Rich's lesson module checklist

Last Modified 9/10/2016

- ❑ 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 2 tested (check Q11 kernel release number and finger user account)
- ❑ Opus – set submit deadline

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

- ❑ Bring Add Codes
- ❑ Bring printed roster

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

Shell commands

Permissions

Secure logins

Processes

CIS 90
Introduction to UNIX/Linux

Navigate file tree

Scheduling tasks

Files and directories

The Command Line

Mail

vi editor

Environment variables

Run programs/scripts

Filters

Pipes

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.

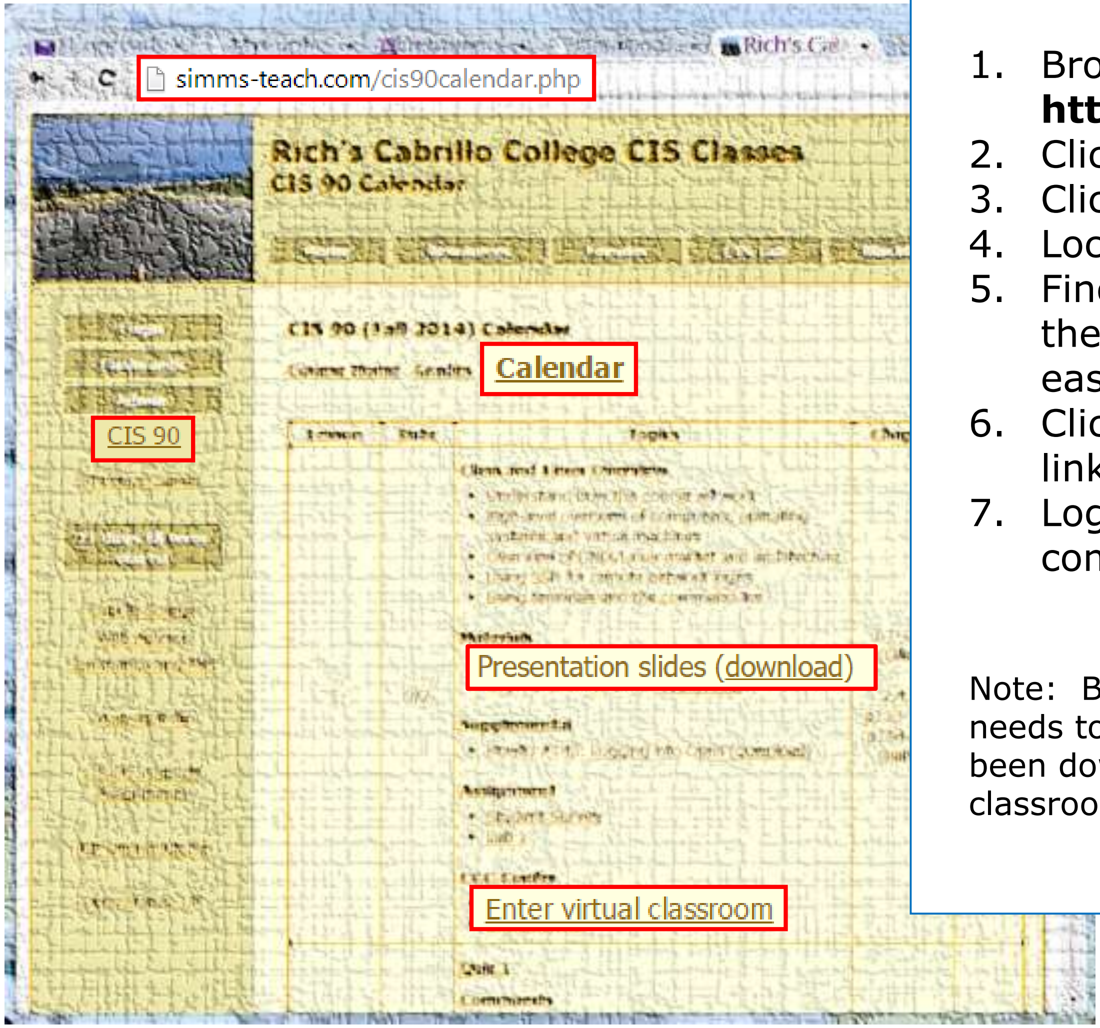
Introductions and Credits

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

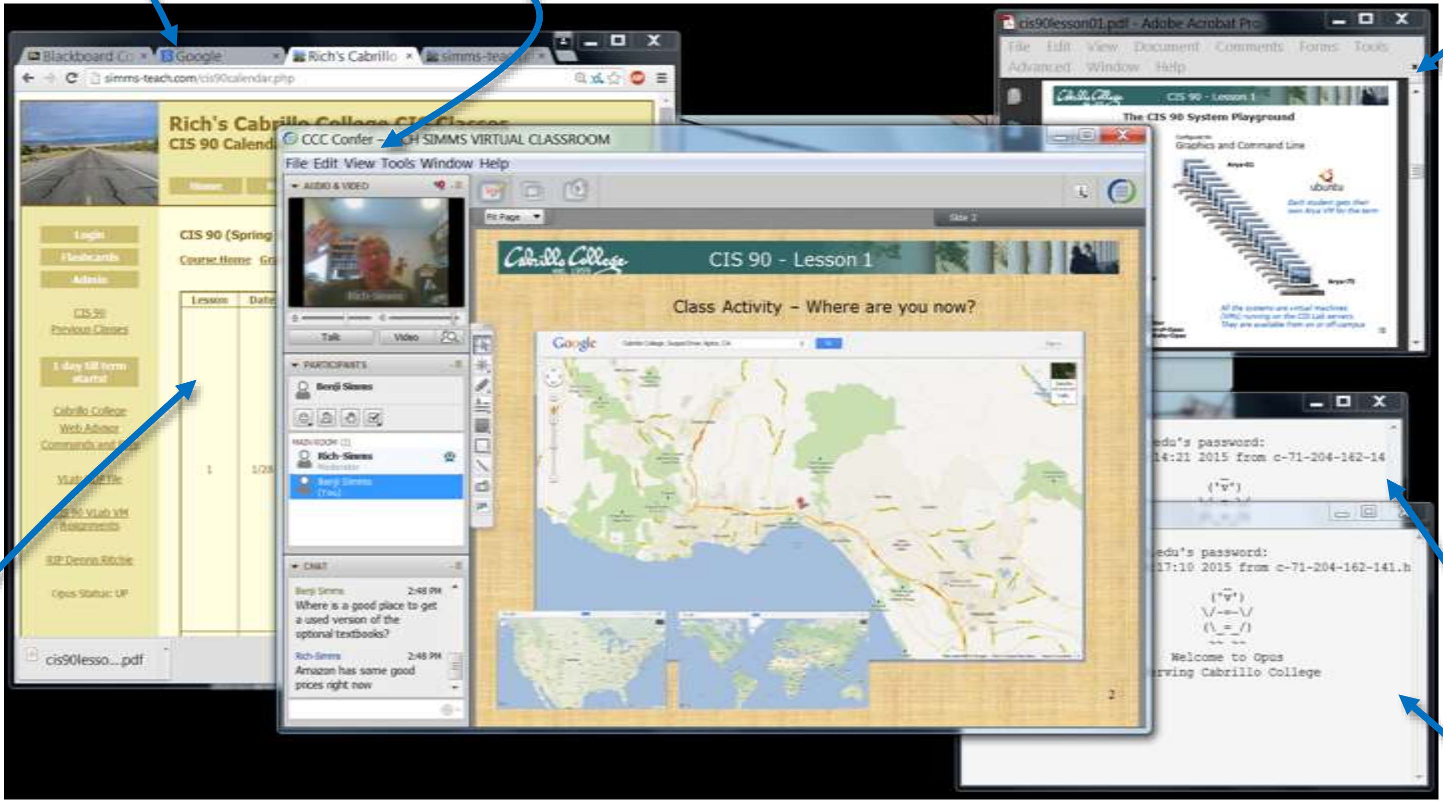

simms-teach.com/cis90calendar.php
Rich's Cabrillo College CIS Classes
CIS 90 Calendar
Calendar
CIS 90
Presentation slides (download)
Enter virtual classroom

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


Google
Rich's Cabrillo College CIS Classes
CIS 90 Calendar
CCC Confer – RICH SIMMS VIRTUAL CLASSROOM
File Edit View Tools Window Help
CIS 90 - Lesson 1
Class Activity – Where are you now?
cis90lesson01.pdf - Adobe Acrobat Pro
The CIS 90 System Playground
cis90lesso....pdf

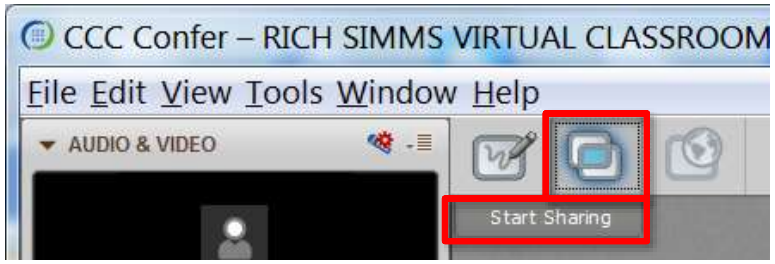
```
edu's password:
14:21 2015 from c-71-204-162-14
```

```
edu's password:
17:10 2015 from c-71-204-162-141.h
 Welcome to Opus
rving Cabrillo College
```

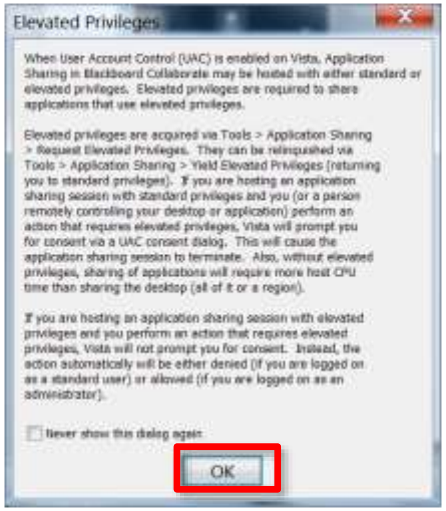
- ❑ CIS 90 website Calendar page
- ❑ One or more login sessions to Opus

Student checklist for sharing desktop with classmates

1) Instructor gives you sharing privileges


CCC Confer – RICH SIMMS VIRTUAL CLASSROOM
File Edit View Tools Window Help
AUDIO & VIDEO
Start Sharing

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


Elevated Privileges

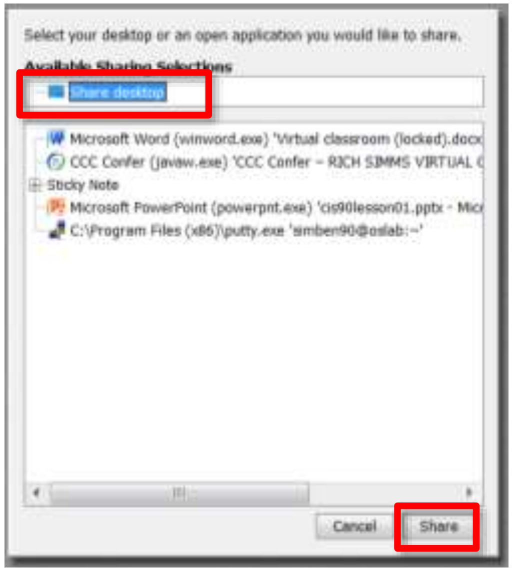
When User Account Control (UAC) is enabled on Vista, Application Sharing in Blackboard Collaborate may be hosted with either standard or elevated privileges. Elevated privileges are required to share applications that use elevated privileges.

Elevated privileges are acquired via Tools > Application Sharing > Request Elevated Privileges. They can be relinquished via Tools > Application Sharing > Yield Elevated Privileges (returning you to standard privileges). If you are hosting an application sharing session with standard privileges and you (or a person remotely controlling your desktop or application) perform an action that requires elevated privileges, Vista will prompt you for consent via a UAC consent dialog. This will cause the application sharing session to terminate. Also, without elevated privileges, sharing of applications will require more host CPU time than sharing the desktop (all of it or a region).

If you are hosting an application sharing session with elevated privileges and you perform an action that requires elevated privileges, Vista will not prompt you for consent. Instead, the action automatically will be either denied (if you are logged on as a standard user) or allowed (if you are logged on as an administrator).

Never show this dialog again

3) Click OK button.


Select your desktop or an open application you would like to share.

Available Sharing Selections

Share desktop

Microsoft Word (winword.exe) 'Virtual classroom (locked).docx

CCC Confer (javaw.exe) 'CCC Confer – RICH SIMMS VIRTUAL C

Sticky Note

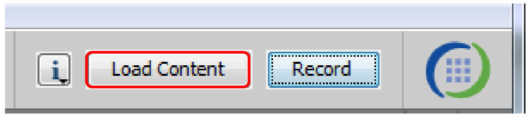
Microsoft PowerPoint (powerpnt.exe) 'cis90lesson01.pptx - Mic

C:\Program Files (x86)\putty.exe 'simben90@oslab:~'

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

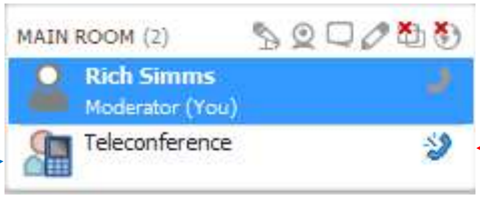
Rich's CCC Confer checklist - setup

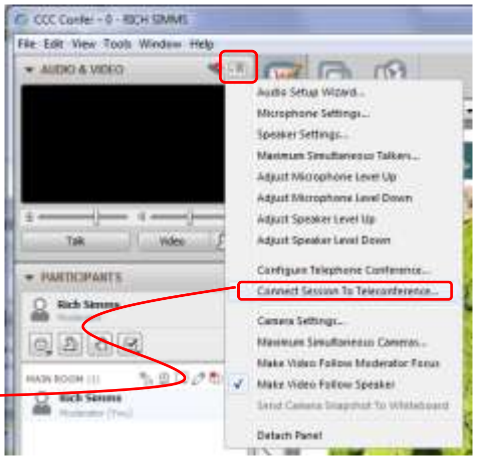
[ ] Preload White Board



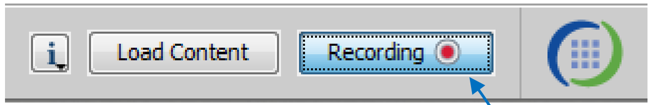
[ ] Connect session to Teleconference

Session now connected to teleconference




CCC Confer - 0 - RICH SIMMS
File Edit View Tools Window Help
AUDIO & VIDEO
Audio Setup Wizard...
Microphone Settings...
Speaker Settings...
Maximum Simultaneous Talkers...
Adjust Microphone Level Up
Adjust Microphone Level Down
Adjust Speaker Level Up
Adjust Speaker Level Down
Configure Telephone Conference...
Connect Session To Teleconference...
Camera Settings...
Maximum Simultaneous Cameras...
Make Video Follow Moderator Focus
Make Video Follow Speaker
Send Camera Snapshot To Whiteboard
Detach Panel
Talk
Video
PARTICIPANTS
Rich Simms

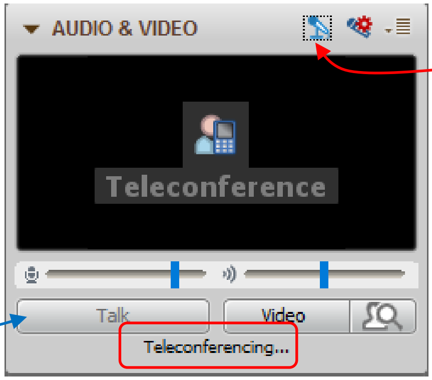
[ ] Is recording on?



Red dot means recording

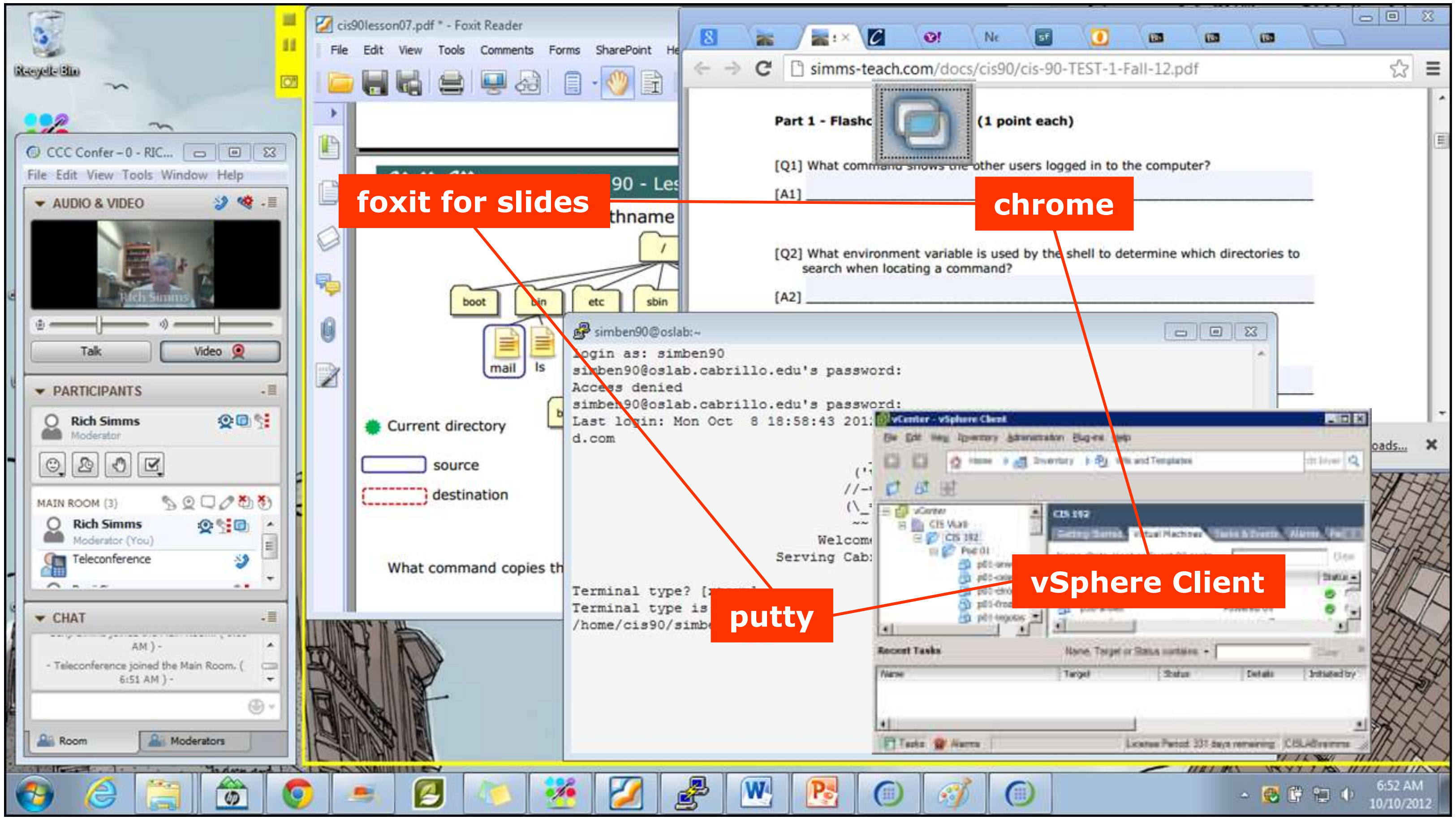
[ ] Use teleconferencing, not mic

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



Part 1 - Flashc... (1 point each)

[Q1] What command shows the other users logged in to the computer?

[A1]

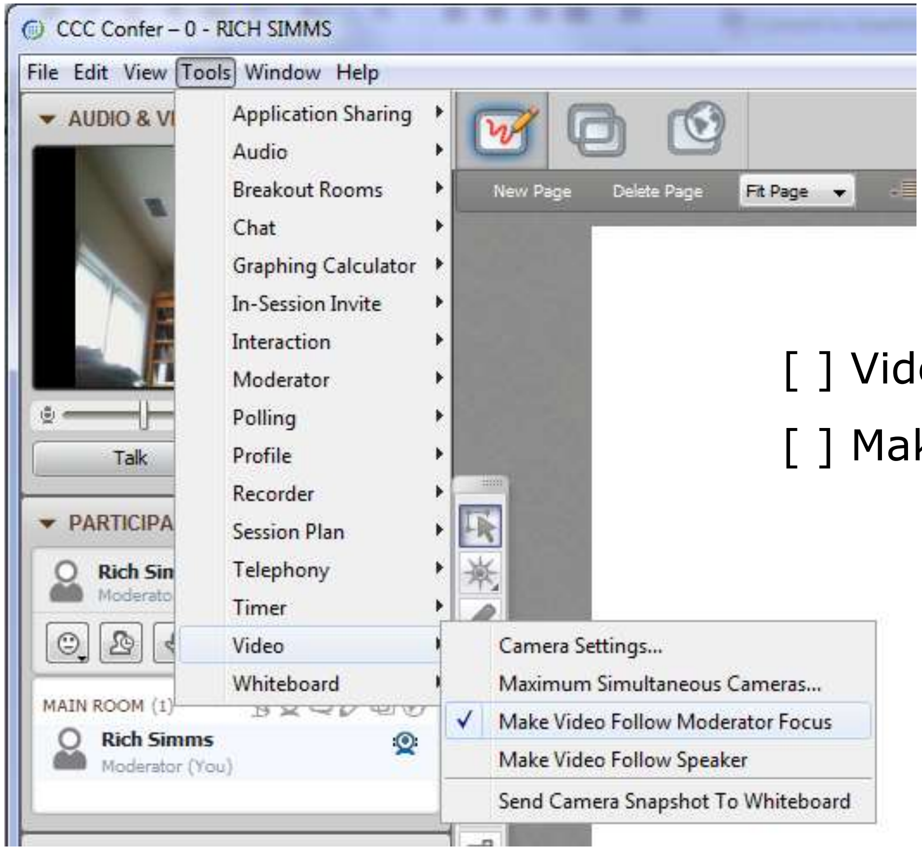
[Q2] What environment variable is used by the shell to determine which directories to search when locating a command?

[A2]

```
login as: simben90
simben90@oslab.cabrillo.edu's password:
Access denied
simben90@oslab.cabrillo.edu's password:
Last login: Mon Oct  8 18:58:43 201
d.com

Welcom
Serving Cab

Terminal type? [
Terminal type is
/home/cis90/simb
```

[ ] layout and share apps

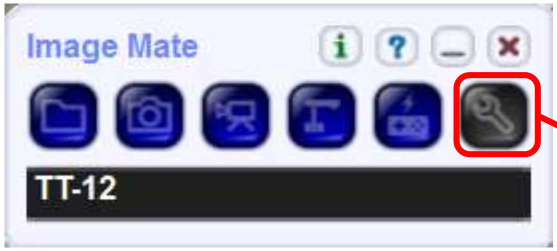
Rich's CCC Confer checklist - webcam setup

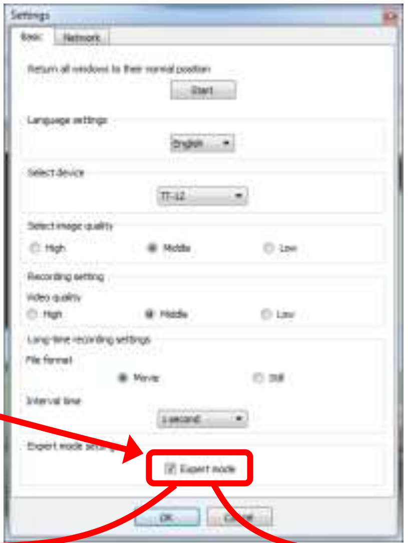


[ ] Video (webcam)

[ ] Make Video Follow Moderator Focus

Rich's CCC Confer checklist - Elmo




Settings

Basic | Network

Return all windows to their normal position

Start

Language settings

English

Select device

TT-12

Select image quality

High [✓ Middle] Low

Recording setting

Video quality

High [✓ Middle] Low

Long-time recording settings

File format

[✓ Movie] Still

Interval time

1 second

Expert mode setting

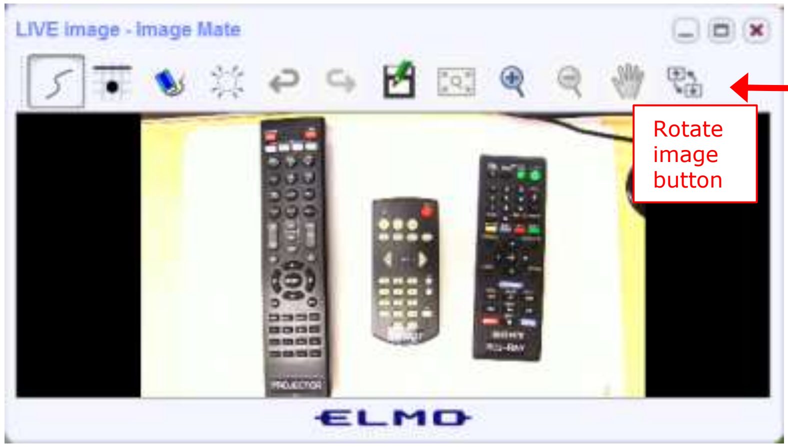
[✓ Expert mode]

OK Cancel

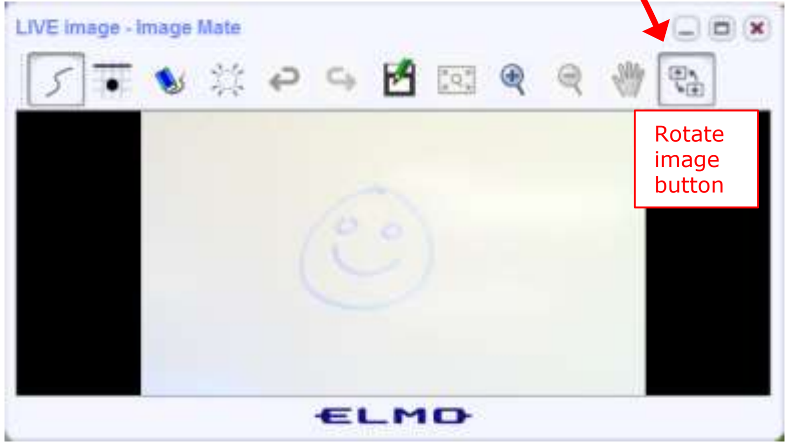
The "rotate image" button is necessary if you use both the side table and the white board.

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

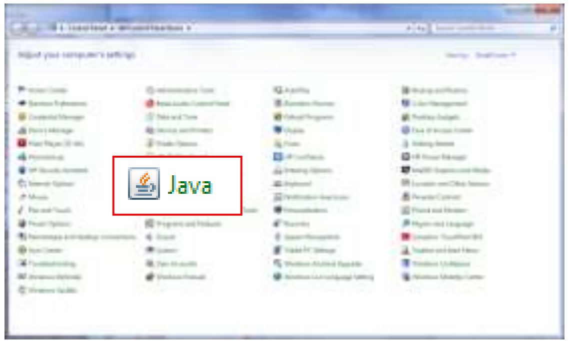


Run and share the Image Mate program just as you would any other app with CCC Confer

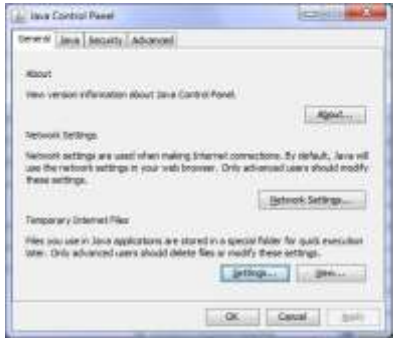
Rich's CCC Confer checklist - universal fixes

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…


Java Control Panel

General | Java | Security | Advanced

About

View version information about Java Control Panel.

About...

Network Settings

Network settings are used when making Internet connections. By default, Java will use the network settings in your web browser. Only advanced users should modify these settings.

Network Settings...

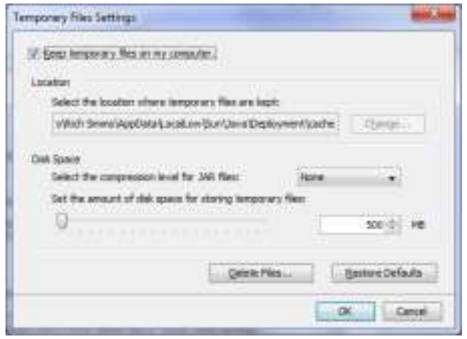
Temporary Internet Files

Files you use in Java applications are stored in a special folder for quick execution later. Only advanced users should delete files or modify these settings.

Settings... | View...

OK | Cancel | Apply

500MB cache size


Temporary Files Settings

☑ Keep temporary files on my computer.

Location

Select the location where temporary files are kept:

\Rich Simms\AppData\LocalLow\Sun\Java\Deployment\cache | Change...

Disk Space

Select the compression level for JAR files: None

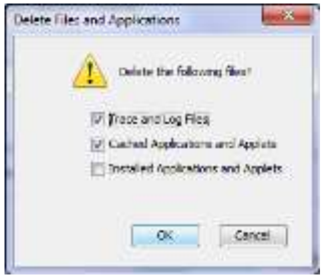
Set the amount of disk space for storing temporary files:

500 MB

Delete Files... | Restore Defaults

OK | Cancel

Delete these


Delete Files and Applications

Delete the following files?

