imapd, spop

MUA gmail, /bin/mail, Outlook, Evolution, Yahoo Mail, hotmail

Assignment

Lab 3

Unix history
via command-line email

Notes to Rich

[ ] - Send out UNIX historical events for Lab 3

use **events** alias or

mail-lab03-events script in **~rsimms/cis90/lab03/scripts/uhist** directory

Lab 3 - Start early and check your Opus email every day!

You will receive a mail message from me with a Unix historical event for a particular year. Save this message to a mailbox called *uhistory*.

The objective of this lab is to use Unix mail to exchange and collect at least 15 individual events with your classmates. There are more students than events so some students will receive the same event.

Start by sending an email to your other classmates with your event and ask them to send you their events. Each time you get a Unix event that you haven't already saved, save it to your *uhistory* mailbox.

Rules:

- Do this lab on Opus using */bin/mail* (the mail command).
- When someone asks you for the date that you received, you must send it to them with the subject being just the year of the event, e.g. 1972. The email message must contain the complete line of event text for that year.
- Each email saved in *uhistory* must be for a single event/year.
- Each email saved in *uhistory* must have a subject that is just the year of the event.

If you receive an email that is missing the event or does not have the year as the subject, reply to the sender and ask them to resend a corrected version.

When you get all the Unix event messages saved in your *uhistory* mailbox you should have up to 22 messages, each with a different date for the Subject field. Delete any duplicate dates you may have.

Lab 3 (and all future labs) must be done on Opus

Tips for Lab 3

Start this lab early in the week and check your mail daily to collect all messages

- Use the **s** command in mail to save a message to your *uhistory* mailbox
- Use **mail -f uhistory** to review your collection
    - Use the **d** command in mail to delete duplicates
- Use the **check3** script to review progress
- You can **submit** your work as many times as you wish up to the deadline. Only the last submittal will be graded. Submit whatever you have completed for partial credit if you run out of time.

Post and read more tips on the forum

Wrap up

New commands:

mail - UNIX mail

```
type <message list>             type messages
next                            goto and type next message
from <message list>             give head lines of messages
headers                         print out active message headers
delete <message list>           delete messages
undelete <message list>         undelete messages
save <message list> folder      append messages to folder and mark as saved
copy <message list> folder      append messages to folder without marking them
write <message list> file       append message texts to file, save attachments
preserve <message list>         keep incoming messages in mailbox even if saved
Reply <message list>            reply to message senders
reply <message list>            reply to message senders and all recipients
mail addresses                  mail to specific recipients
file folder                     change to another folder
quit                            quit and apply changes to folder
xit                             quit and discard changes made to folder
!                               shell escape
cd <directory>                  chdir to directory or home if none given
list                            list names of all available commands

A <message list> consists of integers, ranges of same, or other criteria
separated by spaces.  If omitted, mail uses the last message typed.
```

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*

Next Class

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

1st five forum posts and Lab 3

Quiz questions for next class:

- What command can you use to "chat" with another user?
- How do you forward a message with /bin/mail?
- What is the dead.letter folder?

Backup

Practice Questions Lessons 1 & 2

Practice Test Questions

What is simben90's uid (user ID) on Opus?

Practice Test Questions

What is simben90's uid (user ID) on Opus?

Benji's uid is 1201

```
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=190(cis90) groups=190(cis90),100(users)
/home/cis90/simben $
```

Practice Test Questions

What day of the week was Sept 11, 2001?

Practice Test Questions

What day of the week was Sept 11, 2001?

It was a Tuesday

```
/home/cis90/simben $ cal 9 2001
   September 2001
Su Mo Tu We Th Fr Sa
                    1
 2  3  4  5  6  7  8
 9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30
/home/cis90/simben $
```

Practice Test Questions

Where (what directory) does the program file for the **ps** command reside?

Practice Test Questions

Where (what directory) does the program file for the **ps** command reside?

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

It's in the /bin directory

Practice Test Questions

Parse the following command line. What is the command? How many options and how many arguments are there? What are the options and arguments?

```
ls -l /boot/grub/
```

Practice Test Questions

Parse the following command line. What is the command? How many options and how many arguments are there? What are the options and arguments?

```
ls -l /boot/grub/
```

Command: ls

One option: -l (for long listing)

One argument: /boot/grub

Practice Test Questions

Parse the following command line. What is the command? How many options and how many arguments are there? What are the options and arguments?

```
echo "1 2 3" four 5 six
```

Practice Test Questions

Parse the following command line. What is the command? How many options and how many arguments are there? What are the options and arguments?

```
echo "1 2 3" four 5 six
```

