My Checklist

- Slides
- WB converted fro PowerPoint

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

- Lab 3 tested
- Schedule lock of turnin directory and submit
- 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 historical events ready for mailing

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

Student checklist

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

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

3) Click Enter virtual classroom to join CCC Confer session

4) Connect to Opus using Putty or ssh command

CIS 90 - Lesson 3

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


Francisco

Leila

Justin

Jesus

Shenghong

Paul

Roberto


Sam


Navin


Jimmy

Luis

Tommy


Adrian


Ann


Cameron

Cody

Alejandrino


Deane

Nadia

Richard Z.

Gabriel

Ryan


Takashi


Jeff


Nick


Jonathan

Shea

Dylan

Joshua

Richard I.


Aaron


Nicole

James

Matthew

Abraham

Chris

Ronald

Scott

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

Introductions and Credits

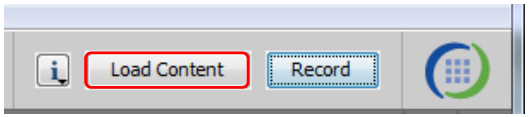
Jim Griffin
- Created this Linux course
- Created Opus and the CIS VLab
- Jim's site: http://cabrillo.edu/~jgriffin/

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/)

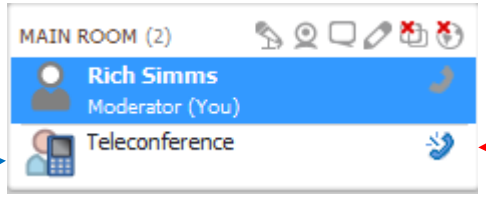
Instructor CCC Confer checklist

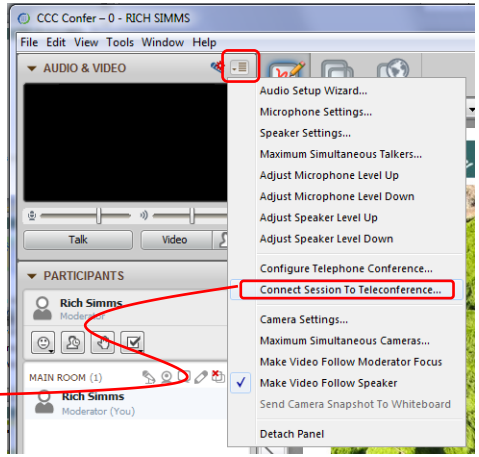
[ ] Preload White Board



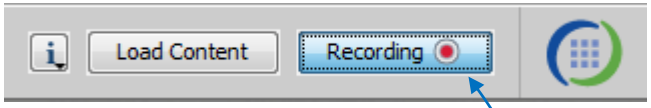
[ ] Connect session to Teleconference

Session now connected to teleconference





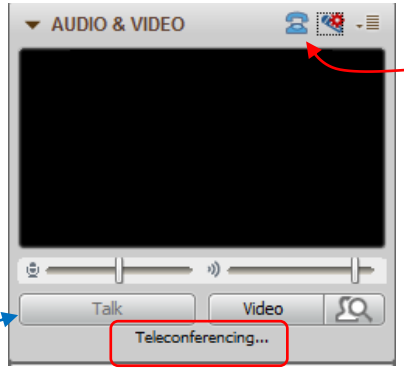
[ ] Is recording on?



Red dot means recording

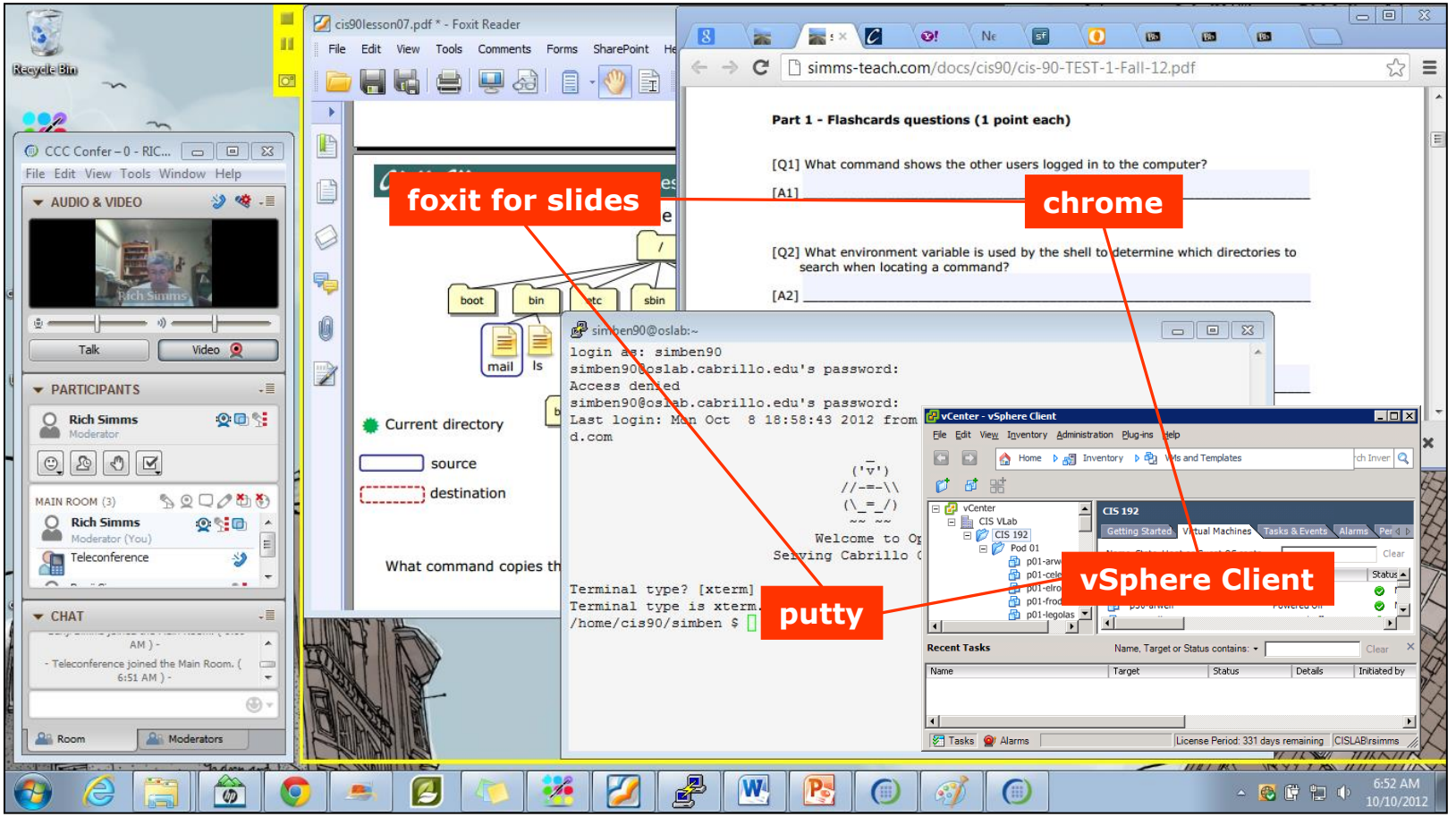
[ ] Use teleconferencing, not mic

Should be greyed out



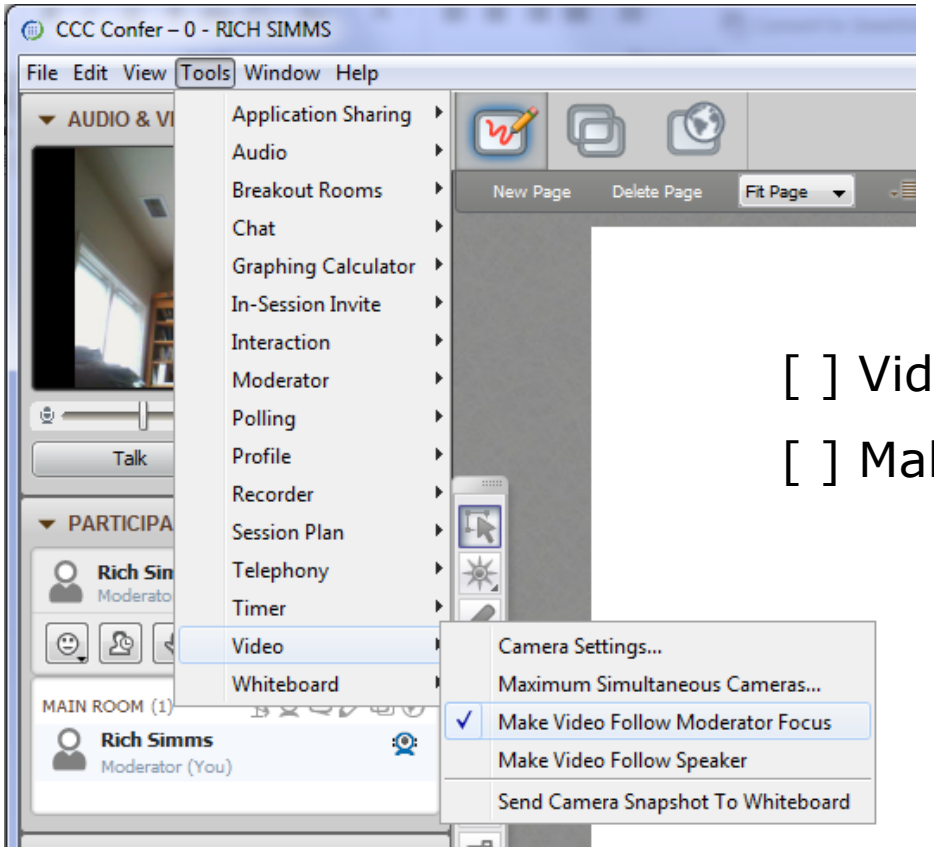
Should show as this live "off hook" telephone handset icon and the Teleconferencing … message displayed

Instructor CCC Confer checklist



[ ] layout and share apps 

Instructor CCC Confer checklist



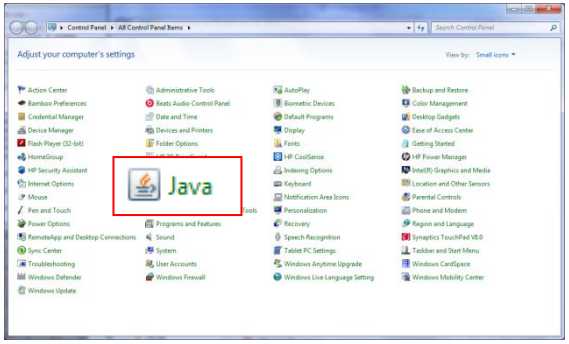
[ ] Video (webcam)

[ ] Make Video Follow Moderator Focus

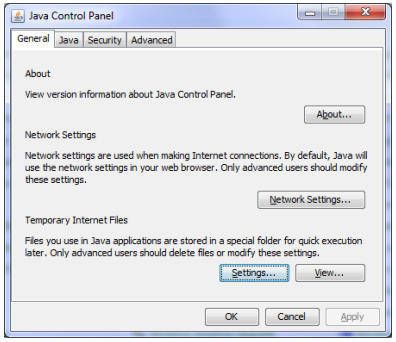
Instructor CCC Confer checklist

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

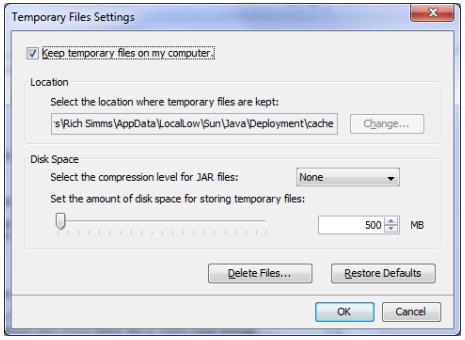
Control Panel (small icons)



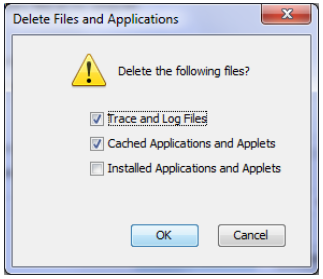
General Tab > Settings…



500MB cache size



Delete these



Google Java download

First Minute Quiz

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

Use CCC Confer White Board

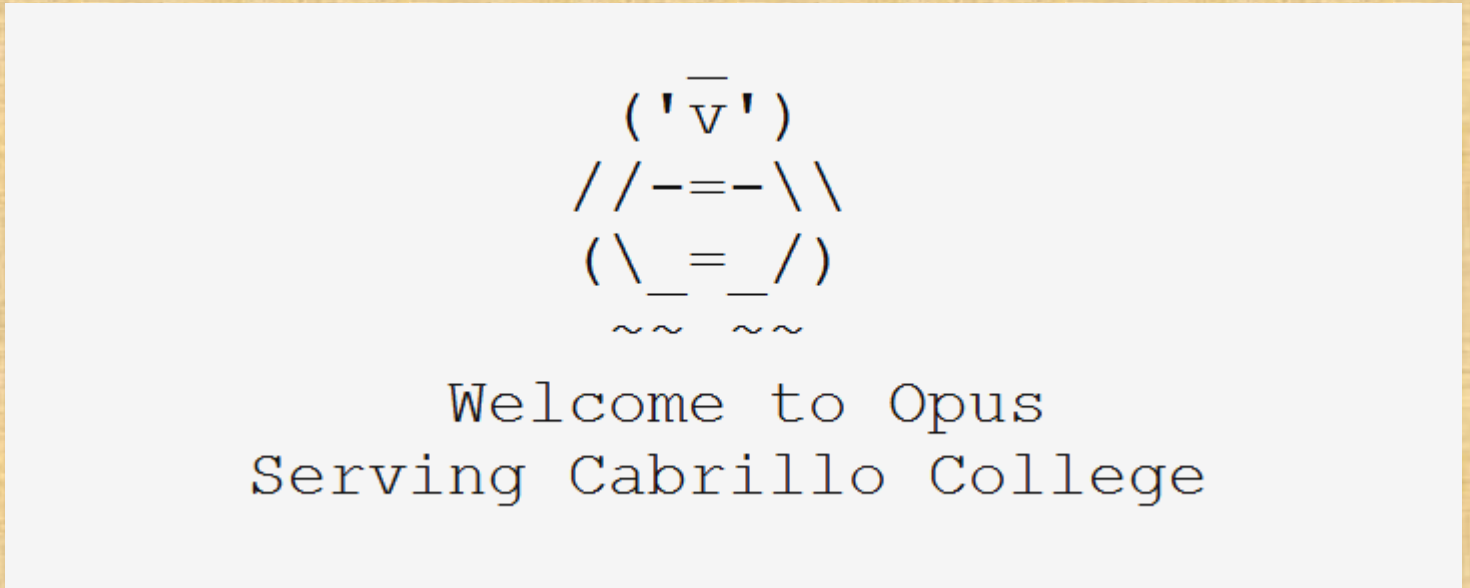
email answers to: risimms@cabrillo.edu

(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 from last week • Mini review • Housekeeping • Write • Basic Mail • More on Mail • 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?

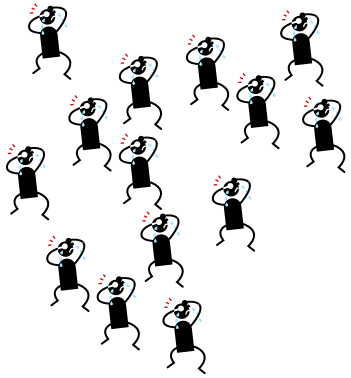
- Graded work in home directories
- Answers in /home/cis90/answers

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.*

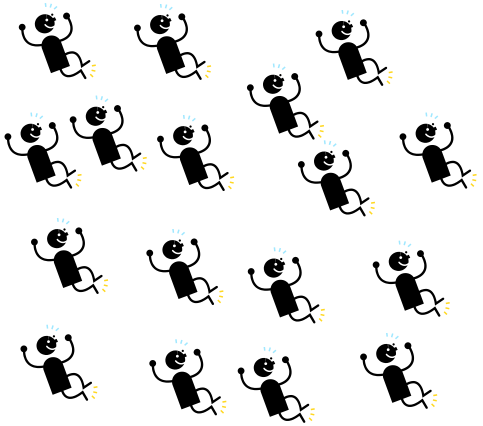
Quiz 1 Results



No quiz submitted= 14

Submitted, but answers not in order or incorrect= 3

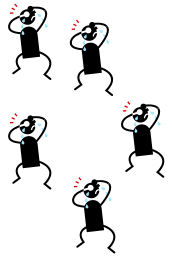
Submitted, but too late= 2



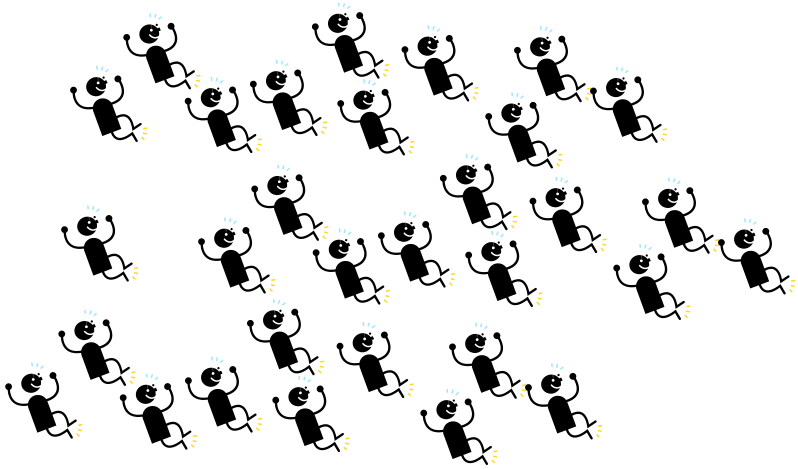
Submitted with correct answers in order = 17

To see answers use: ***cat /home/cis90/answers/quiz01*** *on Opus*

Lab 1 Results



No lab submitted = 5

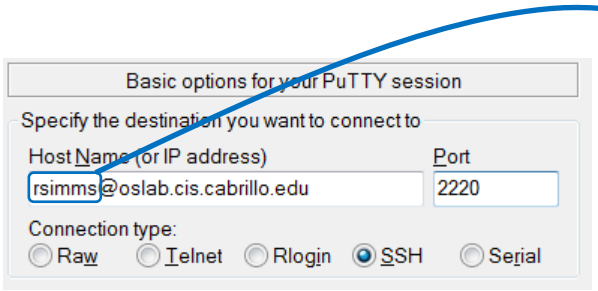


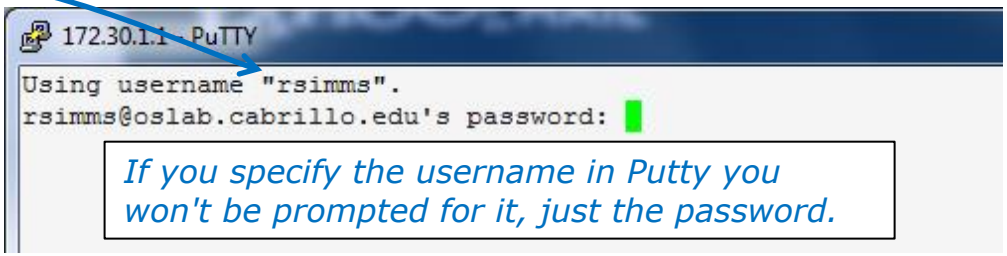
Lab submitted = 31

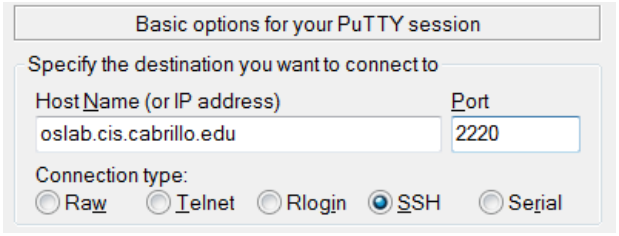
To see answers use: ***cat /home/cis90/answers/lab01*** *on Opus*
To see graded lab use: ***cat lab01.graded*** *(then scroll back to start) on Opus*

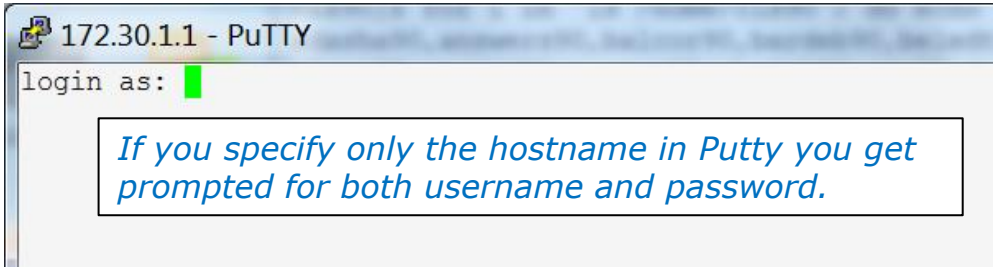
Subtle Stuff

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:

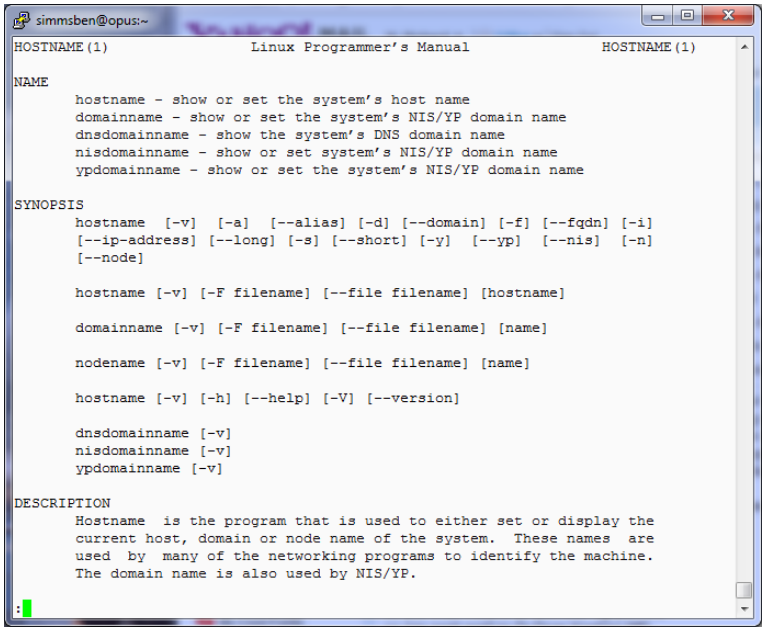
```
/home/cis90/simben $ type hostname
hostname is /bin/hostname
```