☑ Trace and Log Files

☑ Cached Applications and Applets

☐ Installed Applications and Applets

OK | Cancel

Google Java download

Start

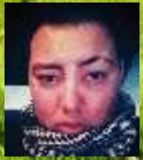
Sound Check

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

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

CIS 90 - Lesson 2

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

									
Vic	Oscar G.	Jesselle	Alex	Mitchel	Colin	Izzy	Luis C.	Cameron	Brandon
Dillon	Joseph	Steve	Nicolette	Joshua	Vance	Adrian	Raul	Matt	Mike
Rodney	Sam	Kevin	Allen	Zakarias	Jim	Dustin	Martin	Zack	Ted
Bruno	Dylan	Eriberto	Tanner	Kyle	Nestor	Oscar N.	Ian	Diego	

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

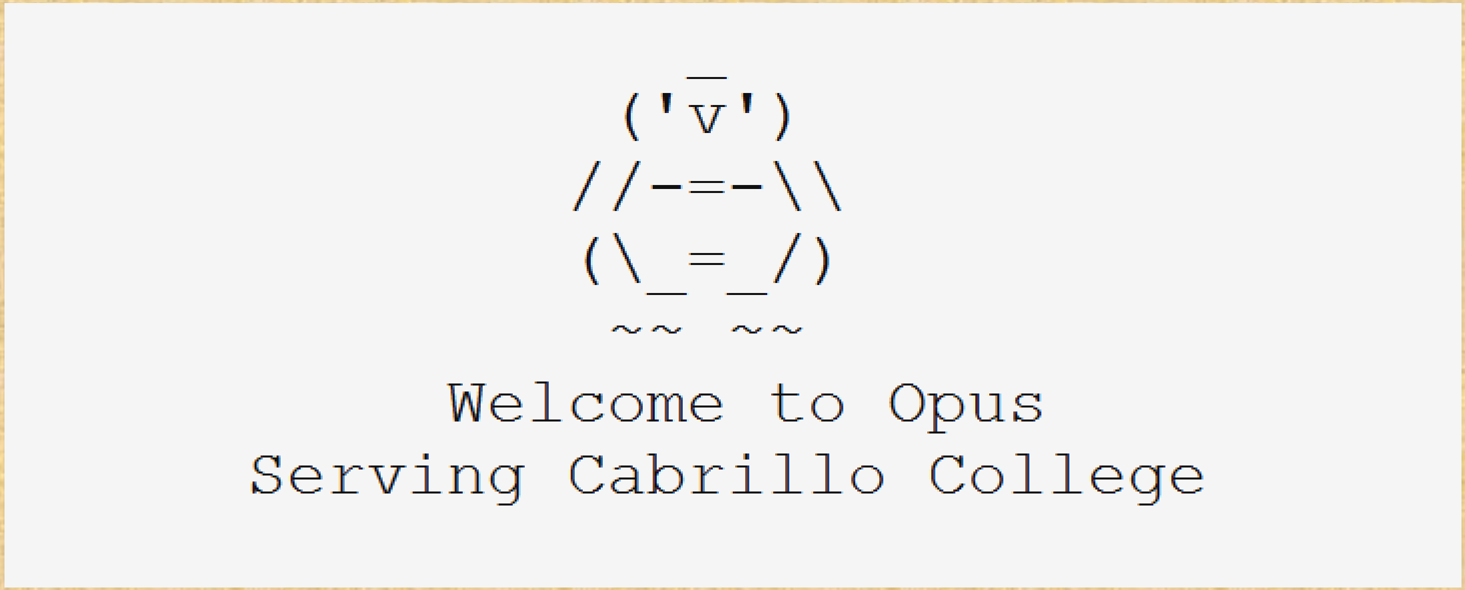
email answers to: `risimms@cabrillo.edu`

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

Commands

Objectives	Agenda
• Understand where account information is kept. • Understand why strong passwords are important. • Learn where commands are located. • Understand how the shell works to run commands. • Discover where to find documentation.	• Quiz • Questions • Using VLab • Virtual terminals • Logging in • Passwords • Housekeeping • Lesson 2 commands • The path • Location of common commands • Programs • Inputs to commands • Command syntax • Parsing • Variables • The shell (six steps) • Metacharacters • Shortcuts • Life without a path • Docs • Wrap up

Class Activity



```
          _
        ('v')
       //-=-\\
       (\_=_/)
        ~~ ~~
    Welcome to Opus
Serving Cabrillo College
```

If you haven't already, log into Opus

Questions

Questions

How this course works?

Past lesson material?

Previous labs?

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.*

Extra Credit

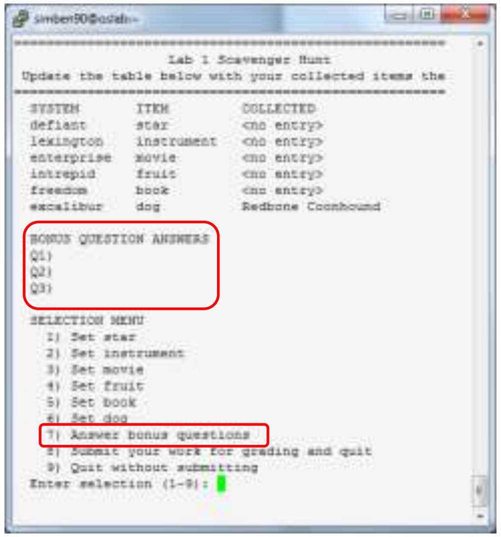
http://simms-teach.com/cis90grades.php

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!

On Lab 1 submittal



```
====================================================================
                    Lab 1 Scavenger Hunt
 Update the table below with your collected items the
====================================================================
  SYSTEM        ITEM          COLLECTED
  defiant       star          <no entry>
  lexington     instrument    <no entry>
  enterprise    movie         <no entry>
  intrepid      fruit         <no entry>
  freedom       book          <no entry>
  excalibur     dog           Redbone Coonhound

  BONUS QUESTION ANSWERS
  Q1)
  Q2)
  Q3)

  SELECTION MENU
    1) Set star
    2) Set instrument
    3) Set movie
    4) Set fruit
    5) Set book
    6) Set dog
    7) Answer bonus questions
    8) Submit your work for grading and quit
    9) Quit without submitting
  Enter selection (1-9):
```

In lesson slides

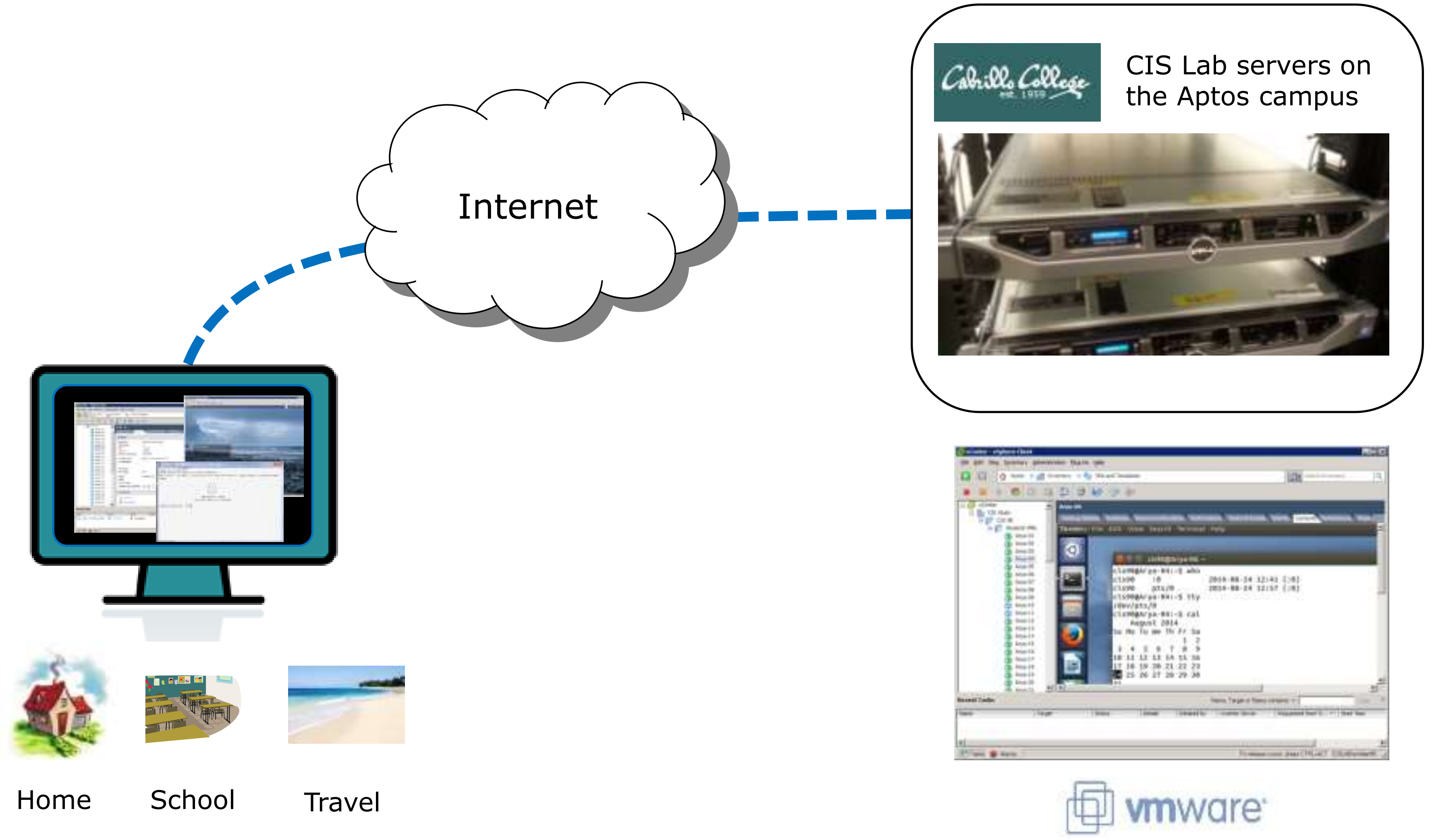
http://simms-teach.com/cis90extracredit.php

- **Web site content review** - The first person to email the instructor pointing out an error or typo on this website will get one point of extra credit for each unique error. The email must specify the specific document or web page, pinpoint the location of the error, and specify what the correction should be. Duplicate errors count as a single point. This does not apply to pre-published material than has been uploaded but not yet presented in class. (Up to 20 points total)

Using CIS VLab (Virtual Lab)

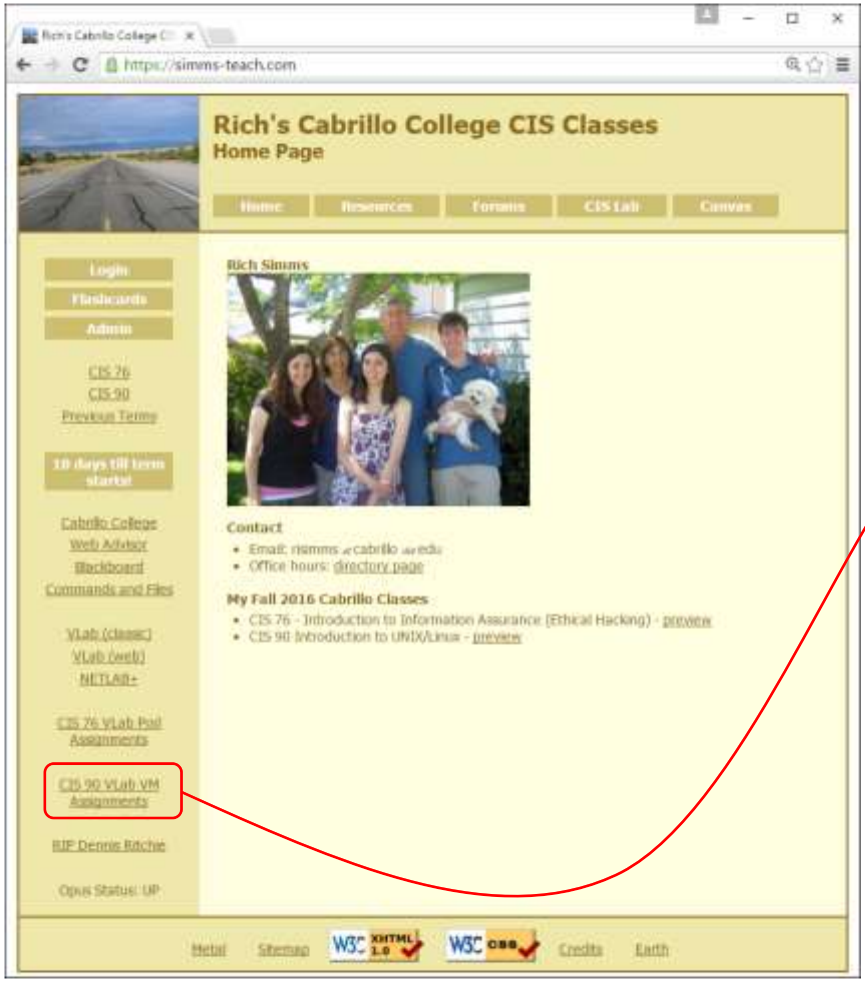
Third driving lesson

Accessing CIS VLab VMs



```
cis90@Arya-04:~$ who
cis90    :0           2014-08-24 12:41 (:0)
cis90    pts/0        2014-08-24 12:57 (:0)
cis90@Arya-04:~$ tty
/dev/pts/0
cis90@Arya-04:~$ cal
    August 2014
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
31
```

http://simms-teach.com/


Rich's Cabrillo College CIS Classes

https://simms-teach.com

Rich's Cabrillo College CIS Classes
Home Page

Rich Simms

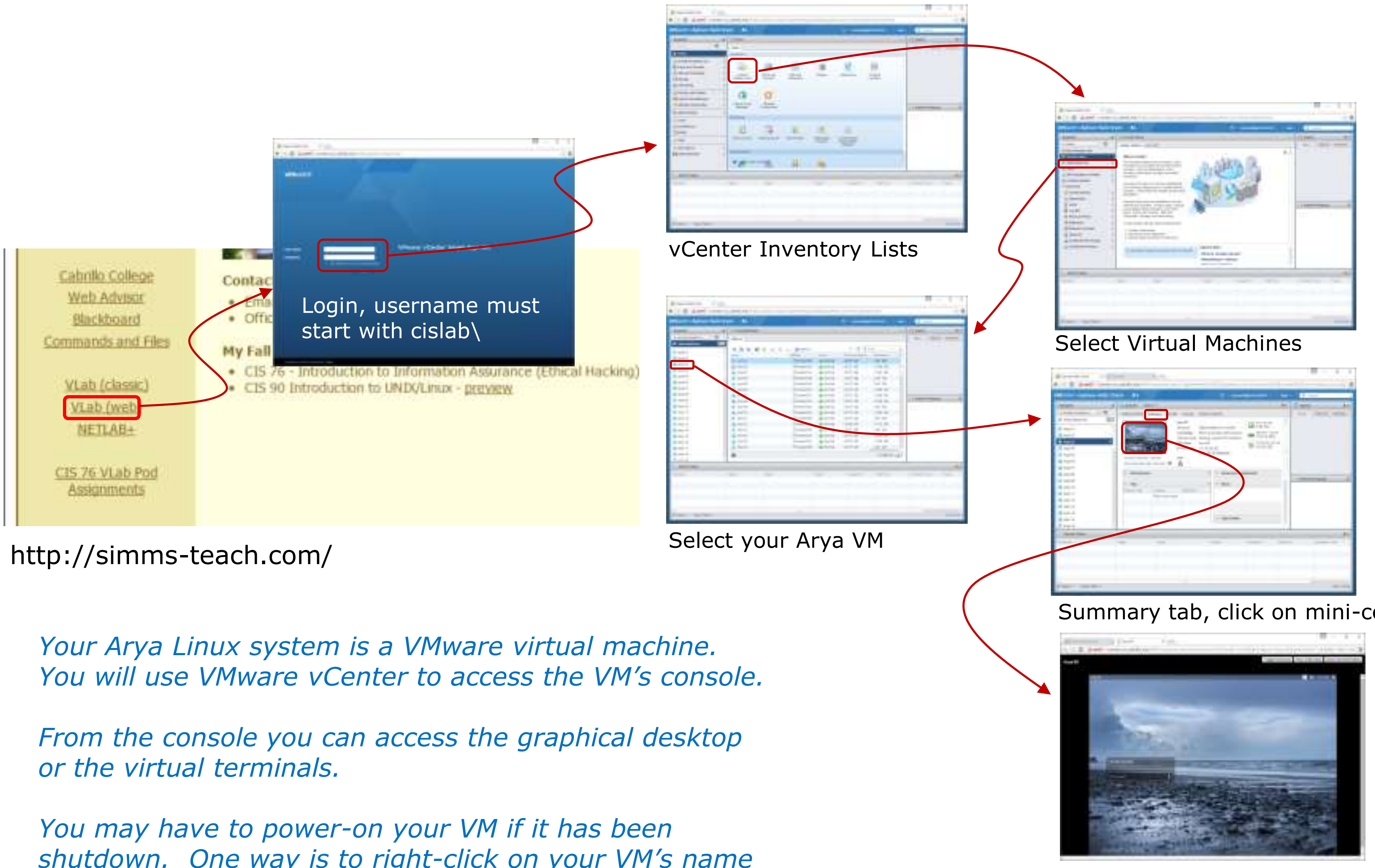
Contact
- Email: rsimms at cabrillo dot edu
- Office hours: directory page

My Fall 2016 Cabrillo Classes
- CIS 76 - Introduction to Information Assurance (Ethical Hacking) - preview
- CIS 90 Introduction to UNIX/Linux - preview

CIS 90 VLab Assignments

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

Accessing CIS VLab via vSphere Web Client


Cabrillo College
Web Advisor
Blackboard
Commands and Files
VLab (classic)
VLab (web)
NETLAB+
CIS 76 VLab Pod Assignments
Contac
My Fall
CIS 76 - Introduction to Information Assurance (Ethical Hacking)
CIS 90 Introduction to UNIX/Linux - preview
http://simms-teach.com/
Login, username must start with cislab\
vCenter Inventory Lists
Select Virtual Machines
Select your Arya VM
Summary tab, click on mini-console
Login

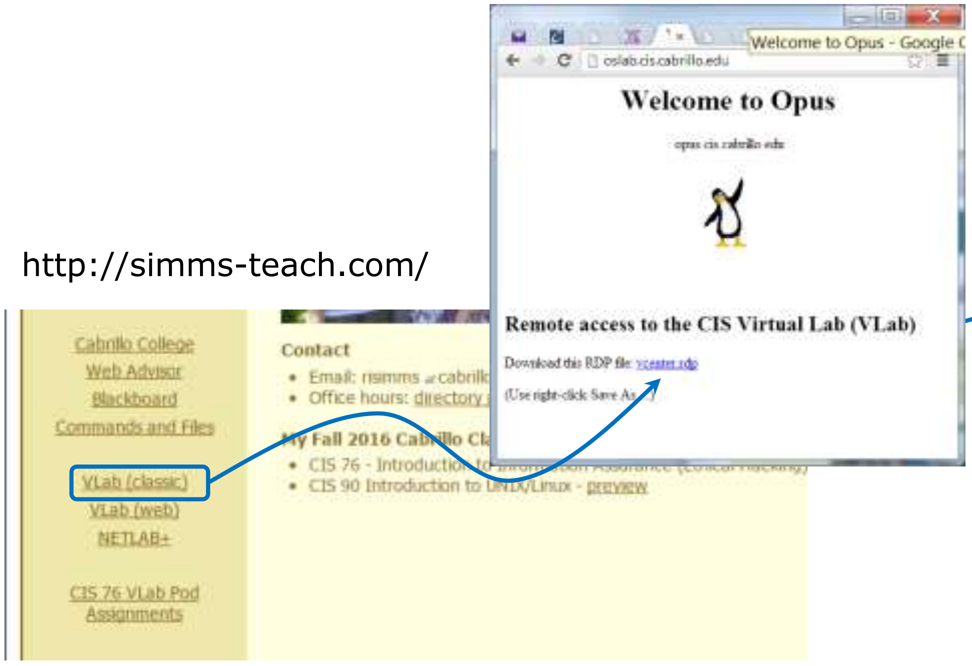
Your Arya Linux system is a VMware virtual machine. You will use VMware vCenter to access the VM's console.

From the console you can access the graphical desktop or the virtual terminals.

You may have to power-on your VM if it has been shutdown. One way is to right-click on your VM's name in the list and select Power > Power On.

Accessing CIS VLab via vSphere Client

http://simms-teach.com/



Cabrillo College
Web Advisor
Blackboard
Commands and Files
VLab (classic)
VLab (web)
NETLAB+
CIS 76 VLab Pod Assignments

Contact
- Email: rsimms at cabrillo
- Office hours: directory

My Fall 2016 Cabrillo Cl
- CIS 76 - Introduction to Information Assurance (Ethical Hacking)
- CIS 90 Introduction to UNIX/Linux - preview

Welcome to Opus - Google C
oslab.cis.cabrillo.edu

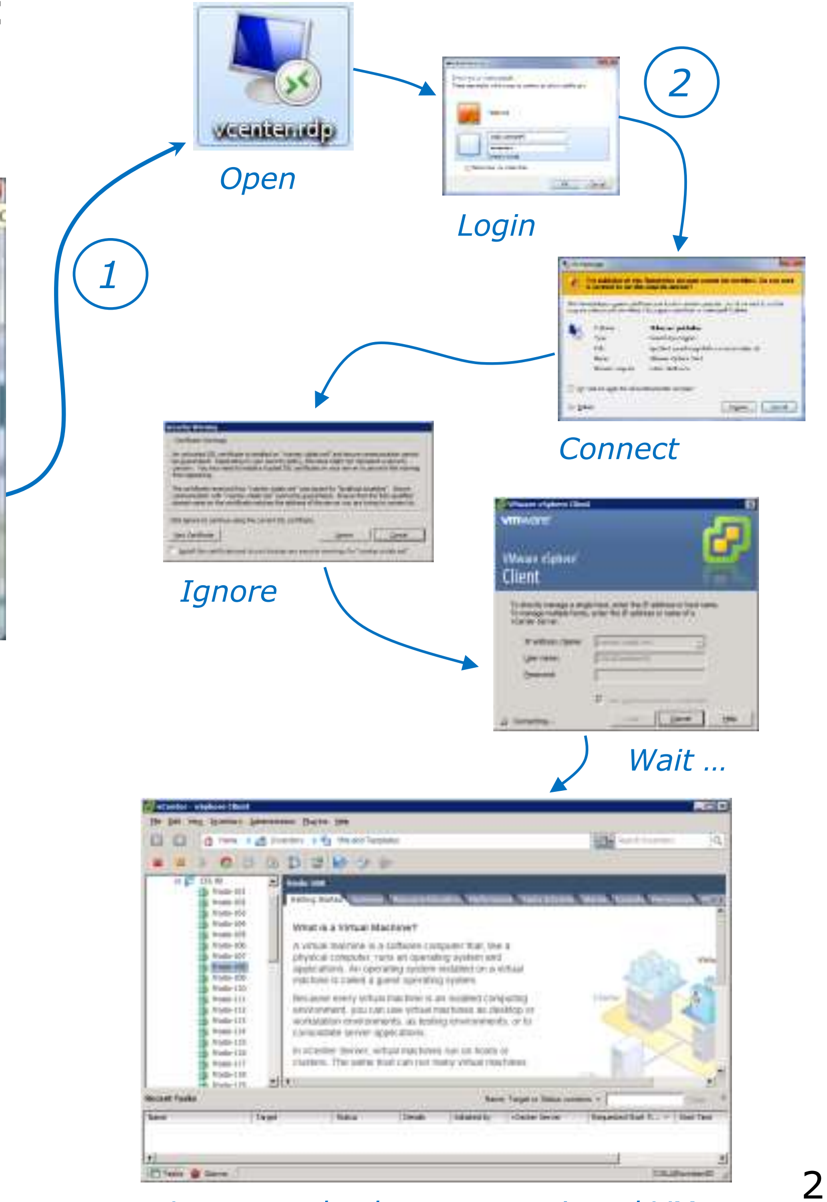
Welcome to Opus

opus.cis.cabrillo.edu

Remote access to the CIS Virtual Lab (VLab)

Download this RDP file: vcenter.rdp

(Use right-click Save As...)



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 need to install an RDP app like Microsoft Remote Desktop.

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

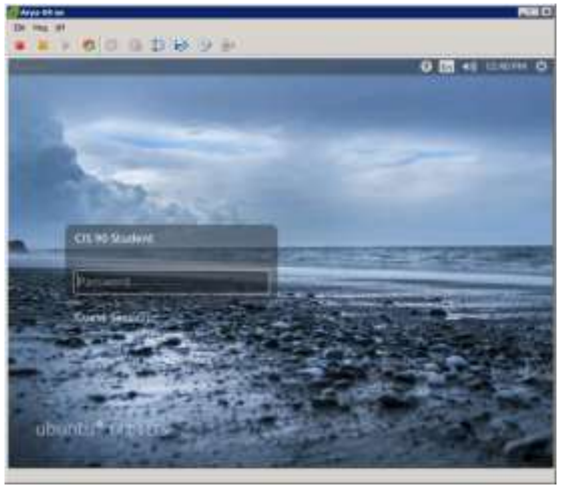
Class Activity

Follow the instructor to open a console on your VM

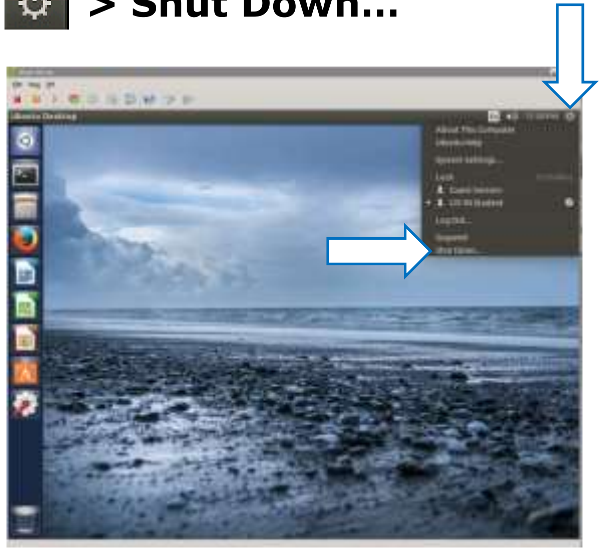
- ❑ Browse to http://simms-teach.com
- ❑ Determine which Arya VM is yours
- ❑ Connect to Vlab’s vCenter
- ❑ Navigate to CIS 90 Arya VMs
- ❑ Select your VM and open the console

The Arya VM

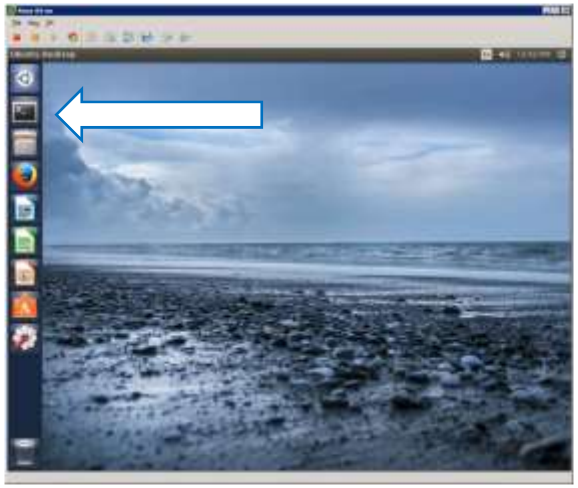
Log in as
CIS 90 Student

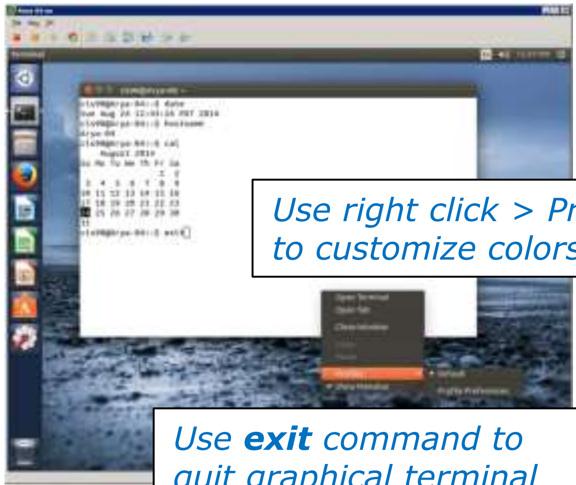


Shutdown using
> Shut Down...