Command: echo

No options

4 arguments:

- *"1 2 3"*
- *four*
- *5*
- *six*

Practice Test Questions

Which program gave you this error message?

```
/home/cis90/simben $ uname-x
-bash: uname-x: command not found
/home/cis90/simben $
```

Practice Test Questions

Which program gave you this error message?

```
/home/cis90/simben $ uname-x
-bash: uname-x: command not found
/home/cis90/simben $
```

It was the bash program. bash is the shell we are using and it could not find a command named uname-x on the path

Practice Test Questions

Which program gave you this error message?

```
/home/cis90/simben $ uname -x
uname: invalid option -- 'x'
Try `uname --help' for more information.
/home/cis90/simben $
```

Practice Test Questions

Which program gave you this error message?

```
/home/cis90/simben $ uname -x
uname: invalid option -- 'x'
Try `uname --help' for more information.
/home/cis90/simben $
```

It was the uname program. The uname program was loaded into memory. It started to handle its options and discovered an unknown option. It printed the error message and aborted.

Practice Test Questions

What terminal device are you using?

Practice Test Questions

What terminal device are you using?

Use the tty command to find out:

```
/home/cis90/simben $ tty
/dev/pts/0
/home/cis90/simben $
```

Practice Test Questions

What type of terminal are you using?

Practice Test Questions

What type of terminal are you using?

Use the **echo $TERM** command to find out:

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

This user's terminal type is xterm

Practice Test Questions

What directories make up your path?

Practice Test Questions

What directories make up your path?

Use echo $PATH to find out:

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

/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
.

There are 10 directories specified on this user's path

Practice Test Questions

Are the **yum, useradd,** and **yell** commands on your path?

Practice Test Questions

Are the **yum, useradd,** and **yell** commands on your path?

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

Yes, on path

```
/home/cis90/simben $ type useradd
useradd is hashed (/usr/sbin/useradd)
```

Yes, on path

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

No, not on path

Note: "is hashed" means bash has previously searched the path and run this command. The location of the command has been saved in the hash table to speed up subsequent searches.

Practice Test Questions

What is the name of the environment variable that defines your shell prompt?

Practice Test Questions

What is the name of the environment variable that defines your shell prompt?

It's PS1

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

/home/cis90/simben $ echo "The PWD variable =" $PWD
The PWD variable = /home/cis90/simben
/home/cis90/simben $
```

Both PS1 and PS2 are environment variables

Practice Test Questions

How do you change the shell prompt to `"Enter next command: "` ?

Practice Test Questions

How do your change the shell prompt to `"Enter next command: "` ?

Set PS1 to new value using "=" sign

```
/home/cis90/simben $
/home/cis90/simben $ PS1="Enter next command: "
Enter next command:
Enter next command: echo $PWD
/home/cis90/simben
Enter next command: echo $PS1
Enter next command:
Enter next command:
```

Practice Test Questions

How do you restore the original shell prompt so it displays the current directory followed by a $ and a blank?

Practice Test Questions

How do your change the shell prompt to "Enter next command: " then change it back again?

To restore the original prompt use:

```
Enter next command: PS1='$PWD $ '
/home/cis90/simben $
```

More Review (variables)

Environment Variables

Use `$` for the "value" of a variable

Analogy: Each variable is a named location. The contents of any location is the "value" of that variable.

```
$ echo $LOGNAME
simmsben

$ echo HOME
HOME

$ echo $HOME
/home/cis90/simmsben

$ echo $SHELL
/bin/bash

$ echo $HOSTNAME
opus.cabrillo.edu
```

Make your own shell variables

Imagine creating a new variable for use as the fan speed in your car

```
$ echo $FAN
```

Initially it's not defined so if echoed it has a null value

```
$ FAN=HI
$ echo $FAN
HI
$ echo "The fan is set to: " $FAN
The fan is set to:  HI
$ FAN=LO
$ echo "The fan is set to: " $FAN
The fan is set to:  LO
```

Create a variable named FAN and set the value to "HI"

Now set the FAN variable to "LO"

Activity