The hostname program file is in the /bin directory

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

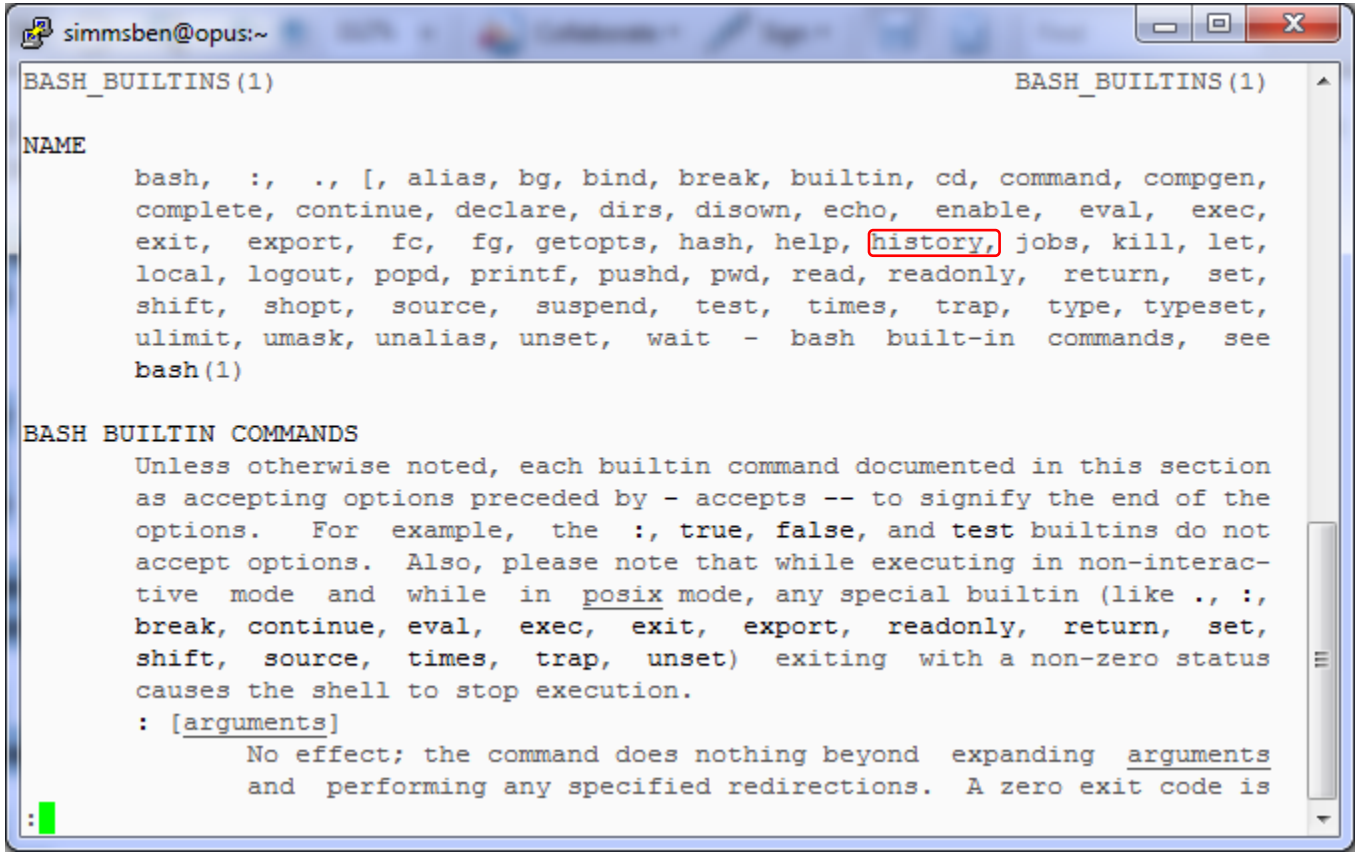
*The **ls** command is aliased, use the **-a** option on the **type** command to find where the command resides on the path*

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

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

The **ssh** command is used to login as *username* on a remote UNIX/Linux system named *hostname* via a firewall *port* as follows:

ssh -p *port username*@*hostname*

Examples:

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

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 either command below to log into Doc from Opus:

```
ssh -p 22 simben90@sun-hwa-iii
ssh sun-hwa-iii
```

Class Activity

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

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

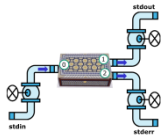
Shell

System Commands

Applications

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

Web servers, dhcp servers, word processors, etc.



Kernel

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

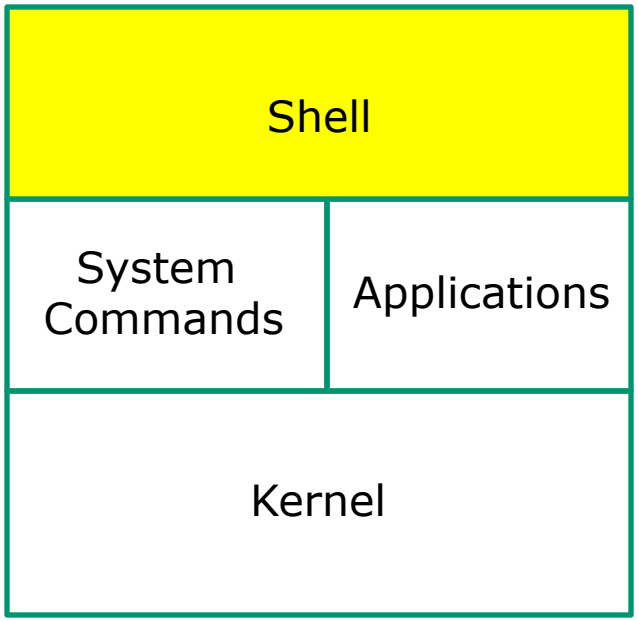
Class Activity

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.

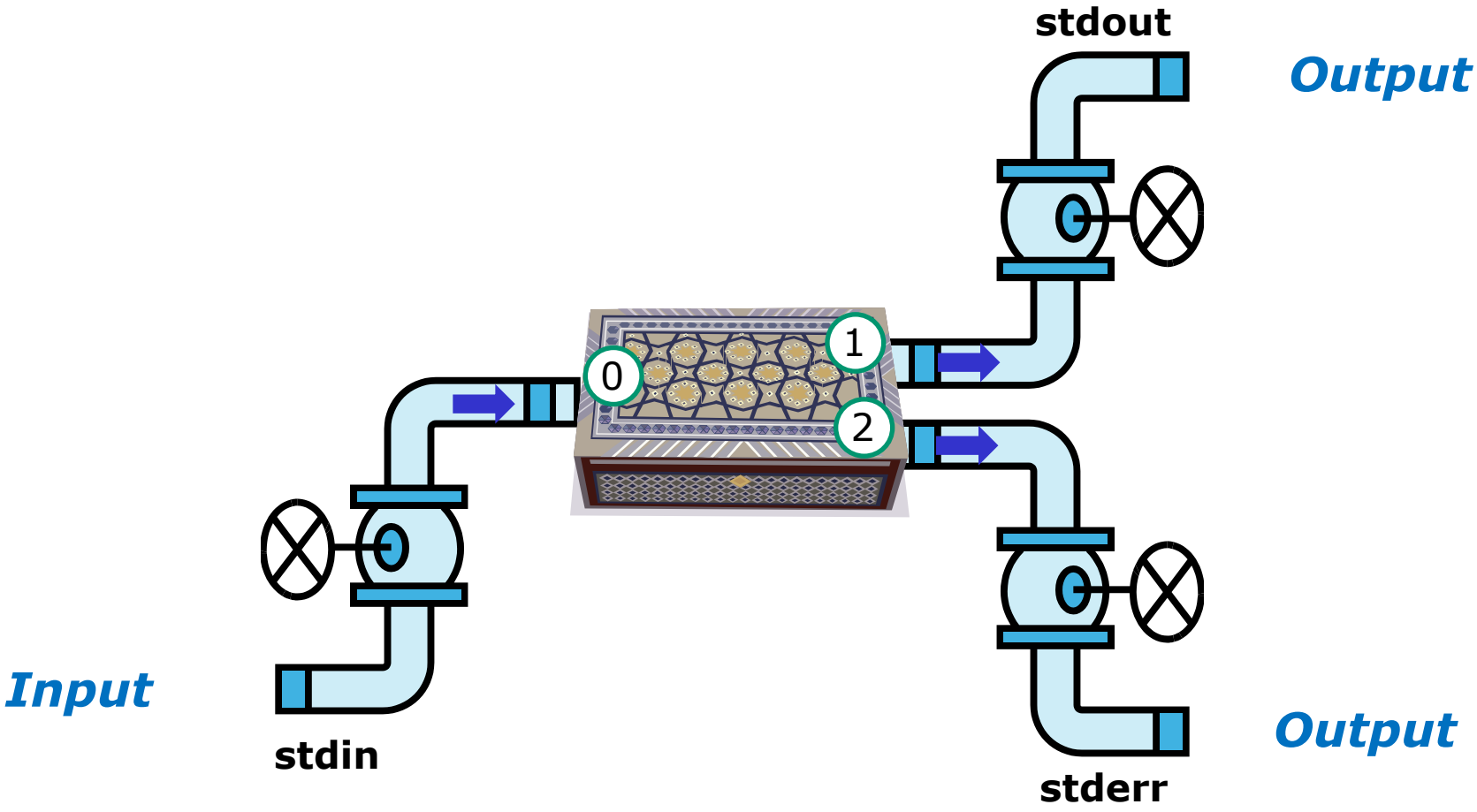
1) How many directories are on your path on Rhea?

Put your answer in the chat window

1) If the shell was searching for the man command on Rhea, how many directories would it have to search to find it?

Put your answer in the chat window

Inputs and Outputs



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

Class Activity

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

Does the banner command on Rhea get it's input from the command line, the keyboard (stdin) or the operating system?

Put your answer in the chat window

Using CIS VLab (Virtual Lab)

Third driving lesson

The CIS 90 System Playground

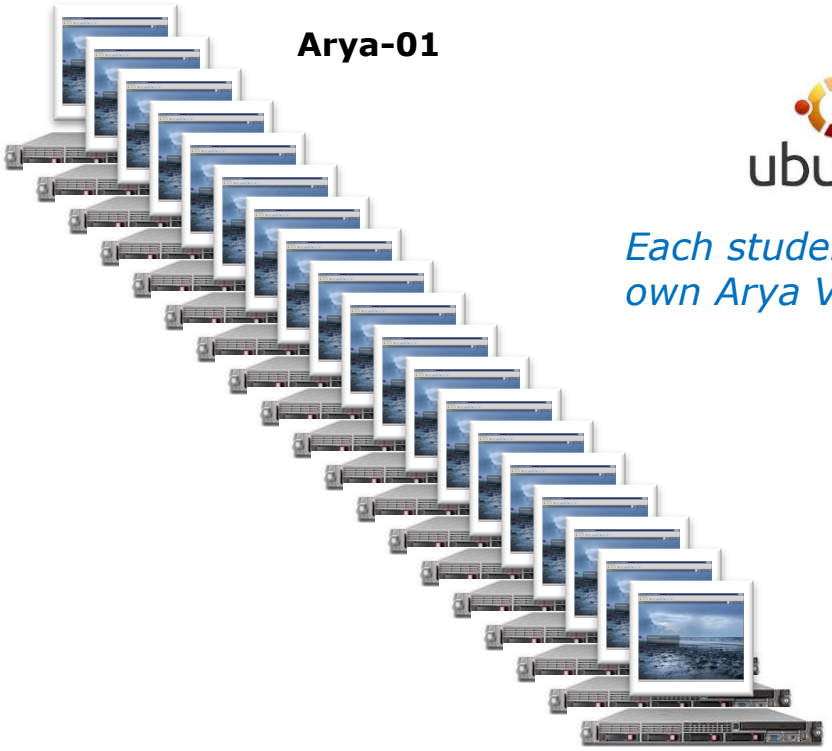
Configured for
Command Line Only

Opus

Sun-Hwa and Sun-Hwa-II

Other UNIX/Linux servers

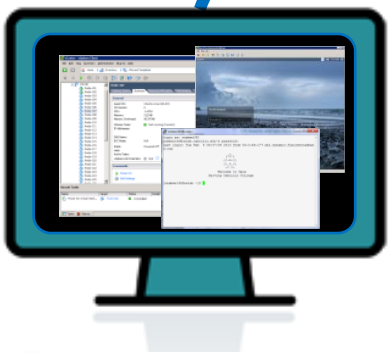
Configured for
Graphics and Command Line



Each student gets their own Arya VM for the term

All the systems are virtual machines (VMs) running on the CIS Lab servers. They are available from on or off-campus