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





```
cis90@arya-04:~$ date
Sun Aug 24 12:03:26 PDT 2014
cis90@arya-04:~$ hostname
arya-04
cis90@arya-04:~$ cal
    August 2014
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
31
cis90@arya-04:~$ exit
```

Use right click > Profiles to customize colors

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

Class Activity

Follow the instructor to login and use your VM

- ❑ Login to your Arya VM*
- ❑ Open a graphical terminal
- ❑ Use who command to see logins
- ❑ Find the “toothed gear” icon to logoff, restart or shutdown

*See the CIS 90 welcome email or announcement in Canvas from the instructor for Arya login credentials

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

Virtual Terminals (consoles)

Fourth driving lesson

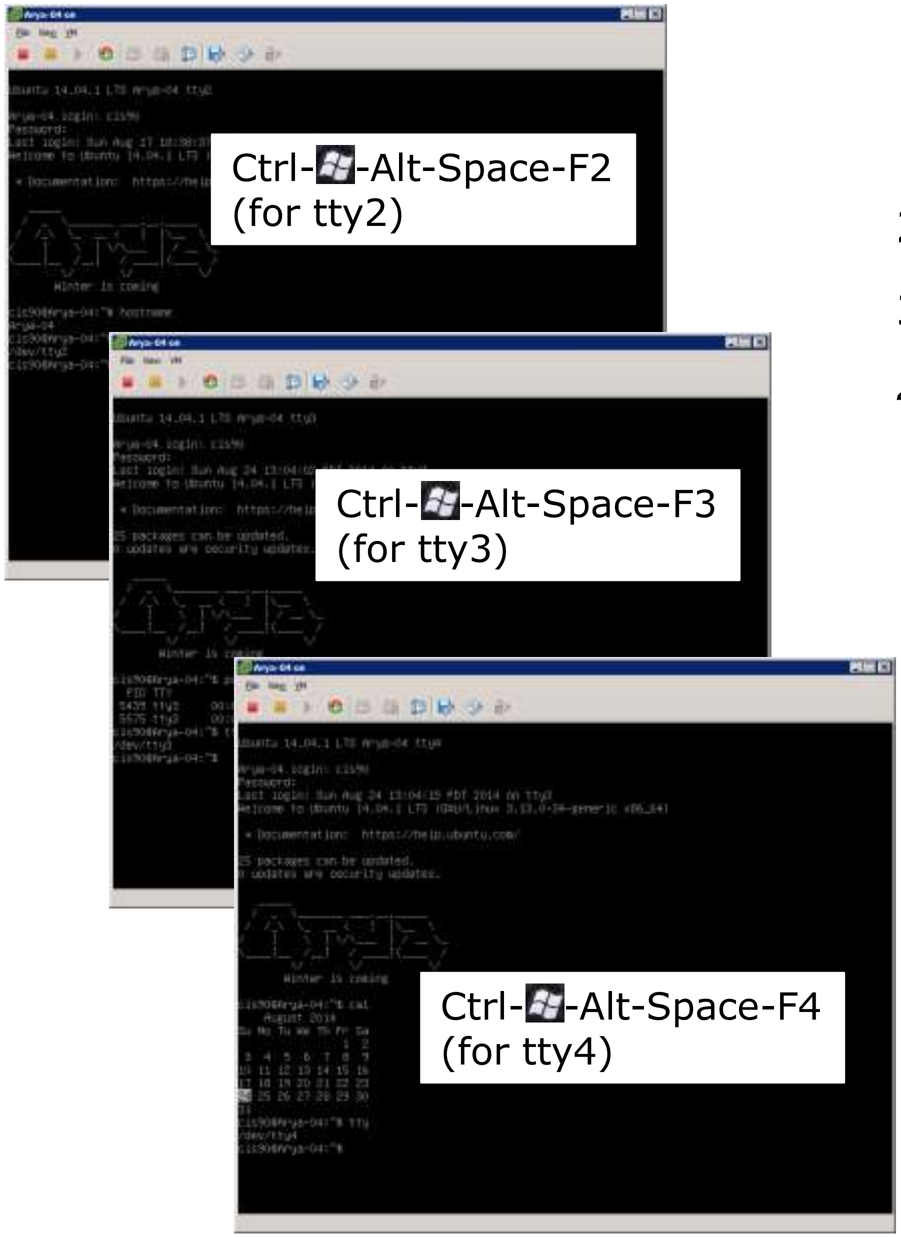
Virtual Terminals

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)

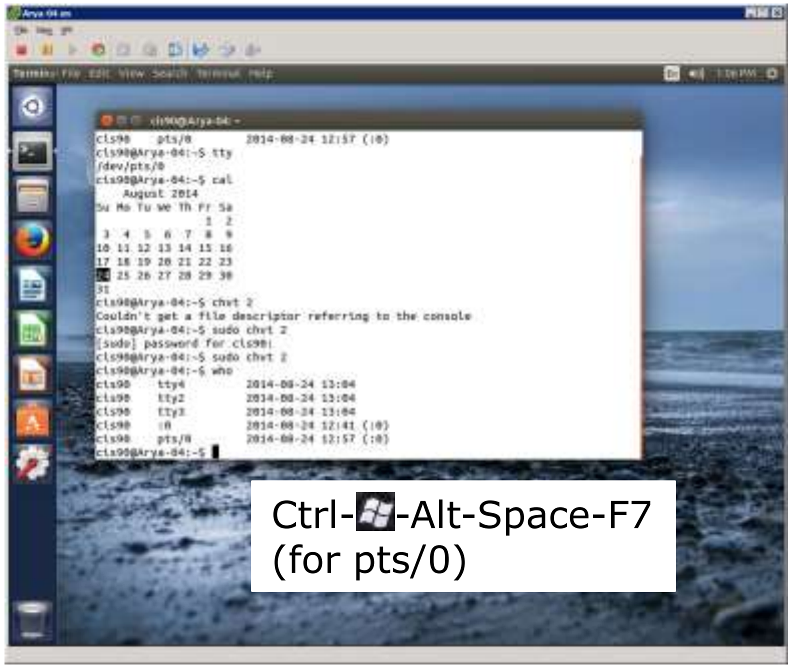


Ctrl-⊞-Alt-Space-F2 (for tty2)

Ctrl-⊞-Alt-Space-F3 (for tty3)

Ctrl-⊞-Alt-Space-F4 (for tty4)

```
Ubuntu 14.04.1 LTS Arya-04 tty4

Arya-04 login: cis90
Password:
Last login: Sun Aug 24 13:04:15 PDT 2014 on tty2
Welcome to Ubuntu 14.04.1 LTS (GNU/Linux 3.13.0-24-generic x86_64)

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

25 packages can be updated.
0 updates are security updates.

       Winter is coming

cis90@Arya-04:~$ cal
    August 2014
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
31
cis90@Arya-04:~$ tty
/dev/tty4
cis90@Arya-04:~$
```

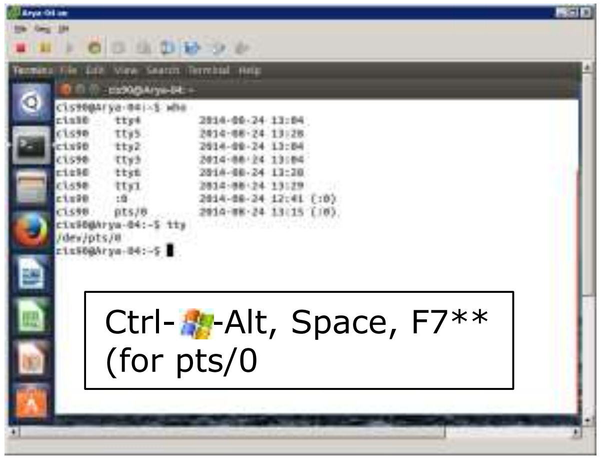


```
cis90    pts/0        2014-08-24 12:57 (:0)
cis90@Arya-04:~$ tty
/dev/pts/0
cis90@Arya-04:~$ cal
    August 2014
Su Mo Tu We Th Fr Sa
                1  2
 3  4  5  6  7  8  9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30
31
cis90@Arya-04:~$ chvt 2
Couldn't get a file descriptor referring to the console
cis90@Arya-04:~$ sudo chvt 2
[sudo] password for cis90:
cis90@Arya-04:~$ sudo chvt 2
cis90@Arya-04:~$ who
cis90    tty4         2014-08-24 13:04
cis90    tty2         2014-08-24 13:04
cis90    tty3         2014-08-24 13:04
cis90    :0           2014-08-24 12:41 (:0)
cis90    pts/0        2014-08-24 12:57 (:0)
cis90@Arya-04:~$
```

Ctrl-⊞-Alt-Space-F7 (for pts/0)

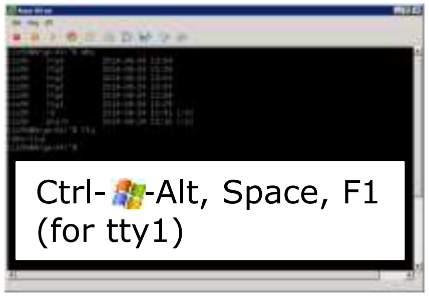
Changing Virtual TTY Terminals using **VMware vSphere**

Windows PC Keyboard

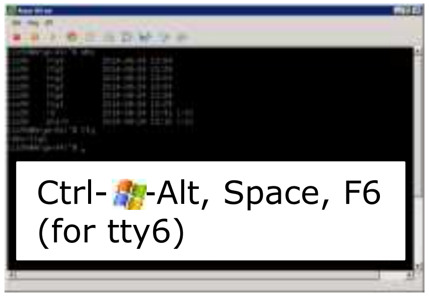


```
cis90@Arya-04:~$ who
cis90    tty4         2014-08-24 13:04
cis90    tty5         2014-08-24 13:28
cis90    tty2         2014-08-24 13:04
cis90    tty3         2014-08-24 13:04
cis90    tty6         2014-08-24 13:28
cis90    tty1         2014-08-24 13:29
cis90    :0           2014-08-24 12:41 (:0)
cis90    pts/0        2014-08-24 13:15 (:0)
cis90@Arya-04:~$ tty
/dev/pts/0
cis90@Arya-04:~$ 
```

Ctrl- -Alt, Space, F7**
(for pts/0)

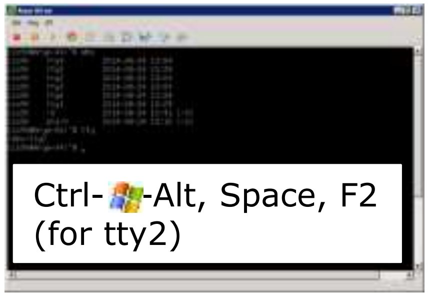


Ctrl- -Alt, Space, F1
(for tty1)

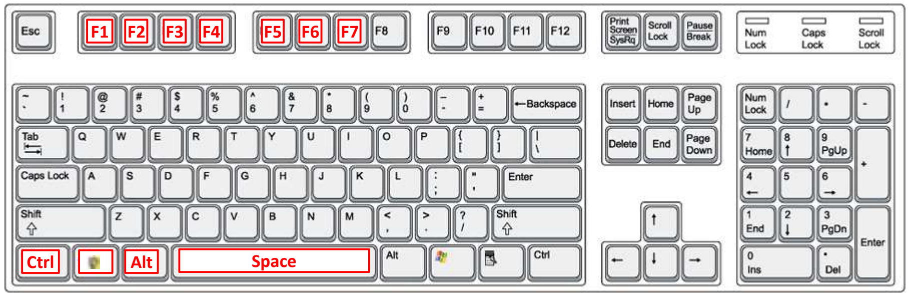


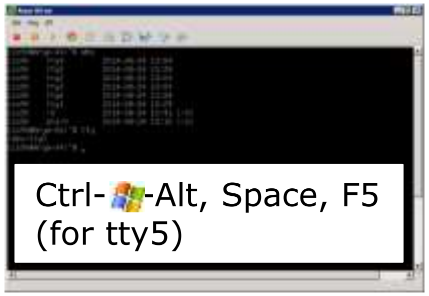
Ctrl- -Alt, Space, F6
(for tty6)

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

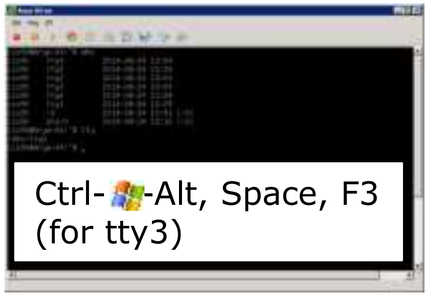


Ctrl- -Alt, Space, F2
(for tty2)

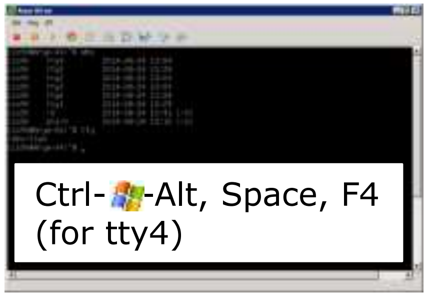




Ctrl- -Alt, Space, F5
(for tty5)



Ctrl- -Alt, Space, F3
(for tty3)



Ctrl- -Alt, Space, F4
(for tty4)

*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.

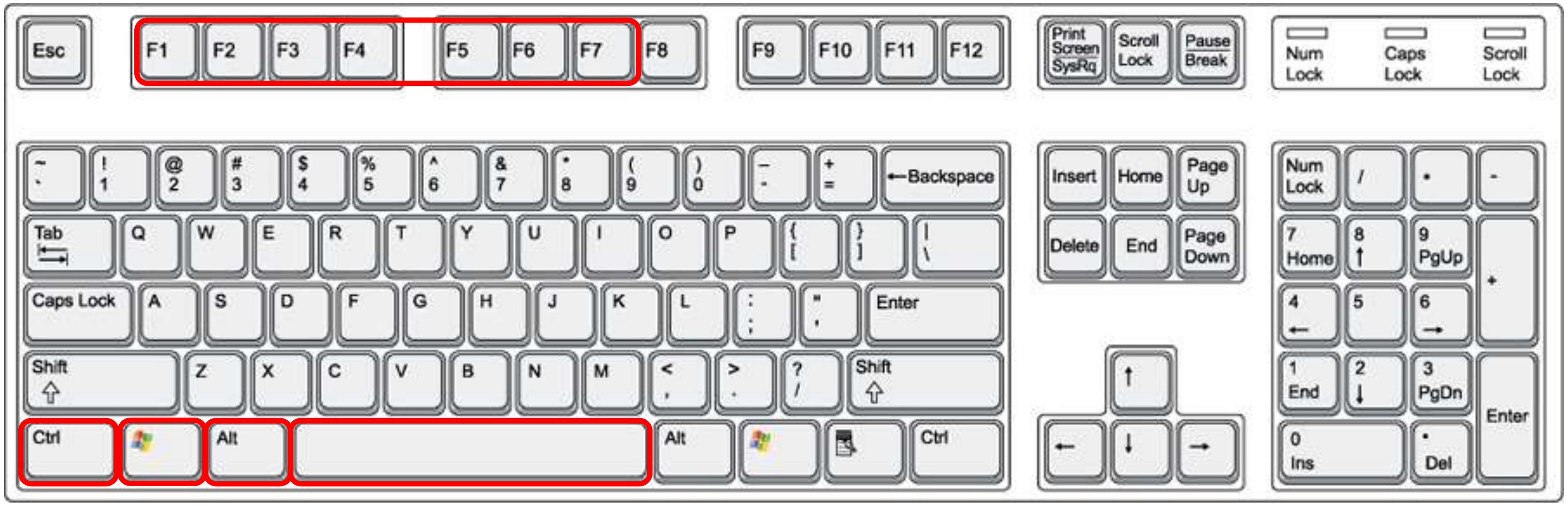
Pressing the ⊞ on some Windows keyboards may not be necessary

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.

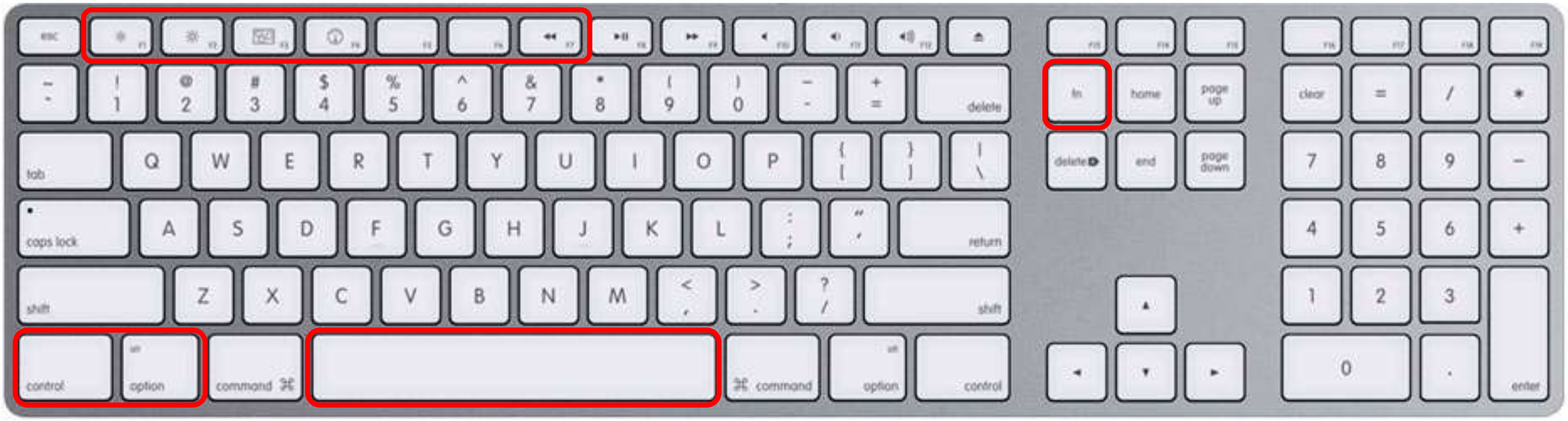
VMware VM Operations
Changing Virtual Terminals with a PC keyboard



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)

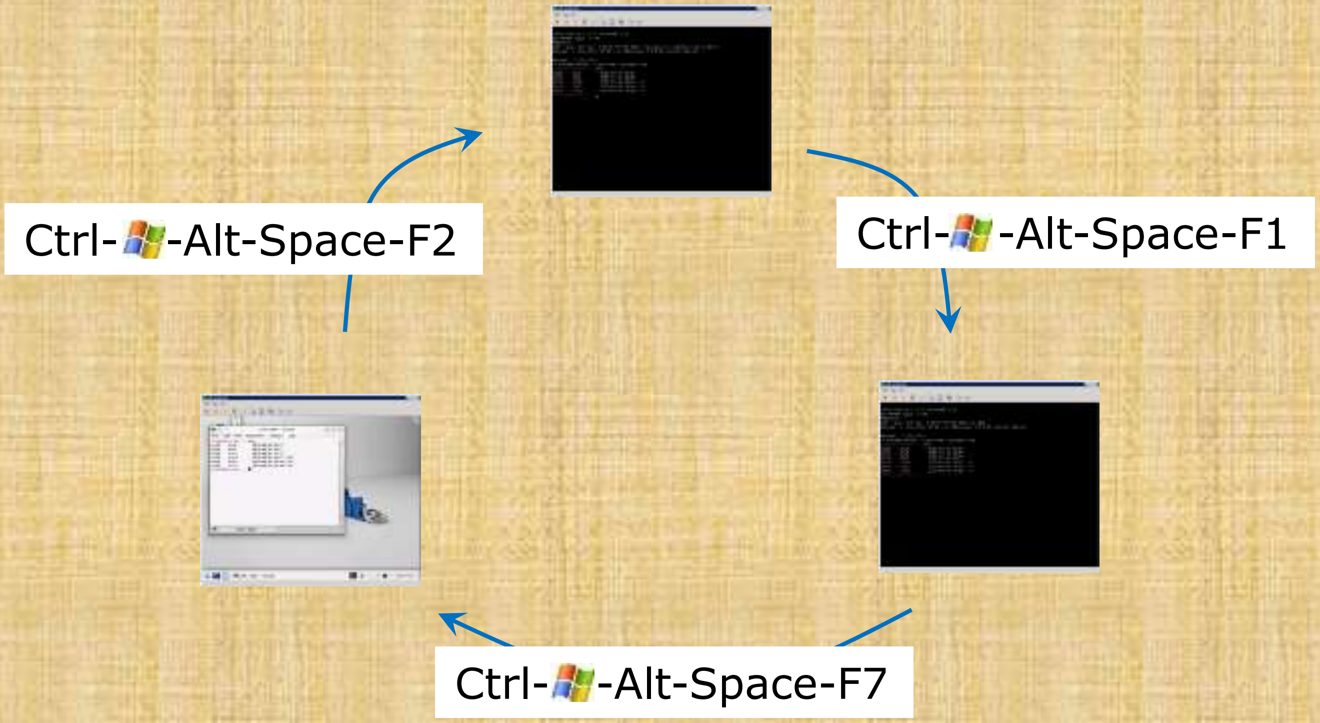
VMware VM Operations
Changing Virtual Terminals with a Mac keyboard



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)

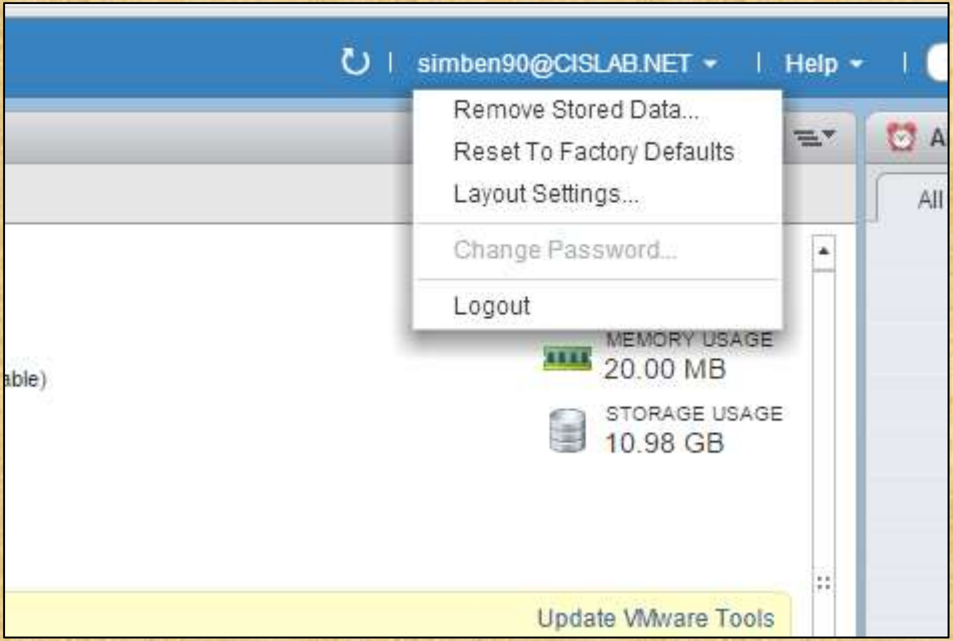
Class Activity



Follow the instructor to:

- 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

Class Activity



Logout of Vlab's vCenter

Your VM will keep running even though you disconnect from vCenter

Logging In

(authentication)

http://www.gutenberg.org/files/15064/15064-h/images/269.png

Who goes there?

What's the password?

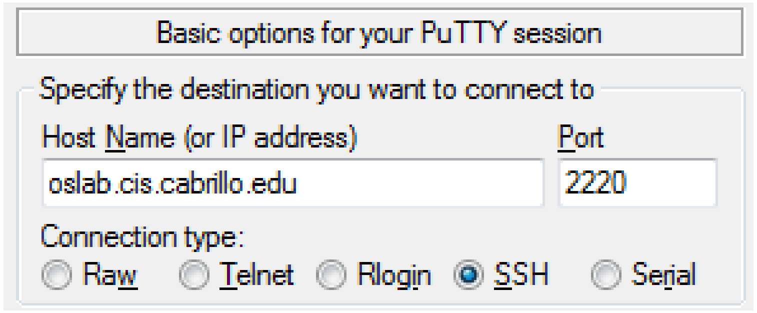
Logging in

- A system administrator can create user accounts for each user that is allowed to login
- To login you must be authenticated as one of those users
- There are two common authentication methods used:
  1) Username and password
  2) Public & private keys

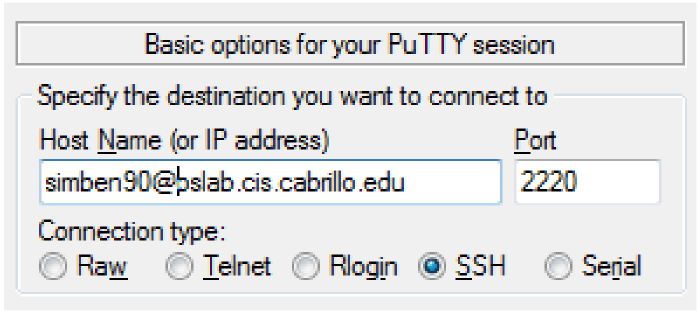
We will cover just usernames and passwords today

Logging in

Logging in using Putty from Windows PCs


Basic options for your PuTTY session
Specify the destination you want to connect to

Host Name (or IP address): oslab.cis.cabrillo.edu
Port: 2220
Connection type: Raw Telnet Rlogin [✓ SSH] Serial


Basic options for your PuTTY session
Specify the destination you want to connect to

Host Name (or IP address): simben90@oslab.cis.cabrillo.edu
Port: 2220
Connection type: Raw Telnet Rlogin [✓ SSH] Serial

If you don't specify your username the system will prompt you for both your username and password

```
login as: simben90
simben90@oslab.cis.cabrillo.edu's password:
```

If you specify your username the system will just prompt you for your password

```
Using username "simben90".
simben90@oslab.cis.cabrillo.edu's password:
```

Logging in with the ssh command from Mac or UNIX/Linux systems

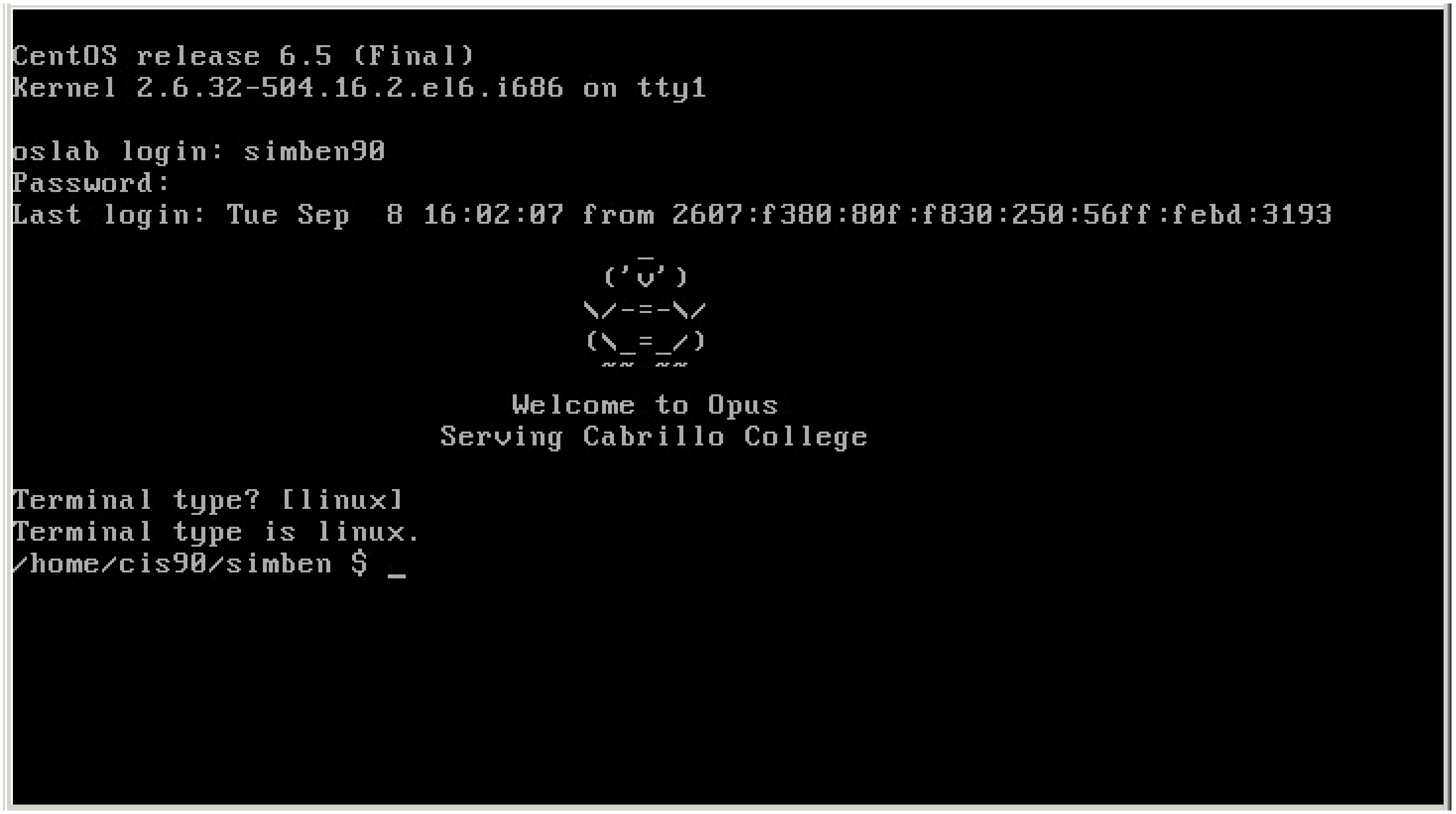
```
ssh -p 2220 simben90@oslab.cis.cabrillo.edu
```

If you don't specify a username the ssh command will use your current username. Be careful, that username may not exist on the remote system you are trying to login to.

```
[rsimms@daughter-of-opus ~]$ ssh -p 2220 simben90@oslab.cis.cabrillo.edu
simben90@oslab.cis.cabrillo.edu's password:
```

Logging in

Logging in on a virtual terminal

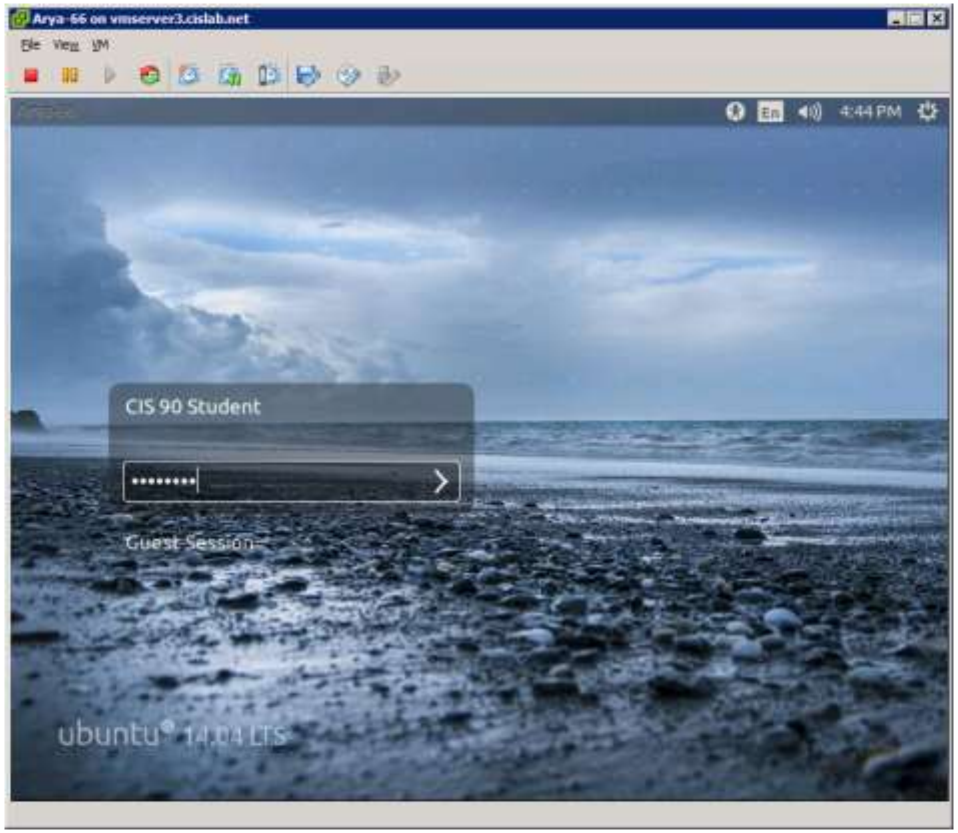


```
CentOS release 6.5 (Final)
Kernel 2.6.32-504.16.2.el6.i686 on tty1

oslab login: simben90
Password:
Last login: Tue Sep  8 16:02:07 from 2607:f380:80f:f830:250:56ff:febd:3193
                                   _
                                 ('v')
                                \/-=-\/
                                (\_=_/)
                                 ~~ ~~
                            Welcome to Opus
                        Serving Cabrillo College

Terminal type? [linux]
Terminal type is linux.
/home/cis90/simben $ _
```

When you have direct physical access to a system you can use one of these virtual terminals on the system console. You are not using ssh over the network in this situation.