```
/home/cis90/simben $ weather=rain
/home/cis90/simben $ country=Spain
/home/cis90/simben $ location="the plain"
/home/cis90/simben $ echo The $weather in $country stays mainly in $location
The rain in Spain stays mainly in the plain
/home/cis90/simben $
```

When **echo** is loaded into memory and starts to run:

1) How many arguments does it receive from the bash shell?

2) Does **echo** see "`$weather`" or "`rain`" as one of the arguments it receives?

Write your answers in the chat window

Mini Review

Expectation Check

Commands you should understand and be comfortable using

Lesson/Lab 1		Lesson/Lab 2	
Commands	**Files & Directories**	**Commands**	**Files & Directories**
cal clear date exit history hostname id ps ssh uname tty who who am i	/etc/issue /etc/*-release	apropos banner bash bc cat cd echo env file finger info file ls passwd set type man whatis	/bin /usr/bin /sbin /usr/sbin /etc/passwd /etc/shadow

If you have any questions on these commands, post a question on the forum!

Class Activity

In what file are all the encrypted passwords kept?

Put your answer in the chat window

ssh command

Syntax:

ssh -p *port username*@*hostname*

Examples:

```
ssh -p 2220 simben90@son-of-opus.simms-teach.com
ssh -p 22 cis90@rhea.cishawks.net
```

Syntax shortcuts:

- If the port is 22, then it does not need to be specified.
- If the username is the same on the remote system it can be left off.
- If domain suffixes are automatically added they can be left off.

For example Benji could use any of the commands below to log into daughter-of-opus from Opus:

```
ssh -p 22 simben90@daughter-of-opus.cis.cabrillo.edu
ssh simben90@daughter-of-opus.cis.cabrillo.edu
ssh daughter-of-opus.cis.cabrillo.edu
ssh daughter-of-opus
```

Use the ssh command to log into a remote system

Class Activity

ssh to the Rhea system (port 22) and login as the cis90 user.

What terminal device are you using on Rhea?

Put your answer in the chat window

Key components of the Linux/UNIX architecture

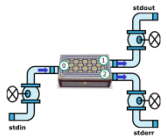
Users interact with the shell to run commands

Shell

System Commands

Applications

Kernel



Commands such as ls, cal, date, tty, id, who, etc.

Web servers, databases, word processors, etc.

The kernel manages processes, memory, file system, and the network stack and interacts with all the hardware components

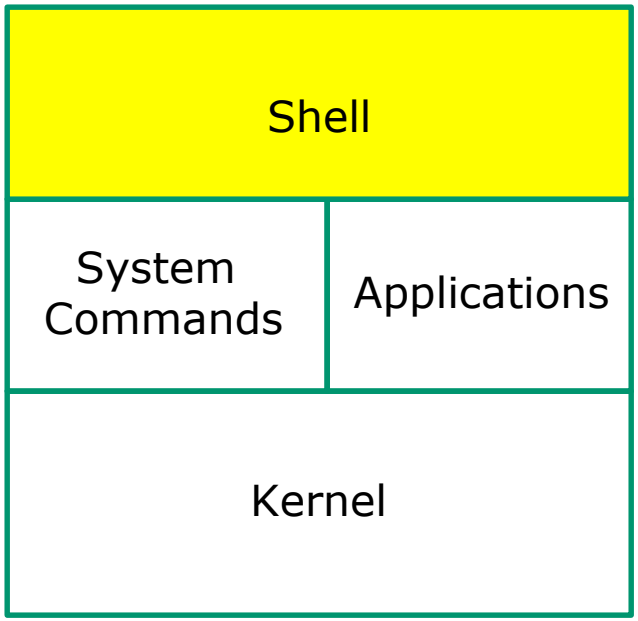
Class Activity

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

What kernel is running on Rhea?

Put your answer in the chat window

Life of the Shell



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

Class Activity

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

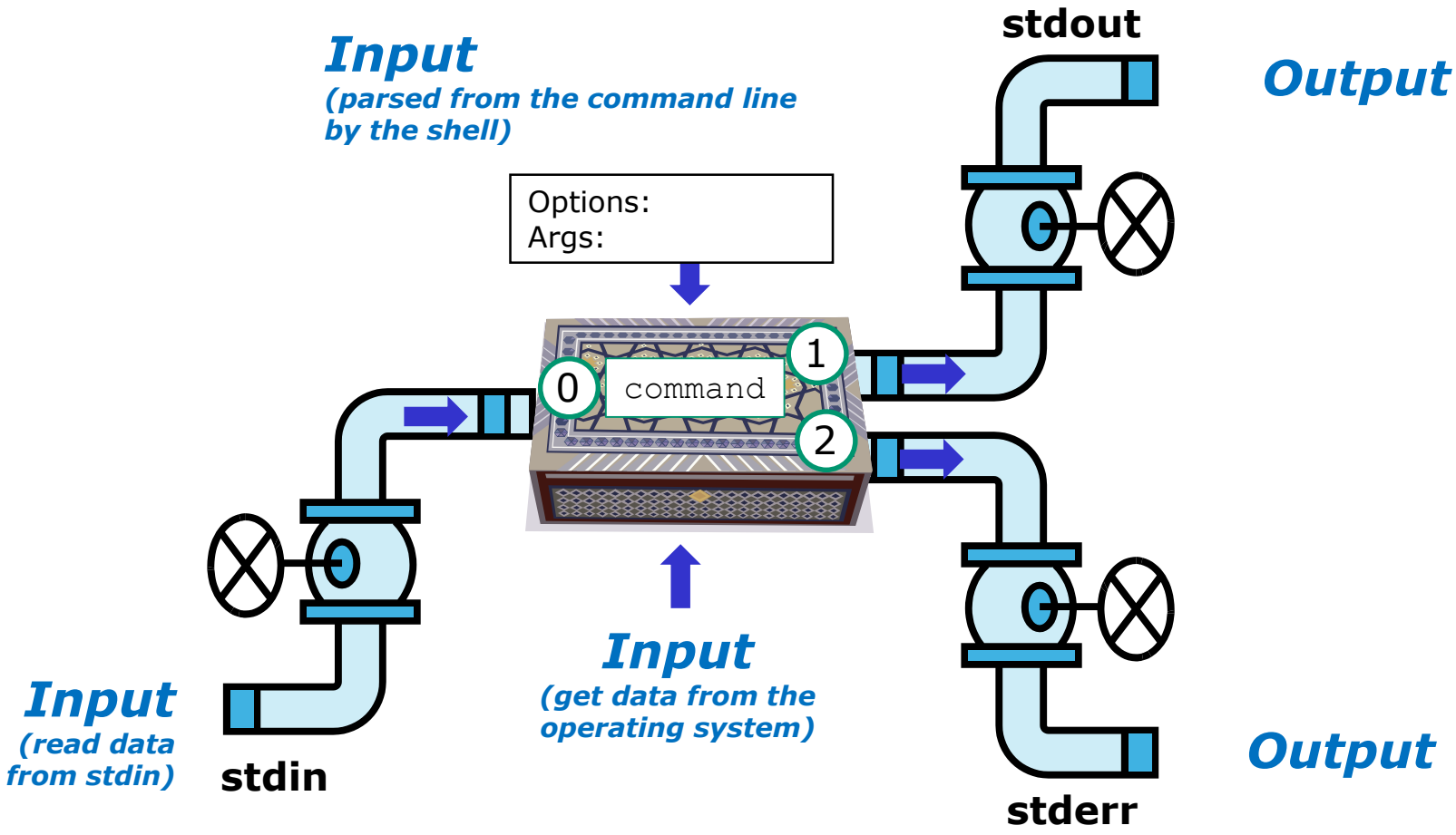
As the cis90 user on Rhea enter this command:

```
ls -lt /usr/games
```

How many directories on the path did the shell have to search to locate the command used above?

Put your answer in the chat window?

Inputs and Outputs



NEW *The three file descriptors provided to every process are named **stdin**, **stdout** and **stderr***

Class Activity

As the cis90 user on Rhea enter this command:

```
banner Hola
```

Where does the **banner** command on Rhea get it's input from?

a) The command line (passed in by the shell)
b) The keyboard (read from stdin)
c) The operating system

Put your answer in the chat window

Answer

In what file are all the encrypted passwords kept?

/etc/shadow

Answer

ssh to the Rhea system (port 22) and login as the cis90 user.

What terminal device are you using on Rhea?

```
/home/cis90/simben $ ssh cis90@rhea
Password for cis90@rhea:
Last login: Tue Feb  9 15:32:36 2016 from opus.cis.cabrillo.edu
FreeBSD 10.0-RELEASE-p18 (GENERIC) #0: Wed Feb 25 01:08:00 UTC 2015

__________.__
\______   \  |__   ____ _____
 |       _/  |  \_/ __ \\__  \
 |    |   \   Y  \  ___/ / __ \_
 |____|_  /___|  /\___  >____  /
        \/     \/     \/     \/
< snipped >
$ tty
/dev/pts/0
```

Terminal device will vary by user

Answer

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

What kernel is running on Rhea?