Accessing CIS VLab VMs



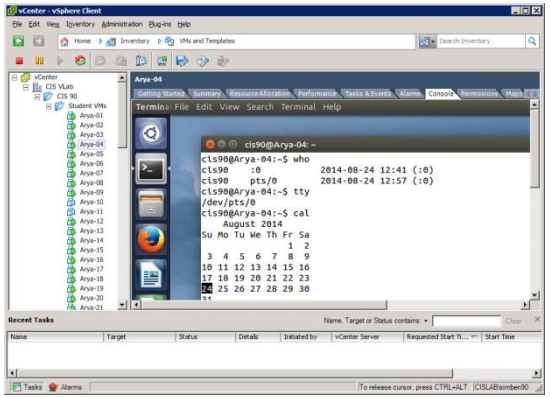
Home

School

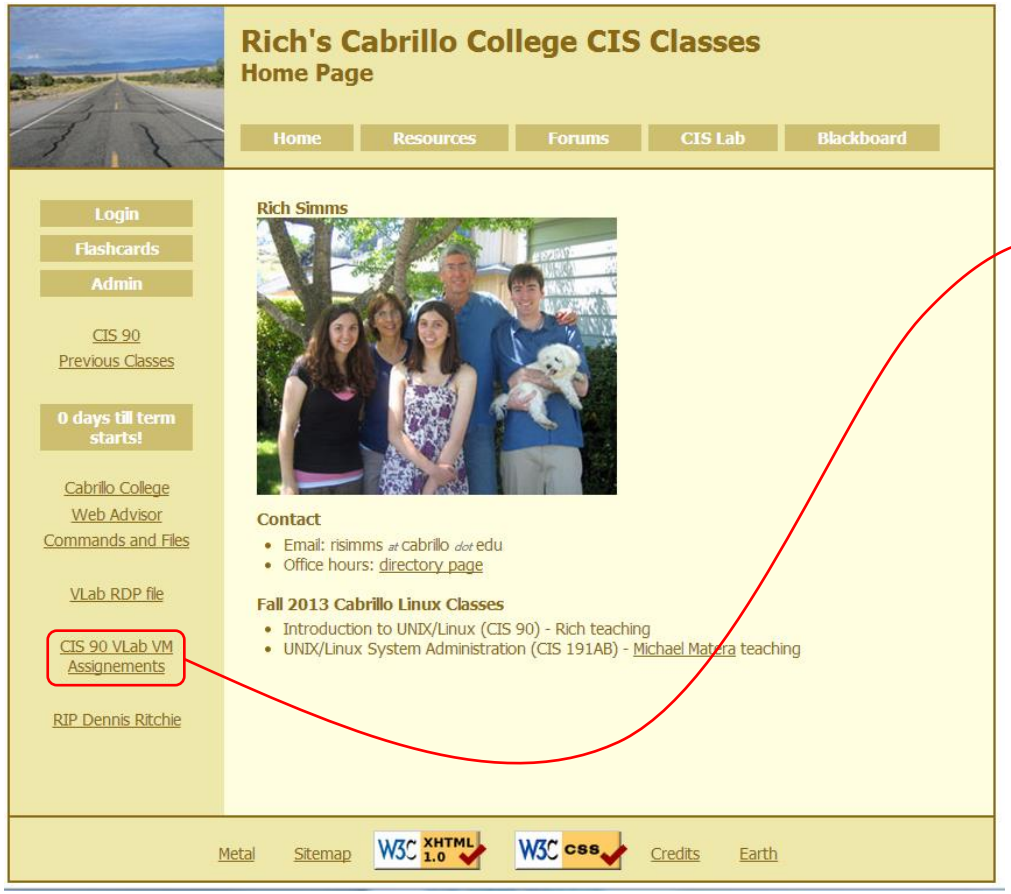
Travel

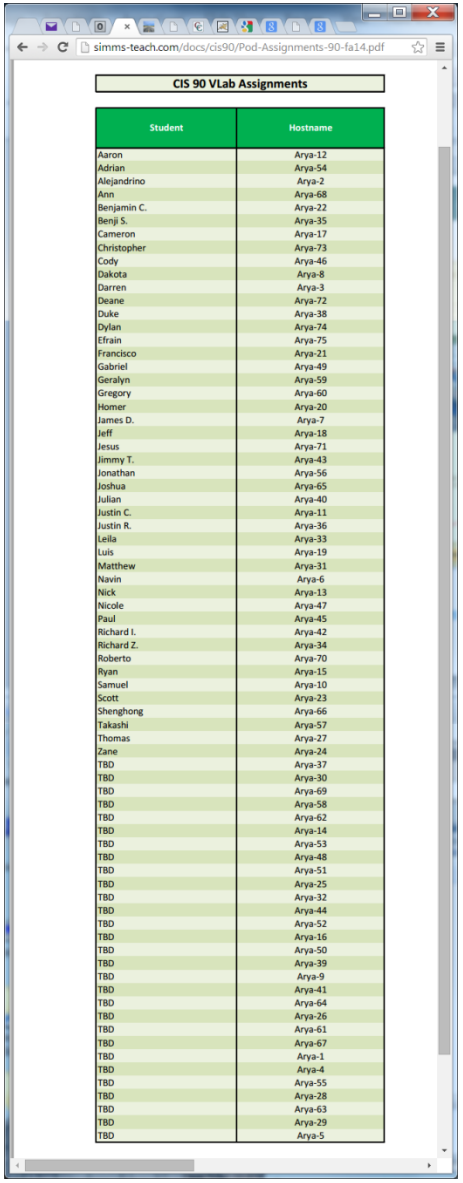
Internet

CIS Lab servers on the Aptos campus



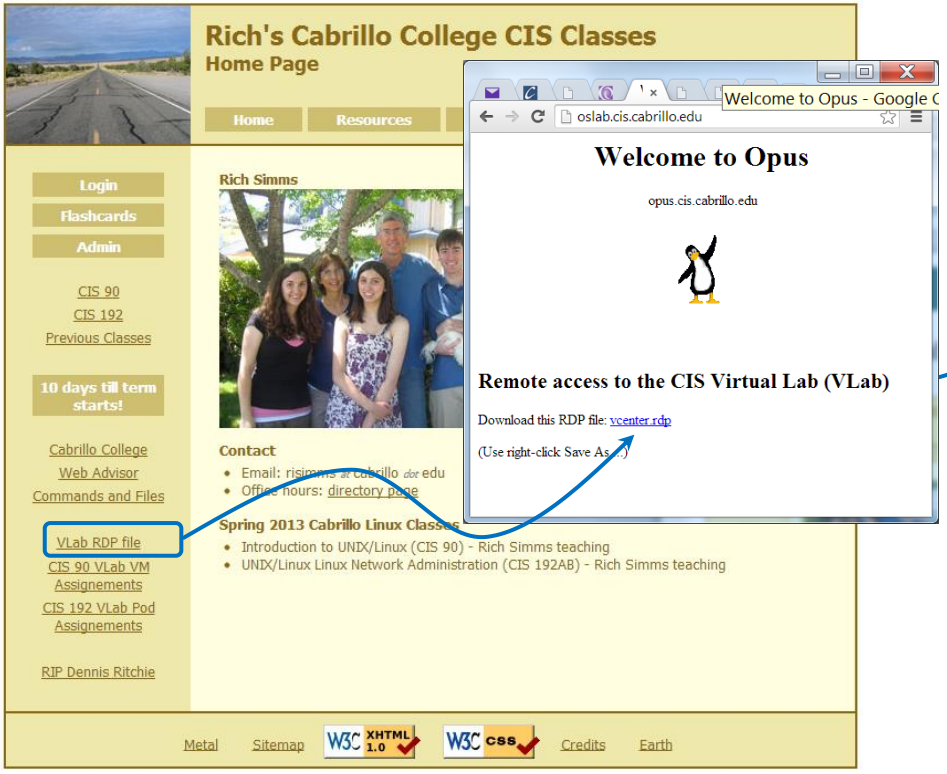
vmware

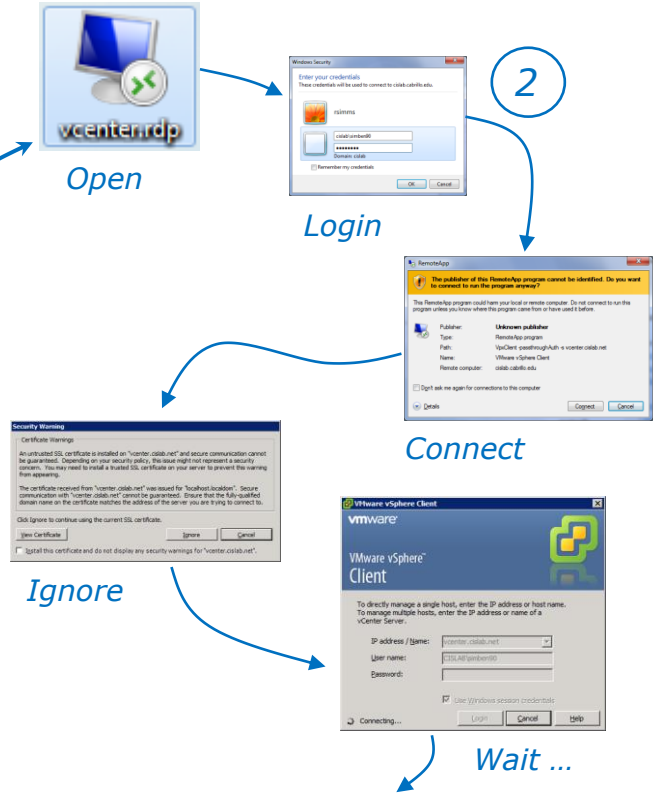


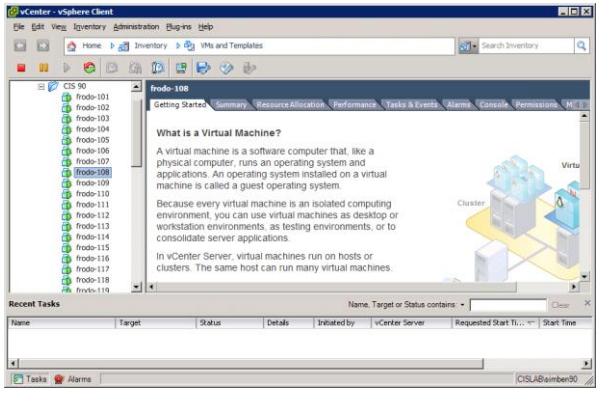


To see which Arya VM is yours use the link on the class website

Accessing CIS VLab







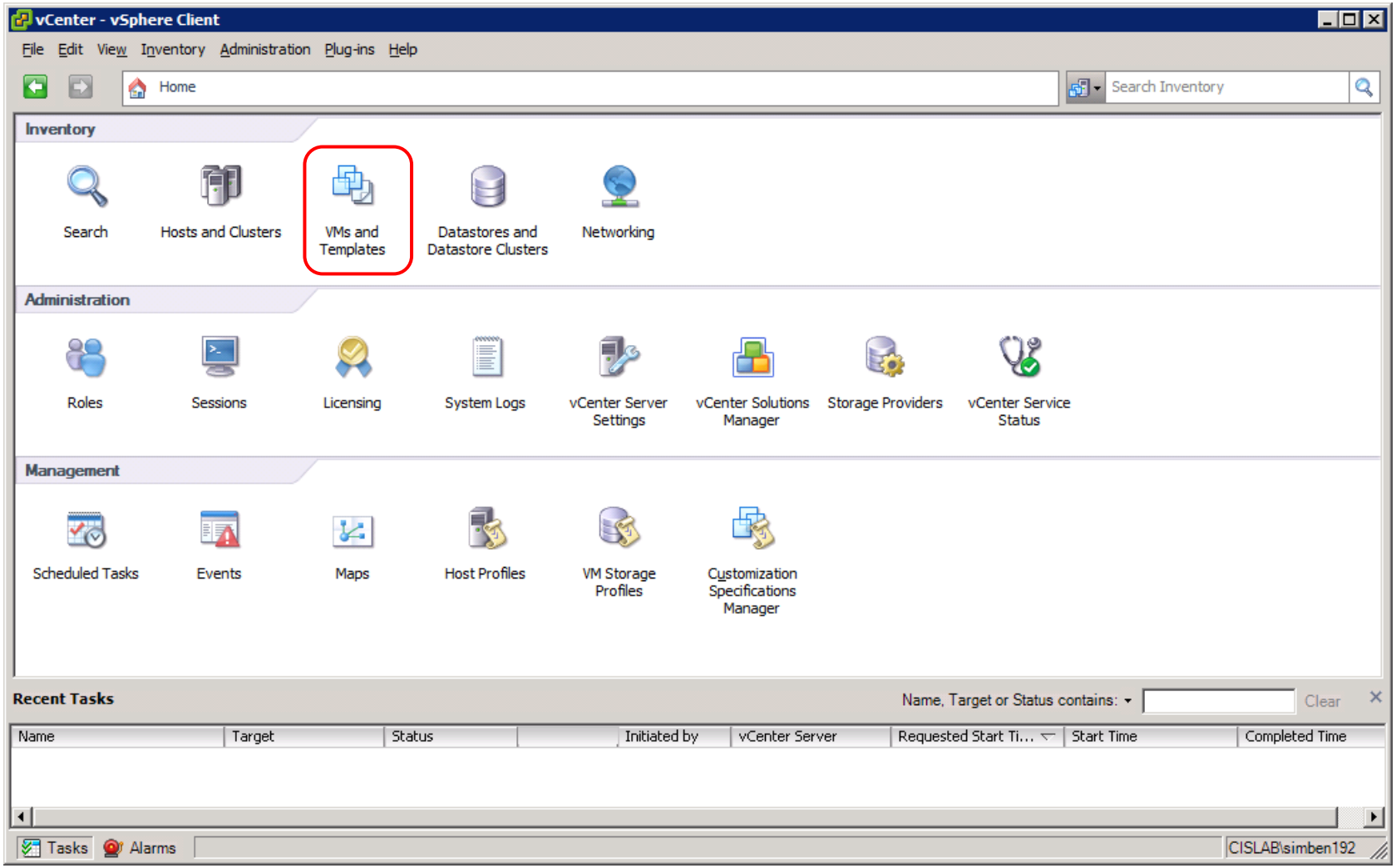
Locate and select your assigned VM

1) Download the vcenter.rdp file to your desktop and then open it to access VLab.

*2) Mac users will **need to install** CoRD.*

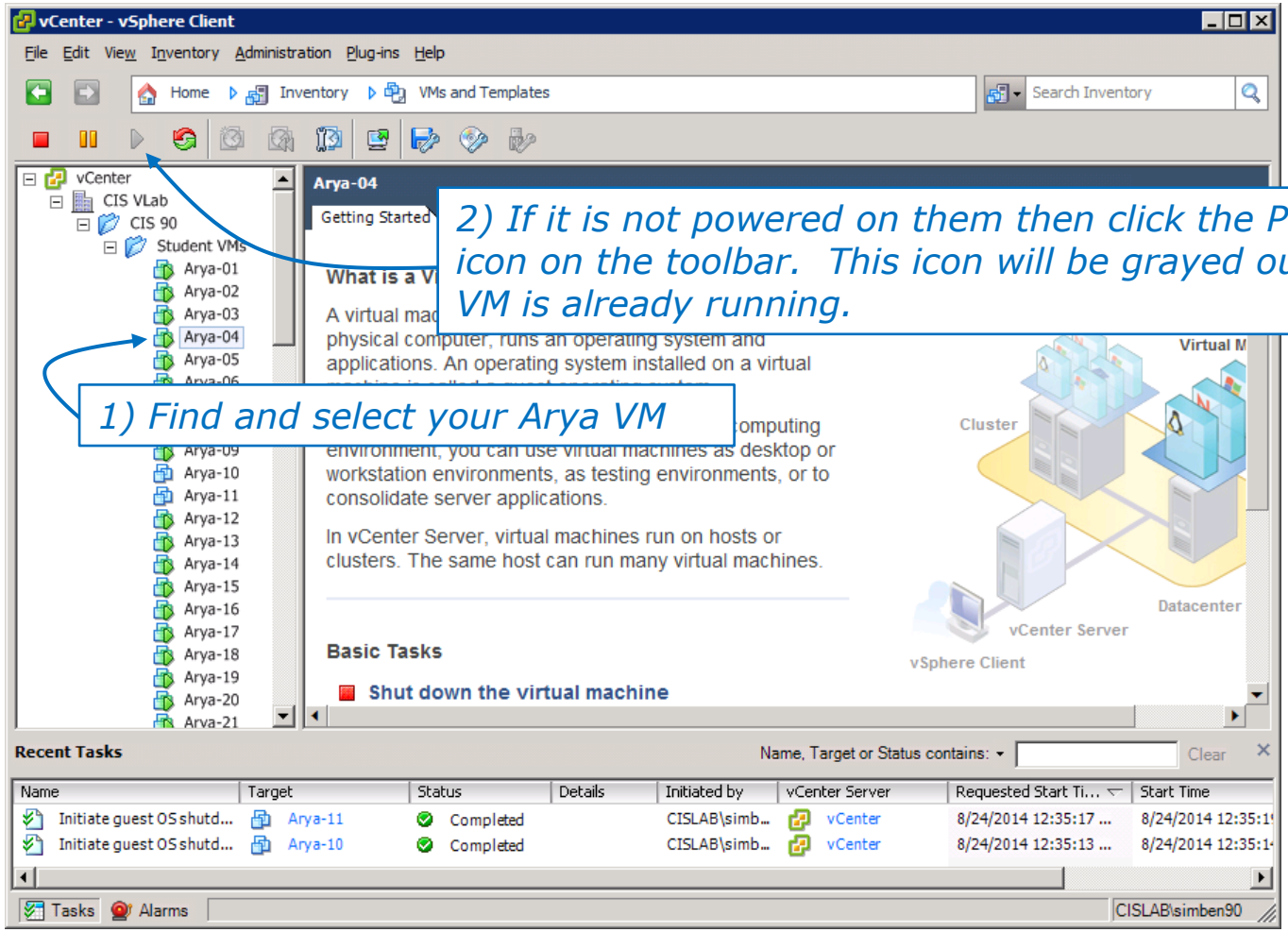
3) When entering your username and password you must preface your username with the "cislab\", for example Benji would use: cislab\simben90

CIS VLab Home View



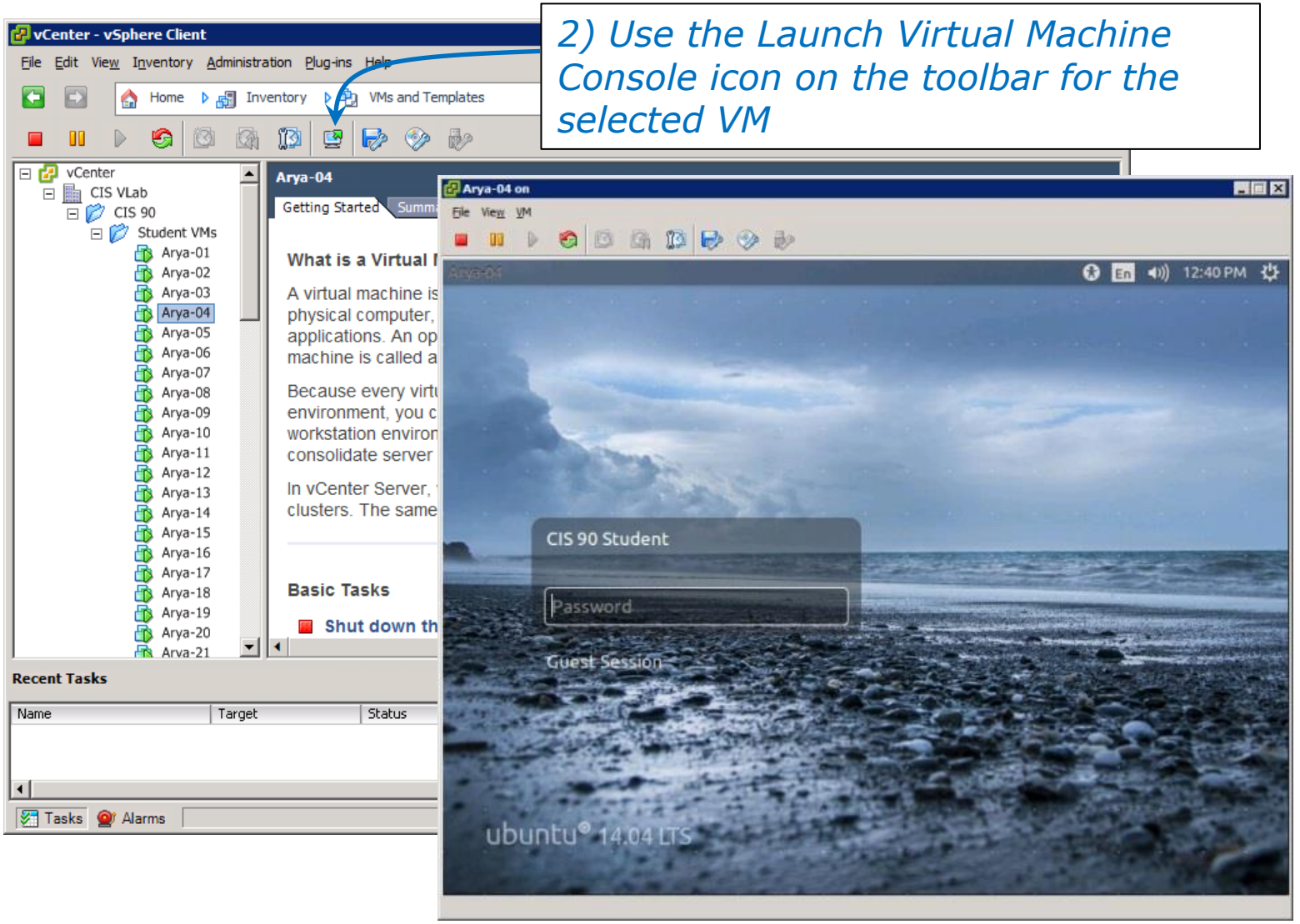
Click VMs and Templates to get to your course VMs

Selecting and powering on your VM

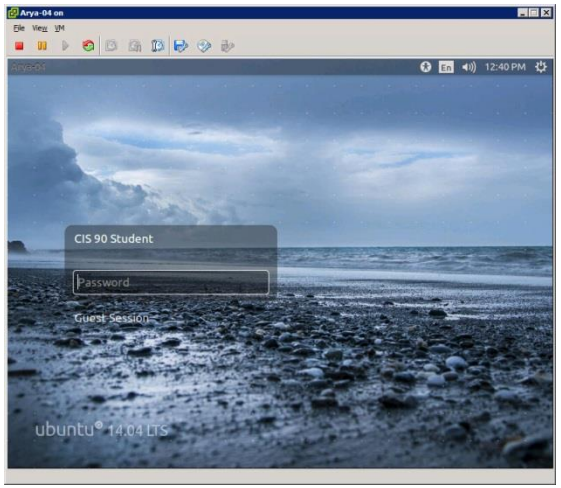


Note that the Arya-10 and Arya-11 VMs above are not powered on

Launching a graphical console



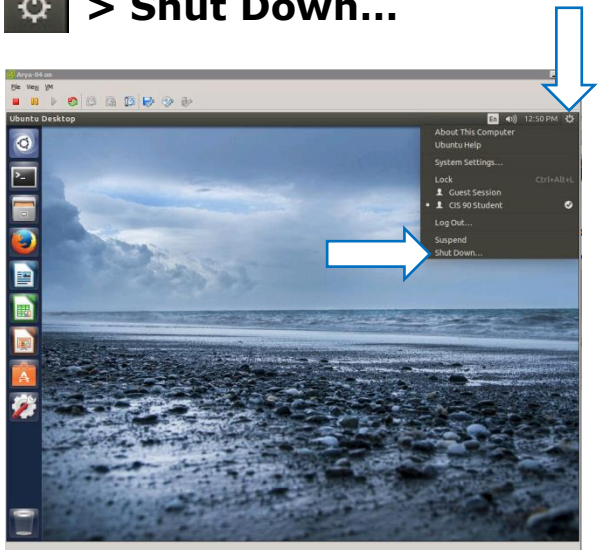
Log in as
CIS 90 Student



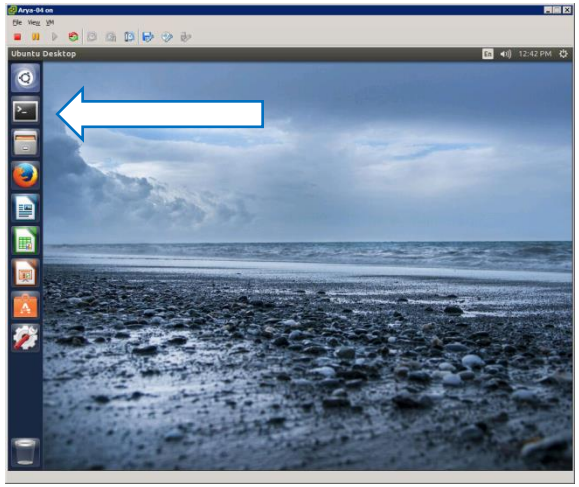
The Arya VM

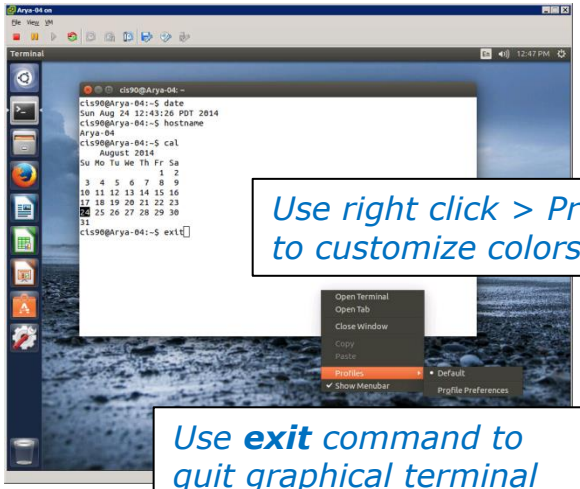
ubuntu

Shutdown using
> Shut Down…



To get a graphical terminal
Terminal icon (under System Settings)





Use right click > Profiles to customize colors

*Use **exit** command to quit graphical terminal*

Command Line vs Graphical Desktop

Access the UNIX/Linux systems using:

ssh when:

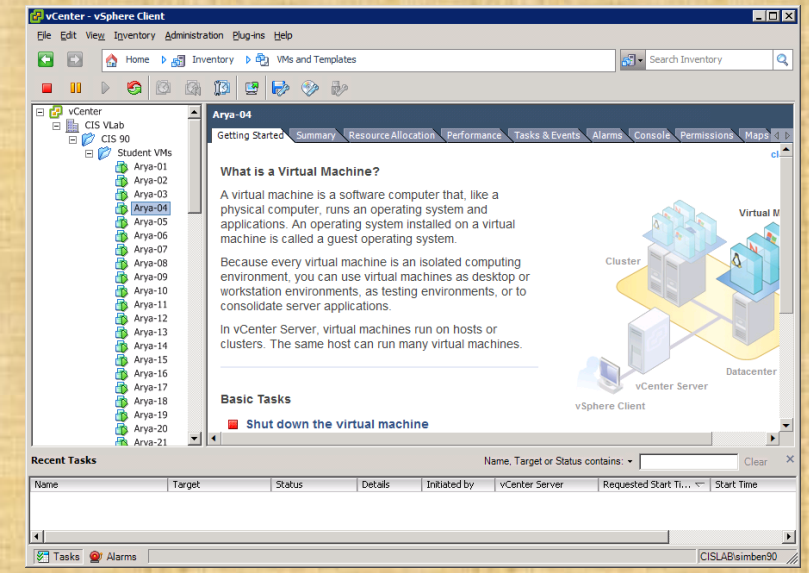
- You just need a command line
- Have a low or high speed network connection
- Note: Windows users can use Putty

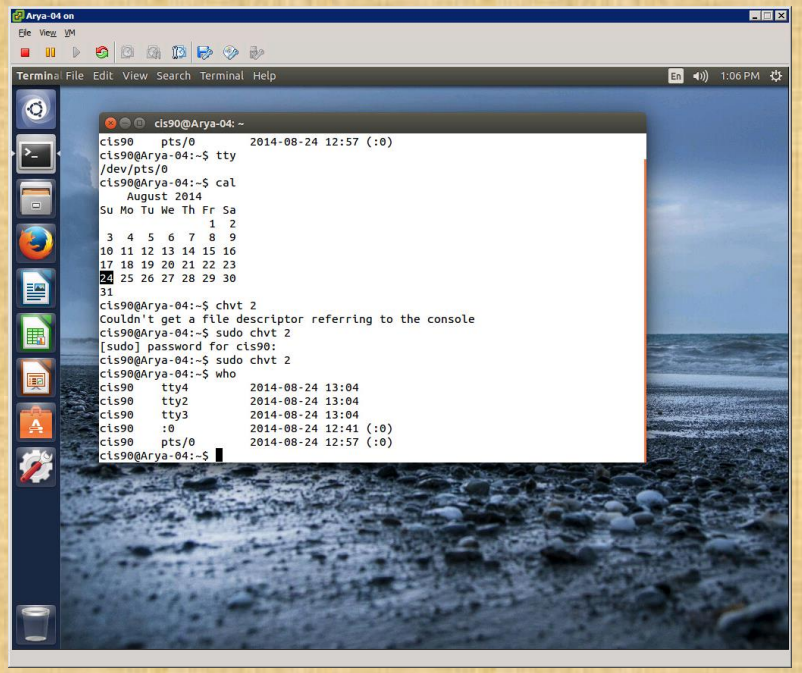
VLab when:

- You want a graphical desktop
- You want to use virtual terminals (the very basic black consoles)
- Note: High speed network connection is needed
- Note: Mac users can use CoRD
- Note: you may need a fix applied to your VM if you experience the dreaded "unintended repeating key" issue

VLab = using the VMware vSphere Client via a Remote Desktop (RDP) connection

Class Activity





Try logging into CIS VLab with your **own credentials**

- Find your VM
- Power it on (if it's not already)
- Open a separate console for your VM
- Login as CIS 90 Student into the graphical desktop
- Run a terminal on the graphical desktop

Virtual Terminals (consoles)

Fourth driving lesson

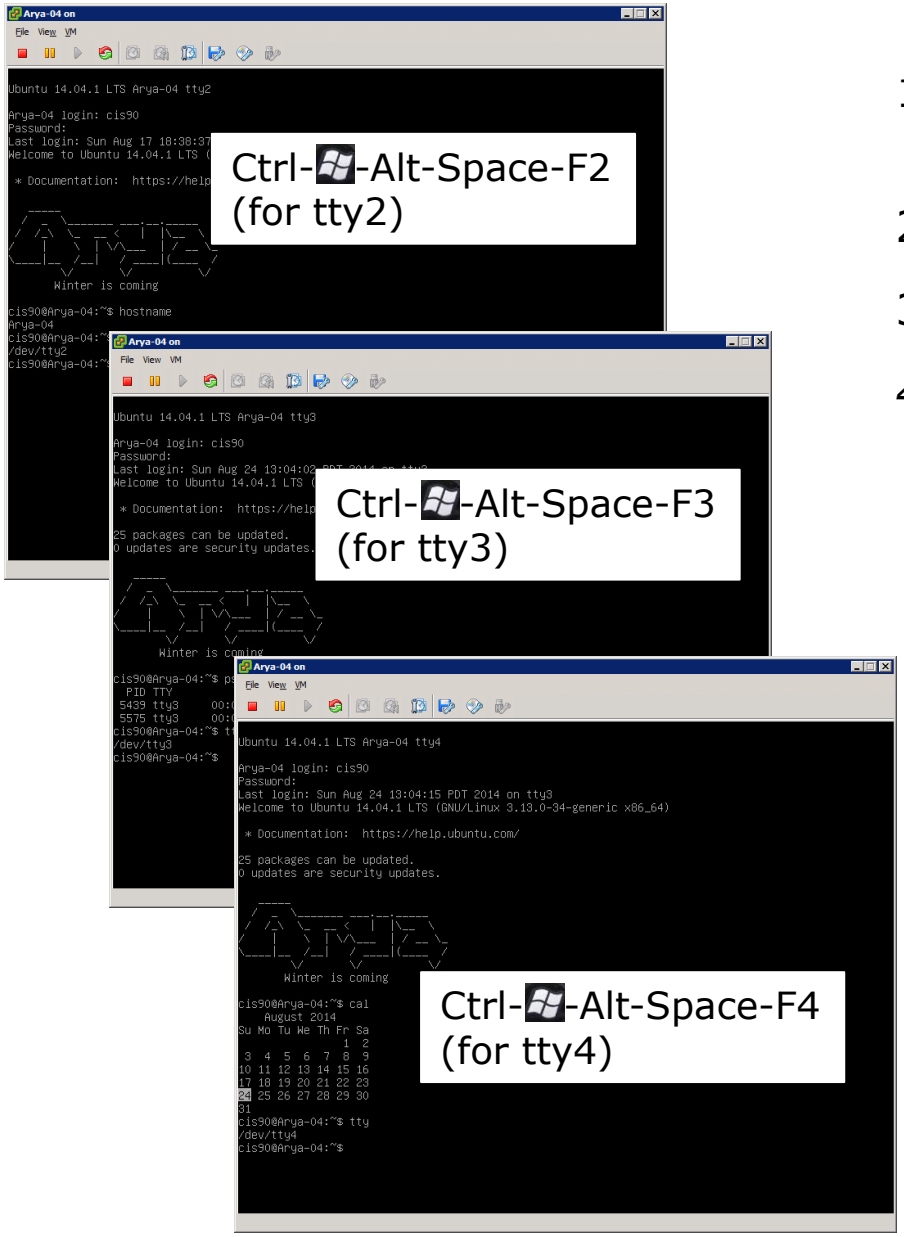
Virtual Terminals

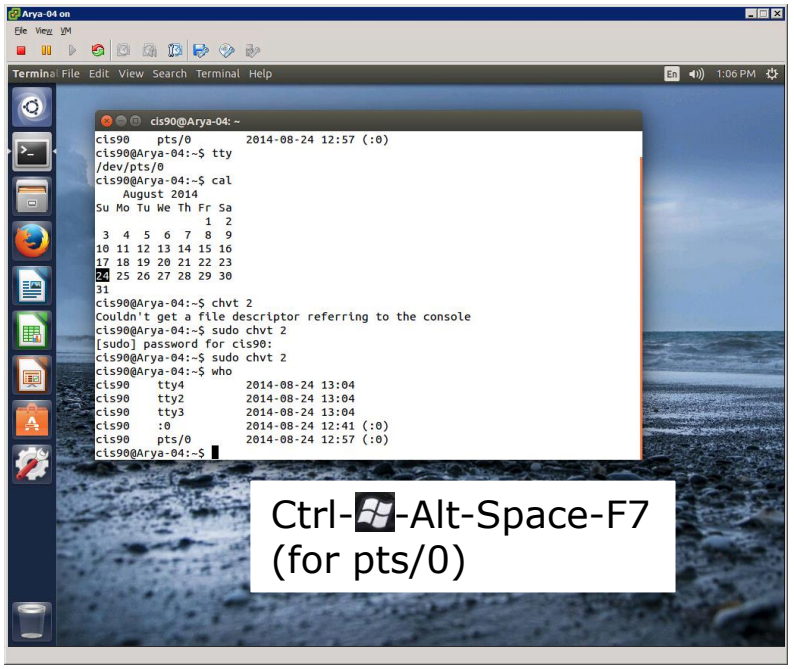
1) While holding down Crtl-⊞-Alt keys, tap Space, then tap F*n* key