Logging in

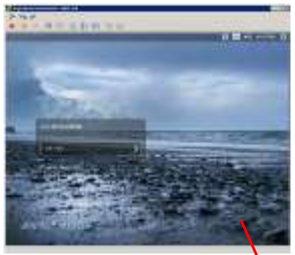
Logging in using a graphical desktop (Ubuntu)



This can be done locally or over the network

Just for kicks

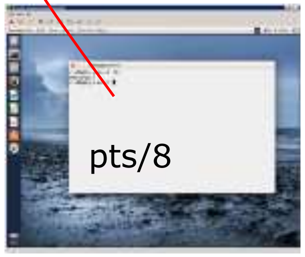
:0



tty1

pts/21

pts/0



pts/8

```
cis90@Arya-66:~$ who
cis90    tty1         2015-09-08 16:43
cis90    :0           2015-09-08 16:53 (:0)
cis90    pts/21       2015-09-08 16:39 (opus.cis.cabrillo.edu)
cis90    pts/0        2015-09-08 16:55 (opus.cis.cabrillo.edu)
cis90    pts/8        2015-09-08 16:53 (:0)
```

Let's login to an Arya using a virtual terminal, a graphical desktop, two ssh sessions and a graphical terminal on the graphical desktop

Logging in

- For systems that are not connected to a directory service (e.g. Microsoft Active Directory) all user accounts are kept in a file named **/etc/passwd**
- For systems that are not connected to a directory service all passwords are kept encrypted in a file named **/etc/shadow**

The /etc/passwd file

The SUPER user is named root

```
[rsimms@daughter-of-opus ~]$ cat /etc/passwd
root:x:0:0:root:/root:/bin/bash
```

Snipped

```
deanna:x:2009:1701:Deanna Troi:/home/deanna:/bin/bash
chakotay:x:2010:1701:Chakotay:/home/chakotay:/bin/bash
kira:x:2011:1701:Kira Nerys:/home/kira:/bin/bash
chekov:x:2012:1701:Pavel Chekov:/home/chekov:/bin/bash
[rsimms@daughter-of-opus ~]$
```

To login your username must match one of the accounts in the */etc/passwd file*

Note: this file no longer contains the passwords!

Viewing your account in /etc/passwd

This command, which we will learn how to do later, outputs ***just one line*** *of the /etc/passwd file on Opus*

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

1) username

2) password (just a placeholder now)

3) User ID (UID)

4) Group ID (GID)

5) Comment

6) Home directory

7) Shell

Note the fields in /etc/passwd are delimited with a ":"

```
/home/cis90/simben $ id
uid=1201(simben90) gid=190(cis90) groups=190(cis90),100(users)
context=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023
```

*Now you know where the **id** command get some of its information!*

The /etc/shadow file

The SUPER user is named root

Use sudo to run command as superuser (root)

```
[rsimms@daughter-of-opus ~]$ cat /etc/shadow
cat: /etc/shadow: Permission denied
[rsimms@daughter-of-opus ~]$ sudo cat /etc/shadow
[sudo] password for rsimms:
root:$6$[redacted]$[redacted]
[redacted]:16226:0:99999:7:::
```

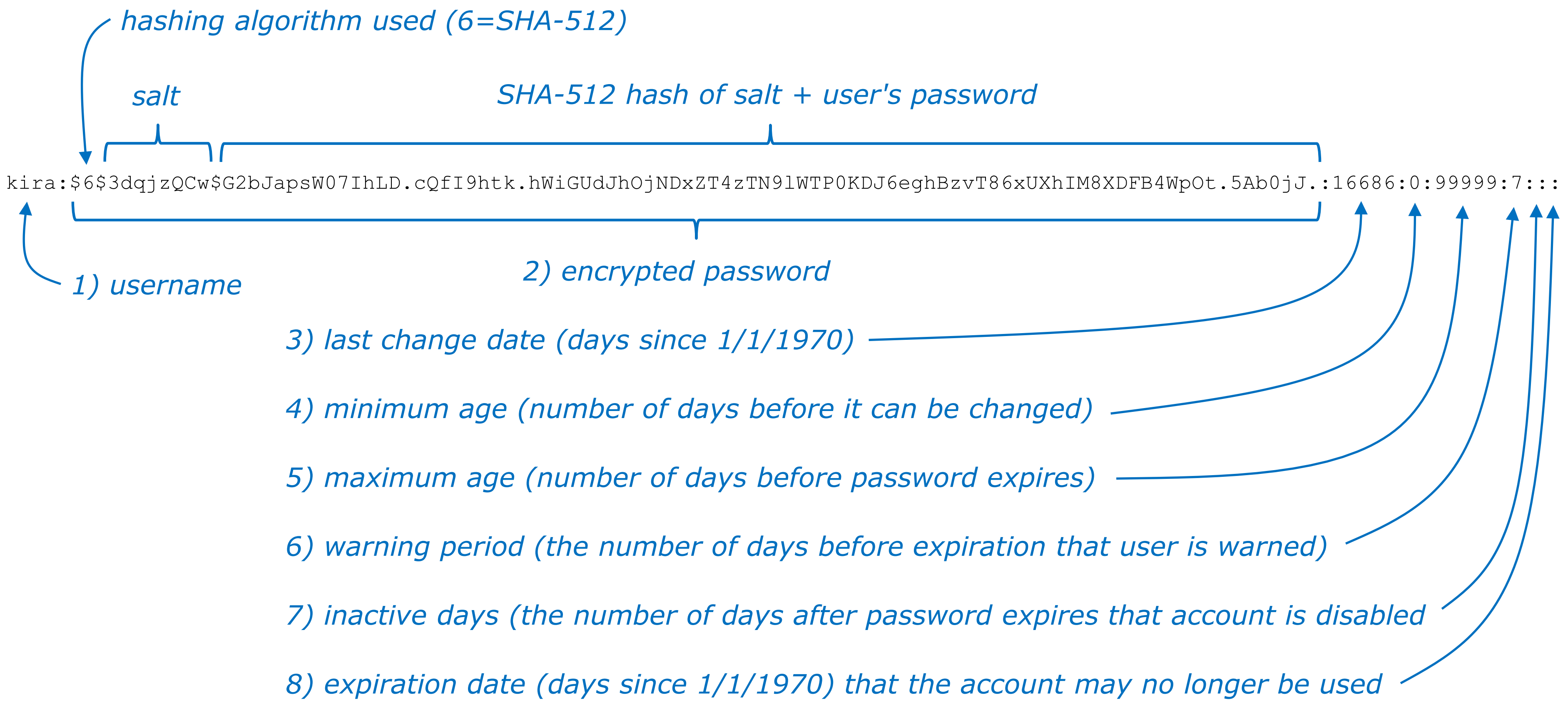
Snipped

```
deanna:$6$hsAXq0Jk$ndIt.oxiFL/qZ7pLAFOaGgxpxAHDEj7ukpd0PfeRN0J9q07Z6Cg0V
3hzo9eSAk0GlaywDtqwL5NefNEEwf9FR1:16686:0:99999:7:::
chakotay:$6$c/kFViIa$nTUJcvJRCut8PwvOSYLlopAI25UsFLNKerGF8OhQIkI78RHTXE1
KOOwvDRSW6BAi4pui7LLpi6JP8QCBMVU1s1:16686:0:99999:7:::
kira:$6$3dqjzQCw$G2bJapsW07IhLD.cQfI9htk.hWiGUdJhOjNDxZT4zTN9lWTP0KDJ6eg
hBzvT86xUXhIM8XDFB4WpOt.5Ab0jJ.:16686:0:99999:7:::
chekov:$6$jd4PMdv0$HPyW/k04DjMDeLO3qUfEzvQj0fWpLuUWMh9RvlOv1V3N/zQxhdhS3
YfSLdhHz0rKBe1wzGGx07CrzOfL3MKNa1:16686:0:99999:7:::
[rsimms@daughter-of-opus ~]$
```

To login, your password must match the encrypted account password kept in the */etc/shadow* file

Only the root user can view this file and the passwords are encrypted!

The /etc/shadow file



```
kira:$6$3dqjzQCw$G2bJapsW07IhLD.cQfI9htk.hWiGUdJhOjNDxZT4zTN9lWTP0KDJ6eghBzvT86xUXhIM8XDFB4WpOt.5Ab0jJ.:16686:0:99999:7:::
```

hashing algorithm used (6=SHA-512)
salt
SHA-512 hash of salt + user's password

1) username

2) encrypted password

3) last change date (days since 1/1/1970)

4) minimum age (number of days before it can be changed)

5) maximum age (number of days before password expires)

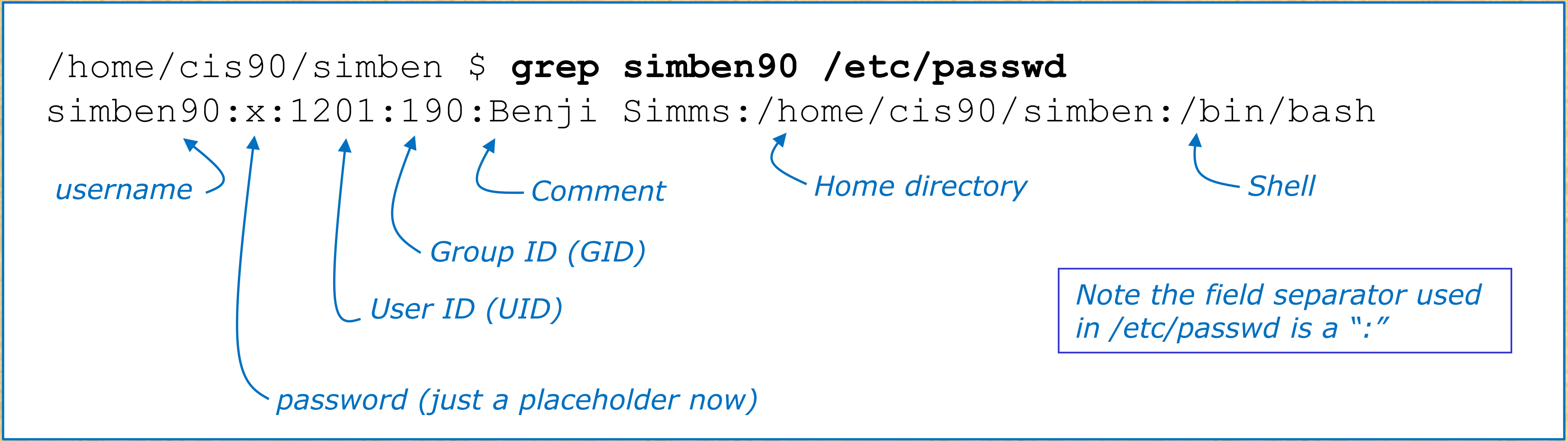
6) warning period (the number of days before expiration that user is warned)

7) inactive days (the number of days after password expires that account is disabled

8) expiration date (days since 1/1/1970) that the account may no longer be used

Note the major fields in /etc/shadow are delimited with a ":". The encrypted password field is further delimited with a "$"

Class Activity



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

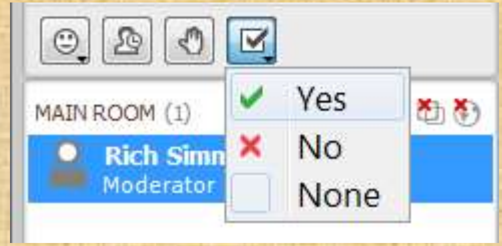
Note the field separator used in /etc/passwd is a ":"

1) Find your record in /etc/passwd

- Paste your UID (User ID) number in the chat window
- Paste your home directory in the chat window
- Paste your shell in the chat window

2) cat /etc/shadow

Give me a green check ✓ if you can view this file otherwise give me a red x



For Supplemental Study

http://www.slashroot.in/how-are-passwords-stored-linux-understanding-hashing-shadow-utils

[/ROOT.IN~] #:

HOME PAGE ABOUT US CONTACT US ARCHIVE ARCHIVES SECURITY NOTES TECHNICAL NEWS NETWORKING

How are passwords stored in Linux (Understanding hashing with shadow utils)

A user account with a corresponding password for that account, is the primary mechanism that can be used for getting access to a Linux machine. Its very much logical to think that the passwords of all the user's in a system must first be saved in some kind of a file or a database, so that it can be verified during a user login attempt.

And you do not require the skill set and expertise of a computer security scientist to think rationally that if you get hold of that database or file, which stores all the passwords, you can easily get access to the machine.

Some people will argue at this point that the database, or the file that contains the passwords, are in an encoded format (hash value), and its not possible to know the real password, from the encoded password hash. However its possible to detect the real password from the encoded ones, by doing a dictionary attack against the encoded value. Let's get back to some basics before going ahead.

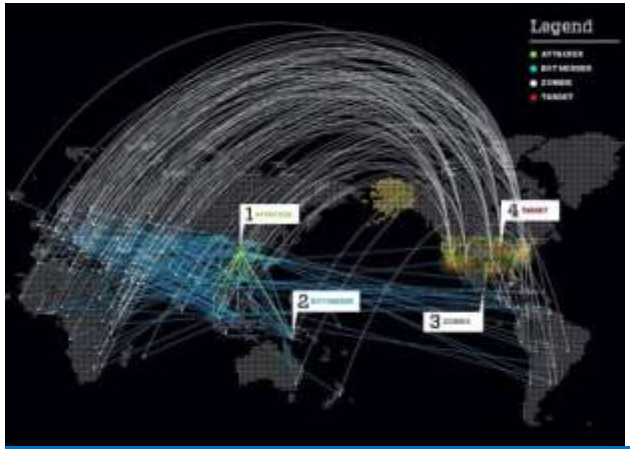
Hashing is a mathematical method to produce a fixed length encoded string for any given string. The

Excellent article on how passwords created and stored

Passwords

Your password

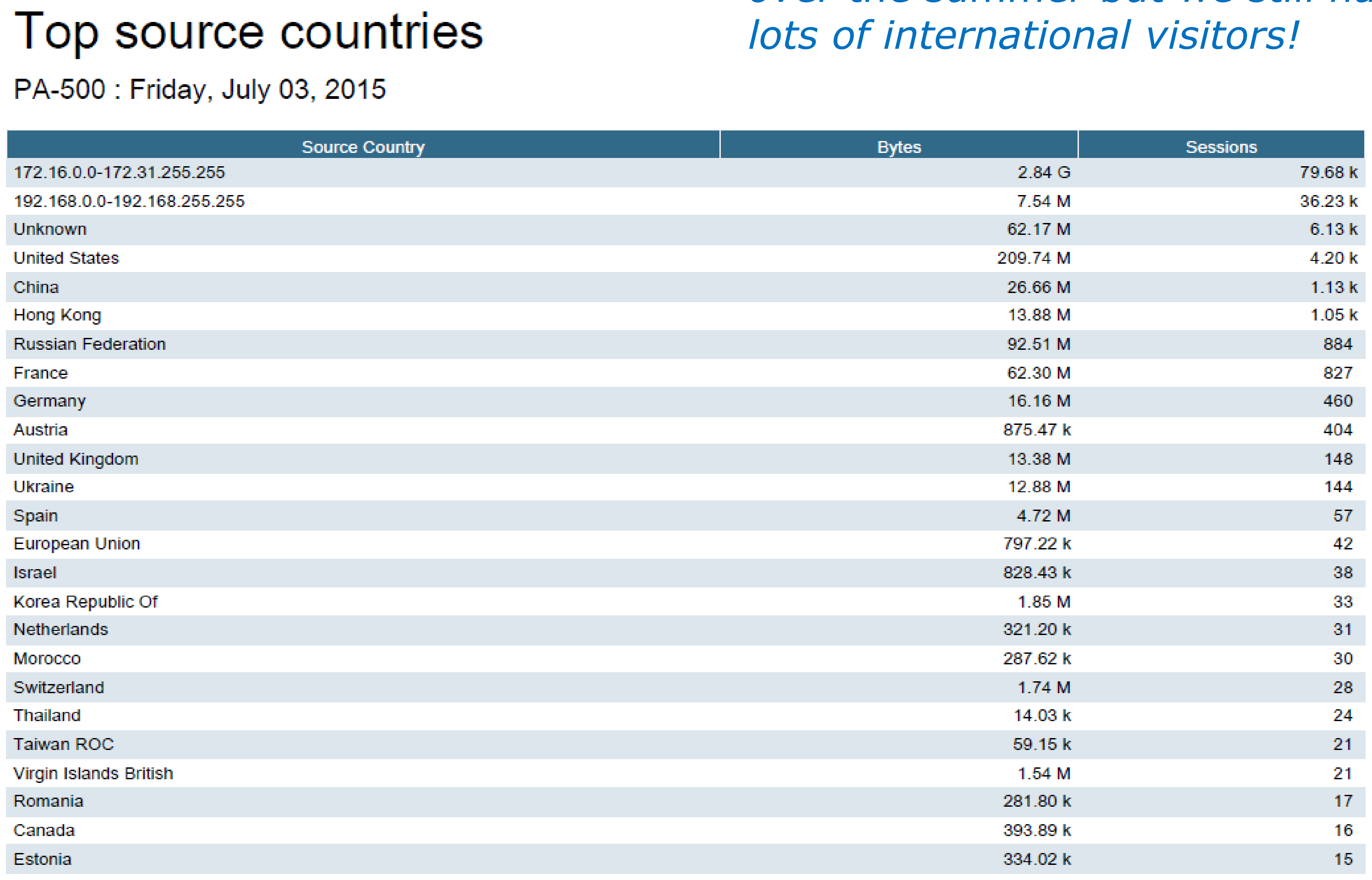
- Strong passwords are critical!
- **Botnets** and malicious **ne-er-do-wells** are constantly attempting to break into computers attached to the Internet! (Even my little Frodo VM at home)



http://mac-internet-security-software-review.toptenreviews.com/how-do-i-know-if-my-computer-is-a-botnet-zombie-.html

http://map.norsecorp.com/#/

July 3, 2015 – Datacenter is idle over the summer but we still have lots of international visitors!



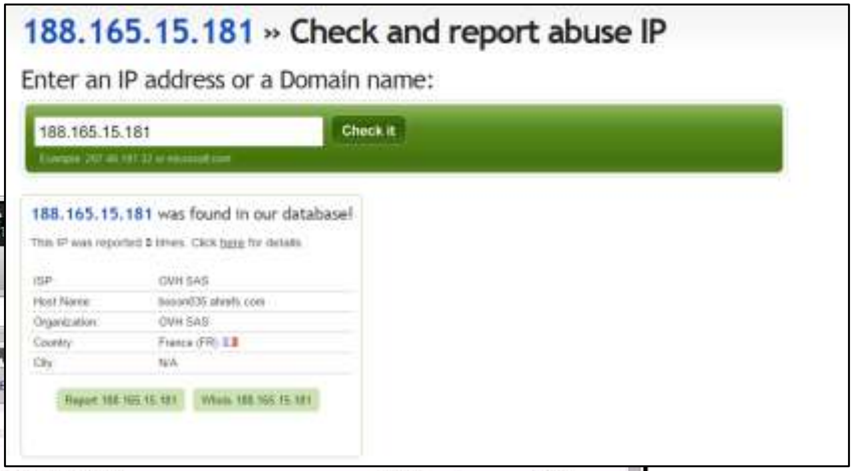
Top source countries

PA-500 : Friday, July 03, 2015

Source Country	Bytes	Sessions
172.16.0.0-172.31.255.255	2.84 G	79.68 k
192.168.0.0-192.168.255.255	7.54 M	36.23 k
Unknown	62.17 M	6.13 k
United States	209.74 M	4.20 k
China	26.66 M	1.13 k
Hong Kong	13.88 M	1.05 k
Russian Federation	92.51 M	884
France	62.30 M	827
Germany	16.16 M	460
Austria	875.47 k	404
United Kingdom	13.38 M	148
Ukraine	12.88 M	144
Spain	4.72 M	57
European Union	797.22 k	42
Israel	828.43 k	38
Korea Republic Of	1.85 M	33
Netherlands	321.20 k	31
Morocco	287.62 k	30
Switzerland	1.74 M	28
Thailand	14.03 k	24
Taiwan ROC	59.15 k	21
Virgin Islands British	1.54 M	21
Romania	281.80 k	17
Canada	393.89 k	16
Estonia	334.02 k	15

Tool: Palo Alto Networks PA-500 (one page of a daily report)

May 28, 2015 – Bad 3-way handshakes being sent to Opus from France



188.165.15.181 » Check and report abuse IP

Enter an IP address or a Domain name:

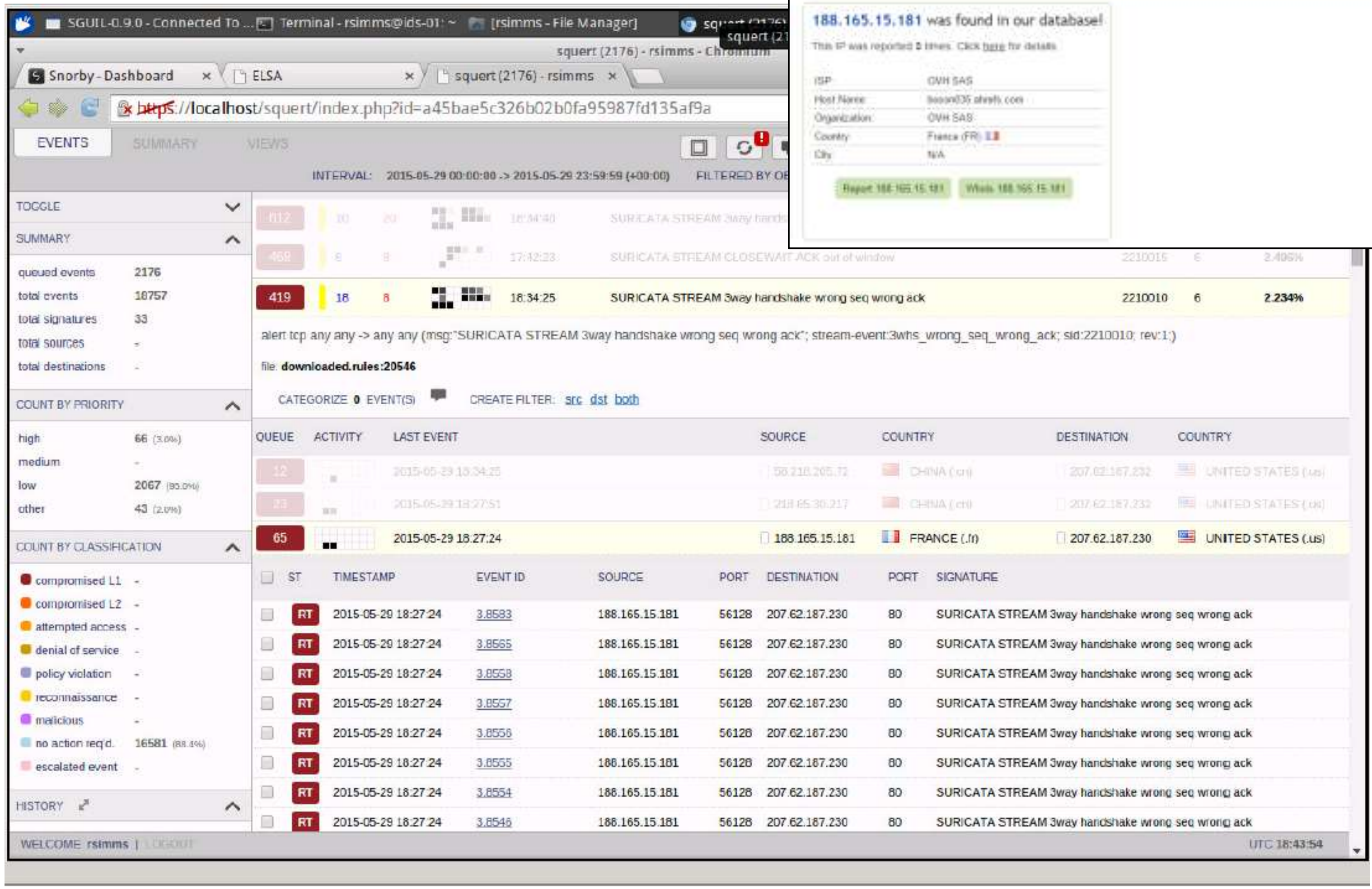
188.165.15.181 | Check it

188.165.15.181 was found in our database!

This IP was reported 8 times. Click here for details.

ISP	OVH SAS
Host Name	[illegible]
Organization	OVH SAS
Country	France (FR)
City	N/A

Report 188.165.15.181 | Whois 188.165.15.181



SGUIL-0.9.0 - Connected To ... | Terminal - rsimms@ids-01: ~ | [rsimms - File Manager] | squert (2176)

squert (2176) - rsimms - Chromium

Snorby - Dashboard | ELSA | squert (2176) - rsimms

~~https~~://localhost/squert/index.php?id=a45bae5c326b02b0fa95987fd135af9a

EVENTS | SUMMARY | VIEWS

INTERVAL: 2015-05-29 00:00:00 -> 2015-05-29 23:59:59 (+00:00) FILTERED BY OB

SUMMARY	
queued events	2176
total events	18757
total signatures	33
total sources	-
total destinations	-

COUNT BY PRIORITY	
high	66 (3.0%)
medium	-
low	2067 (95.0%)
other	43 (2.0%)

COUNT BY CLASSIFICATION	
compromised L1	-
compromised L2	-
attempted access	-
denial of service	-
policy violation	-
reconnaissance	-
malicious	-
no action req'd.	16581 (88.4%)
escalated event	-

HISTORY

```
1012  10  20  18:34:40  SURICATA STREAM 3way handshake ...
459    6   8  17:42:23  SURICATA STREAM CLOSEWAIT ACK out of window   2210015  6  2.496%
419   18   8  18:34:25  SURICATA STREAM 3way handshake wrong seq wrong ack   2210010  6  2.234%
```

```
alert tcp any any -> any any (msg:"SURICATA STREAM 3way handshake wrong seq wrong ack"; stream-event:3whs_wrong_seq_wrong_ack; sid:2210010; rev:1;)
```

file: **downloaded.rules:20546**

CATEGORIZE **0** EVENT(S) CREATE FILTER: src dst both

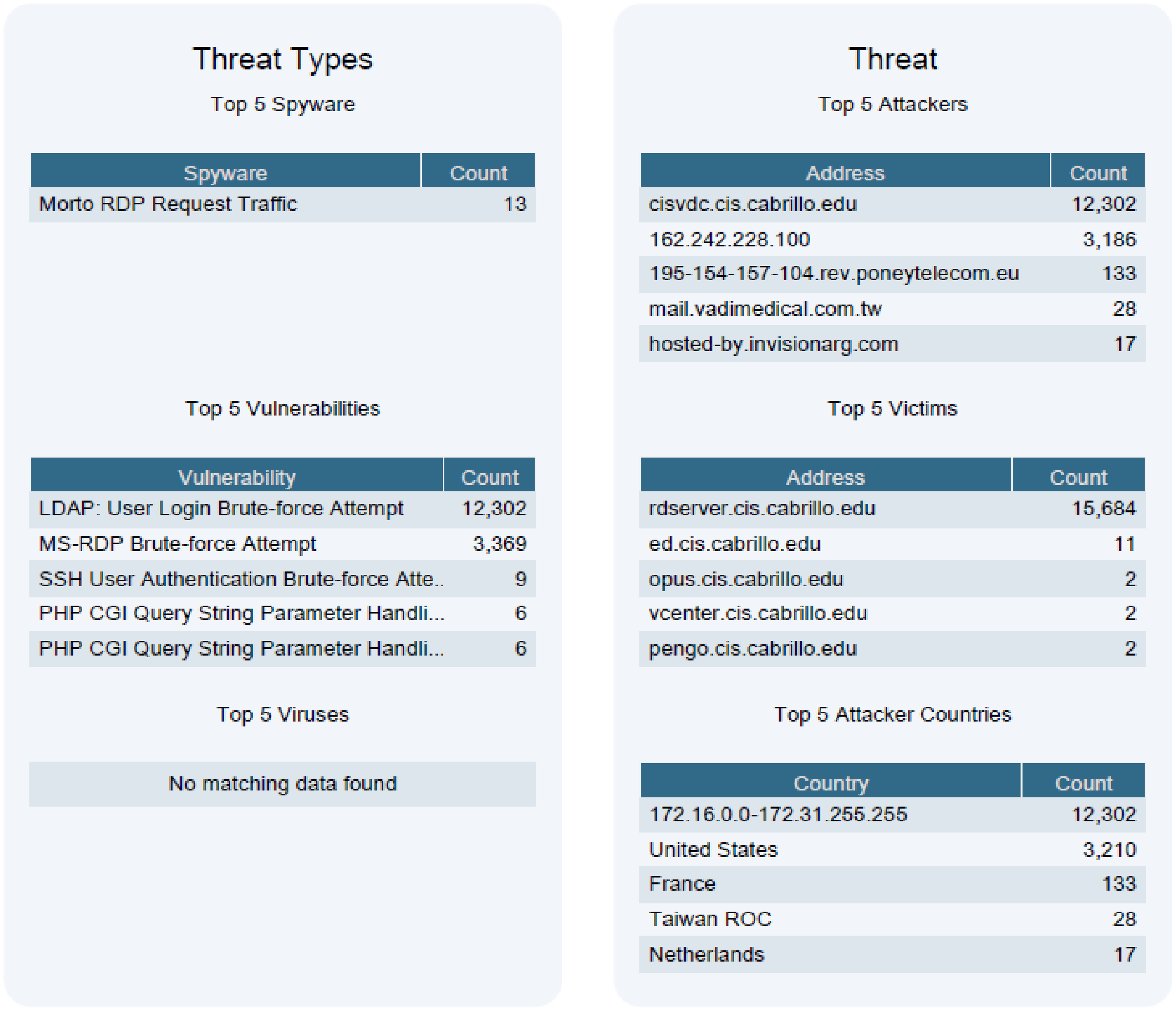
QUEUE	ACTIVITY	LAST EVENT	SOURCE	COUNTRY	DESTINATION	COUNTRY
12		2015-05-29 18:34:25	58.218.205.72	CHINA (.cn)	207.62.187.232	UNITED STATES (.us)
23		2015-05-29 18:27:51	218.65.30.217	CHINA (.cn)	207.62.187.232	UNITED STATES (.us)
65		2015-05-29 18:27:24	188.165.15.181	FRANCE (.fr)	207.62.187.230	UNITED STATES (.us)

ST	TIMESTAMP	EVENT ID	SOURCE	PORT	DESTINATION	PORT	SIGNATURE
RT	2015-05-29 18:27:24	3.8583	188.165.15.181	56128	207.62.187.230	80	SURICATA STREAM 3way handshake wrong seq wrong ack
RT	2015-05-29 18:27:24	3.8565	188.165.15.181	56128	207.62.187.230	80	SURICATA STREAM 3way handshake wrong seq wrong ack
RT	2015-05-29 18:27:24	3.8558	188.165.15.181	56128	207.62.187.230	80	SURICATA STREAM 3way handshake wrong seq wrong ack
RT	2015-05-29 18:27:24	3.8557	188.165.15.181	56128	207.62.187.230	80	SURICATA STREAM 3way handshake wrong seq wrong ack
RT	2015-05-29 18:27:24	3.8556	188.165.15.181	56128	207.62.187.230	80	SURICATA STREAM 3way handshake wrong seq wrong ack
RT	2015-05-29 18:27:24	3.8555	188.165.15.181	56128	207.62.187.230	80	SURICATA STREAM 3way handshake wrong seq wrong ack
RT	2015-05-29 18:27:24	3.8554	188.165.15.181	56128	207.62.187.230	80	SURICATA STREAM 3way handshake wrong seq wrong ack
RT	2015-05-29 18:27:24	3.8546	188.165.15.181	56128	207.62.187.230	80	SURICATA STREAM 3way handshake wrong seq wrong ack

WELCOME rsimms | LOGOUT UTC 18:43:54

Tool: Squert (part of the Security Onion IDS)

July 9, 2015 – Datacenter is idle over the summer break but we still have lots of strangers trying to log in!