```
/home/cis90/simben $ ssh cis90@rhea
Password for cis90@rhea:
Last login: Tue Feb  9 15:32:36 2016 from opus.cis.cabrillo.edu
FreeBSD 10.0-RELEASE-p18 (GENERIC) #0: Wed Feb 25 01:08:00 UTC 2015

__________.__
\______   \  |__   ____ _____
 |       _/  |  \_/ __ \\__  \
 |    |   \   Y  \  ___/ / __ \_
 |____|_  /___|  /\___  >____  /
        \/     \/     \/     \/
< snipped >
$ uname
FreeBSD
```

Free BSD kernel

Answer

If you haven't already, ssh to the Rhea system (port 22) and login as cis90.

As the cis90 user on Rhea enter this command:

`ls -lt /usr/games`

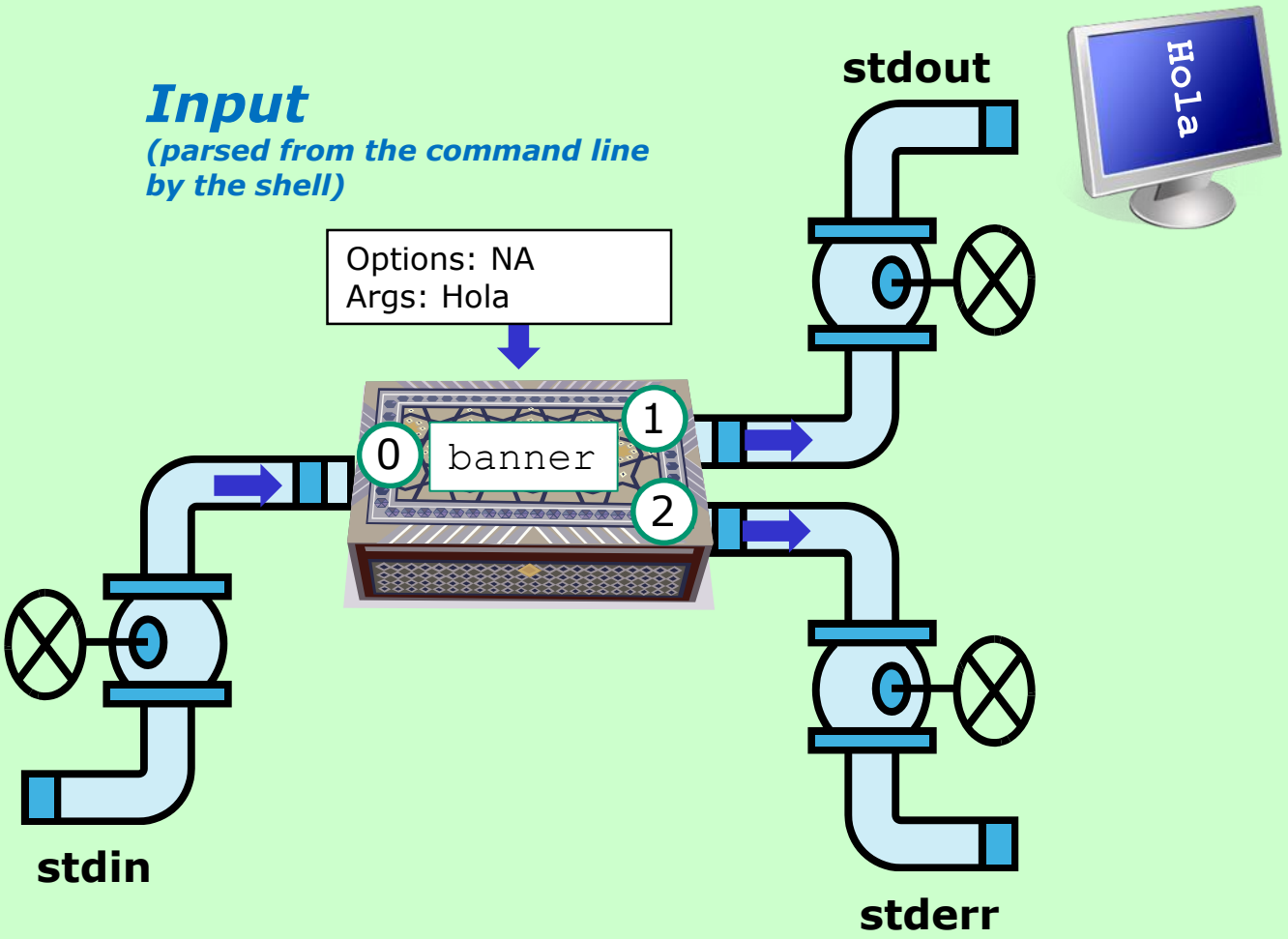
How many directories on the path did the shell have to search to locate the command used above?

```
$ type ls
ls is /bin/ls
$ echo $PATH
/sbin:/bin:/usr/sbin:/usr/bin:/usr/games:/usr/local/sbin:/usr/local/bin:/home/cis90/bin
```

The shell had to search two directories. The first was /sbin and the second was /bin.

Answer

$ **banner Hola**



*The **banner** command is an example of a command that gets its input from the command line*