2) or try: **chvt** *n*

3) or try: **sudo chvt** *n*

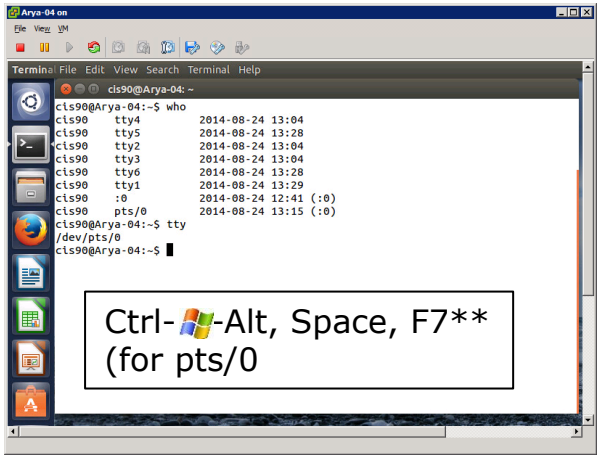
4) or try: <alt-key> n
(in an Ubuntu virtual terminal)

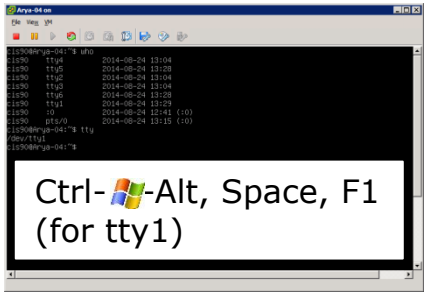


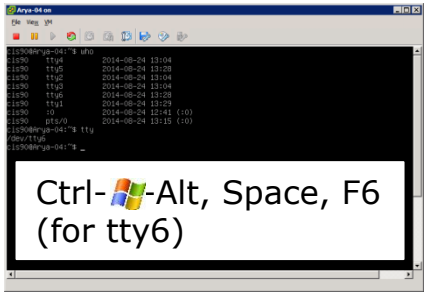


Changing Virtual TTY Terminals using **VMware vSphere**

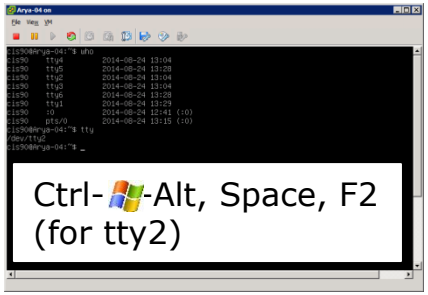
Windows PC Keyboard

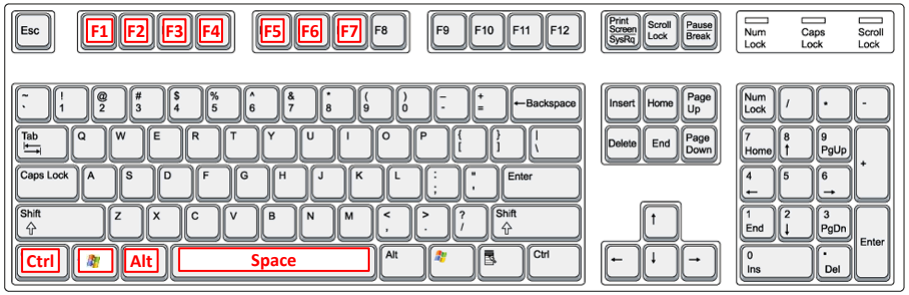


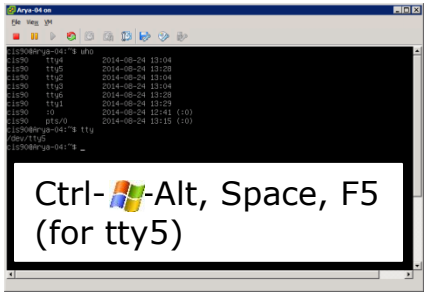


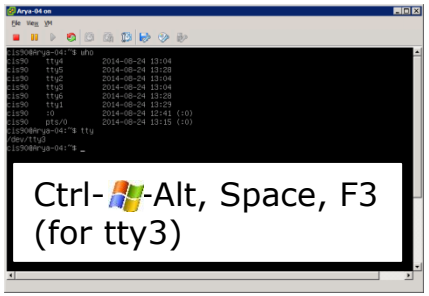


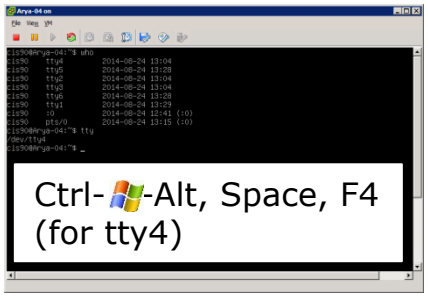
While holding down Crtl-⊞-Alt keys, tap Space, then tap Fn key*











*On some PC keyboards it is not necessary to use the ⊞ key

Note: This is for vSphere only. The ⊞ key and Space bar are not pressed for physical (non-VM) servers

Changing Virtual Terminals on VMware Linux VMs

VMware operations	
On PC Keyboard:	While holding down the Ctrl-⊞-Alt keys, tap spacebar then tap f1, f2, ... or f7.
On Mac keyboard:	Hold down Control and Option keys, tap the spacebar, hold down fn key (in addition to Control and Option keys) and tap f1, f2, ... or f7.

Pressing the ⊞ on some Windows keyboards may not be necessary

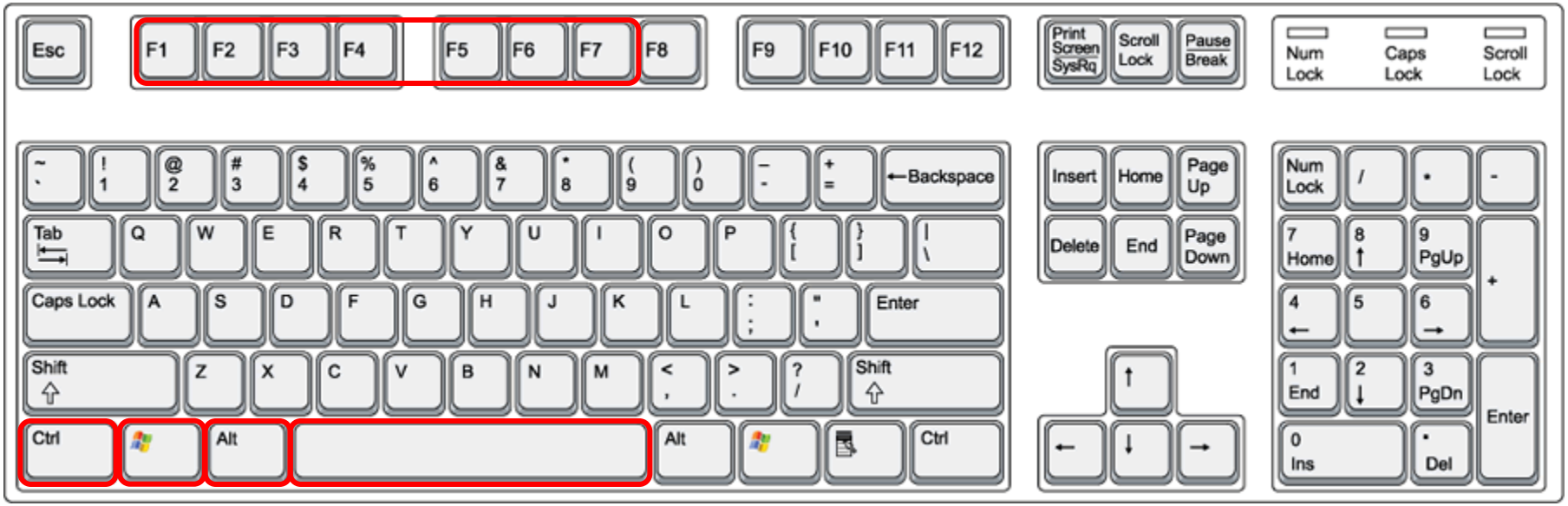
F7 is graphics mode for the Ubuntu VMs.

The Centos VMs do not have a graphics mode components installed (run level 3 only)

Note: the spacebar does not need to be tapped on a physical (non-VM) system. This is only required when changing virtual terminals on VMware VMs.

VMware VM Operations

Changing Virtual Terminals with a PC keyboard



On PC keyboard:

While holding down the **Ctrl-**⊞**-Alt** keys,
tap **Spacebar** then tap **F***n* key
(where *n*=1-7 to specify a function key)

VMware VM Operations

Changing Virtual Terminals with a Mac keyboard

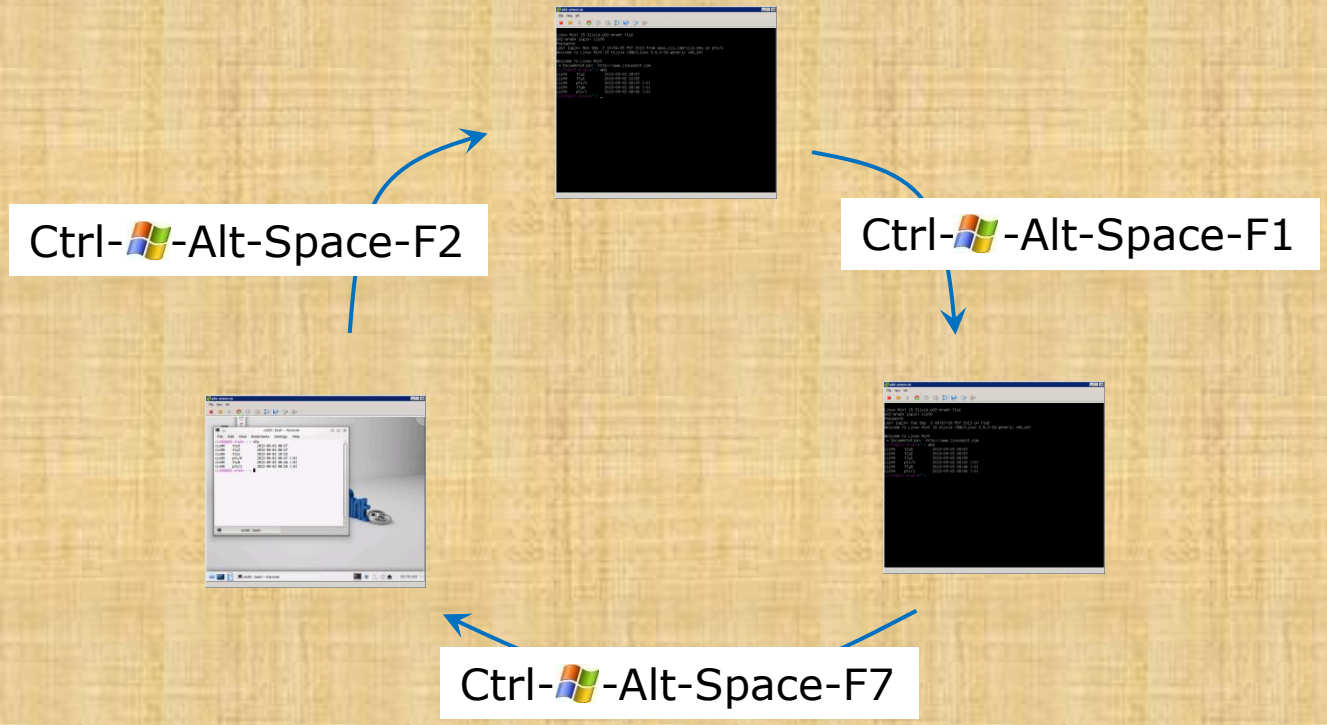
On Mac keyboard:

While holding down the **control-option** keys

tap **Spacebar** then tap **fn-F***n* keys

(where *n*=1-7 to specify a function key)

Class Activity



On your VM:

- Try changing between the graphical desktop and the TTYs
- Login as cis90 on tty1 and tty2
- Run a terminal on the graphical desktop
- Use the who command to see how many logins there are

Terminals

Hardware Terminals

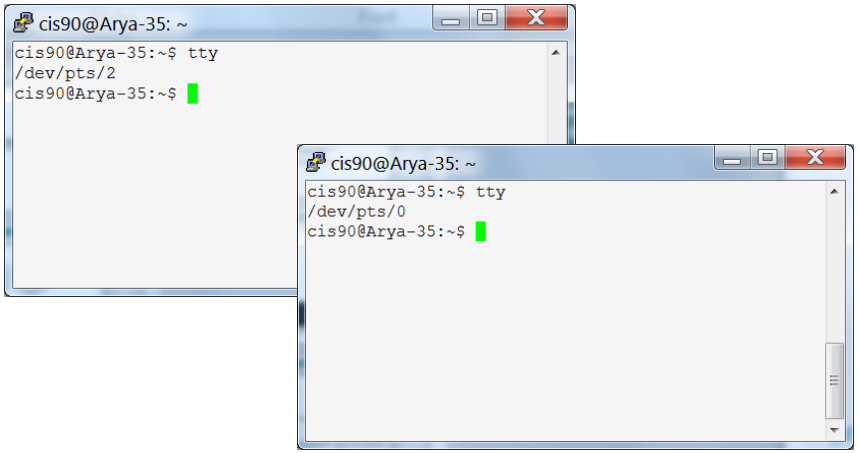
Teletype (TTY)

VT100

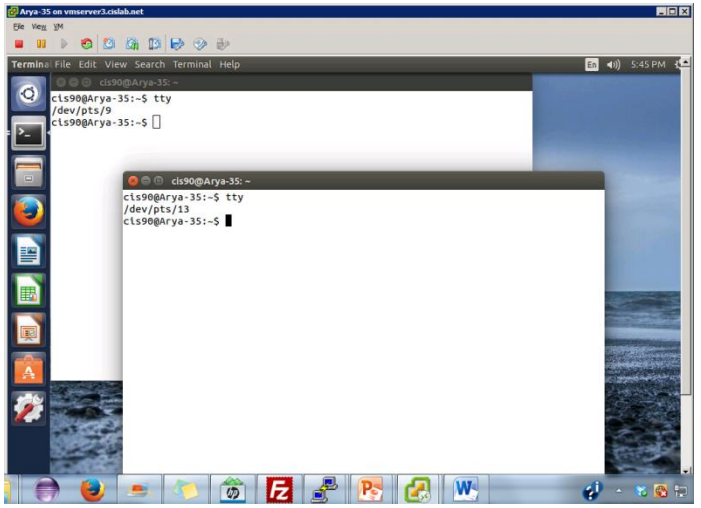
Terminals were used in the old days to interact with "minicomputers" and "mainframe" computers.

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

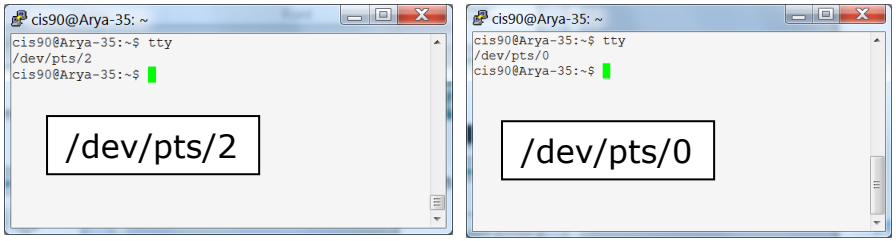


Graphical terminals (with scroll bars, colors, customizable backgrounds, fonts and sizes) built into Linux/Mac computers

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

Various terminal devices on an Arya VM

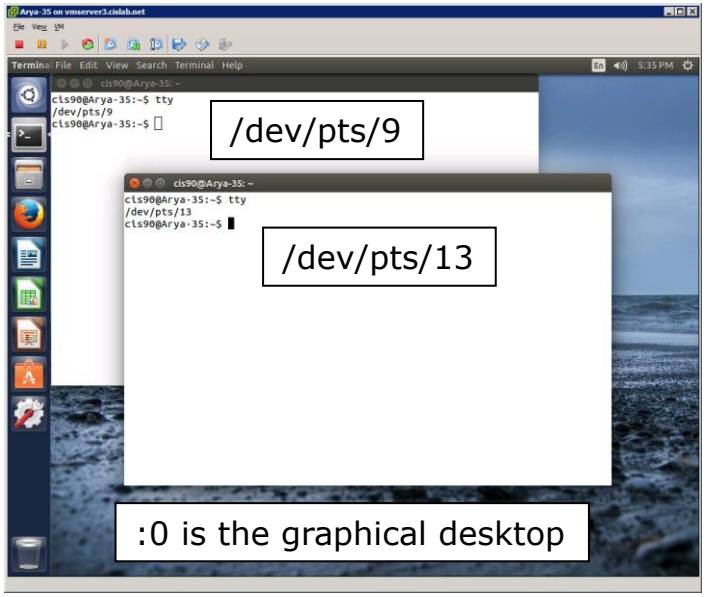
Terminal emulators (e.g. Putty)