Threat Types

Top 5 Spyware

Spyware	Count
Morto RDP Request Traffic	13

Top 5 Vulnerabilities

Vulnerability	Count
LDAP: User Login Brute-force Attempt	12,302
MS-RDP Brute-force Attempt	3,369
SSH User Authentication Brute-force Atte..	9
PHP CGI Query String Parameter Handli...	6
PHP CGI Query String Parameter Handli...	6

Top 5 Viruses

No matching data found

Threat

Top 5 Attackers

Address	Count
cisvdc.cis.cabrillo.edu	12,302
162.242.228.100	3,186
195-154-157-104.rev.poneytelecom.eu	133
mail.vadimedical.com.tw	28
hosted-by.invisionarg.com	17

Top 5 Victims

Address	Count
rdserver.cis.cabrillo.edu	15,684
ed.cis.cabrillo.edu	11
opus.cis.cabrillo.edu	2
vcenter.cis.cabrillo.edu	2
pengo.cis.cabrillo.edu	2

Top 5 Attacker Countries

Country	Count
172.16.0.0-172.31.255.255	12,302
United States	3,210
France	133
Taiwan ROC	28
Netherlands	17

Tool: Palo Alto Networks PA-500 (one page of a daily report)

They never stop trying

The ne'er-do-wells trying to break in …
this is why you need strong passwords

```
--------------------- SSHD Begin ------------------------

SSHD Killed: 1 Time(s)

SSHD Started: 1 Time(s)

Disconnecting after too many authentication failures for user:
   guest90 : 1 Time(s)


 Failed logins from:
    76.254.22.196 (adsl-76-254-22-196.dsl.pltn13.sbcglobal.net): 2 times
    201.7.115.194 (201-7-115-194.spopa302.ipd.brasiltelecom.net.br): 2135 times
    210.240.12.14: 20 times

 Illegal users from:
    201.7.115.194 (201-7-115-194.spopa302.ipd.brasiltelecom.net.br): 564 times
    210.240.12.14: 42 times


Users logging in through sshd:
   guest:
      76.254.22.196 (adsl-76-254-22-196.dsl.pltn13.sbcglobal.net): 2 times
   jimg:
      70.132.20.25 (adsl-70-132-20-25.dsl.snfc21.sbcglobal.net): 7 times
   ordazedw:
      76.254.22.196 (adsl-76-254-22-196.dsl.pltn13.sbcglobal.net): 1 time
   root:
      63.249.86.11 (dsl-63-249-86-11.cruzio.com): 3 times
      70.132.20.25 (adsl-70-132-20-25.dsl.snfc21.sbcglobal.net): 1 time
   rsimms:
      63.249.86.11 (dsl-63-249-86-11.cruzio.com): 2 times
```

Tool: logwatch report showing malicious attempts to break into Opus

/var/log/wtmp and var/log/btmp

```
[root@opus log]# lastb | sort | cut -f1 -d' ' | grep -v ^$ | uniq -c > bad
[root@opus log]# sort -g bad > bad.sort
[root@opus log]# cat  bad.sort | tail -50
    471 ftp
    472 public
    490 test
    490 tomcat
    498 user
    506 service
    508 mike
    508 username
    524 cyrus
    530 pgsql
    532 test1
    544 master
    554 linux
    554 toor
    576 paul
    584 support
    590 testuser
    604 irc
    610 test
    656 noc
    686 www
    690 postfix
    723 john
    734 testing
    738 adam
    746 alex
    754 info
    798 tester
    832 library
    935 guest
    990 admin
   1002 office
   1022 temp
   1070 ftpuser
   1138 webadmin
   1298 nagios
   1332 web
   1374 a
   1384 student
   1416 postgres
   1690 user
   1858 oracle
   1944 mysql
   2086 webmaste
   5324 test
  10803 root
  10824 admin
  18679 root
  24064 root
[root@opus log]#
```

Top 50 usernames used by the ne'er-do-wells when attacking Opus

How to make a strong password

Current goal: require at least 2^{64} guesses

- Use upper case, lower case, punctuation, digits
- The longer the better (10 or more characters) 94^{10} => 65.64 bits of entropy
- Random, not in any dictionary
- Something you can remember (Google "best password managers")
- Different password for different services
- Keep it secret -- change when compromised
- A MUST for your email accounts!

GOOD (but not truly random)

`Wh0le#!!!!`	(Whole sh'bang)
`KuKu4(co)2`	(Cuckoo for Cocoa Puffs)
`#0p.&.s@ve`	(shop and save)
`Idl02$d@y`	(I do laundry on Tuesday)
`Iwb@tB0aWw`	(I was born at the bottom of a wishing well)

BETTER (pass phrases of 6 random words) 2000^{6} => 65.79 bits of entropy

```
splendid roll arrest boiling silk shelter
heap pancake wooden complete inject ethereal
few balance note sedate alike tense
```

passwd command
Change user's password

Syntax:

passwd *[username]*

Example:

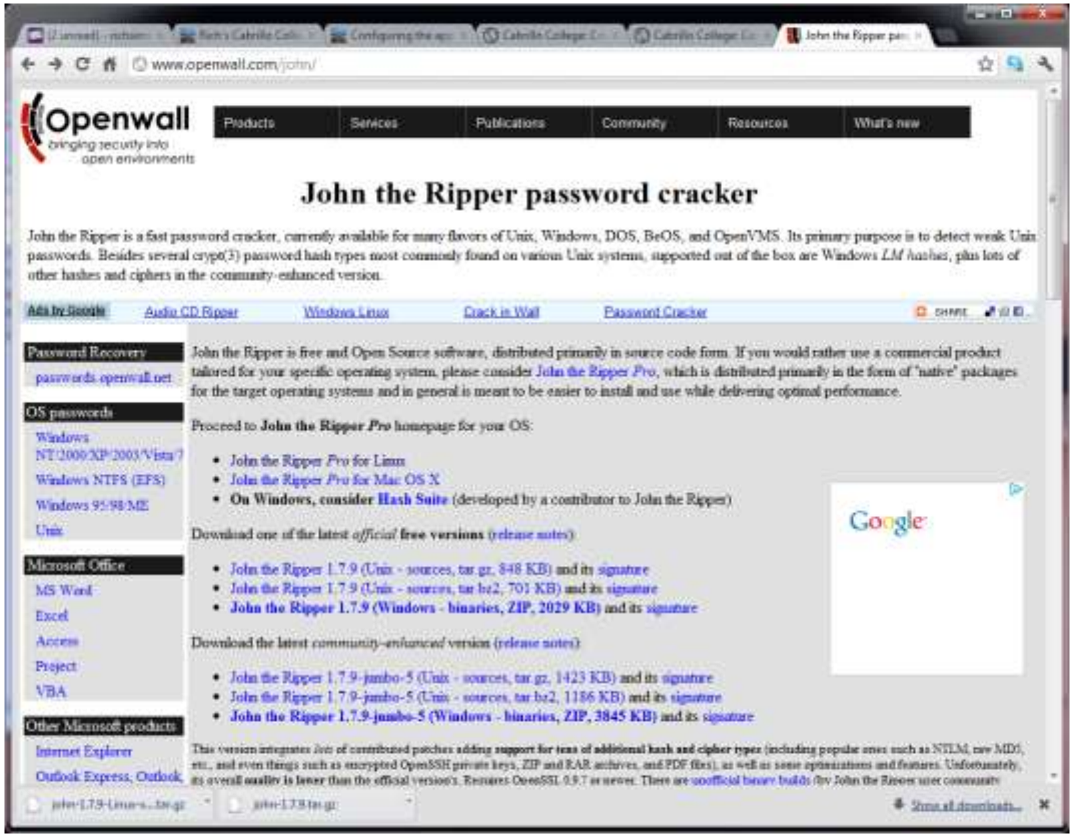
```
/home/cis90/simmsben $ passwd
Changing password for user simben90.
Changing password for simben90
(current) UNIX password:
New UNIX password:
Retype new UNIX password:
passwd: all authentication tokens updated successfully.
/home/cis90/simmsben $
```

Note, the passwords are not echoed as you type them.

This changes your password on Opus only (not other VMs, the forum or BlackBoard)

John the Ripper

An open source cracker that tries common passwords first followed by a brute force dictionary attack



John the Ripper password cracker

John the Ripper is a fast password cracker, currently available for many flavors of Unix, Windows, DOS, BeOS, and OpenVMS. Its primary purpose is to detect weak Unix passwords. Besides several crypt(3) password hash types most commonly found on various Unix systems, supported out of the box are Windows *LM hashes*, plus lots of other hashes and ciphers in the community-enhanced version.

John the Ripper is free and Open Source software, distributed primarily in source code form. If you would rather use a commercial product tailored for your specific operating system, please consider John the Ripper *Pro*, which is distributed primarily in the form of "native" packages for the target operating systems and in general is meant to be easier to install and use while delivering optimal performance.

Proceed to **John the Ripper *Pro*** homepage for your OS:

- John the Ripper *Pro* for Linux
- John the Ripper *Pro* for Mac OS X
- **On Windows, consider Hash Suite** (developed by a contributor to John the Ripper)

Download one of the latest *official* **free versions** (release notes):

- John the Ripper 1.7.9 (Unix - sources, tar.gz, 848 KB) and its signature
- John the Ripper 1.7.9 (Unix - sources, tar.bz2, 701 KB) and its signature
- **John the Ripper 1.7.9 (Windows - binaries, ZIP, 2029 KB)** and its signature

Download the latest *community-enhanced* version (release notes):

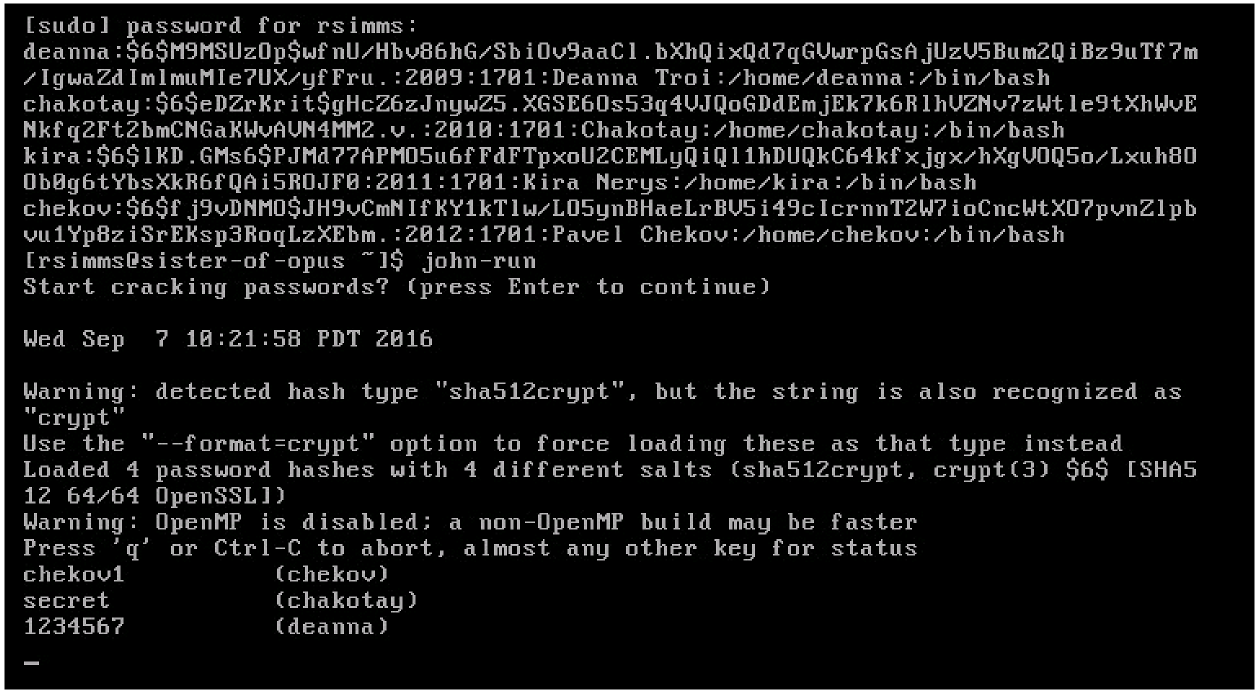
- John the Ripper 1.7.9-jumbo-5 (Unix - sources, tar.gz, 1423 KB) and its signature
- John the Ripper 1.7.9-jumbo-5 (Unix - sources, tar.bz2, 1186 KB) and its signature
- **John the Ripper 1.7.9-jumbo-5 (Windows - binaries, ZIP, 3845 KB)** and its signature

This version integrates *lots* of contributed patches adding **support for tens of additional hash and cipher types** (including popular ones such as NTLM, raw MD5, etc., and even things such as encrypted OpenSSH private keys, ZIP and RAR archives, and PDF files), as well as some optimizations and features. Unfortunately, its overall **quality is lower** than the official version's. Requires OpenSSL 0.9.7 or newer. There are unofficial binary builds (by John the Ripper user community

Instructor: Use daughter and john-demo aliases to demo. Cat password.1st for common passwords.

Four users: deanna, chakotay, kira and chekov with <u>weak</u> passwords:

1234567
secret
terces
chekov1

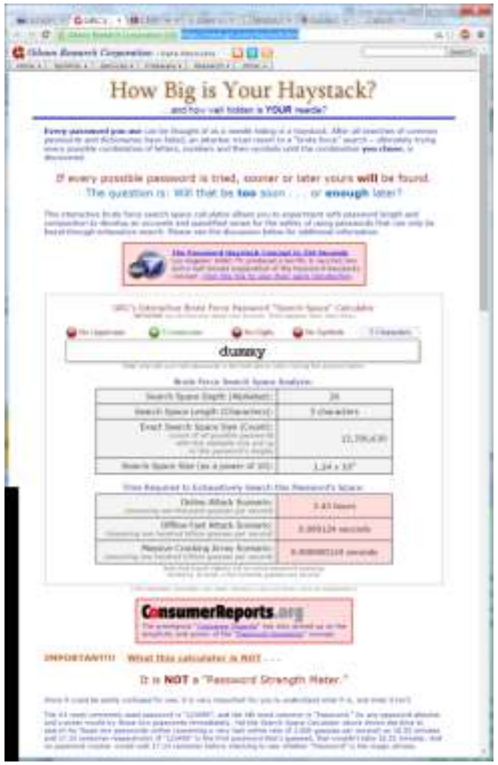


```
[sudo] password for rsimms:
deanna:$6$M9MSUzOp$wfnU/Hbv86hG/SbiOv9aaCl.bXhQixQd7qGVwrpGsAjUzV5Bum2QiBz9uTf7m
/IgwaZdImlmuMIe7UX/yfFru.:2009:1701:Deanna Troi:/home/deanna:/bin/bash
chakotay:$6$eDZrKrit$gHcZ6zJnywZ5.XGSE6Os53q4VJQoGDdEmjEk7k6RlhVZNv7zWtle9tXhWvE
Nkfq2Ft2bmCNGaKWvAVN4MM2.v.:2010:1701:Chakotay:/home/chakotay:/bin/bash
kira:$6$lKD.GMs6$PJMd77APMO5u6fFdFTpxoU2CEMLyQiQl1hDUQkC64kfxjgx/hXgVOQ5o/Lxuh8O
Ob0g6tYbsXkR6fQAi5ROJF0:2011:1701:Kira Nerys:/home/kira:/bin/bash
chekov:$6$fj9vDNMO$JH9vCmNIfKY1kTlw/LO5ynBHaeLrBV5i49cIcrnnT2W7ioCncWtXO7pvnZlpb
vu1Yp8ziSrEKsp3RoqLzXEbm.:2012:1701:Pavel Chekov:/home/chekov:/bin/bash
[rsimms@sister-of-opus ~]$ john-run
Start cracking passwords? (press Enter to continue)

Wed Sep  7 10:21:58 PDT 2016

Warning: detected hash type "sha512crypt", but the string is also recognized as
"crypt"
Use the "--format=crypt" option to force loading these as that type instead
Loaded 4 password hashes with 4 different salts (sha512crypt, crypt(3) $6$ [SHA5
12 64/64 OpenSSL])
Warning: OpenMP is disabled; a non-OpenMP build may be faster
Press 'q' or Ctrl-C to abort, almost any other key for status
chekov1          (chekov)
secret           (chakotay)
1234567          (deanna)
_
```

sister-of-opus

For Supplemental Study

https://www.grc.com/haystack.htm



How Big is Your Haystack?

... and how well hidden is YOUR needle?

If every possible password is tried, sooner or later yours **will** be found.
The question is: Will that be **too** soon . . . or **enough** later?

dummy

Search Space Depth (Alphabet):	26
Search Space Length (Characters):	5 characters
Exact Search Space Size (Count):	12,356,630
Search Space Size (as a power of 10):	1.24×10^7

Time Required to Exhaustively Search this Password's Space:

Online Attack Scenario:	3.43 hours
Offline Fast Attack Scenario:	0.000124 seconds
Massive Cracking Array Scenario:	0.000000124 seconds

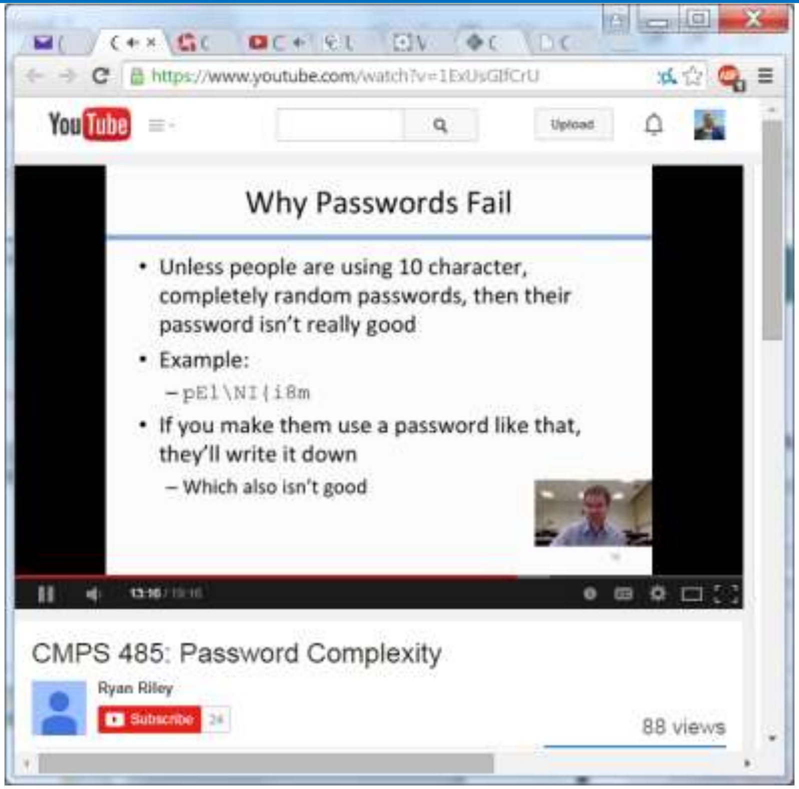
ConsumerReports.org

IMPORTANT!!! What this calculator is NOT . . .

It is **NOT** a "Password Strength Meter."

Password strength calculator for <u>random</u> passwords

https://www.youtube.com/watch?v=1ExUsGIfCrU



https://www.youtube.com/watch?v=1ExUsGIfCrU

Why Passwords Fail

- Unless people are using 10 character, completely random passwords, then their password isn't really good
- Example:
  - pE1\NI{i8m
- If you make them use a password like that, they'll write it down
  - Which also isn't good

CMPS 485: Password Complexity

Ryan Riley

88 views

Excellent presentation on making strong passwords

Housekeeping

Housekeeping

1. Send me your student survey today

2. Lab 1 due by 11:59PM (Opus time) tonight

   Use **`submit`** to turn in your work

   Grading Rubric (30 points)
   5 points for each correct scavenger hunt item
   3 points - optional extra credit questions (1 point each).

   Use **`verify`** to see what your turned in

3. Last day to drop/add is this Saturday

Roll Call

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

Turn off recording

Do roll call using both rosters

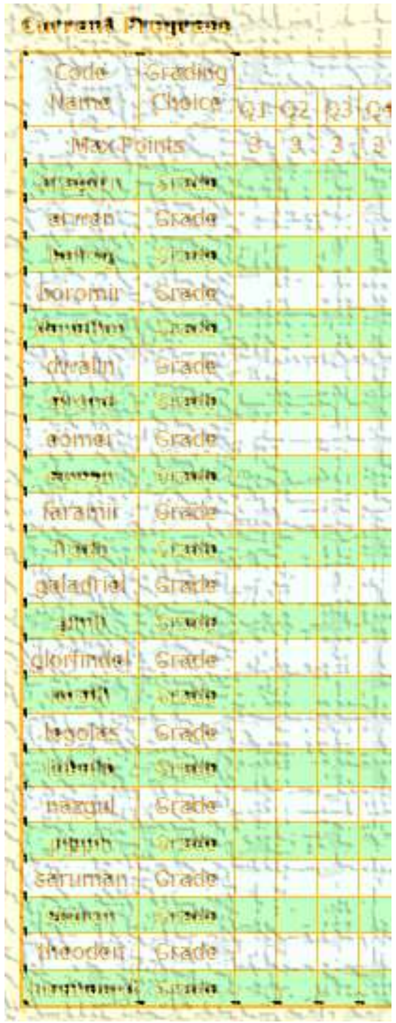
Turn on recording

Lab Assignments

Pearls of Wisdom:

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

Grading Code Names
Lord of the Rings Characters


Current Progress

Code Name	Grading Choice	Q1	Q2	Q3	Q4
Max Points		3	3	3	3
[illegible]	Grade				
aragon	Grade				
[illegible]	Grade				
boromir	Grade				
[illegible]	Grade				
dwalin	Grade				
[illegible]	Grade				
eomer	Grade				
[illegible]	Grade				
faramir	Grade				
frodo	Grade				
galadriel	Grade				
gimli	Grade				
glorfindel	Grade				
[illegible]	Grade				
legolas	Grade				
[illegible]	Grade				
nazgul	Grade				
pippin	Grade				
saruman	Grade				
[illegible]	Grade				
theoden	Grade				
[illegible]	Grade				

I'll start sending out LOR code names this week for ***everyone who sends or has sent me their survey***.

Introduction to UNIX/Linux (CIS 90)
Student Survey

Student Information

- Preferred first name: ____________ Last name: ____________
- Date: ________ Email address: ____________
- Grading choice: ○ pass/no-pass ○ grade
  [illegible]

Computer Background

- Previous computer classes or training taken:
- Work or other experience using computers:

Study Groups

Students often like to work together on assignments and prepare for tests. However you may not know anyone else in the class to work with.

- Would you like to participate in a CIS 90 study group? ○ yes ○ no
- If so:
  - Would you like to participate: ○ face-to-face ○ online ○ either way
  - Would you like the instructor to help place you in a study group with other interested classmates? ○ yes ○ no

Course Objectives

- What are you hoping to learn in this class?
- Other comments or special learning needs?

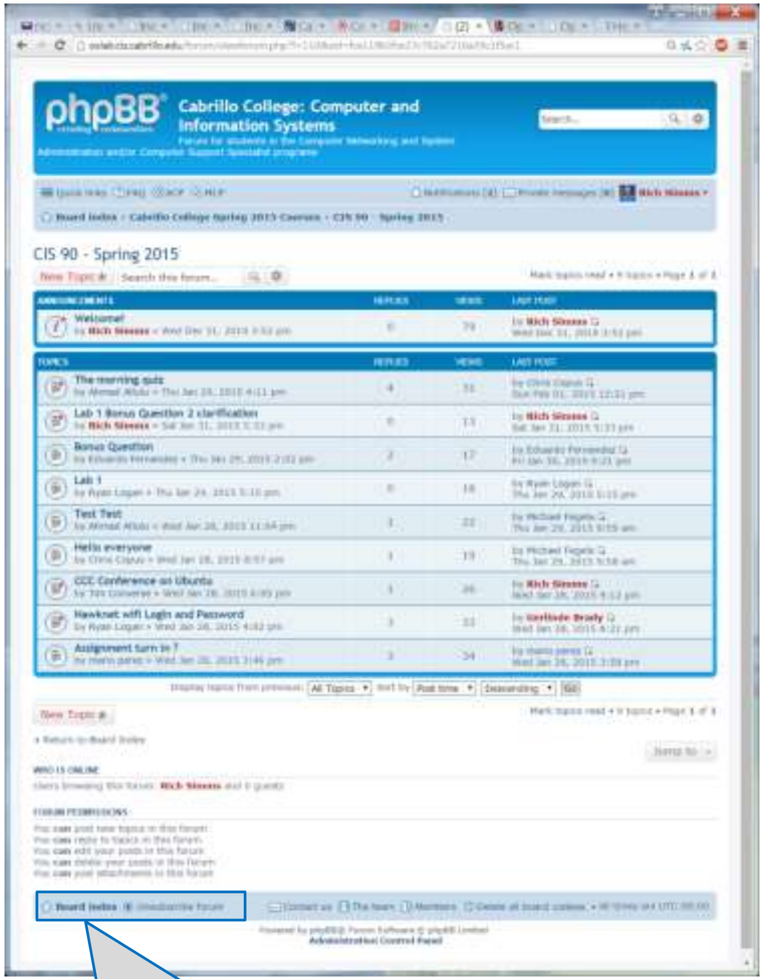
[illegible]

To get notifications of new forum posts

1) Login to the forum

2) Go to the CIS 90 forum

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



phpBB Cabrillo College: Computer and Information Systems

Forum for students in the Computer Networking and System Administration and/or Computer Support Specialist programs

Board index ‹ Cabrillo College Spring 2015 Courses ‹ CIS 90 - Spring 2015

CIS 90 - Spring 2015

ANNOUNCEMENTS	REPLIES	VIEWS	LAST POST
Welcome! by Rich Simms » Wed Dec 31, 2014 3:52 pm	0	79	by Rich Simms Wed Dec 31, 2014 3:52 pm

TOPICS	REPLIES	VIEWS	LAST POST
The morning quiz by [illegible] » Thu Jan 29, 2015 4:11 pm	4	51	by [illegible] Sun Feb 01, 2015 12:21 pm
Lab 1 Bonus Question 2 clarification by Rich Simms » Sat Jan 31, 2015 5:33 pm	0	13	by Rich Simms Sat Jan 31, 2015 5:33 pm
Bonus Question by Eduardo Fernandez » Thu Jan 29, 2015 2:02 pm	2	17	by Eduardo Fernandez Fri Jan 30, 2015 9:21 pm
Lab 1 by Ryan Logan » Thu Jan 29, 2015 5:10 pm	0	18	by Ryan Logan Thu Jan 29, 2015 5:10 pm
Test Test by [illegible] » Wed Jan 28, 2015 11:54 pm	1	22	by [illegible] Thu Jan 29, 2015 9:55 am
Hello everyone by [illegible] » Wed Jan 28, 2015 8:57 am	1	19	by [illegible] Thu Jan 29, 2015 9:58 am
CCC Conference on Ubuntu by [illegible] » Wed Jan 28, 2015 4:05 pm	1	26	by Rich Simms Wed Jan 28, 2015 4:12 pm
Hawknet wifi Login and Password by Ryan Logan » Wed Jan 28, 2015 4:02 pm	1	22	by [illegible] Wed Jan 28, 2015 4:27 pm
Assignment turn in ? by mario perez » Wed Jan 28, 2015 3:46 pm	1	34	by mario perez Wed Jan 28, 2015 3:59 pm

Display topics from previous: All Topics Sort by Post time Descending Go

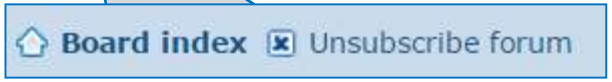
New Topic

Return to Board Index

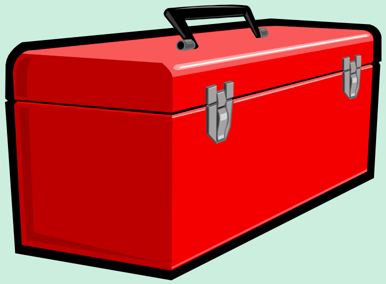
WHO IS ONLINE

FORUM PERMISSIONS

Board index Unsubscribe forum

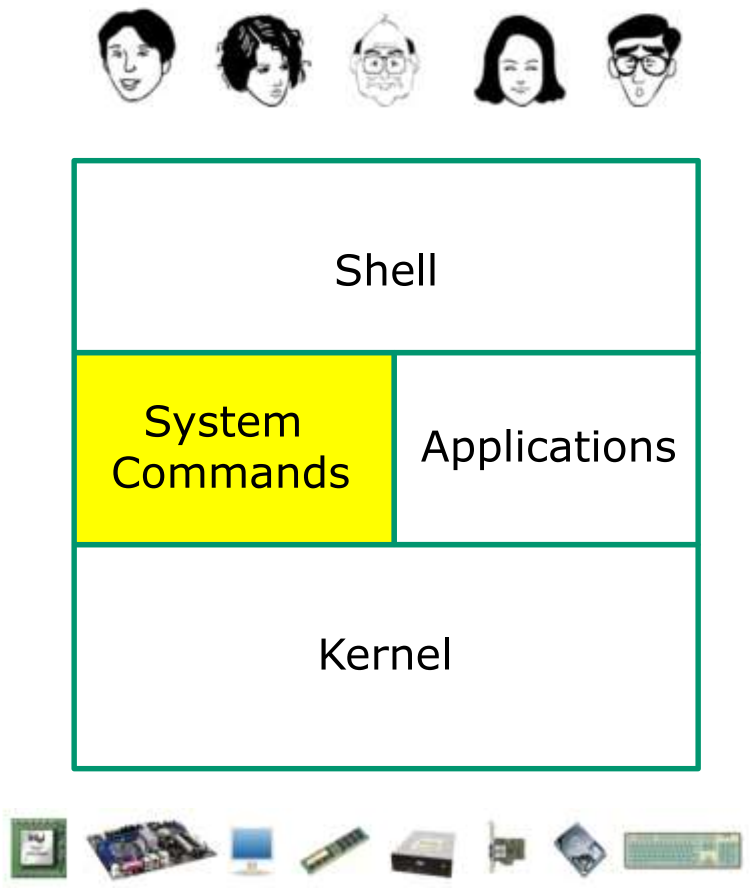


This is what it should look like



Lesson 2 Commands

UNIX/Linux Architecture
System Commands



- 100's of system commands and utilities.
- Commands like **ls** (list directories), **cat** (print a file), **rm** (remove a file), … etc.
- Utilities like **vi** (text editor), **sort** (sorts file contents), **find** (searches), … etc.
- Larger utilities like **sendmail** (email), **tar** (backup), **tcpdump** (sniffer), … etc.
- Administrative utilities like **useradd**, **groupadd**, **passwd** (change password), … etc.

Lesson 2 commands for your toolbox

echo	- Prints text and variables
banner	- Make a banner
ls	- List directory contents
cat	- View file (name comes from con<u>cat</u>enate)
file	- Show additional information about a file
type	- Shows where a command resides on the path
apropos	- Searches the whatis database for strings
whatis	- Searches the whatis database for commands
man	- Show the manual page for a command
info	- Alternate online documentation tool
bc	- Binary calculator
passwd	- Change password
set	- List all shell variables
env	- List all environment variables

Follow Me

echo	- Prints text and variables
banner	- Make a banner
ls	- List directory contents
cat	- View file (name comes from con<u>cat</u>enate)
file	- Show additional information about a file
type	- Shows where a command resides on the path
apropos	- Searches the whatis database for strings
whatis	- Searches the whatis database for commands
man	- Show the manual page for a command
info	- Alternate online documentation tool
bc	- Binary calculator

Lesson 2 Commands

Supplemental examples

echo command

Print text and variables

Syntax:

echo *[string]*

```
/home/cis90/simben $ echo hello rich
hello rich

/home/cis90/simben $ echo joy to the world
joy to the world
```

banner command

Output a banner

Syntax:

banner *[string]*

banner *[string] [string] … [string]*

```
/home/cis90/simben $ banner I Love Linux
 #####
   #
   #
   #
   #
   #
 #####

#       ####### #     # #######
#       #     # #     # #
#       #     # #     # #
#       #     # #     # #####
#       #     #  #   #  #
#       #     #   # #   #
####### #######    #    #######

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

Similar to echo command but outputs banner sized letters instead

ls command

List files or directory contents

Syntax:

ls *[pathname]*

ls *[pathname] [pathname] … [pathname]*

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

Listing the contents of the current directory

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

Listing the contents of the Poems directory

```
/home/cis90/simben $ ls mission /bin/ps /usr/local/bin/banner
/bin/ps  mission  /usr/local/bin/banner
```

Listing three files

Regular files show as black, directories show as blue and executable programs/scripts show as green

cat command

Con<u>cat</u>enate and view file contents

Syntax:

cat *[pathname]*

cat *[pathname] [pathname] … [pathname]*

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

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

< snipped >

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

                                                Alan Sherman
```

What happens if you spell cat backwards instead? 🙂

file command

Show additional file information

Syntax:

file *[pathname]*

file *[pathname] [pathname] … [pathname]*

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

/home/cis90/simben $ file Miscellaneous/
Miscellaneous/: directory

/home/cis90/simben $ file timecal mission /usr/bin/cal
timecal:      Bourne-Again shell script text executable
mission:      ASCII English text
/usr/bin/cal: ELF 32-bit LSB executable, Intel 80386, version 1
(SYSV), dynamically linked (uses shared libs), for GNU/Linux
2.6.18, stripped
```

type command

Search for a command on the path

Syntax:

type *[command]*

type *[command] [command] … [command]*

```
[rsimms@opus run]$ type cal
cal is /usr/bin/cal
```

name of the file (command/program)

name of the directory where file is found

cal *is located in the* ***/usr/bin*** *directory*

```
[rsimms@oslab ~]$ type bogus
-bash: type: bogus: not found
```

bogus *is not on the user's path*

```
[rsimms@opus run]$ type uname cal
uname is /bin/uname
cal is /usr/bin/cal
```

uname *is in the* ***/bin*** *directory*
cal *is in the* ***/usr/bin*** *directory*

```
[rsimms@oslab ~]$ type type
type is a shell builtin
```

type *is built into the shell program*

apropos command

search the whatis database for strings

Syntax:

apropos *string*

```
 /home/cis90/simben $ apropos echo
 echo                       (1)   - display a line of text
 echo                       (1p)   - write arguments to standard output
 echo [builtins]            (1)   - bash built-in commands, see bash(1)
 lessecho                   (1)   - expand metacharacters
 pam_echo                   (8)   - PAM module for printing text messages
 ping                       (8)   - send ICMP ECHO_REQUEST to network hosts
 ping6 [ping]               (8)   - send ICMP ECHO_REQUEST to network hosts
```

whatis command
search the whatis database for commands

Syntax:

whatis *command*

```
 /home/cis90/simben $ whatis echo
echo                     (1)   - display a line of text
echo                     (1p)   - write arguments to standard output
echo [builtins]          (1)   - bash built-in commands, see bash(1)
```

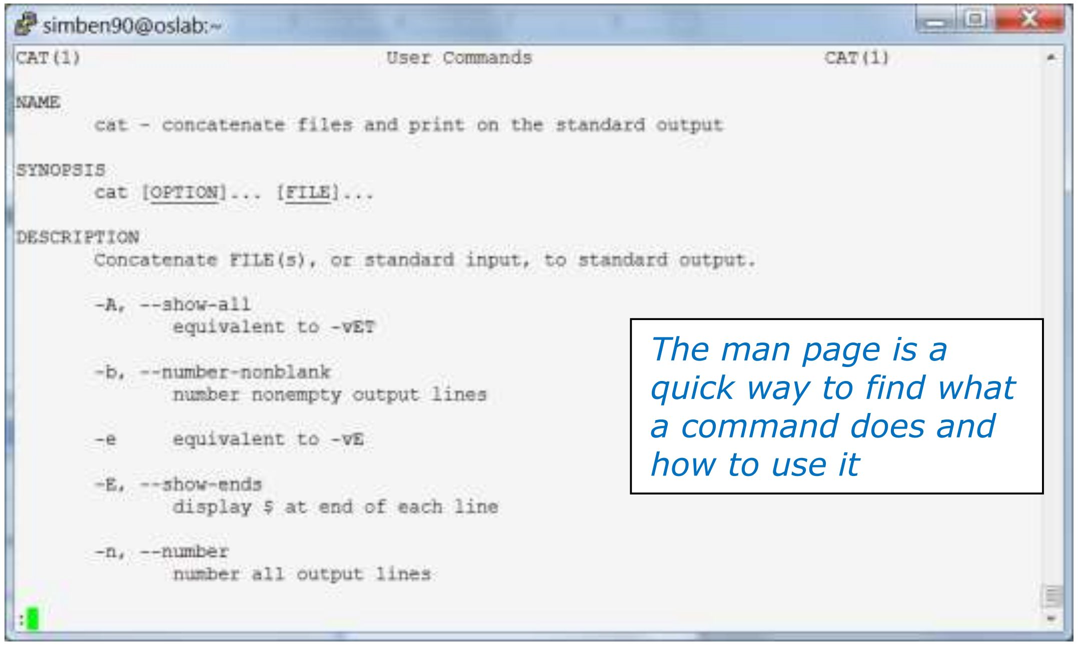
man command

Show the manual page (documentation) for a command

Syntax:

man *command*

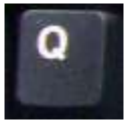
/home/cis90/simben $ **man cat**



```
simben90@oslab:~
CAT(1)                          User Commands                          CAT(1)

NAME
       cat - concatenate files and print on the standard output

SYNOPSIS
       cat [OPTION]... [FILE]...

DESCRIPTION
       Concatenate FILE(s), or standard input, to standard output.

       -A, --show-all
              equivalent to -vET

       -b, --number-nonblank
              number nonempty output lines

       -e     equivalent to -vE

       -E, --show-ends
              display $ at end of each line

       -n, --number
              number all output lines

:
```

The man page is a quick way to find what a command does and how to use it

Use these keys to scroll



Use q key to quit

info command

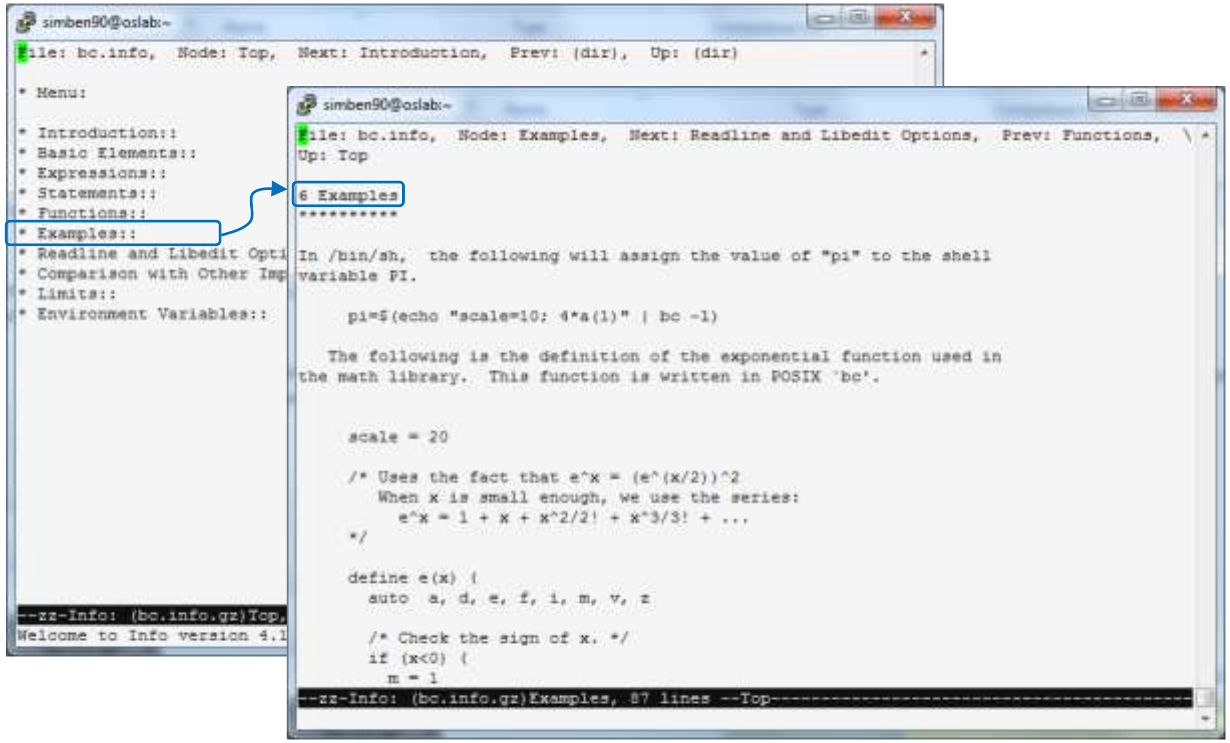
Alternate documentation tool for commands

Syntax:

info *command*

Similar to man but has has links to additional pages

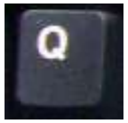
```
/home/cis90/simben $ info bc
```



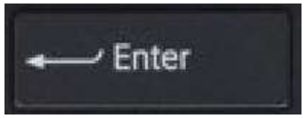
```
simben90@oslab:~
File: bc.info,  Node: Top,  Next: Introduction,  Prev: (dir),  Up: (dir)

* Menu:

* Introduction::
* Basic Elements::
* Expressions::
* Statements::
* Functions::
* Examples::
* Readline and Libedit Opti
* Comparison with Other Imp
* Limits::
* Environment Variables::

--zz-Info: (bc.info.gz)Top,
Welcome to Info version 4.1
```

```
simben90@oslab:~
File: bc.info,  Node: Examples,  Next: Readline and Libedit Options,  Prev: Functions, \
Up: Top

6 Examples
**********

In /bin/sh,  the following will assign the value of "pi" to the shell
variable PI.

     pi=$(echo "scale=10; 4*a(1)" | bc -l)

   The following is the definition of the exponential function used in
the math library.  This function is written in POSIX `bc'.


     scale = 20

     /* Uses the fact that e^x = (e^(x/2))^2
        When x is small enough, we use the series:
          e^x = 1 + x + x^2/2! + x^3/3! + ...
     */

     define e(x) {
       auto  a, d, e, f, i, m, v, z

       /* Check the sign of x. */
       if (x<0) {
         m = 1
--zz-Info: (bc.info.gz)Examples, 87 lines --Top-----------------------------------------
```

Use these keys to scroll



Use q key to quit



Use Enter to follow a link (*)

Use L to go back to last page

*Move cursor over an * and press Enter to follow link*

bc command
A binary calculator

Syntax:
bc

```
/home/cis90/simben $ bc
bc 1.06.95
Copyright 1991-1994, 1997, 1998, 2000, 2004, 2006
Free Software Foundation, Inc.
This is free software with ABSOLUTELY NO WARRANTY.
For details type `warranty'.
2+2
4
3*30
90
(3*31)+251*1.5
469.5
quit
/home/cis90/simben $
```

Enter mathematical expressions for bc to solve

Use quit to end program

The Path

The Path

The shell uses your path to locate commands to execute

- A path is a ordered set of directories along which the shell will search to locate commands to execute
- The path is defined by the PATH variable
- Show your path with **echo $PATH**
- If you specify a command *xxxx* that the shell cannot find on the path it will print the following error message:

  -bash: *xxxx*: command not found

- To run a command that is not on your path the complete absolute or relative pathname must be specified. e.g. **/usr/bin/uname** instead of just **uname.**

Shell Path

The path is used by the shell to locate commands to run

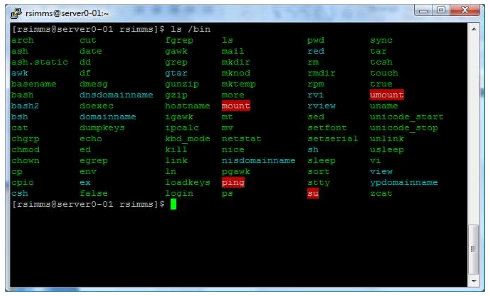
```
/home/cis90/simben $ echo $PATH
/usr/lib/qt-3.3/bin:/usr/local/bin:/bin:/usr/bin:/usr/local/sbin:/usr/sbin:/sbin:/home/cis90/simben/../bin:/home/cis90/simben/bin:.
```

The colon character is used to separate directories on the path

Locations of common commands

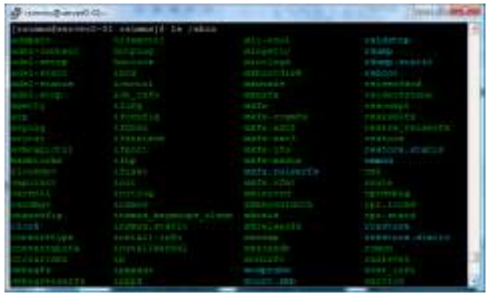
Directories of common commands

/bin

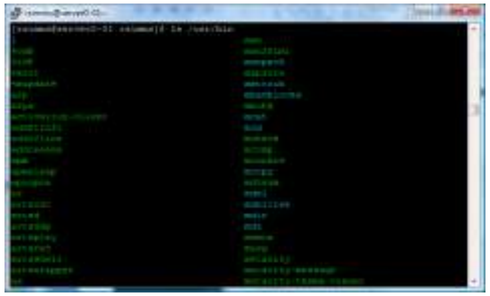


```
[rsimms@server0-01 rsimms]$ ls /bin
arch        cut            fgrep      ls             pwd        sync
ash         date           gawk       mail           red        tar
ash.static  dd             grep       mkdir          rm         tcsh
awk         df             gtar       mknod          rmdir      touch
basename    dmesg          gunzip     mktemp         rpm        true
bash        dnsdomainname  gzip       more           rvi        umount
bash2       doexec         hostname   mount          rview      uname
bsh         domainname     igawk      mt             sed        unicode_start
cat         dumpkeys       ipcalc     mv             setfont    unicode_stop
chgrp       echo           kbd_mode   netstat        setserial  unlink
chmod       ed             kill       nice           sh         usleep
chown       egrep          link       nisdomainname  sleep      vi
cp          env            ln         pgawk          sort       view
cpio        ex             loadkeys   ping           stty       ypdomainname
csh         false          login      ps             su         zcat
[rsimms@server0-01 rsimms]$
```

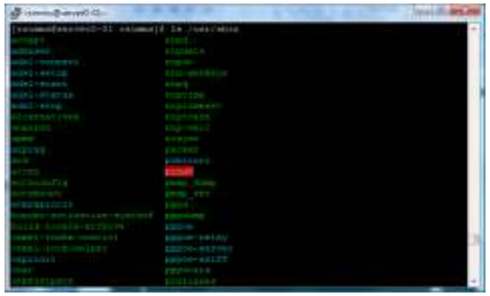
/sbin



/usr/bin



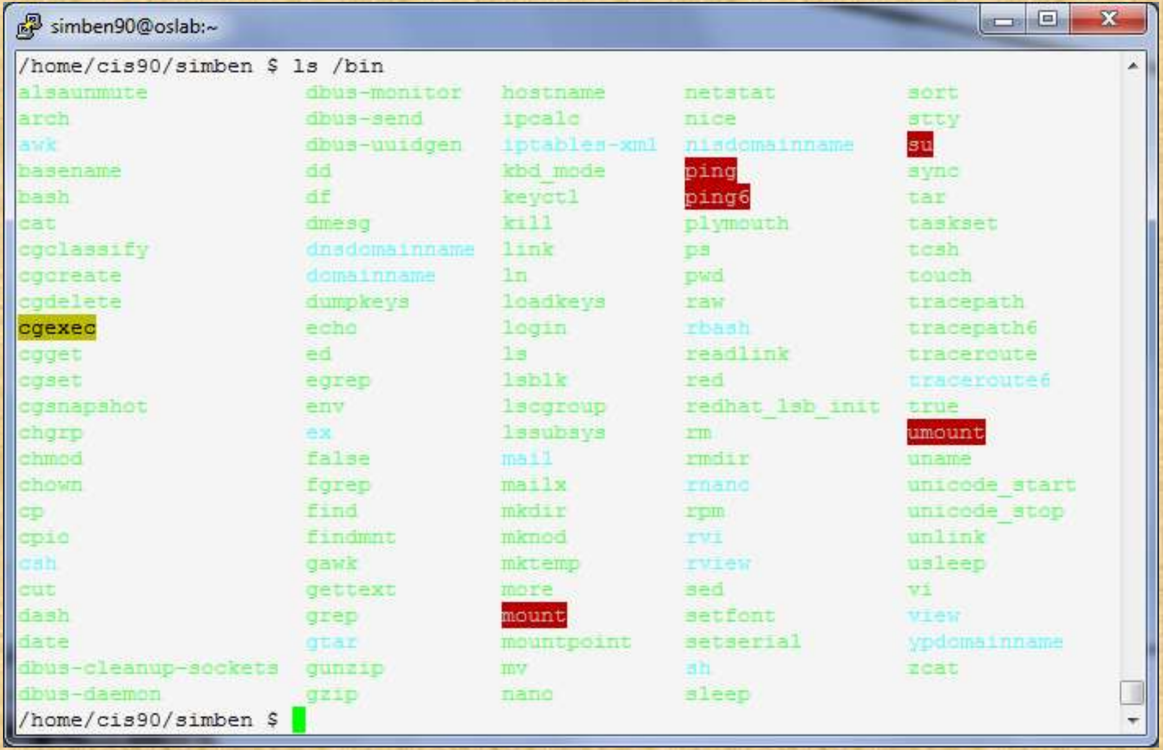
/usr/sbin



Most commands reside in these four directories. They can be found in other places as well. For example system administrators often put custom commands in /usr/local/bin.

The /bin directory

ls /bin



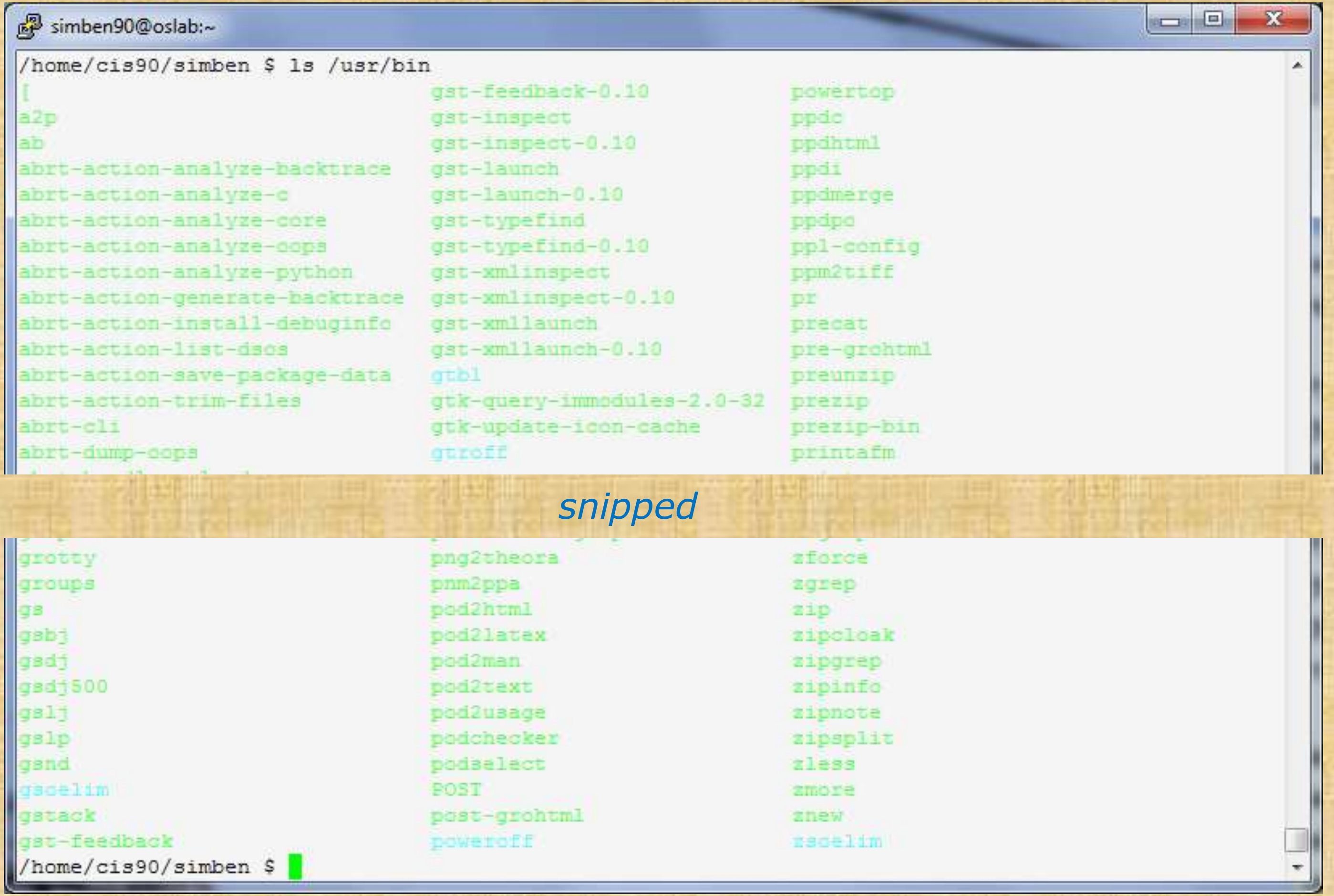
```
/home/cis90/simben $ ls /bin
alsaunmute            dbus-monitor   hostname      netstat          sort
arch                  dbus-send      ipcalc        nice             stty
awk                   dbus-uuidgen   iptables-xml  nisdomainname    su
basename              dd             kbd_mode      ping             sync
bash                  df             keyctl        ping6            tar
cat                   dmesg          kill          plymouth         taskset
cgclassify            dnsdomainname  link          ps               tcsh
cgcreate              domainname     ln            pwd              touch
cgdelete              dumpkeys       loadkeys      raw              tracepath
cgexec                echo           login         rbash            tracepath6
cgget                 ed             ls            readlink         traceroute
cgset                 egrep          lsblk         red              traceroute6
cgsnapshot            env            lscgroup      redhat_lsb_init  true
chgrp                 ex             lssubsys      rm               umount
chmod                 false          mail          rmdir            uname
chown                 fgrep          mailx         rnano            unicode_start
cp                    find           mkdir         rpm              unicode_stop
cpio                  findmnt        mknod         rvi              unlink
csh                   gawk           mktemp        rview            usleep
cut                   gettext        more          sed              vi
dash                  grep           mount         setfont          view
date                  gtar           mountpoint    setserial        ypdomainname
dbus-cleanup-sockets  gunzip         mv            sh               zcat
dbus-daemon           gzip           nano          sleep
/home/cis90/simben $
```

/bin has essential commands used by everyone.

Do you see any of the commands we learned in Lesson 1 in the /bin directory? Type the names of those commands in the chat window.

The /usr/bin directory

ls /usr/bin



```
simben90@oslab:~
/home/cis90/simben $ ls /usr/bin
[                                  gst-feedback-0.10            powertop
a2p                                gst-inspect                  ppdc
ab                                 gst-inspect-0.10             ppdhtml
abrt-action-analyze-backtrace      gst-launch                   ppdi
abrt-action-analyze-c              gst-launch-0.10              ppdmerge
abrt-action-analyze-core           gst-typefind                 ppdpo
abrt-action-analyze-oops           gst-typefind-0.10            ppl-config
abrt-action-analyze-python         gst-xmlinspect               ppm2tiff
abrt-action-generate-backtrace     gst-xmlinspect-0.10          pr
abrt-action-install-debuginfo      gst-xmllaunch                precat
abrt-action-list-dsos              gst-xmllaunch-0.10           pre-grohtml
abrt-action-save-package-data      gtbl                         preunzip
abrt-action-trim-files             gtk-query-immodules-2.0-32   prezip
abrt-cli                           gtk-update-icon-cache        prezip-bin
abrt-dump-oops                     gtroff                       printafm
```

snipped

```
grotty                             png2theora                   zforce
groups                             pnm2ppa                      zgrep
gs                                 pod2html                     zip
gsbj                               pod2latex                    zipcloak
gsdj                               pod2man                      zipgrep
gsdj500                            pod2text                     zipinfo
gslj                               pod2usage                    zipnote
gslp                               podchecker                   zipsplit
gsnd                               podselect                    zless
gsoelim                            POST                         zmore
gstack                             post-grohtml                 znew
gst-feedback                       poweroff                     zsoelim
/home/cis90/simben $
```

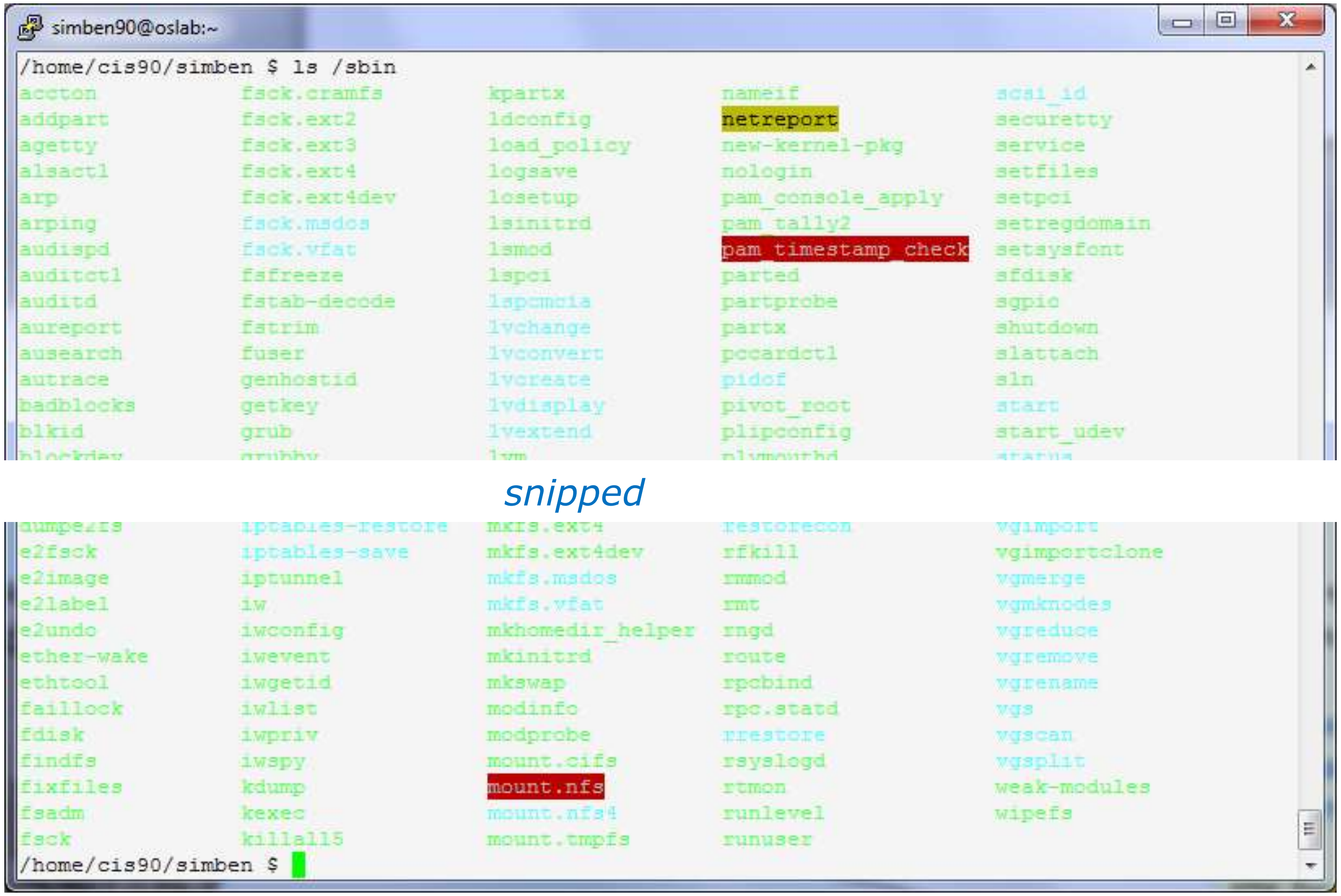
There are a "ton" of additional commands (programs) in this directory.

You will need to scroll through a lot of pages to see them all!

Do you see any of the commands we learned in Lesson 1 in the /usr/bin directory? Type the names of those commands in the chat window.

The /sbin directory

ls /sbin



simben90@oslab:~

```
/home/cis90/simben $ ls /sbin
accton          fsck.cramfs       kpartx           nameif                scsi_id
addpart         fsck.ext2         ldconfig         netreport             securetty
agetty          fsck.ext3         load_policy      new-kernel-pkg        service
alsactl         fsck.ext4         logsave          nologin               setfiles
arp             fsck.ext4dev      losetup          pam_console_apply     setpci
arping          fsck.msdos        lsinitrd         pam_tally2            setregdomain
audispd         fsck.vfat         lsmod            pam_timestamp_check   setsysfont
auditctl        fsfreeze          lspci            parted                sfdisk
auditd          fstab-decode      lspcmcia         partprobe             sgpio
aureport        fstrim            lvchange         partx                 shutdown
ausearch        fuser             lvconvert        pcscardctl            slattach
autrace         genhostid         lvcreate         pidof                 sln
badblocks       getkey            lvdisplay        pivot_root            start
blkid           grub              lvextend         plipconfig            start_udev
blockdev        grubby            lvm              plymouthd             status
```

snipped