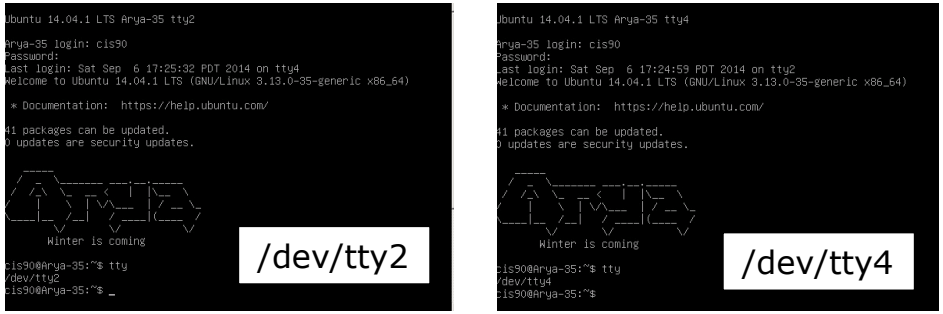

```
cis90@Arya-35:~$ who
cis90    tty4         2014-09-06 17:25
cis90    tty2         2014-09-06 17:25
cis90    pts/2        2014-09-06 17:20 (enterprise.cis.cabrillo.edu)
cis90    :0           2014-09-06 17:20 (:0)
cis90    pts/0        2014-09-06 17:21 (2601:9:6680:53b:4d09:e2b6:e7fc:d999)
cis90  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



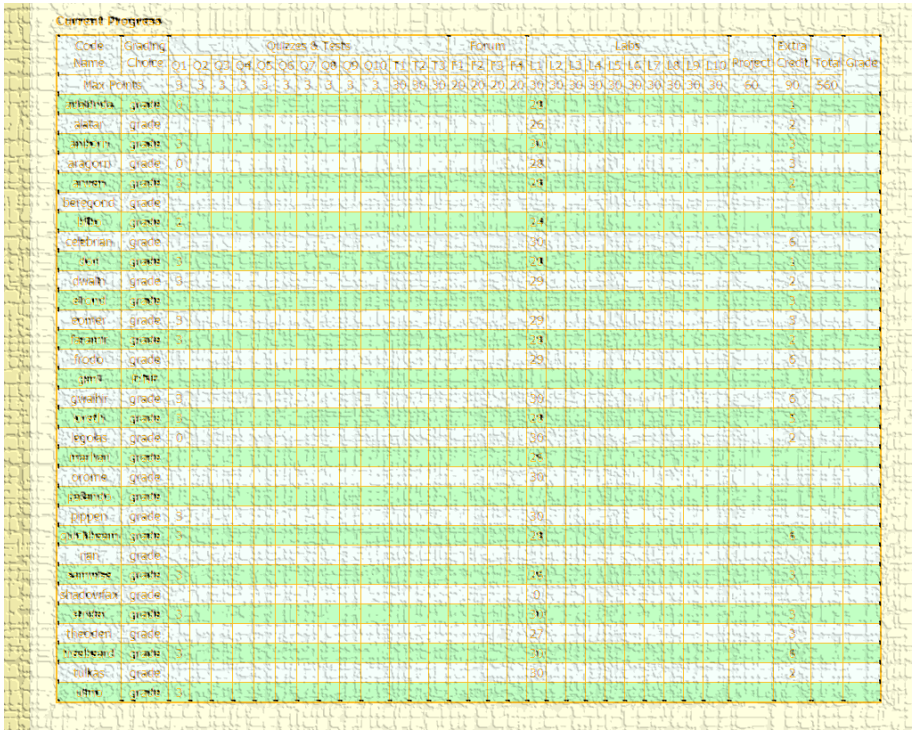
Housekeeping

Lab 2 due tonight

- Use **history -a** before using **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.
- 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



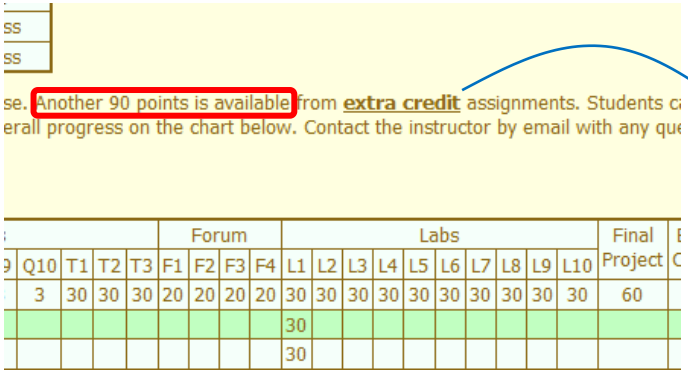
Grades for Quiz 1, Lab 1 and extra credit have been posted on the CIS 90 website.

Send me your survey to get your LOR code name.

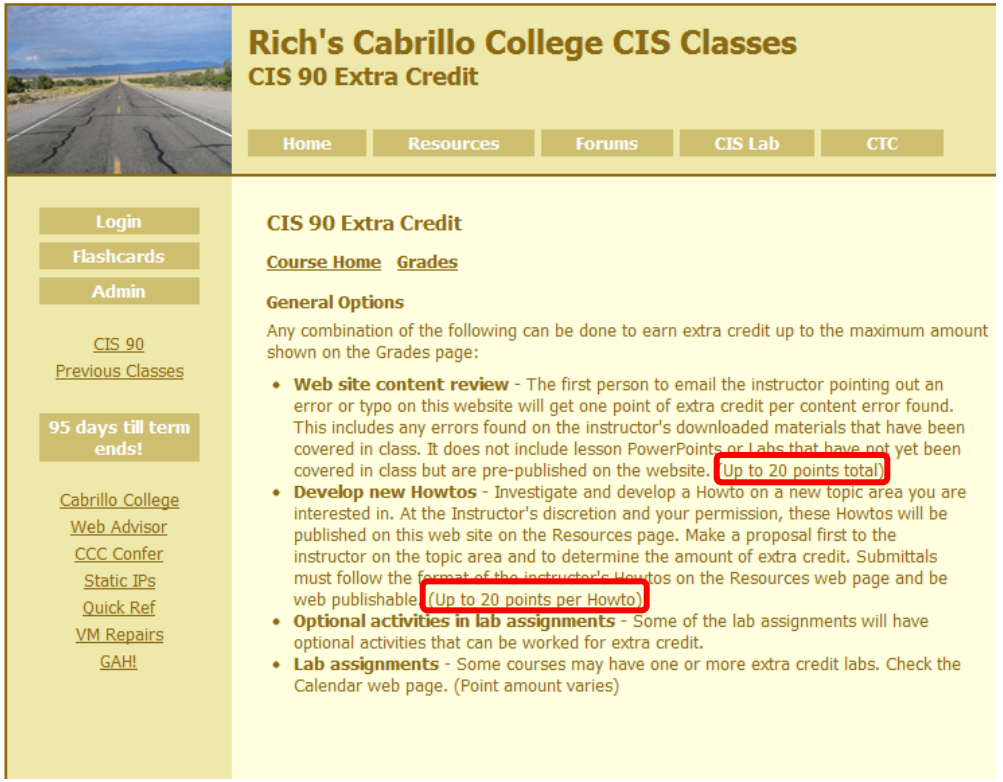
At the end of the term I'll add up all your points and assign you a grade using this table:

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

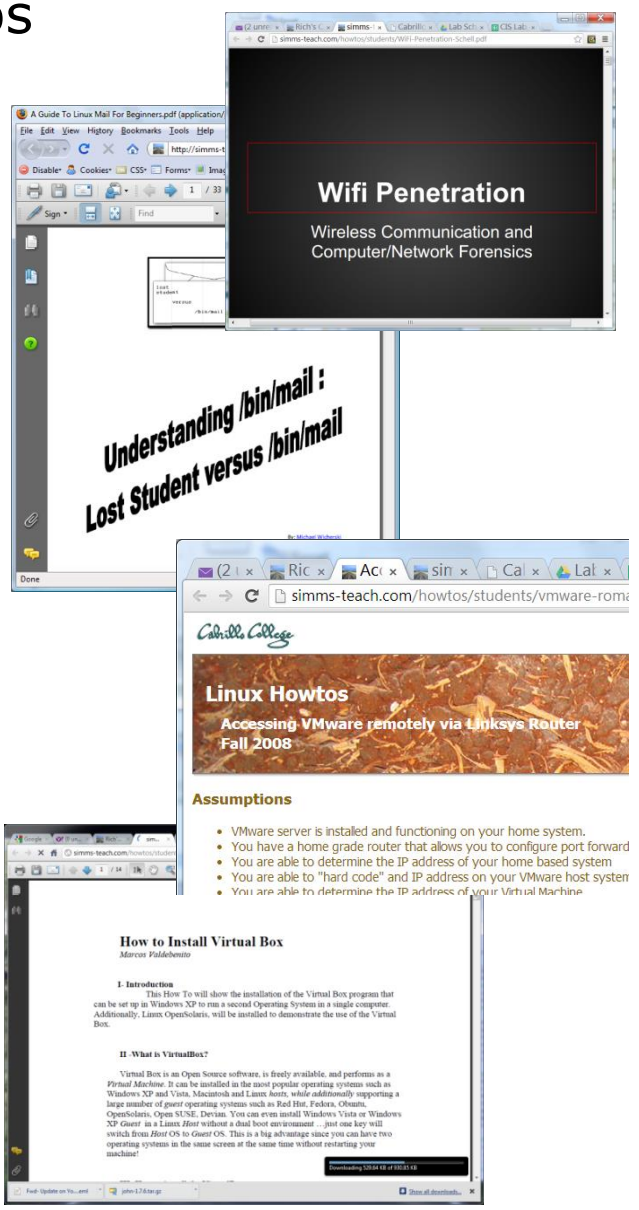
Extra Credit



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

Expectation Check

Skills you should be comfortable performing

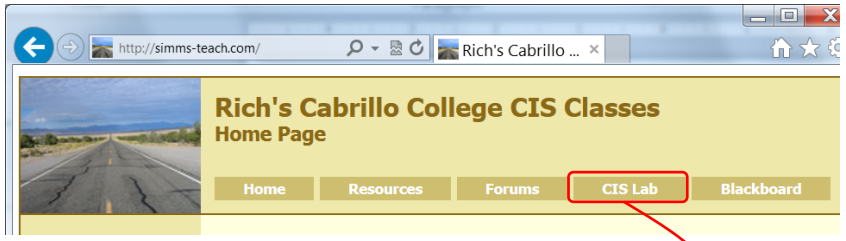
- Navigating the course website: simms-teach.com
- Entering the CCC Confer Virtual Classroom
- Reviewing video archives of the lessons
- Downloading and searching lessons PDFs
- Checking your current grade status
- Checking when assignments are due
- Checking when quizzes and tests will be held
- Finding the answers for graded labs and quizzes

- Logging into Opus from home or school using SSH
- Logging into Arya or other VMs from Opus using SSH
- Using Arya's graphical desktop via VLab
- Changing Virtual (TTY) Terminals on Arya
- Reading and making forum posts

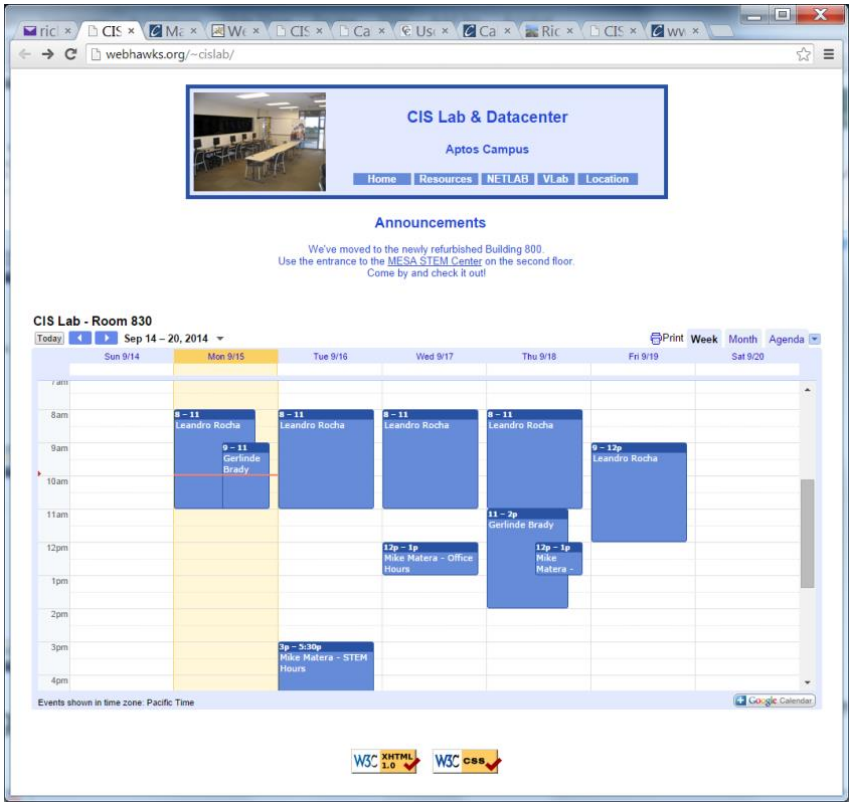
- Parsing any shell command
- Getting documentation on any command
- Identify the four key components of the UNIX/Linux architecture
- Identify the six steps the shell does for every command
- Temporarily change your shell prompt
- Set and show values of shell variables

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

Having trouble getting started in this course?



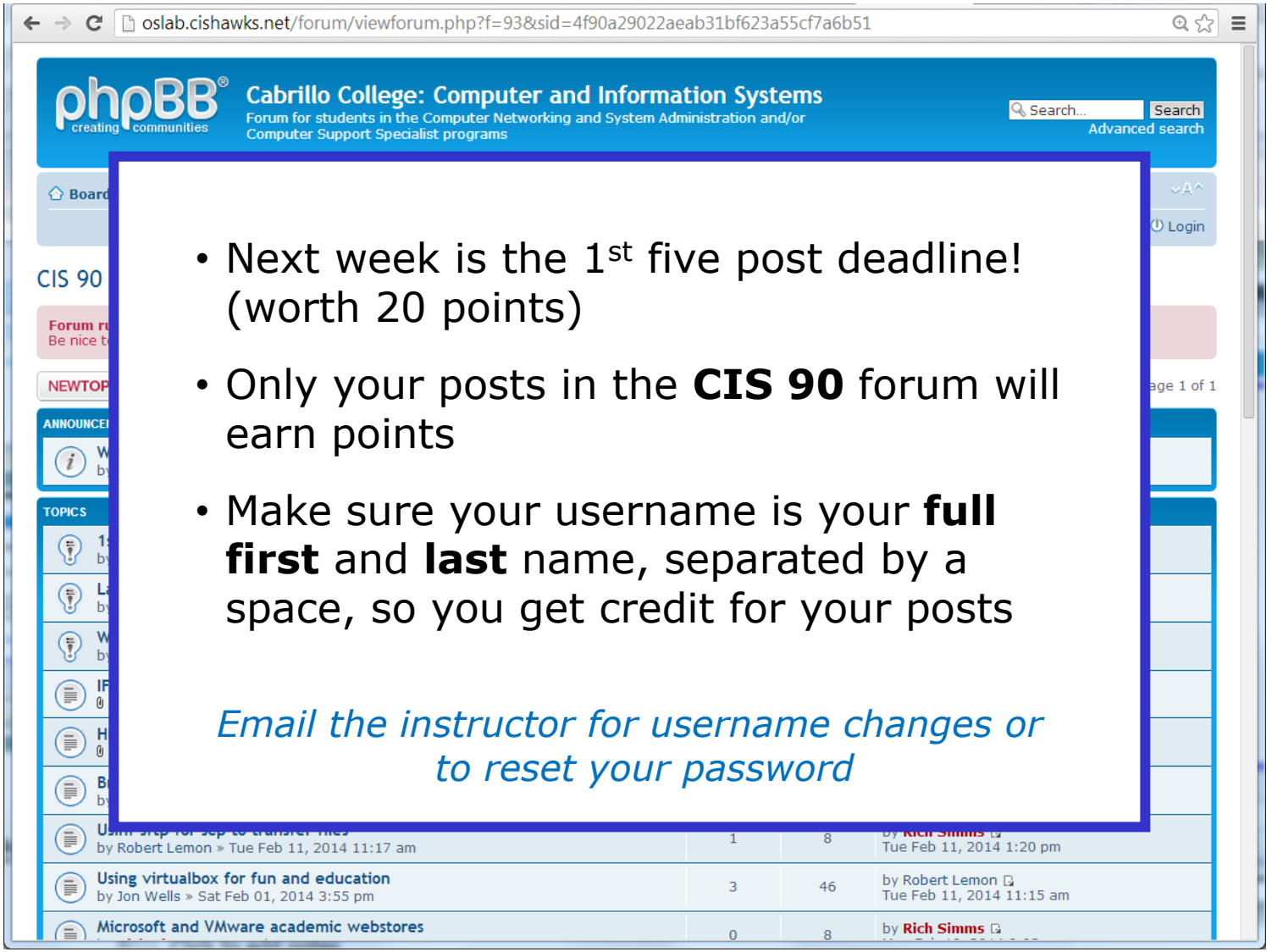
If you would like some additional come over to the CIS Lab.



Leandro and Geoff are both CIS 90 Alumni.

Michael is the other Linux instructor.

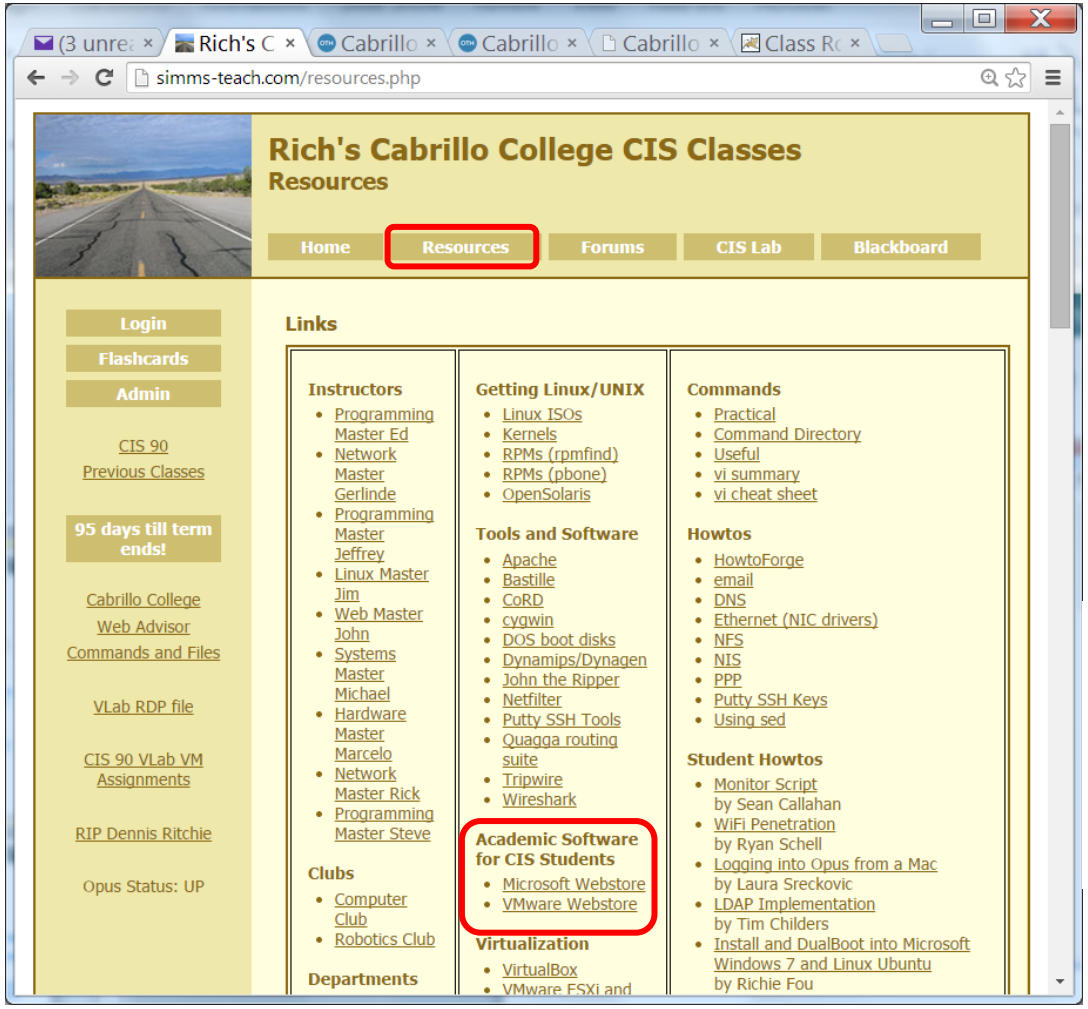
Forum



- 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

Software for eligible CIS students

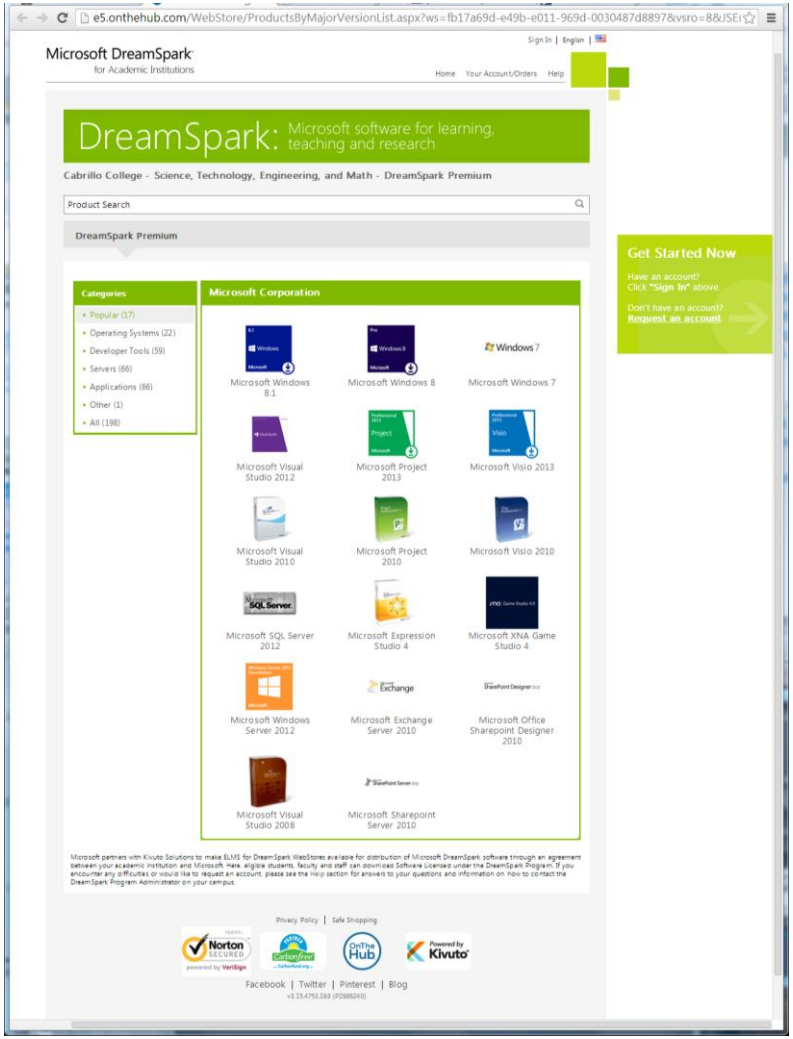


Microsoft

How to obtain Microsoft and VMware software for academic use

vmware

Microsoft products for CIS students



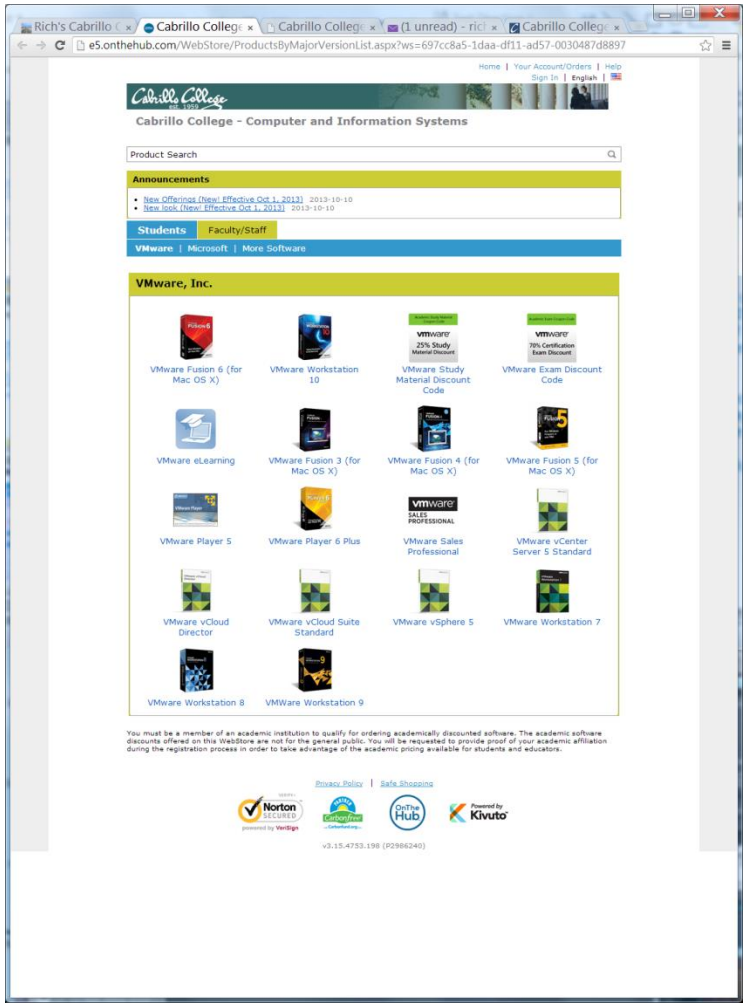
Accounts for students enrolled in CIS 90 have been created using your WebAdvisor email addresses.

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

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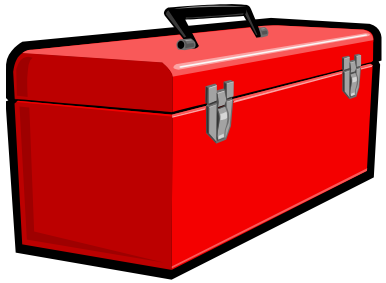
Happy downloading!

Notes to Rich

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



More commands for your toolbox

Introducing some new commands for this lesson

write	*"chat" with another user by writing to their terminal*
mesg	*enable/disable writes to your terminal*
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 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

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

The write command resides in the /usr/bin directory

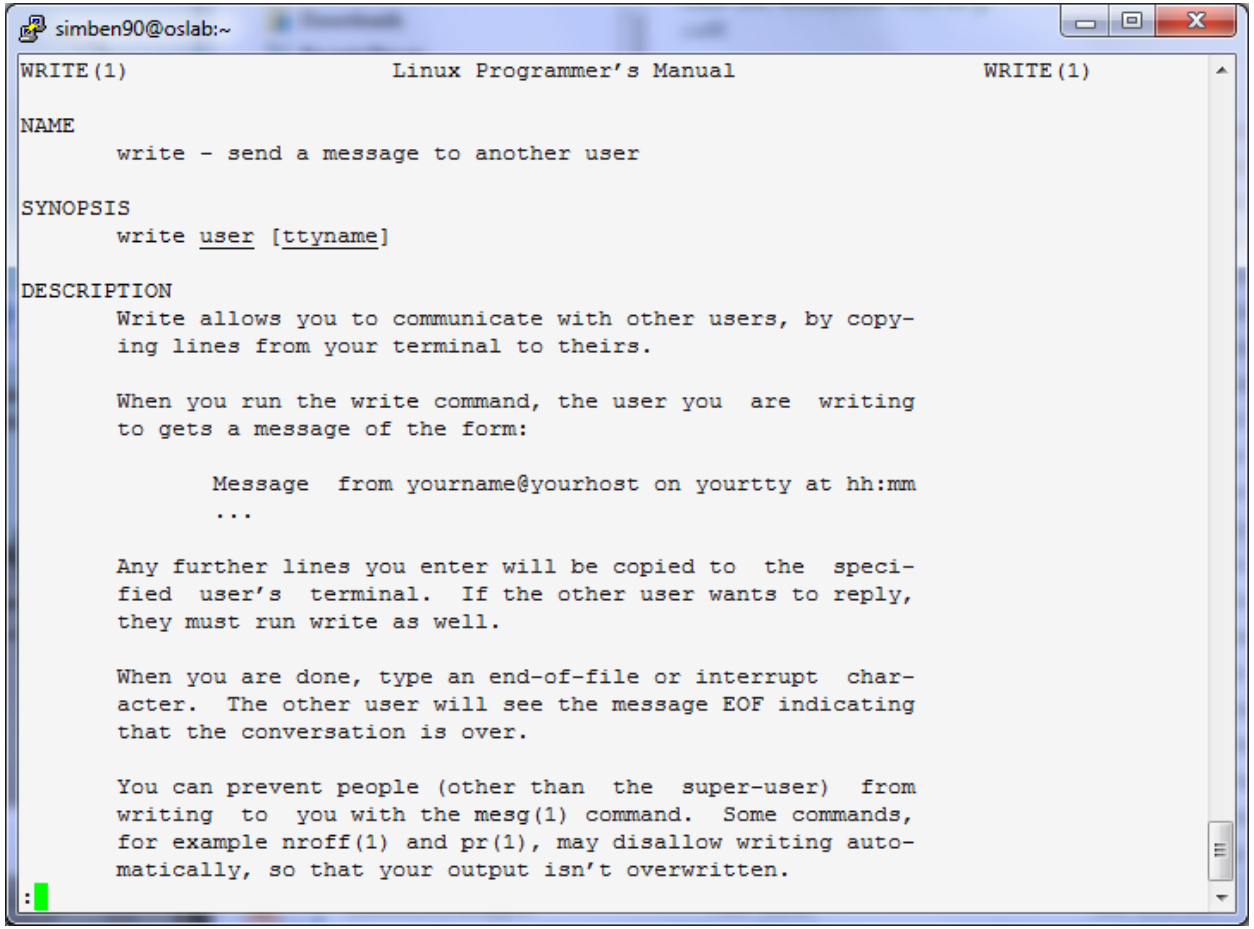
```
/home/cis90/simben $ file /usr/bin/write
/usr/bin/write: setgid ELF 32-bit LSB shared object, Intel 80386,
version 1 (SYSV), dynamically linked (uses shared libs), for
GNU/Linux 2.6.18, stripped
```

The write command is a binary executable

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 Exercise
write and mesg

- Students, please login to Opus using your own accounts
- Rich, run the pairs script to pair up all the CIS 90 students.
- Students, use the write command to "chat" with your pair mate. e.g. **write** *username*
- Students, 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)

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 kadlei90 bincam90` *multiple usernames as arguments*

`mail richsimms@yahoo.com atirob90` *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

~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)