```
dumpe2fs        iptables-restore  mkfs.ext4        restorecon            vgimport
e2fsck          iptables-save     mkfs.ext4dev     rfkill                vgimportclone
e2image         iptunnel          mkfs.msdos       rmmod                 vgmerge
e2label         iw                mkfs.vfat        rmt                   vgmknodes
e2undo          iwconfig          mkhomedir_helper rngd                  vgreduce
ether-wake      iwevent           mkinitrd         route                 vgremove
ethtool         iwgetid           mkswap           rpcbind               vgrename
faillock        iwlist            modinfo          rpc.statd             vgs
fdisk           iwpriv            modprobe         rrestore              vgscan
findfs          iwspy             mount.cifs       rsyslogd              vgsplit
fixfiles        kdump             mount.nfs        rtmon                 weak-modules
fsadm           kexec             mount.nfs4       runlevel              wipefs
fsck            killall5          mount.tmpfs      runuser
/home/cis90/simben $
```

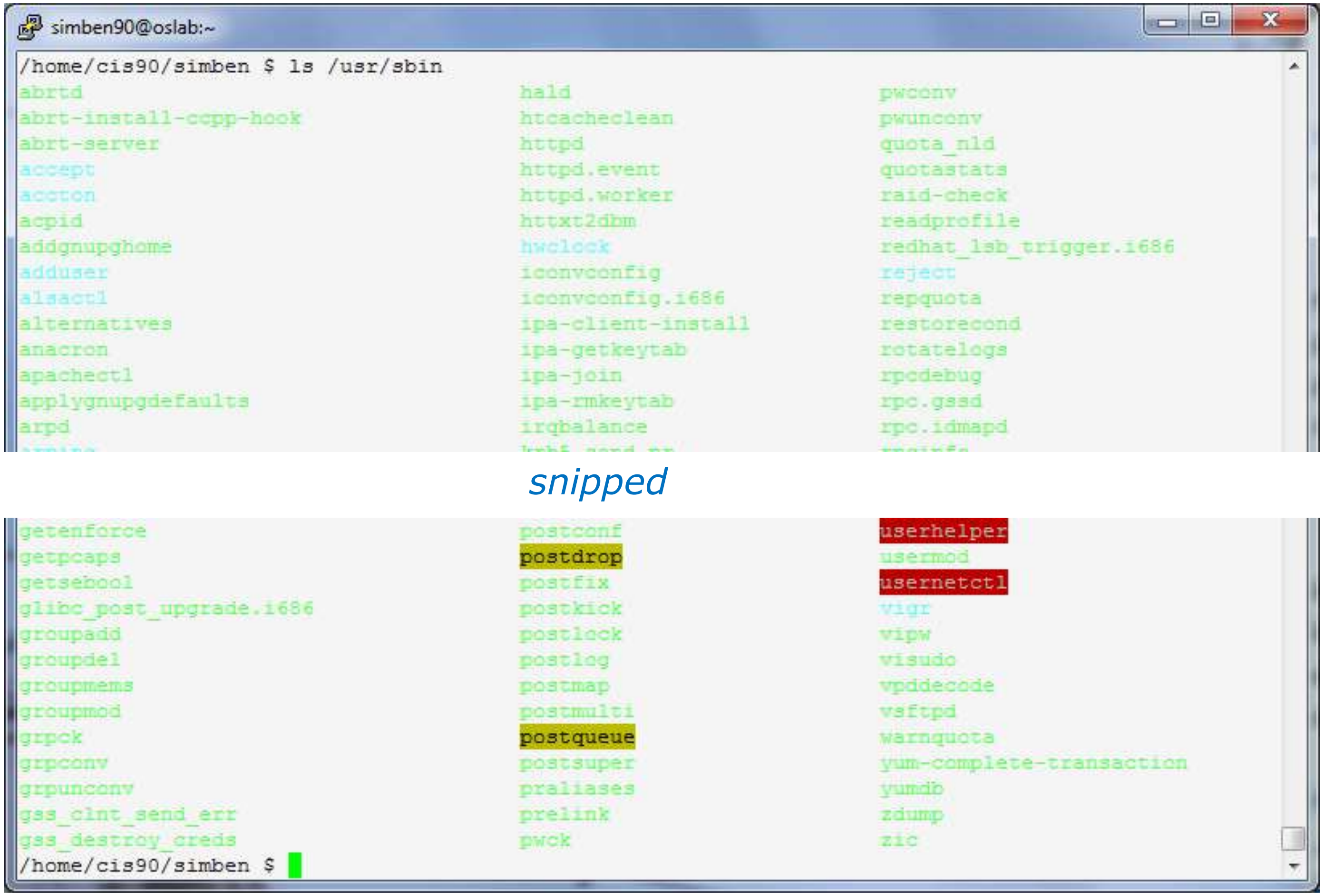
These are essential commands and utilities used by system administrators.

*This is where the **chkconfig**, **ifconfig** and **iptables** commands are found.*

You will learn how to use these commands in CIS 191 and CIS 192.

The /usr/sbin directory

`ls /usr/sbin`



```
simben90@oslab:~
/home/cis90/simben $ ls /usr/sbin
abrtd                                  hald                        pwconv
abrt-install-ccpp-hook                 htcacheclean                pwunconv
abrt-server                            httpd                       quota_nld
accept                                 httpd.event                 quotastats
accton                                 httpd.worker                raid-check
acpid                                  httxt2dbm                   readprofile
addgnupghome                           hwclock                     redhat_lsb_trigger.i686
adduser                                iconvconfig                 reject
alsactl                                iconvconfig.i686            repquota
alternatives                           ipa-client-install          restorecond
anacron                                ipa-getkeytab               rotatelogs
apachectl                              ipa-join                    rpcdebug
applygnupgdefaults                     ipa-rmkeytab                rpc.gssd
arpd                                   irqbalance                  rpc.idmapd
```

snipped

```
getenforce                             postconf                    userhelper
getpcaps                               postdrop                    usermod
getsebool                              postfix                     usernetctl
glibc_post_upgrade.i686                postkick                    vigr
groupadd                               postlock                    vipw
groupdel                               postlog                     visudo
groupmems                              postmap                     vpddecode
groupmod                               postmulti                   vsftpd
grpck                                  postqueue                   warnquota
grpconv                                postsuper                   yum-complete-transaction
grpunconv                              praliases                   yumdb
gss_clnt_send_err                      prelink                     zdump
gss_destroy_creds                      pwck                        zic
/home/cis90/simben $
```

These are additional commands and utilities are typically used by system administrators.

This is where commands like ***useradd, userdel, tcpdump*** *are located.*

You will learn how to use these commands in CIS 191 and CIS 192.

Use the type command to find a command on the path

Syntax:

type *[command]*

type *[command] [command] … [command]*

```
[rsimms@opus run]$ type cal
cal is /usr/bin/cal
```

$\text{cal is }\underbrace{\text{/usr/bin}}_{\text{name of the directory where file is found}}/\underbrace{\text{cal}}_{\text{name of the file (command/program)}}$

***cal** is located in the **/usr/bin** directory*

name of the file
(command/program)

name of the directory
where file is found

```
[rsimms@oslab ~]$ type bogus
-bash: type: bogus: not found
```

***bogus** is not on the user's path*

```
[rsimms@opus run]$ type uname cal
uname is /bin/uname
cal is /usr/bin/cal
```

***uname** is in the **/bin** directory*
***cal** is in the **/usr/bin** directory*

```
[rsimms@oslab ~]$ type type
type is a shell builtin
```

***type** is built into the shell*

Class Activity

1) Where are the **scavenge** and **sc** commands?

2) What kind of files are they?

Type your answers in the chat window.

To get answer:

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

ssh is in the /usr/bin directory

Switch to electronic white board

Class Activity

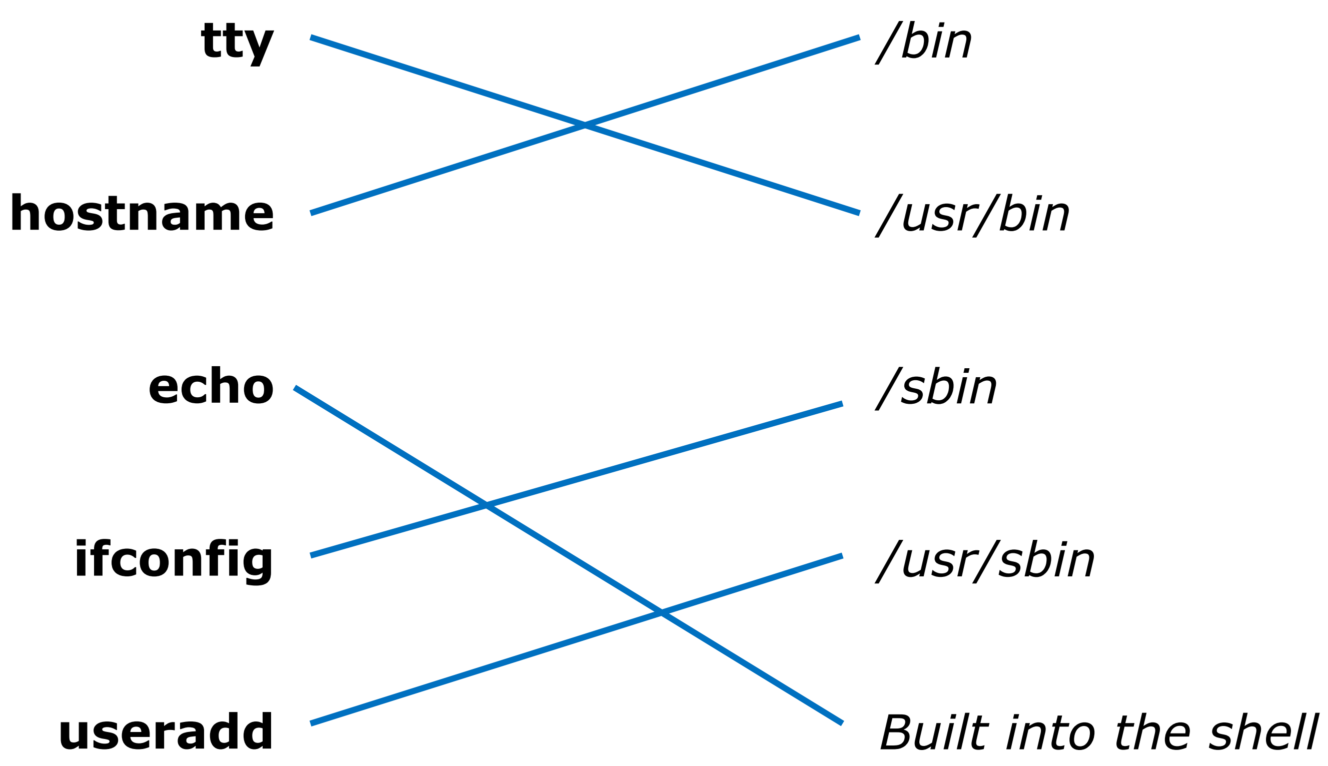
Draw a line connecting the command to the directory where it resides

bc	*/bin*
tty	*/usr/bin*
echo	*/sbin*
ifconfig	*/usr/sbin*
useradd	*Built into the shell*

You will learn more about useradd in CIS 191 and ifconfig in CIS 192

Class Activity

Draw a line connecting the command to the directory where it resides



Switch back to slides

Programs

Binary code vs text scripts

UNIX commands & utilities are executable programs

A program can be <u>binary code</u>:

- Binary machine code is unprintable. A programmer must use hex dumps to examine it.
- Binary machine code executes very quickly and is targeted for a specific CPU instruction set.
- The binaries are produced by compiling source code written in a higher level language such as C, or C++.
- Examples: The ls command, the uname command, the bash shell itself.

A program can be a text-based <u>script</u>:

- A script can be directly viewed and printed.
- A script does not need to be compiled. It is interpreted on the fly and because of that doesn't run as fast as binary code.
- Common scripting languages include bash, perl and python.
- Examples: The apropos command.

Two example programs: apropos and cal

Lets take a deep dive on two random commands:

apropos - searches the whatis database for a string of text

cal - prints a calendar

I'll be using this graphic to indicate a program that has been loaded into memory to be executed

Try both programs (commands) to see what they do

apropos

cal

*The **apropos** command searches the whatis database.*

```
/home/cis90/simben $ apropos uname
oldolduname [obsolete] (2)   - obsolete system calls
olduname [obsolete]   (2)   - obsolete system calls
uname                 (1)   - print system information
uname                 (1p)   - return system name
uname                 (2)   - get name and information about current kernel
uname                 (3p)   - get the name of the current system
```

*The **cal** command prints a calendar*

```
/home/cis90/simben $ cal
   February 2012
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
```

Use **type** to find where the programs are on the path

apropos

cal

```
/home/cis90/simben $ type apropos cal
apropos is hashed (/usr/bin/apropos)
cal is /usr/bin/cal
```

*The **apropos** and **cal** commands are both in the **/usr/bin** directory.*

Note: Sometimes you will see "hashed" which means the command has been run previously and its location on the path has been temporarily "remembered". This is to speed up subsequent path searches for the same command.

Use the **ls** command to list the programs files

```
/home/cis90/simben $ type apropos cal
apropos is hashed (/usr/bin/apropos)
cal is /usr/bin/cal
```

```
/home/cis90/simben $ ls /usr/bin/apropos /usr/bin/cal
/usr/bin/apropos  /usr/bin/cal
```

Note, both files show as green because they are executables (more on this later)

```
/home/cis90/simben $ ls -F /usr/bin/apropos /usr/bin/cal
/usr/bin/apropos*  /usr/bin/cal*
```

*FYI, use the -F option if color blind. Executables have a * suffix.*

Use the **file** command to get additional info on the files

apropos

cal

```
/home/cis90/simben $ file /usr/bin/apropos
/usr/bin/apropos: POSIX shell script text executable
```

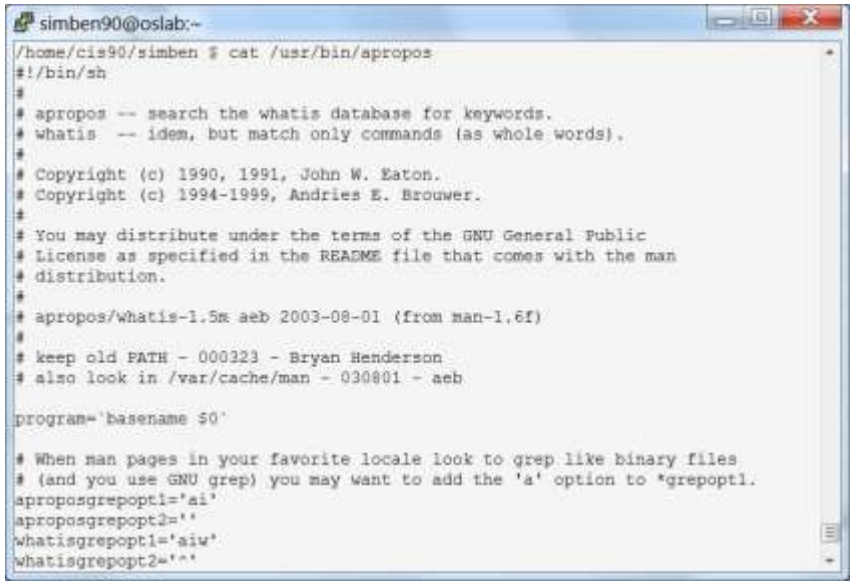
***apropos** is a shell script*

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

***cal** is binary code (has been compiled from higher level source code)*

Viewing the contents of the program files

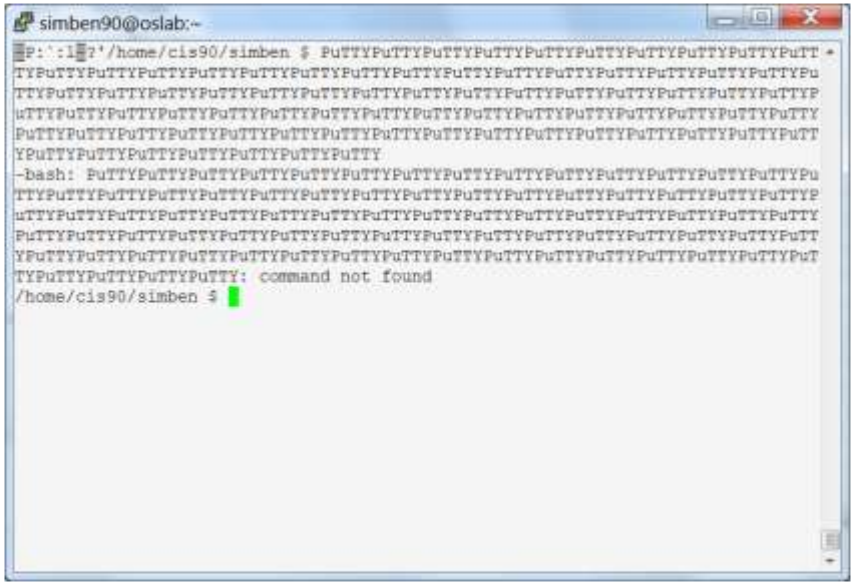
`cat /usr/bin/apropos`



```
/home/cis90/simben $ cat /usr/bin/apropos
#!/bin/sh
#
# apropos -- search the whatis database for keywords.
# whatis  -- idem, but match only commands (as whole words).
#
# Copyright (c) 1990, 1991, John W. Eaton.
# Copyright (c) 1994-1999, Andries E. Brouwer.
#
# You may distribute under the terms of the GNU General Public
# License as specified in the README file that comes with the man
# distribution.
#
# apropos/whatis-1.5m aeb 2003-08-01 (from man-1.6f)
#
# keep old PATH - 000323 - Bryan Henderson
# also look in /var/cache/man - 030801 - aeb

program=`basename $0`

# When man pages in your favorite locale look to grep like binary files
# (and you use GNU grep) you may want to add the 'a' option to *grepopt1.
aproposgrepopt1='ai'
aproposgrepopt2=''
whatisgrepopt1='aiw'
whatisgrepopt2='^'
```

*The **cat** command can print the apropos file because it is a readable (and editable) **ASCII** text script*

`cat /usr/bin/cal`



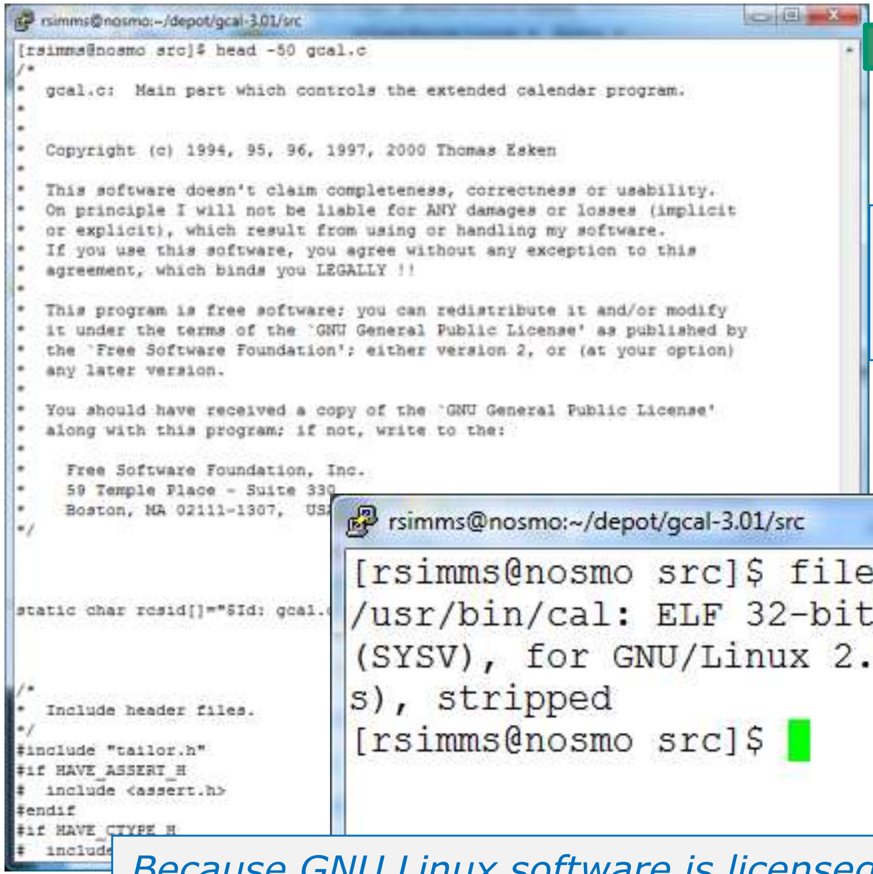
```
▒P:`:1▒?'/home/cis90/simben $ PuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTT
TYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPu
TTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYP
uTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTY
PuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTT
YPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTY
-bash: PuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPu
TTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYP
uTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTY
PuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTT
YPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuTTYPuT
TYPuTTYPuTTYPuTTYPuTTY: command not found
/home/cis90/simben $
```

*The **cat** command "chokes" trying to print the **binary** cal file because it is full of unprintable machine code.*

How binary programs are created

cal

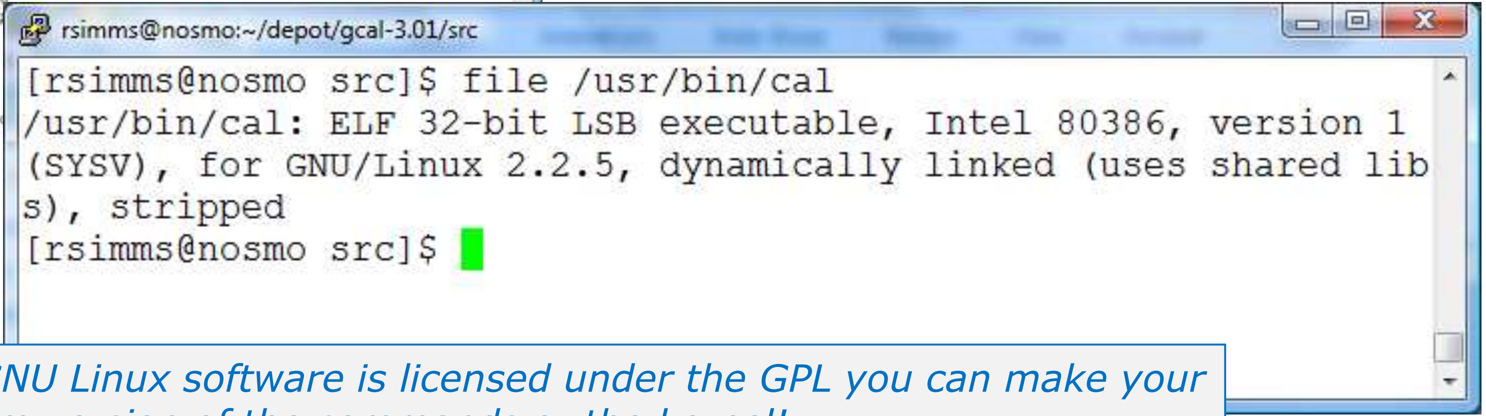
From: gcal-3.01.tar.gz



rsimms@nosmo:~/depot/gcal-3.01/src

```
[rsimms@nosmo src]$ head -50 gcal.c
/*
*  gcal.c:  Main part which controls the extended calendar program.
*
*
*  Copyright (c) 1994, 95, 96, 1997, 2000 Thomas Esken
*
*  This software doesn't claim completeness, correctness or usability.
*  On principle I will not be liable for ANY damages or losses (implicit
*  or explicit), which result from using or handling my software.
*  If you use this software, you agree without any exception to this
*  agreement, which binds you LEGALLY !!
*
*  This program is free software; you can redistribute it and/or modify
*  it under the terms of the `GNU General Public License' as published by
*  the `Free Software Foundation'; either version 2, or (at your option)
*  any later version.
*
*  You should have received a copy of the `GNU General Public License'
*  along with this program; if not, write to the:
*
*    Free Software Foundation, Inc.
*    59 Temple Place - Suite 330
*    Boston, MA 02111-1307,  US
*/



static char rcsid[]="$Id: gcal.



/*
*  Include header files.
*/
#include "tailor.h"
#if HAVE_ASSERT_H
#  include <assert.h>
#endif
#if HAVE_CTYPE_H
#  include
```

*Note: The **cal** binary code resulted from compiling the original gcal.c source code.*



rsimms@nosmo:~/depot/gcal-3.01/src

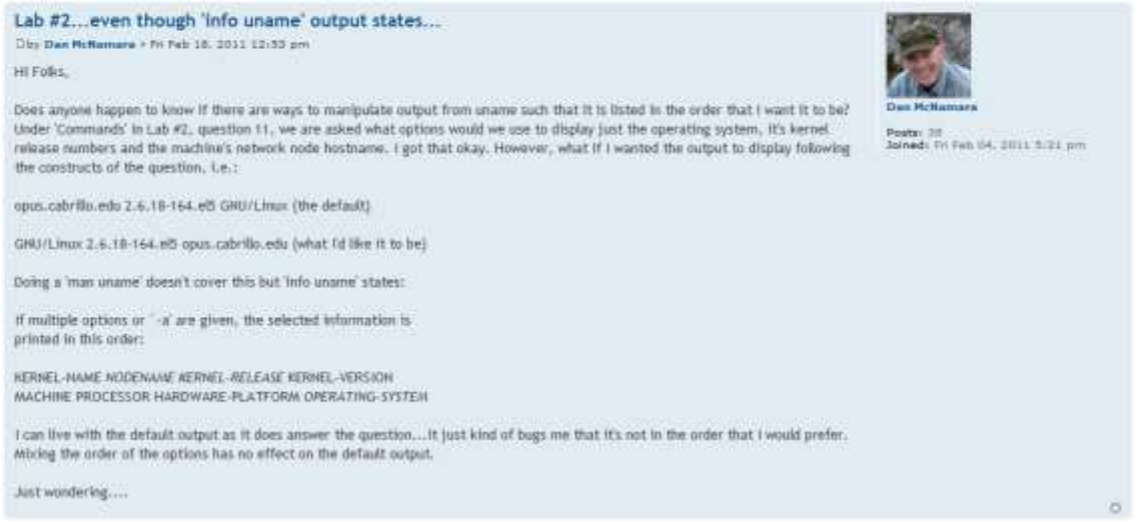
```
[rsimms@nosmo src]$ file /usr/bin/cal
/usr/bin/cal: ELF 32-bit LSB executable, Intel 80386, version 1
(SYSV), for GNU/Linux 2.2.5, dynamically linked (uses shared lib
s), stripped
[rsimms@nosmo src]$ 
```

Because GNU Linux software is licensed under the GPL you can make your own custom version of the commands or the kernel!

FYI

See this forum post from a previous class for an example of obtaining the source code for a Linux command and modifying it:

http://oslab.cabrillo.edu/forum/viewtopic.php?f=31&t=683&p=2774



Lab #2...even though 'info uname' output states...

by **Dan McNamara** » Fri Feb 18, 2011 12:53 pm

Dan McNamara

Posts: 38
Joined: Fri Feb 04, 2011 5:21 pm

Hi Folks,

Does anyone happen to know if there are ways to manipulate output from uname such that it is listed in the order that I want it to be? Under 'Commands' in Lab #2, question 11, we are asked what options would we use to display just the operating system, it's kernel release numbers and the machine's network node hostname. I got that okay. However, what if I wanted the output to display following the constructs of the question, i.e.:

opus.cabrillo.edu 2.6.18-164.el5 GNU/Linux (the default)

GNU/Linux 2.6.18-164.el5 opus.cabrillo.edu (what I'd like it to be)

Doing a 'man uname' doesn't cover this but 'info uname' states:

If multiple options or `-a' are given, the selected information is
printed in this order:

KERNEL-NAME *NODENAME* *KERNEL-RELEASE* KERNEL-VERSION
MACHINE PROCESSOR HARDWARE-PLATFORM *OPERATING-SYSTEM*

I can live with the default output as it does answer the question....It just kind of bugs me that it's not in the order that I would prefer.
Mixing the order of the options has no effect on the default output.

Just wondering....

*It all started when Dan did Lab 2 and wanted to change the way **uname** ordered its output!*

Class Activity

1) Where is the **scavenge** program?
   Hint: use the **type** command with scavenge as the argument.
   Type your answer in the chat window.

2) Is the **scavenge** command a binary executable or a shell script?
   Hint: use the **file** command with the location of scavenge as the argument.
   Type your answer in the chat window.

3) Can you **cat** the **scavenge** command?
   Paste a line of output in the chat window.

4) Is **scavenge** a UNIX command?
   Hint: use the **man** or **whatis** commands with scavenge as the argument.
   Type your answer in the chat window.