```
/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
```

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

The N signifies a new message

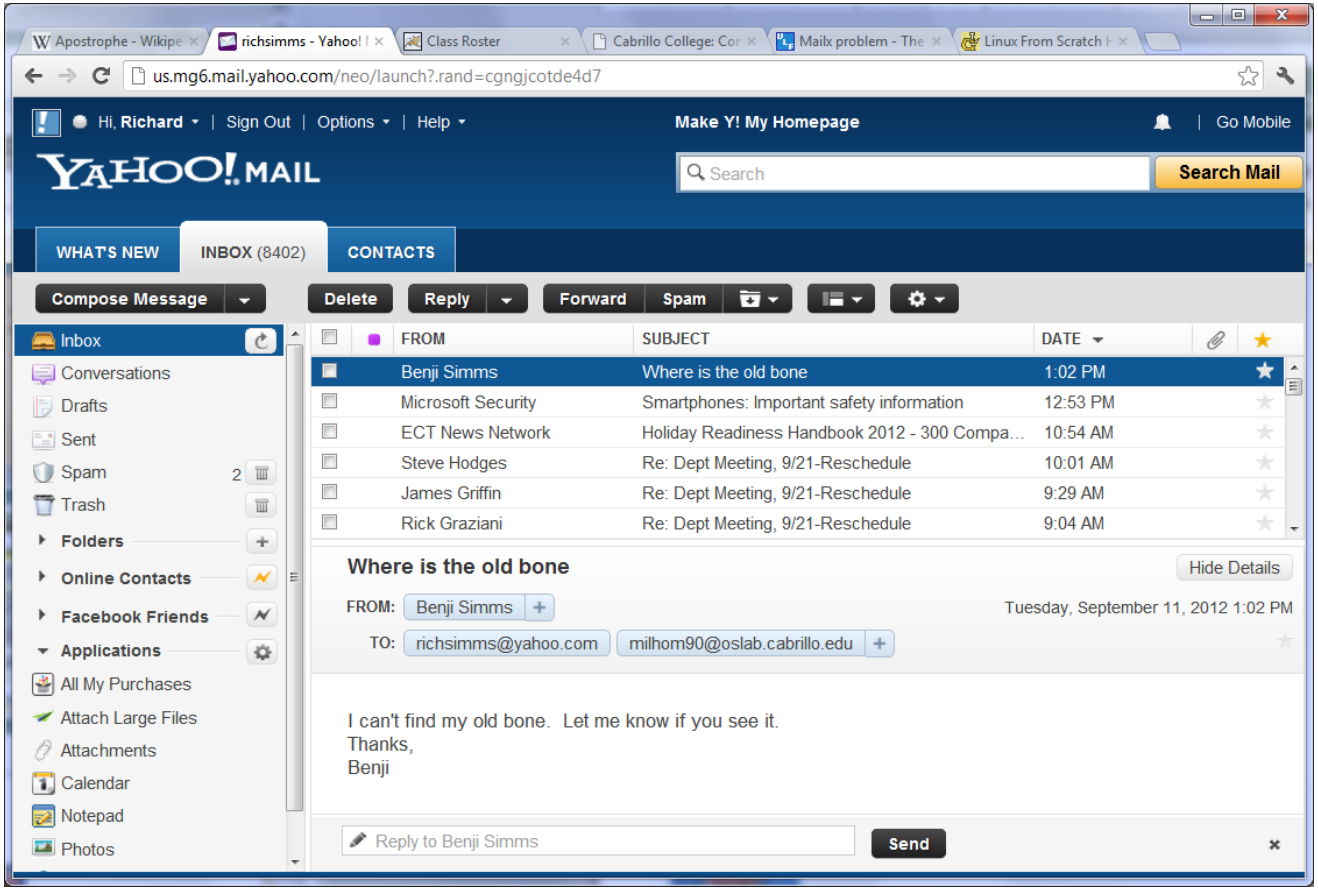
He types 1 to read message 1

The & is the mail prompt

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

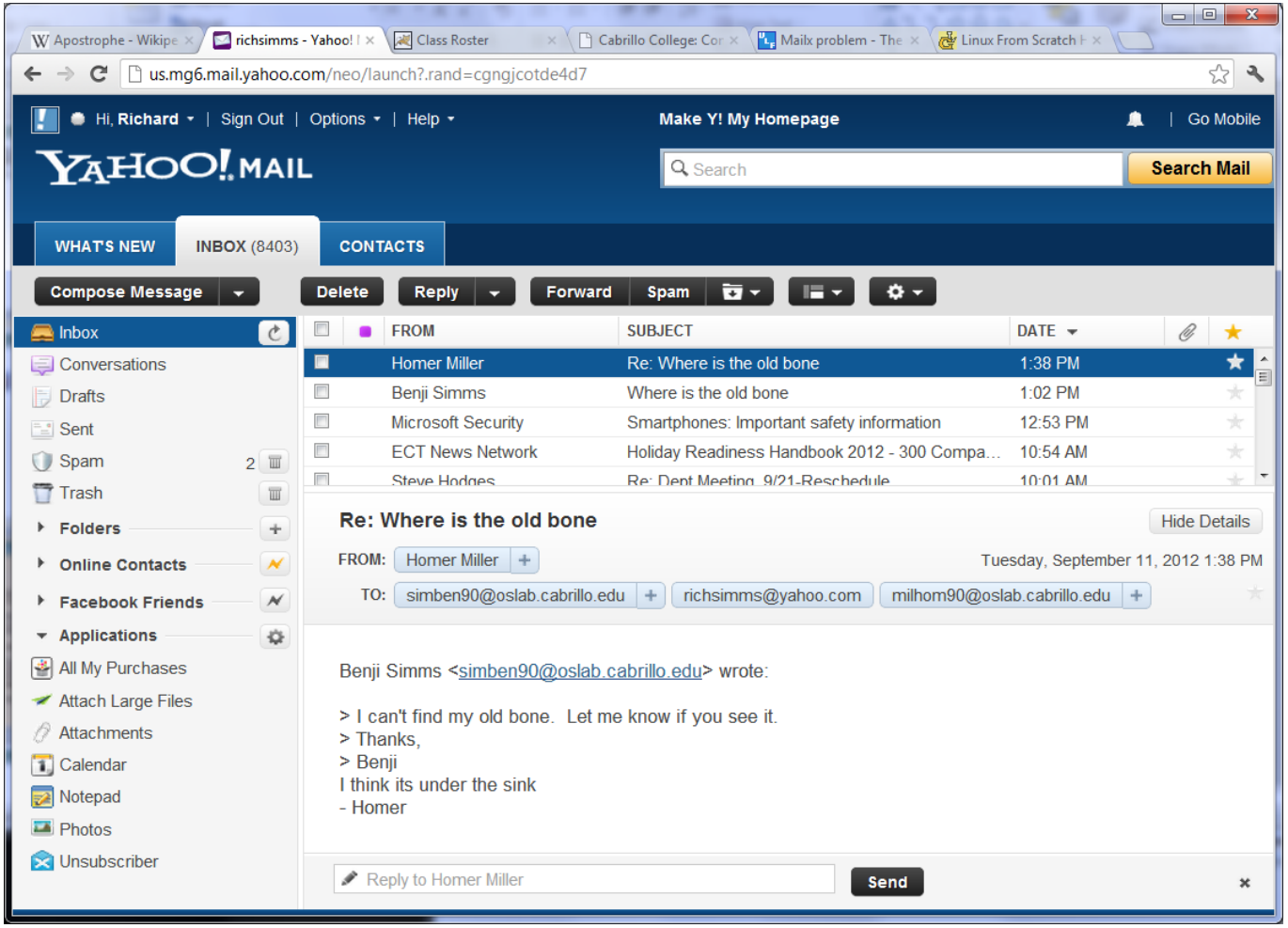
Benji
(simben90)

```
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

Benji checks for new mail

Prints the first (and only) message

Saves this message to a folder named "archives"

```
/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
```

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

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

&
```

Tip: Use this to send the event you get from the instructor to others for Lab 3

mail commands

Alternate ways to forward a message

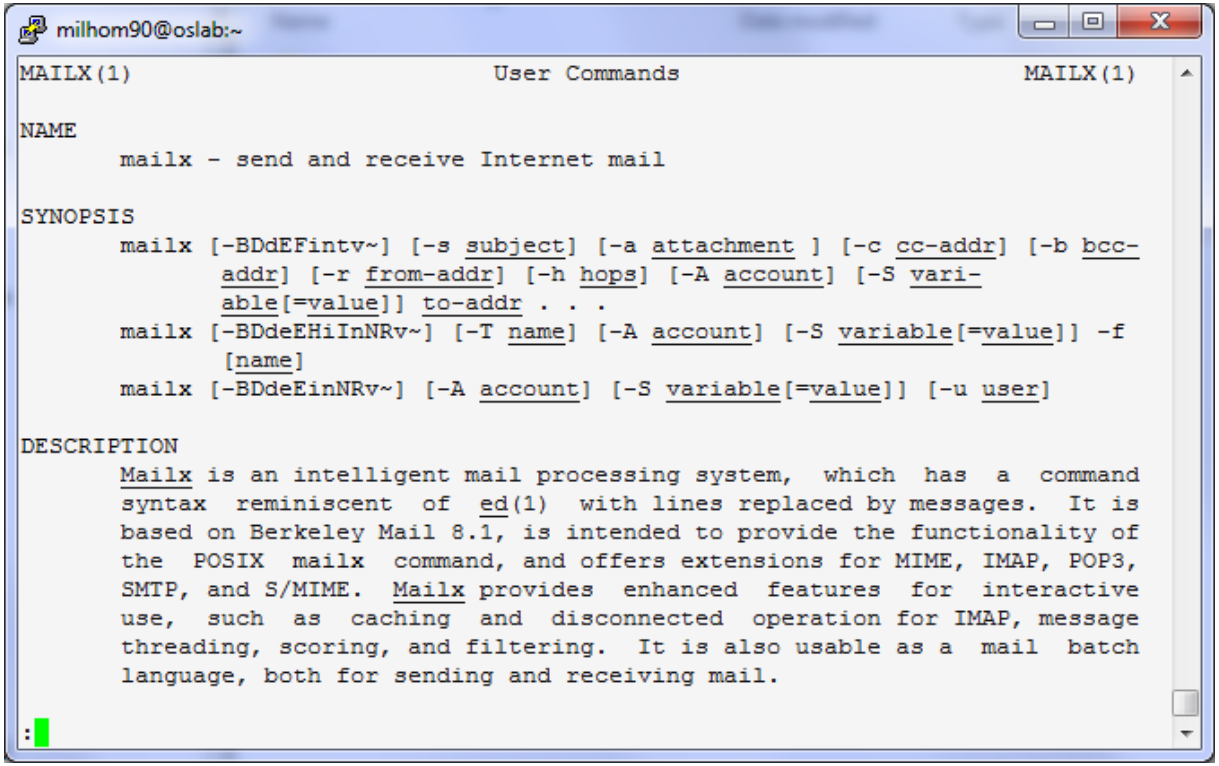
There is an easier way to forward a message with the latest version of mailx!

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

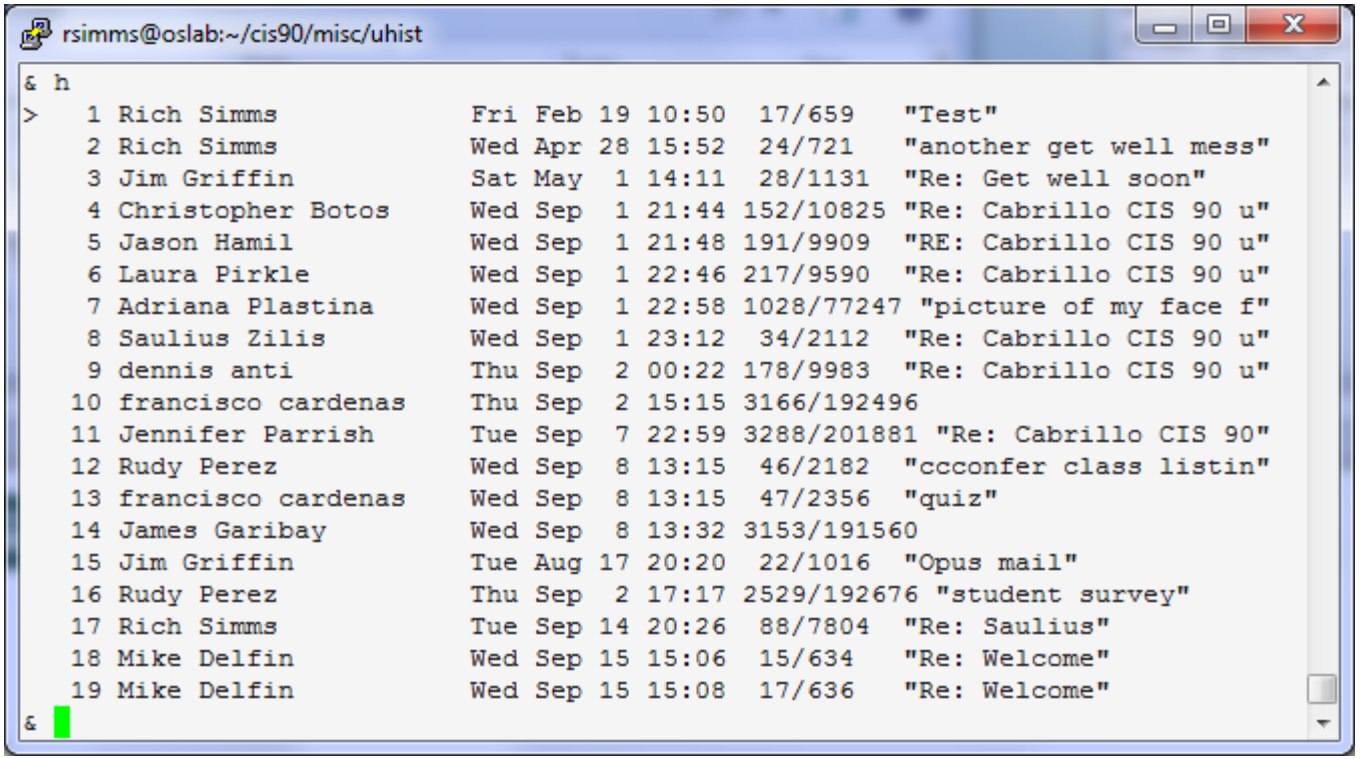
```
& ?
                mail commands
type <message list>             type messages
next                            goto and type next message
from <message list>             give head lines of messages
headers                         print out active message headers
delete <message list>           delete 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)

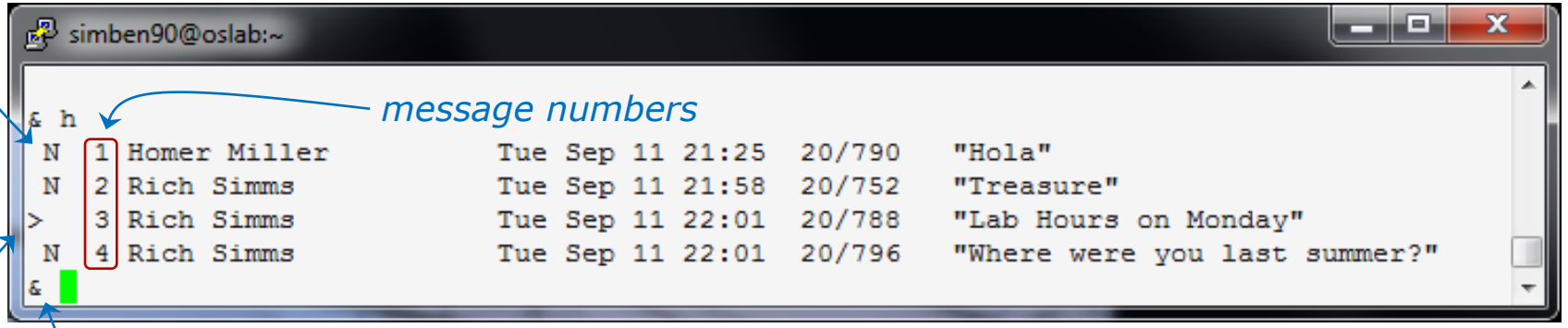


*Use the **h** command to show messages the current folder*

mail h (headers) command

e.g. list my current folder)

N = New message, a U = Unread message



message numbers

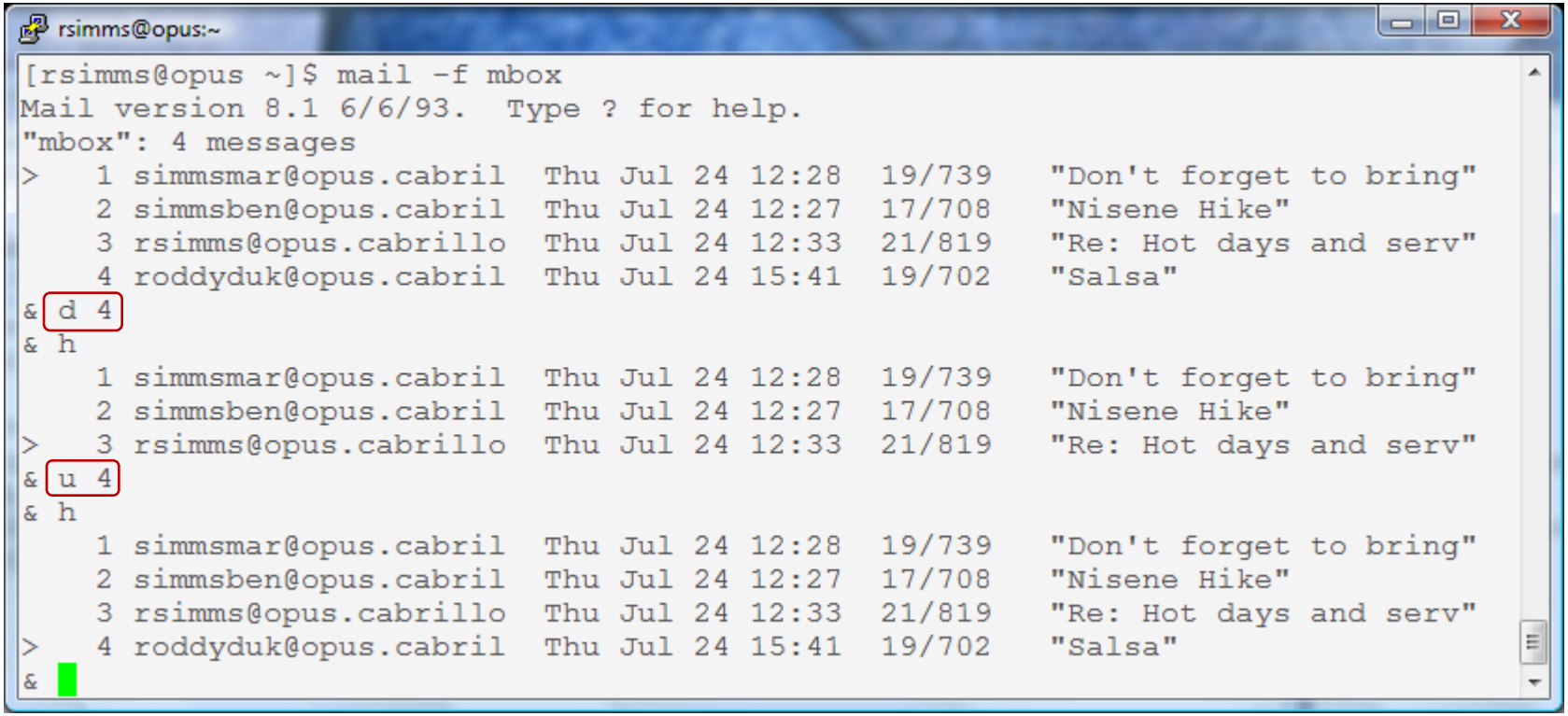
& is mail prompt for next command

> 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

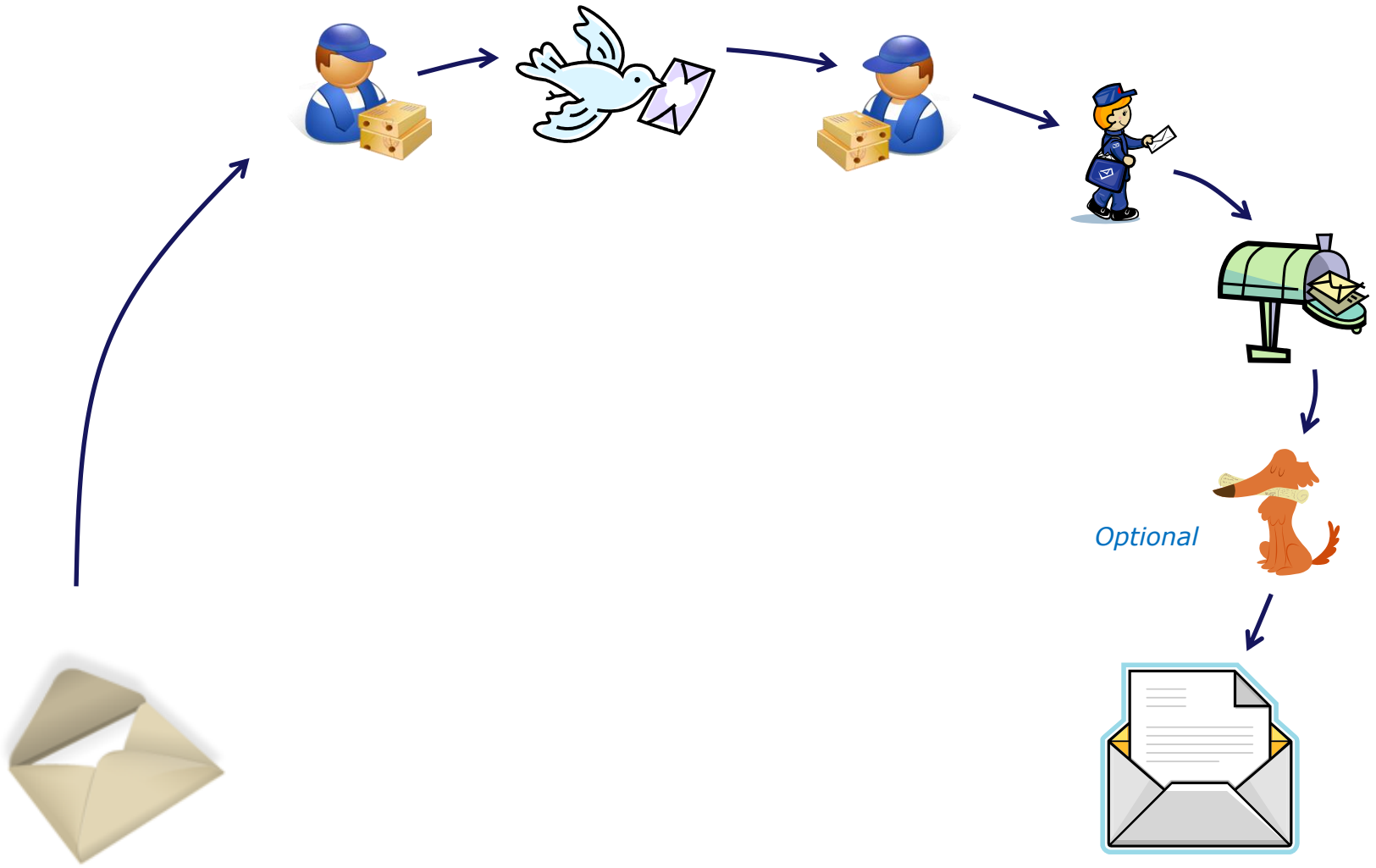
- Now read your mail

  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

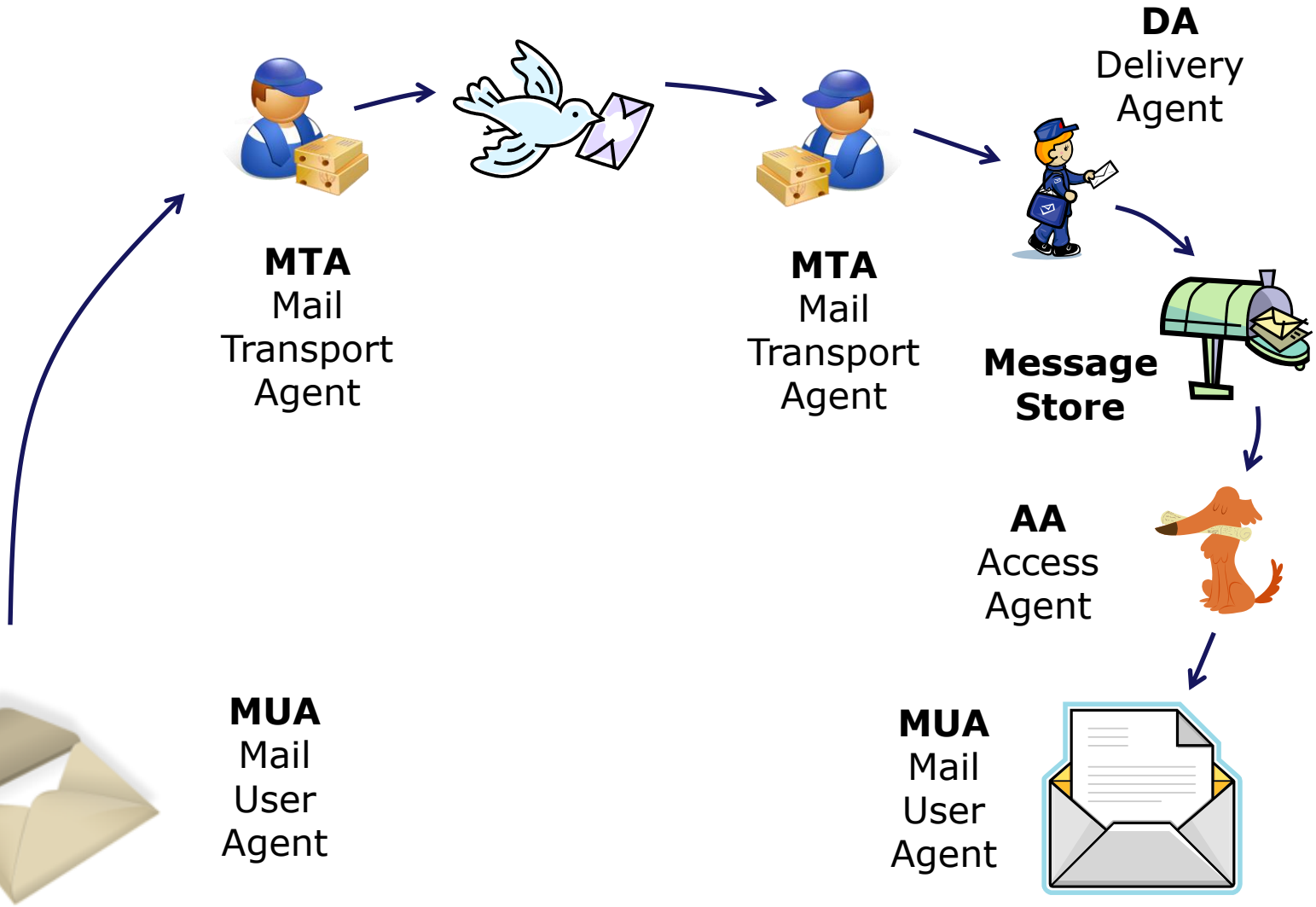
end-to-end email



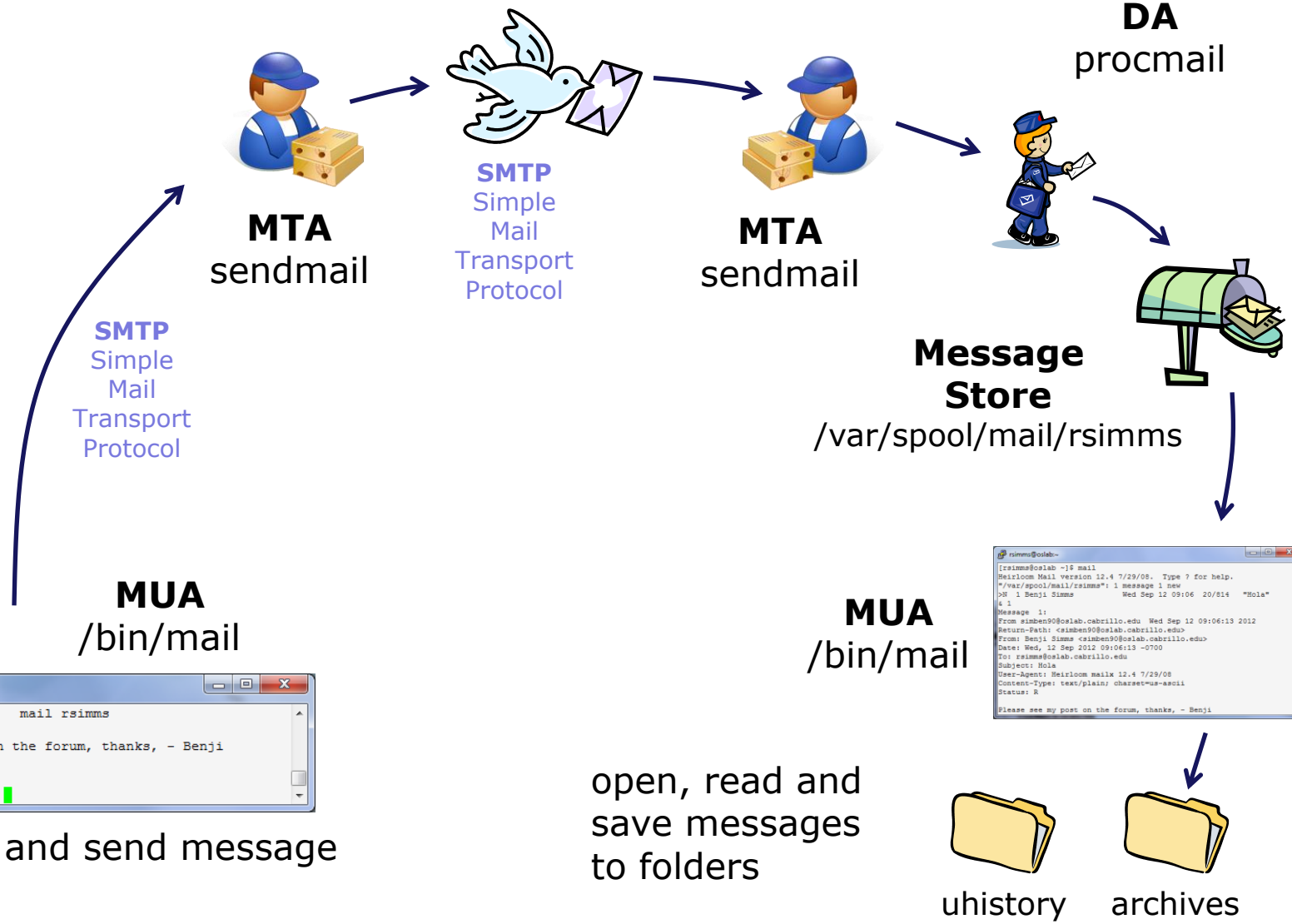
compose and send message

open and read message

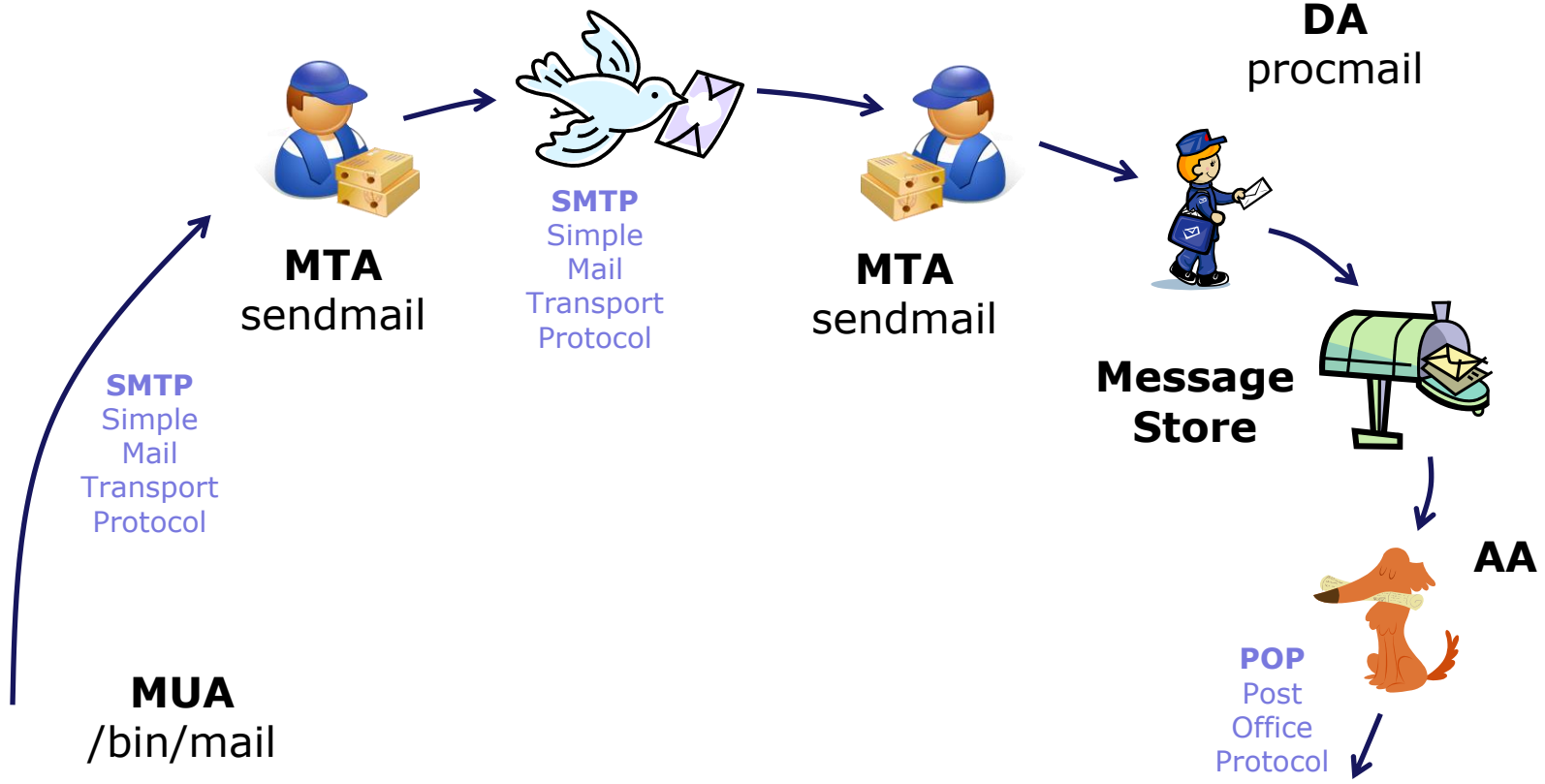
end-to-end email

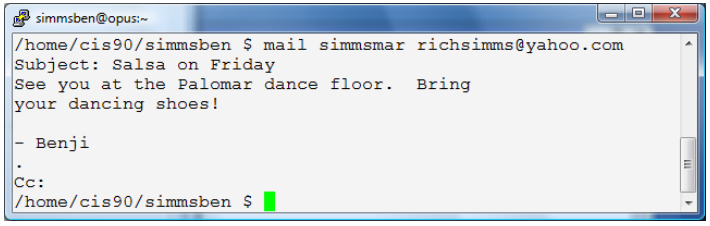


end-to-end email: example Implementation



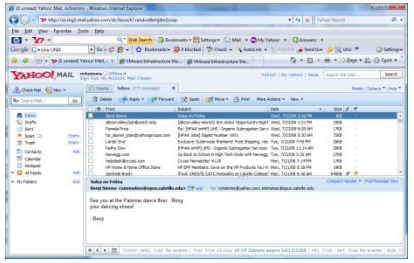
end-to-end email: example Implementation





compose and send message

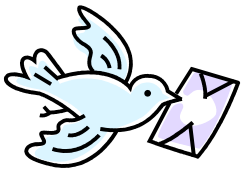
MUA
Yahoo
Mail



open and read message

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

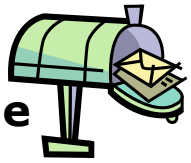
MTA
Mail
Transport
Agent



SMTP
Simple
Mail
Transport
Protocol

MTA
Mail
Transport
Agent

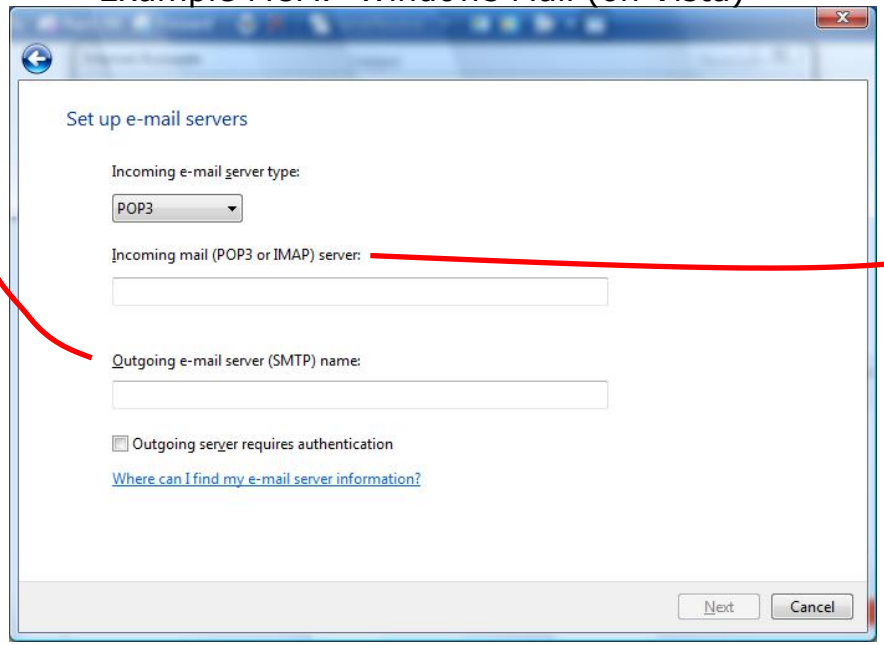
DA
Delivery
Agent



Message Store

SMTP
Simple
Mail
Transport
Protocol

Example MUA: Windows Mail (on Vista)



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.

Other MUAs MTAs, DAs, AAs

end-to-end email

some of the many players

MTA  sendmail, Exim, Microsoft Exchange, Postfix

DA  /bin/mail, procmail, smrsh

AA  imapd, spop

MUA  /bin/mail, pine, elm, Outlook, gmail, Evolution, Yahoo Mail

Lab 3

Notes to Rich

[ ] - Send out UNIX historical events for Lab 3

use **events** alias

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 $
```

Practice Questions sun-hwa-iii

My favorite ice cream shop

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

Activity

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

Write your command in the chat window

Activity

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

Activity

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

Copy the output of that command 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, 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
first=Benji
uid=1201
index=1
Benji gets Marianne's Banana ice cream today!
```

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

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

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

Answer: BASH shell script

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

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 ~]$ echo $PATH
/usr/local/bin:/bin:/usr/bin:/usr/local/sbin:/usr/sbin:
/home/cis90/simben/.local/bin:/home/cis90/simben/bin
```

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

Answer: Four

1) /usr/local/bin
2) /bin
3) /usr/bin
4) /usr/local/sbin 

Practice Test Questions

Is **icecream** a standard UNIX command?

Write your answer in the chat window

Practice Test Questions

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
```

Answer: NO

Practice Test Questions

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

Write your answer in the chat window

Practice Test Questions

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

Practice Test Questions

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

Write your answer in the chat window

Practice Test Questions

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
Fedora release 17 (Beefy Miracle)
Kernel \r on an \m (\l)

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

Answer: Fedora 17

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

$ 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
```

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

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:

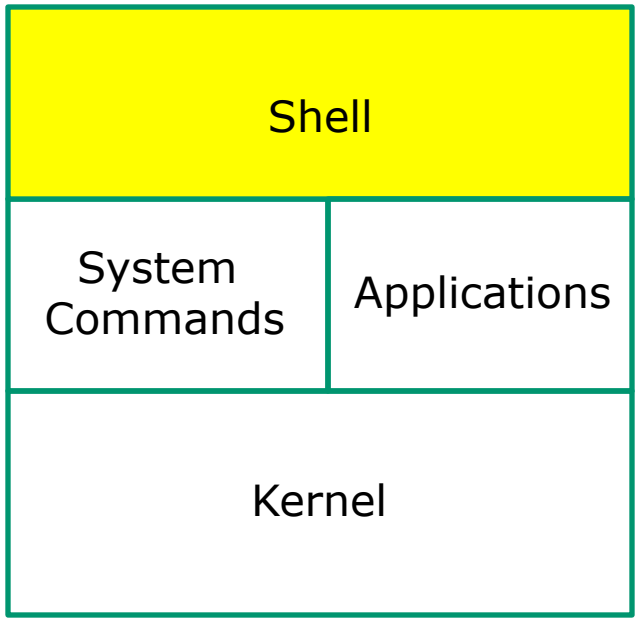
1) How many arguments does it receive from the bash shell?

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

Write your answers in the chat window

More Review (shell)

The Shell



- Allows users to interact with the computer via a "**command line**".
- **Prompts** for a command, parses the command, finds the right program and gets that program executed.
- Is called a "**shell**" because it hides the underlying operating system.

- Multiple shell programs are available: **sh** (Bourne shell), **bash** ("bourne-again" shell), **csh** (C shell), **ksh** (Korn shell).
- The shell is a **user interface** and a **programming language** (scripts).
- GNOME and KDE desktops could be called **graphical shells**

Command Syntax

Shell prints this to prompt user to enter a command

Shell parses this command line

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

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

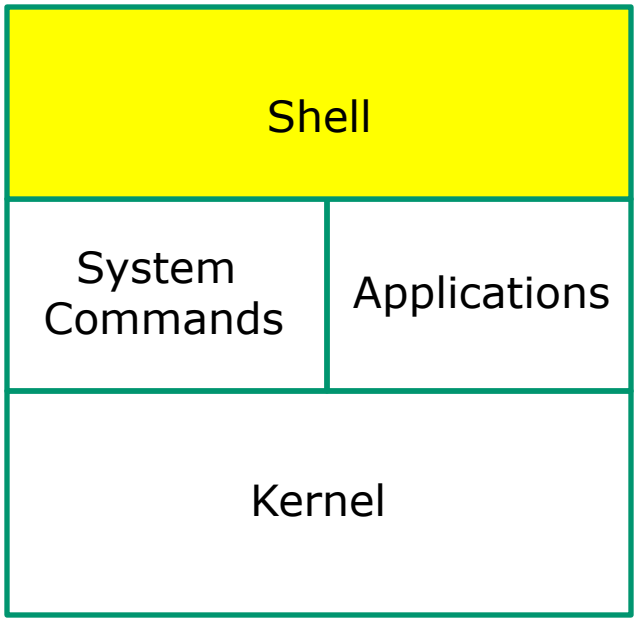
***Redirection** is covered later in the course*

Examples

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

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

The six steps of the Shell



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

Life of the Shell

Example:

```
/home/cis90/simben $ ls -lt proposal1 proposal2
-rw-r--r--. 1 simben90 cis90 1074 Aug 26  2003 proposal1
-rw-r--r--. 1 simben90 cis90 2175 Jul 20  2001 proposal2
/home/cis90/simben $
```

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

Lets take a deep dive into how a command gets executed.

Note it is always a team effort by both the shell and the command.

Life of the Shell

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

1) Prompt user for a command

Example:

The shell begins by outputting the prompt (which is based on the PS1 variable)

```
/home/cis90/simben $ ls -lt proposal1 proposal2
```

Then you type the command

FYI, you can mimic outputting the prompt yourself with these commands:

```
/home/cis90/simben $ echo $PS1
$PWD $
/home/cis90/simben $ echo $PWD $
/home/cis90/simben $
/home/cis90/simben $ echo my prompt is: $PWD $
my prompt is: /home/cis90/simben $
```

to show value of PS1 variable

echo the output of the previous command

was output by the echo command above

Life of the Shell

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

2) Parse command user typed

Example:

```
ls -lt proposal1 proposal2
```

- Command = ls
- 2 Options = l, t
- 2 Arguments = proposal1, proposal2
- Redirection = NA

The shell uses the command syntax rules to break down the command line into options, arguments and redirection.

Parsing includes expanding variables and properly handling any metacharacters.

The shell doesn't actually distinguish between options and arguments. To the shell it is just another argument comprised of a string of text separated by blanks. We will distinguish between options and arguments to better understand command syntax and how it controls what commands do.

Life of the Shell

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

3) Search for program on the path

ls -lt proposal1 proposal2

Use this command to see the path directories (separated by :'s) on your path

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

*The shell will search each directory in order for an **ls** command*

```
/usr/lib/qt-3.3/bin  no
/usr/local/bin       no
/bin                 YES! - it was found in the /bin directory
/usr/bin
/usr/local/sbin
/usr/sbin
/sbin
/home/cis90/simben/../bin
/home/cis90/simben/bin
     .
```

Note: If the shell cannot find the command on the path it will output "command not found"

Try mimicking what the shell does to search for ls:

```
/home/cis90/simben $ ls /usr/lib/qt-3.3/bin/ls
ls: cannot access /usr/lib/qt-3.3/bin/ls: No
such file or directory

/home/cis90/simben $ ls /usr/local/bin/ls
ls: cannot access /usr/local/bin/ls: No such
file or directory

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

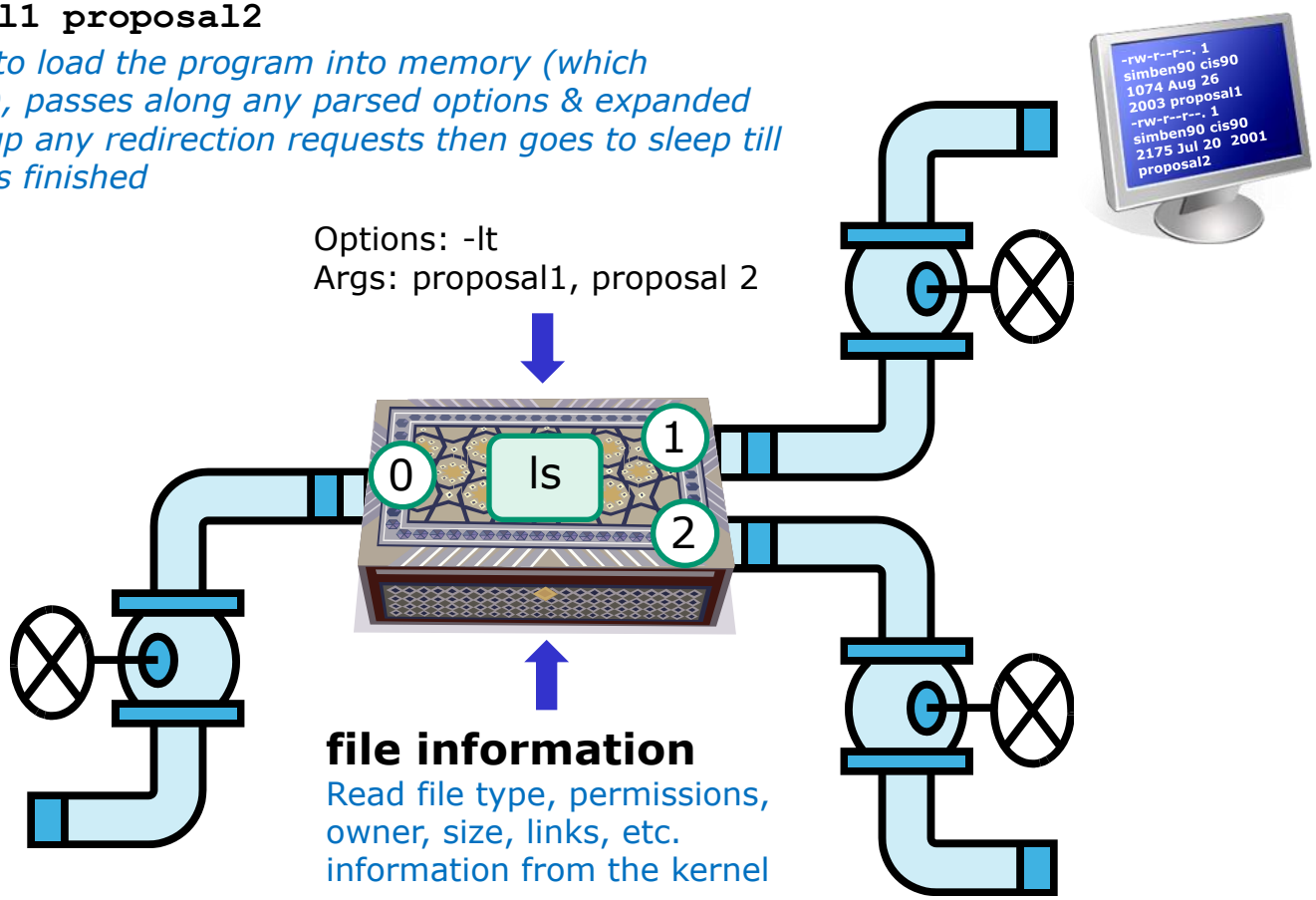
Life of the Shell

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

4) Execute the command

```
ls -lt proposal1 proposal2
```

Invokes the kernel to load the program into memory (which becomes a process), passes along any parsed options & expanded arguments, hooks up any redirection requests then goes to sleep till the new process has finished



Life of the Shell

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

5) Nap while the command (process) runs to completion

(The shell, itself a loaded process, goes into the sleep state and waits till the command process is finished)

```
/home/cis90/simben $ ls -lt proposal1 proposal2
-rw-r--r--. 1 simben90 cis90 1074 Aug 26  2003 proposal1
-rw-r--r--. 1 simben90 cis90 2175 Jul 20  2001 proposal2
```

Life of the Shell

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

6) And do it all over again … go to step 1

Practice Test Questions

Knowing the steps the shell performs, which of the two processes shown below is "taking a nap"?

```
/home/cis90/simben $ ps
  PID TTY          TIME CMD
21559 pts/0    00:00:00 bash
22012 pts/0    00:00:00 ps
```

Shell's steps
1) Prompt
2) Parse
3) Search
4) Execute
5) Nap
6) Repeat

Practice Test Questions

Knowing the steps the shell performs, which of the two processes shown below is "taking a nap"?

```
/home/cis90/simben $ ps
  PID TTY          TIME CMD
21559 pts/0    00:00:00 bash
22012 pts/0    00:00:00 ps
```

Shell's steps
1) Prompt
2) Parse
3) Search
4) Execute
5) Nap
6) Repeat

Answer: bash (the shell) is sleeping

```
/home/cis90/simben $ ps -l
F S   UID   PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S  1001 21559 21558  0  80   0 -  1275 -      pts/0    00:00:00 bash
0 R  1001 22013 21559  0  80   0 -  1213 -      pts/0    00:00:00 ps
```

Status column, R=running, S=sleeping

More Review (inputs)

Inputs to commands

Program
(a file on the hard drive)

Loads into RAM

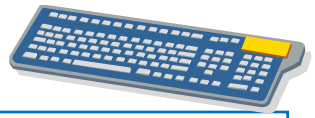
Command line
(parsed by shell):
Options: …
Args: …
A

Commands can get input from:
- A Command line
- B Keyboard
- C Operating System

stdout

console screen (default)

console keyboard (default)



stdin

read ⇅ write

stderr

console screen (default)

Operating System C

Information available only from the OS. E.g. files, directories, date & time, process info, user info, tty info etc.

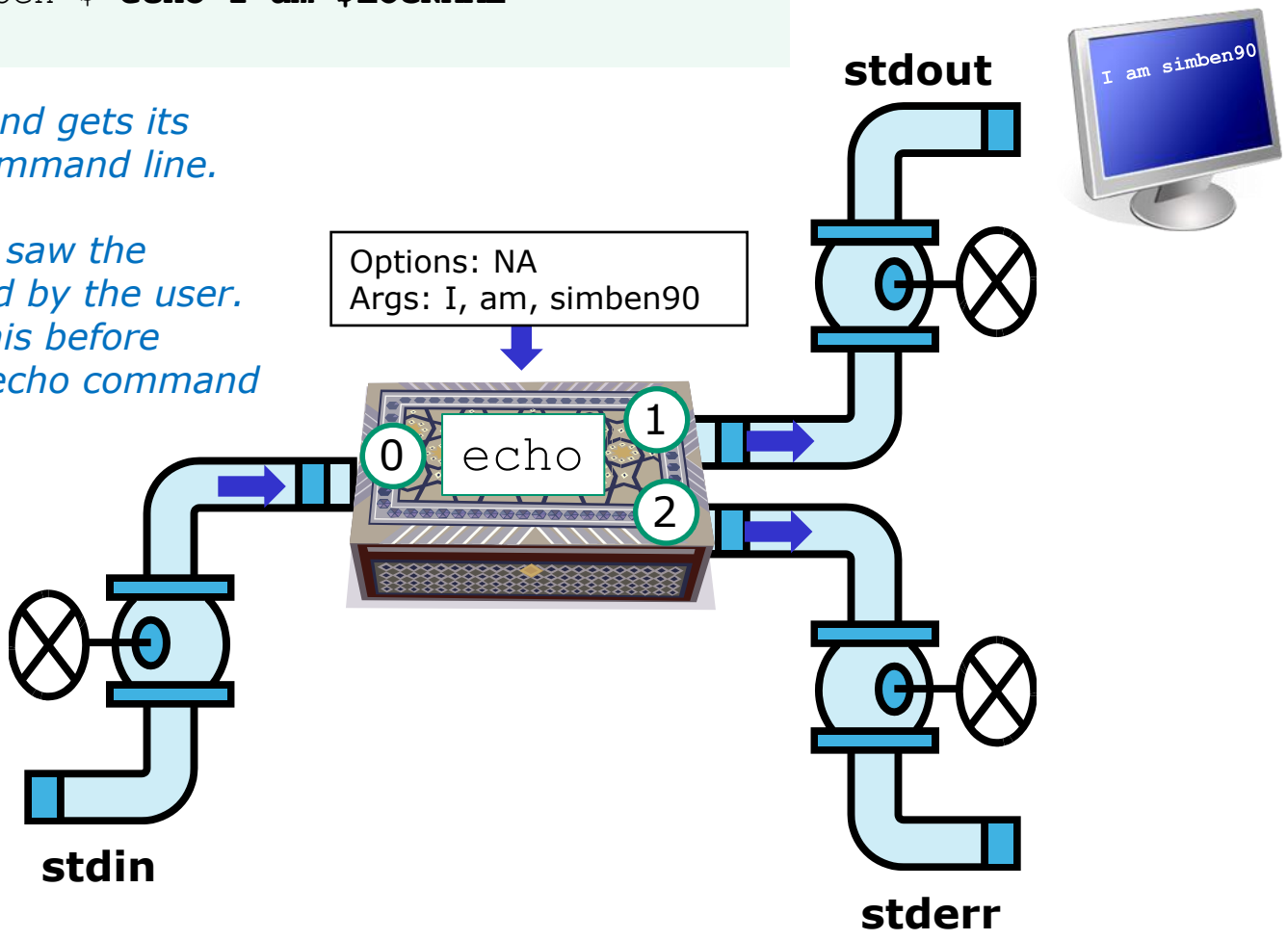
Keyboard B
Additional data command needs from user. E.g. passwords, math expressions, …

echo gets input from the command line

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

*The **echo** command gets its input from the command line.*

Note: echo never saw the $LOGNAME" typed by the user. bash expanded this before passing it to the echo command

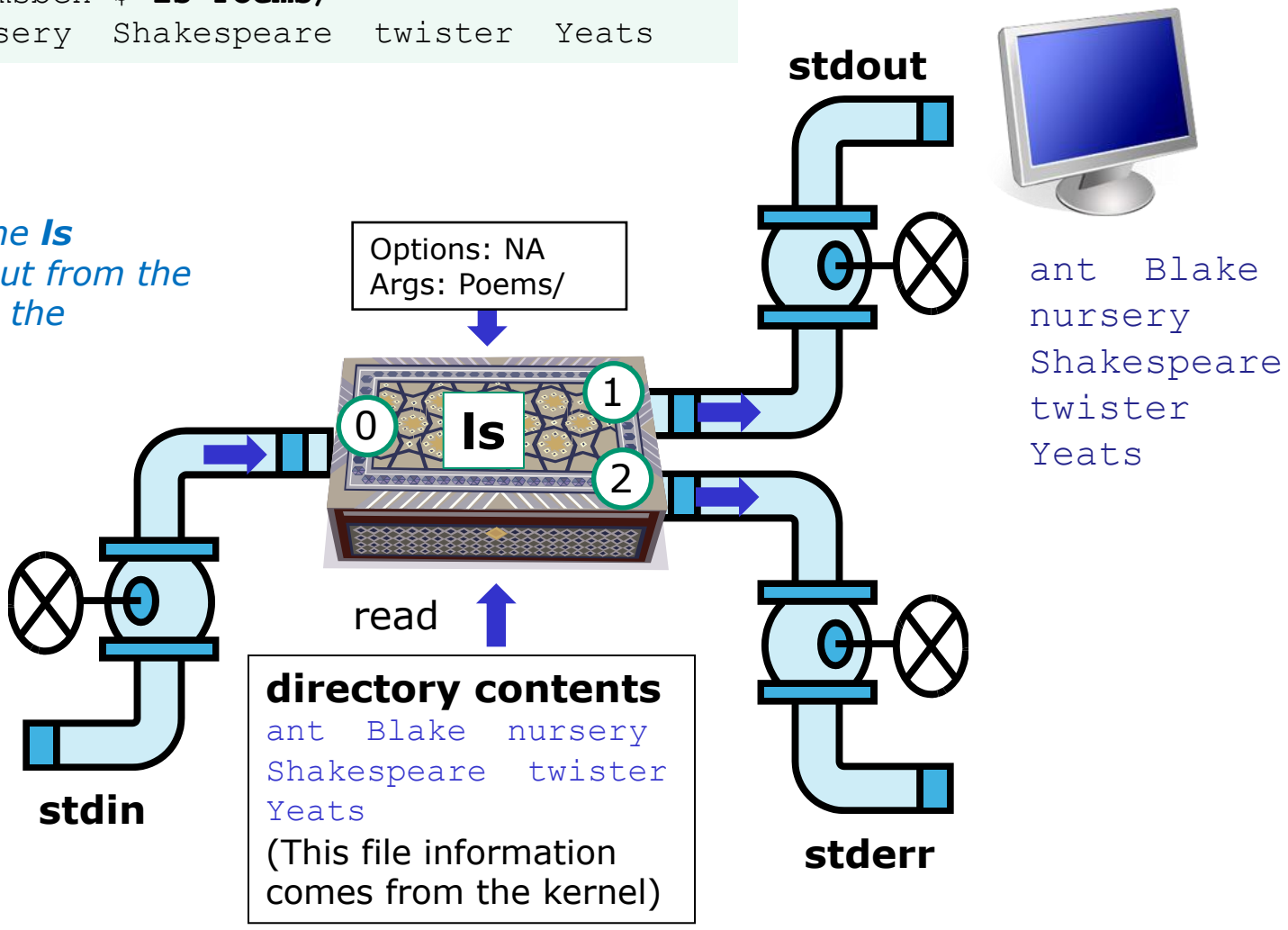


stdin and stderr were never used for this command

This ls command got input from the OS

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

*In this example, the **ls** command gets input from the command line and the operating system*

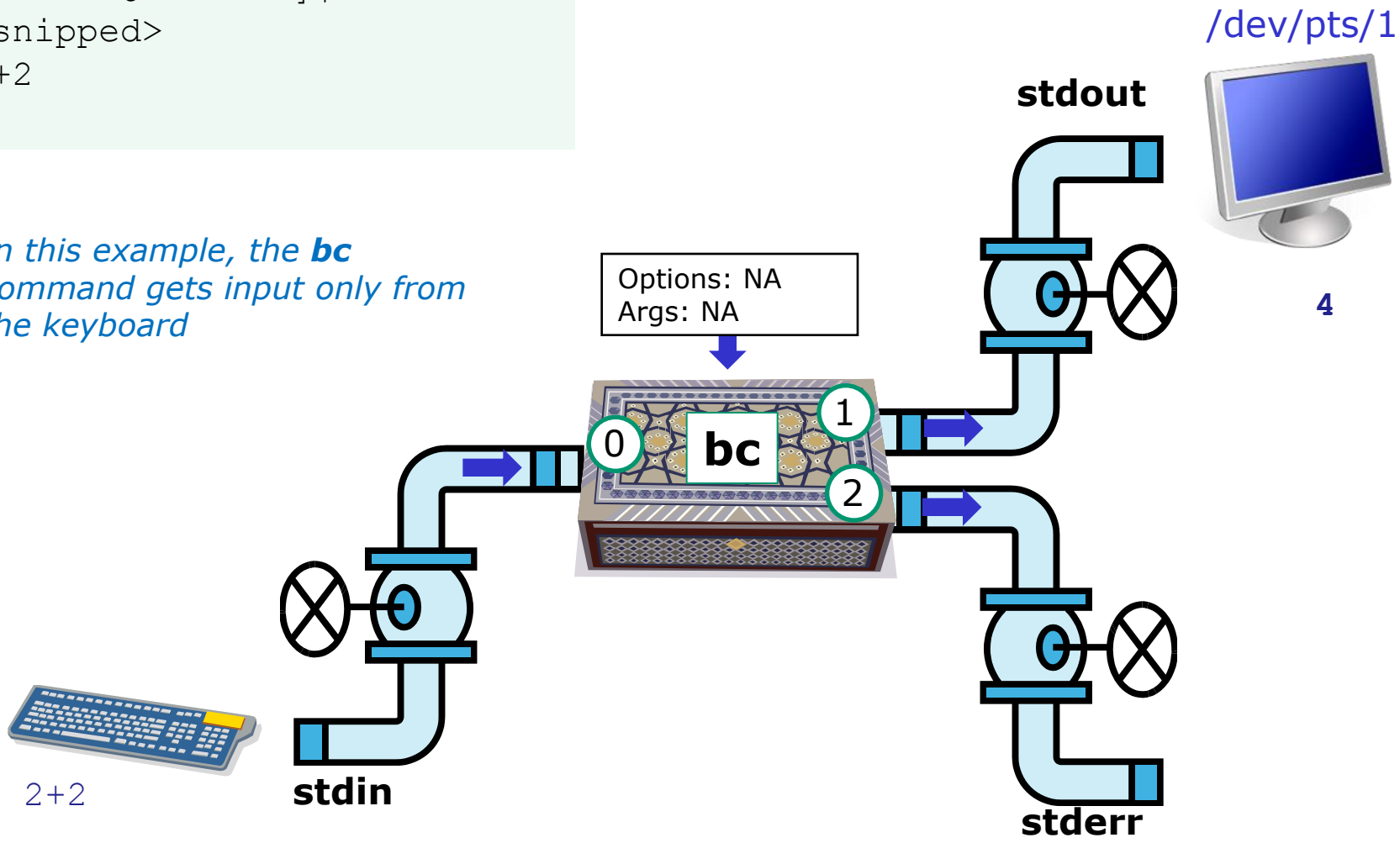


stdin and stderr were never used for this command

This bc command gets input from the keyboard

```
[rsimms@nosmo ~]$ bc
<snipped>
2+2
4
```

*In this example, the **bc** command gets input only from the keyboard*



stderr was never used for this command