```
/home/cis90/simben $ type scavenge
scavenge is /usr/local/bin/scavenge
/home/cis90/simben $ file /usr/local/bin/scavenge
/usr/local/bin/scavenge: Bourne-Again shell script text executable
/home/cis90/simben $ cat /usr/local/bin/scavenge
<snipped>
/home/cis90/simben $ man scavenge
No manual entry for scavenge
/home/cis90/simben $
```

Inputs to Commands

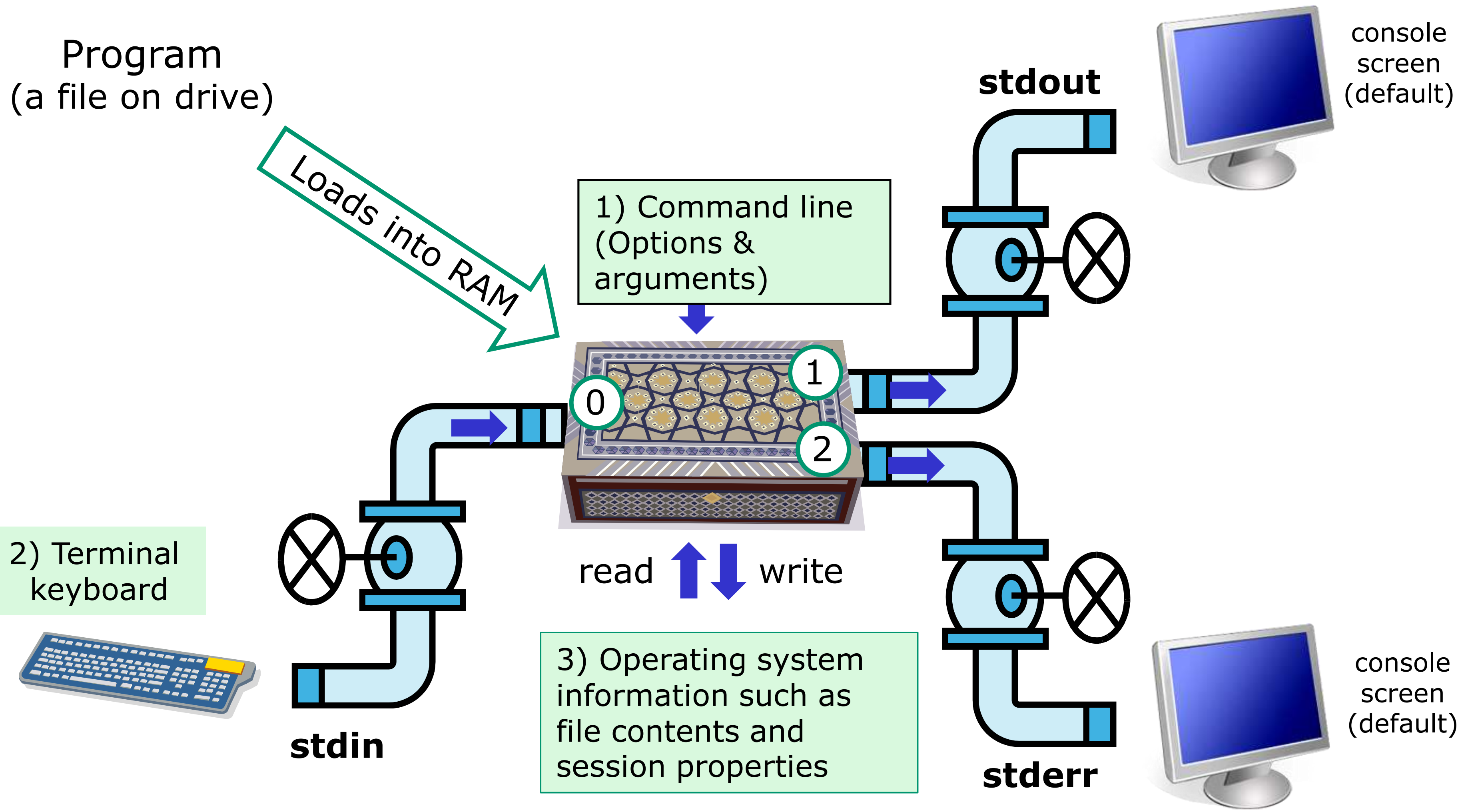
You will get these questions when you submit Lab 2

1) Name a UNIX command that gets its input only from the command line?

2) Name an interactive command that reads its input from the keyboard?

3) Name a UNIX command that gets its input from the Operating System?

Inputs to Commands



Name a UNIX command that gets its input only from the command line?

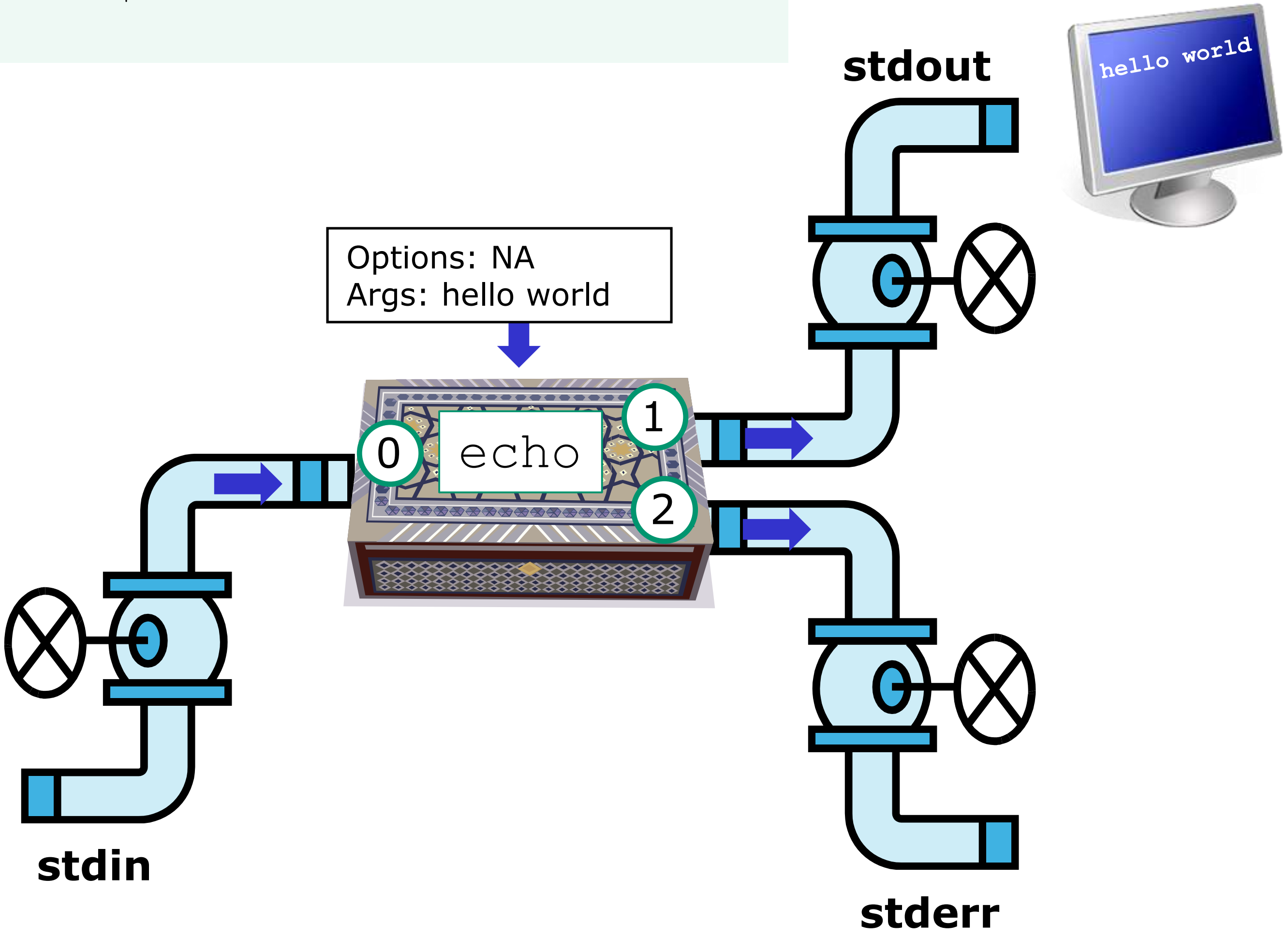
```
/home/cis90/simmen $ echo hello world
hello world
```

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

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

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

echo command

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



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

Name an interactive command that reads its input from the keyboard?

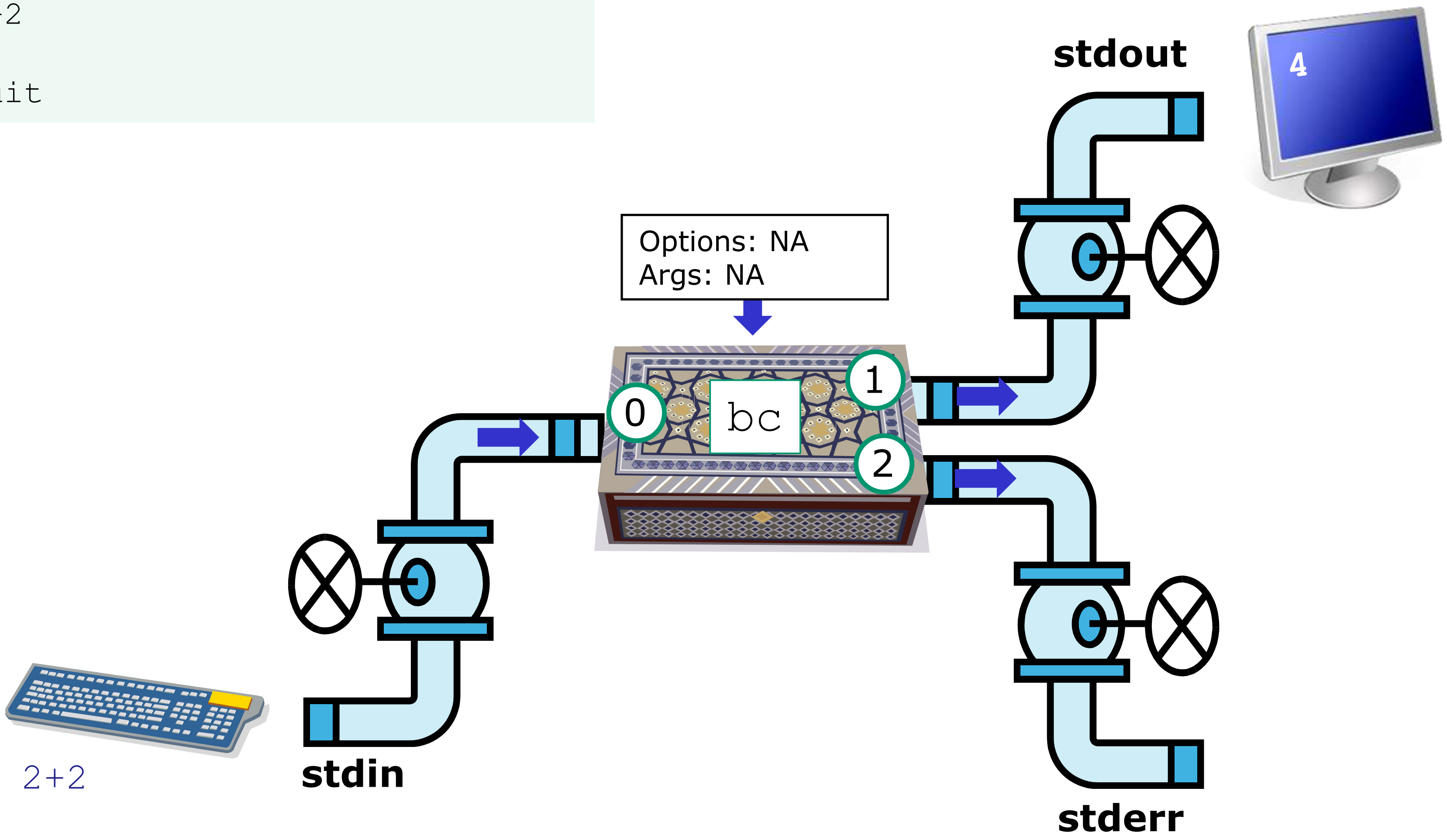
```
/home/cis90/simmsben $ bc
bc 1.06
Copyright 1991-1994, 1997, 1998, 2000 Free
Software Foundation, Inc.
This is free software with ABSOLUTELY NO
WARRANTY.
For details type `warranty'.
2+2
4
500-200+3
303
sqrt(64)
8
quit
```

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

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

bc command

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



*The **bc** (binary calculator) command is an example of an interactive command that reads its input from the keyboard*

Name a UNIX command that gets its input from the Operating System?

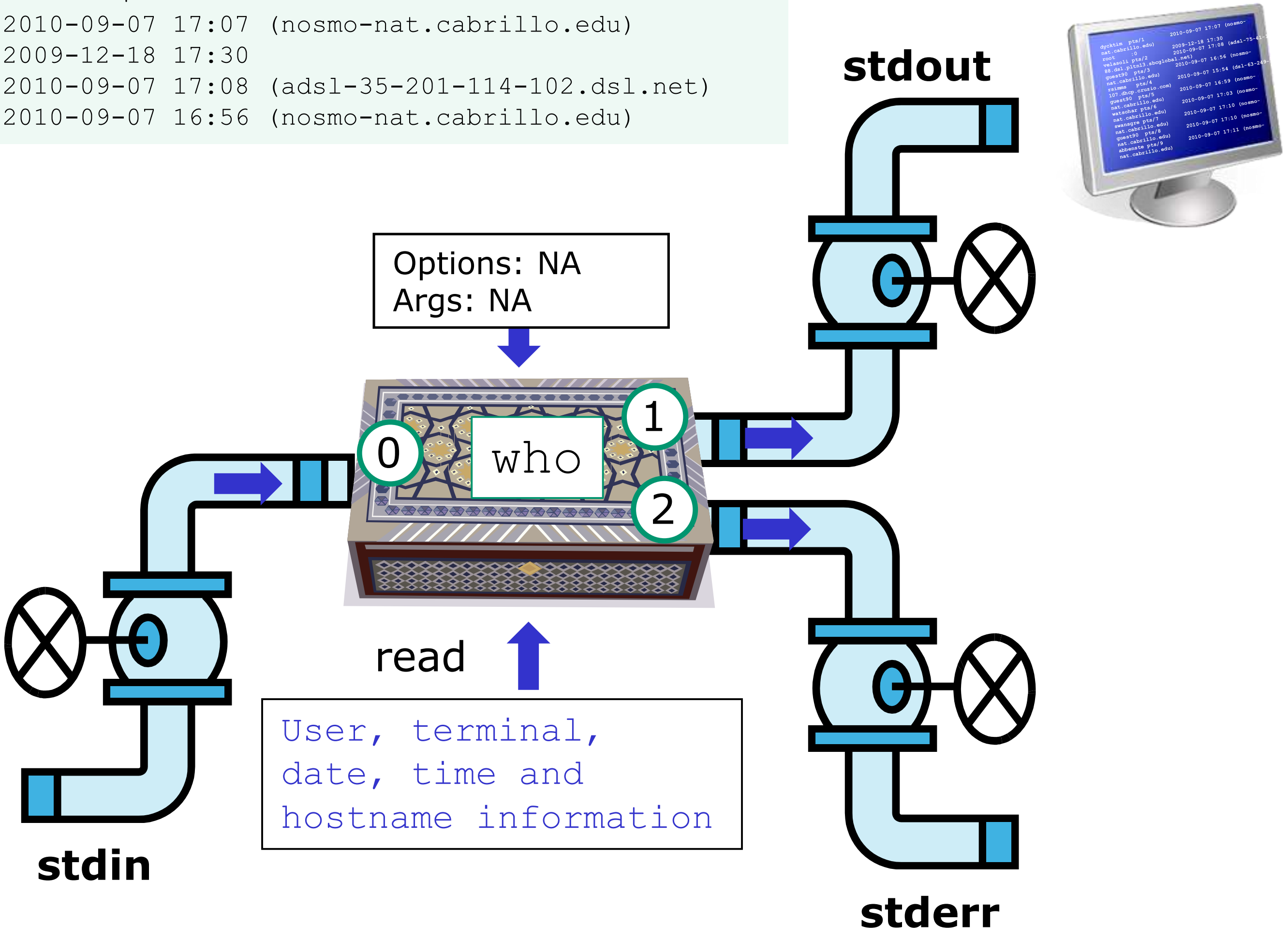
```
/home/cis90/simmen $ who
dycktim  pts/1        2010-09-07 17:07 (nosmo-nat.cabrillo.edu)
root     :0           2009-12-18 17:30
velasoli pts/2        2010-09-07 17:08 (adsl-35-201-114-102.dsl.net)
guest90  pts/3        2010-09-07 16:56 (nosmo-nat.cabrillo.edu)
rsimms   pts/4        2010-09-07 15:54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

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

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

who command

```
/home/cis90/simmsben $ who
dycktim  pts/1        2010-09-07 17:07 (nosmo-nat.cabrillo.edu)
root     :0           2009-12-18 17:30
velasoli pts/2        2010-09-07 17:08 (adsl-35-201-114-102.dsl.net)
guest90  pts/3        2010-09-07 16:56 (nosmo-nat.cabrillo.edu)
```



*The **who** command is an example of a command that gets its input from the Operating System*

Class Activity

Where is this **ps** command getting its input from?

```
/home/cis90/simben $ ps
  PID TTY          TIME CMD
26981 pts/2    00:00:00 bash
28587 pts/2    00:00:00 ps
/home/cis90/simben $
```

Type your answer in the chat window

Command Syntax

(grammar lesson)

Some new vocabulary

from Dictionary.com

parse [pahrs, pahrz] ***verb, parsed, pars·ing*.**
verb (used with object)

1. to analyze (a sentence) in terms of grammatical constituents, identifying the parts of speech, syntactic relations, etc.

2. to describe (a word in a sentence) grammatically, identifying the part of speech, inflectional form, syntactic function, etc.

3. Computers . to analyze (a string of characters) in order to associate groups of characters with the syntactic units of the underlying grammar.

One of the things the shell does is parse what is typed by the user. This results in the command line being analyzed to identify the command, the options, the arguments and any redirection.

Command Syntax

Command	Options	Arguments	Redirection

Command – is the name of an executable program file.

Options – a special type of argument that is used to control how the program operate operates.

Arguments – the objects the command is directed to work upon. Multiple arguments are separated by spaces.

Redirection – The default input stream (stdin) is from the console keyboard, the default output (stdout) and error (stderr) streams go to the console screen. Redirection can modify these streams to other files or devices.

Command Syntax Rules

Command	Options	Arguments	Redirection

Command – usually at the beginning of the line

Options – follow the command, usually starts with a dash, may be combined after a single "-" or separated by spaces. Note that `-iad` is the same as `-i -a -d`

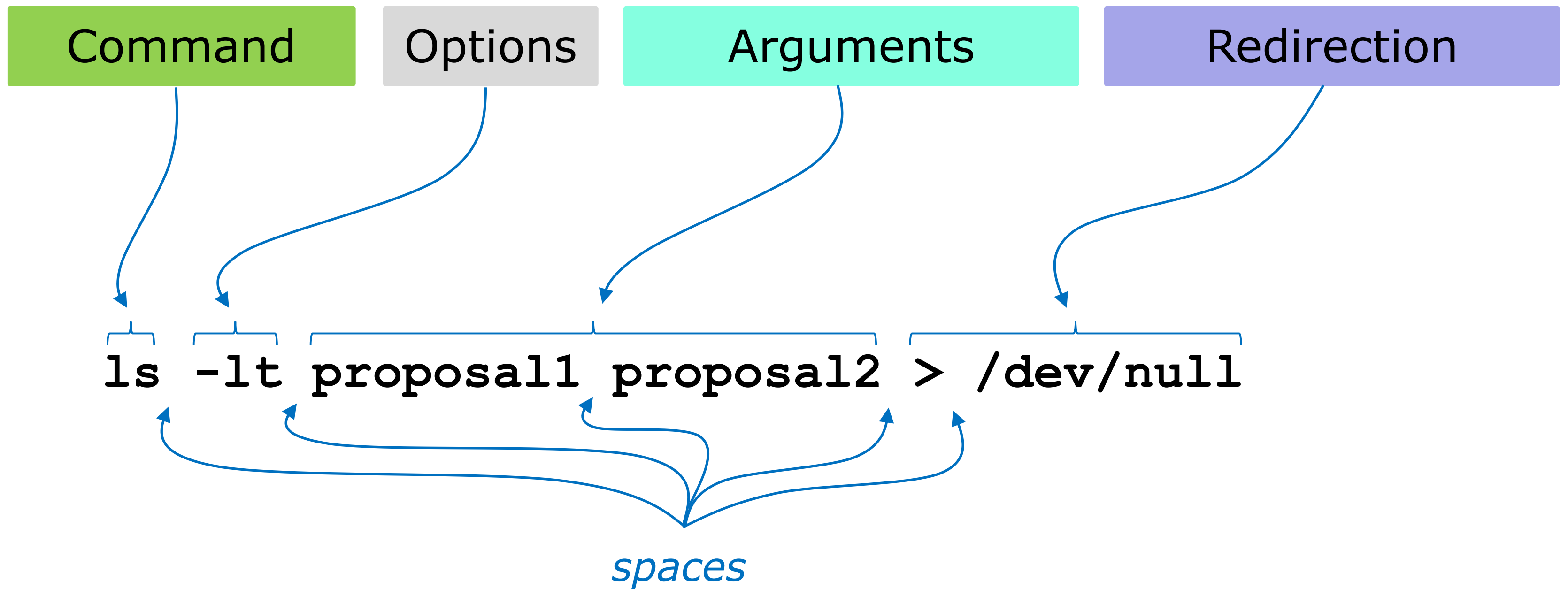
Arguments – follow the options. Multiple arguments must be separated by spaces.

Redirection – Will be a <, >, >>, 2> or | followed by the I/O redirection.

Spaces are required between commands, options, arguments and any redirection

Multiple spaces are treated as a single space (unless inside quotes)

Command Syntax Example



Don't worry now about what the example command above does, for now we just want to be able to parse it into the command, options, arguments and any redirection

More Command Syntax Examples

Command | Options | Arguments | Redirection

The command syntax is the underlying grammar used to parse the command line

```
/home/cis90/simben $ hostname
opus.cabrillo.edu

/home/cis90/simben $ uname -o
GNU/Linux

/home/cis90/simben $ ls -ld Poems/
drwxr-xr-x 5 simben90 cis90 4096 Jan 18  2004 Poems/

/home/cis90/simben $ ls -li letter > /dev/null
```

More on redirection in later lessons

Parsing

Command Syntax

Command	Options	Arguments	Redirection

```
/home/cis90/simben $ echo I love Linux
I love Linux
```

Use the chat window to type your answers

Command:

Options:
    How many:
    What are they:

Arguments:
    How many:
    What are they:

Redirection:
    How many:
    What is redirected:

Command Syntax

Command	Options	Arguments	Redirection

```
/home/cis90/simben $ echo I love Linux
I love Linux
```

Please parse the command line above

Command: echo

Options:
- How many: NA
- What are they: NA

Arguments:
- How many: 3
- What are they: I, Love, Linux

Redirection:
- How many: NA
- What is redirected: NA

Command Syntax

Command | Options | Arguments | Redirection

```
/home/cis90/simben $ ls -ld /bin /usr/bin
drwxr-xr-x 2 root root  4096 Nov 23 13:49 /bin
drwxr-xr-x 2 root root 61440 Nov 23 13:49 /usr/bin
```

Use the chat window to type your answers

Command:

Options:
How many:
What are they:

Arguments:
How many:
What are they:

Redirection:
How many:
What is redirected:

Command Syntax

Command	Options	Arguments	Redirection

```
/home/cis90/simben $ ls -ld /bin /usr/bin
drwxr-xr-x 2 root root  4096 Nov 23 13:49 /bin
drwxr-xr-x 2 root root 61440 Nov 23 13:49 /usr/bin
```

Please parse the command line above

Command: ls

Options:

How many:	2
What are they:	l, d

Arguments:

How many:	2
What are they:	/bin, /usr/bin

Redirection:

How many:	NA
What is redirected:	NA

Command Syntax

Command	Options	Arguments	Redirection

```
/home/cis90/simben $ ls-ld/bin/usr/bin
-bash: ls-ld/bin/usr/bin: No such file or directory
```

Use the chat window to type your answers

Command:

Options:
How many:
What are they:

Arguments:
How many:
What are they:

Redirection:
How many:
What is redirected:

Command Syntax

Command	Options	Arguments	Redirection

```
/home/cis90/simben $ ls-ld/bin/usr/bin
-bash: ls-ld/bin/usr/bin: No such file or directory
```

Please parse the command line above

Command: ls-ld/bin/usr/bin

Options:

How many:	NA
What are they:	NA

Arguments:

How many:	NA
What are they:	NA

Redirection:

How many:	NA
What is redirected:	NA

Spaces are required between commands, options, arguments and any redirection

Command Syntax

Command	Options	Arguments	Redirection

```
/home/cis90/simben $ file proposal1 timecal
proposal1: ASCII English text
timecal:   shell archive or script for antique kernel text
```

Use the chat window to type your answers

Command:

Options:
How many:
What are they:

Arguments:
How many:
What are they:

Redirection:
How many:
What is redirected:

Command Syntax

Command	Options	Arguments	Redirection

```
/home/cis90/simben $ file proposal1 timecal
proposal1: ASCII English text
timecal:   shell archive or script for antique kernel text
```

Please parse the command line above

Command: file

Options:
- How many: NA
- What are they: NA

Arguments:
- How many: 2
- What are they: proposal1, timecal

Redirection:
- How many: NA
- What is redirected: NA

Variables

Shell Variables

- A shell variable gives a name to a location in memory where data can be kept during the session. This data value is lost when a session ends.
- The shell variables used to customize the users environment are called *Environment* variables.
- When parsing, the shell will look for a $ followed by a variable name and replace it with the value of the variable.

To show the value of a variable use the **echo** command and precede the variable name with a $

echo $PS1 *shows the current value of the PS1 variable*

To change the value of a variable, use an = sign with no surrounding blanks and no $

PS1="Enter next command: " *sets the PS1 prompt variable*

Shell Environment Variables

These variables are automatically set for you when you log in

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

Showing common environment variable values

```
/home/cis90/simben $ echo $TERM
xterm
```
Shows your terminal type

```
/home/cis90/simben $ echo $PWD
/home/cis90/simben
```
Shows your current working directory

```
/home/cis90/simben $ echo $PS1
$PWD $
```
Shows your level 1 prompt string

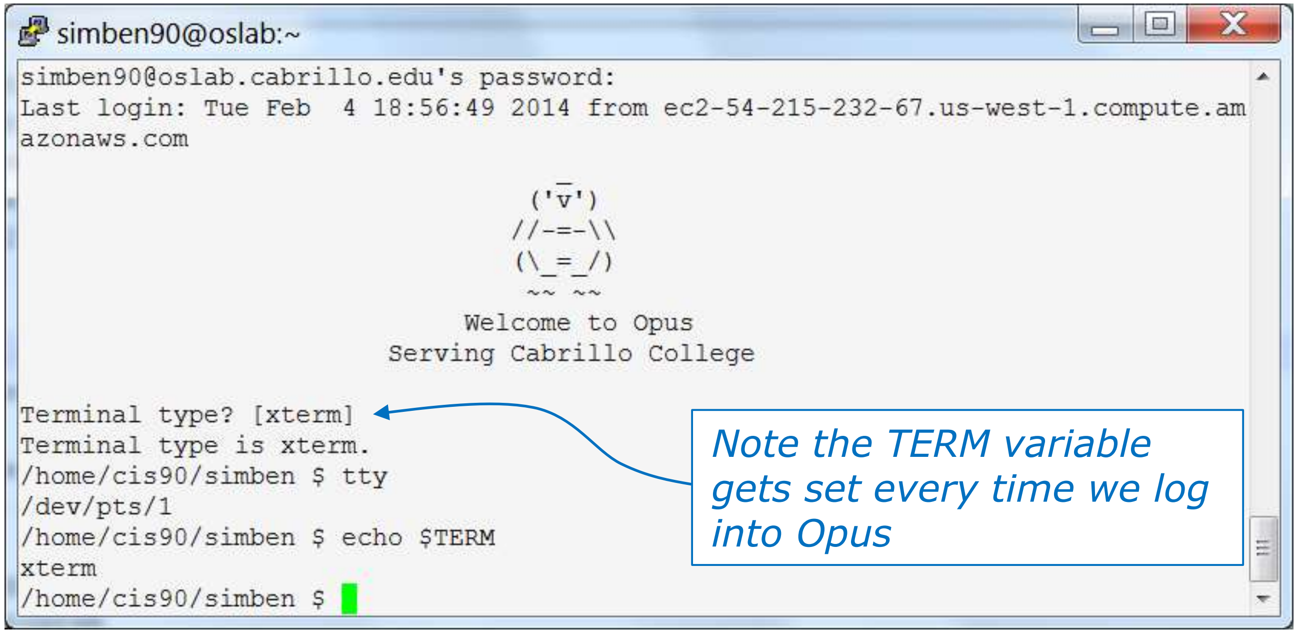
```
/home/cis90/simben $ echo $HOME
/home/cis90/simben
```
Shows your home directory

```
/home/cis90/simben $ echo $SHELL
/bin/bash
```
Shows your shell

```
/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:.
```
Shows the directories making up your path

Note that Terminal type ≠ Terminal device

The TERM variable holds the terminal type which is different than the terminal device



simben90@oslab:~

```
simben90@oslab.cabrillo.edu's password:
Last login: Tue Feb  4 18:56:49 2014 from ec2-54-215-232-67.us-west-1.compute.am
azonaws.com

                                ('v')
                               //-=-\\
                               (\_=_/)
                                ^^ ^^
                             Welcome to Opus
                        Serving Cabrillo College

Terminal type? [xterm]
Terminal type is xterm.
/home/cis90/simben $ tty
/dev/pts/1
/home/cis90/simben $ echo $TERM
xterm
/home/cis90/simben $ 
```

Note the TERM variable gets set every time we log into Opus

*Use **tty** to see terminal device*

*Use **echo $TERM** to see terminal type*

Setting Variable Values

To change the value of a variable, use an = sign with no surrounding blanks and no $

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

Show the current terminal type

```
/home/cis90/simben $ TERM=dumb
/home/cis90/simben $ echo $TERM
dumb
```

Change the terminal type and display the new value

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

Change the terminal type back to the original value

In Lab 2 you will see what happens when the terminal type is changed

The SHELL variable

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

The SHELL variable will be set to the name of the shell your are running. Benji is running the bash shell.

```
/home/cis90/simben $ ps
  PID TTY          TIME CMD
 7364 pts/1    00:00:00 bash
 7745 pts/1    00:00:00 ps
```

In Lesson 1 we used the ps command to see the shell being run

```
/home/cis90/simben $ cat /etc/passwd | grep simben
simben90:x:1201:190:Benji Simms:/home/cis90/simben:/bin/bash
```

The shell that is run is determined by the entry in /etc/passwd

Changing the shell prompt

(PS1 variable)

The PS1 variable

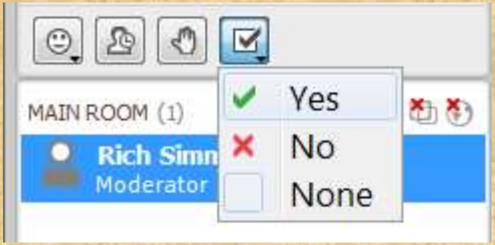
```
/home/cis90/simben $ echo $PS1
$PWD $
```

The PS1 variable defines the shell prompt

Follow Me

```
/home/cis90/simben $ PS1="By your command > "
By your command > date
Mon Sep  3 17:25:32 PDT 2012
By your command >


By your command > PS1='What can I do for you $LOGNAME? '
What can I do for you simben90? date
Mon Sep  3 17:26:10 PDT 2012
What can I do for you simben90?


What can I do for you simben90? PS1='$PWD $ '
/home/cis90/simben $ date
Mon Feb  3 18:06:30 PST 2014
```

Give me a green check ✓ if you are successful and a red x if stuck on CCC Confer



Need a fresh start -- just log out and back in again and your prompt will be back to normal!

Changing the shell prompt

More PS1 prompt examples

Changing the prompt

There are some special \codes you can insert when setting the prompt

\u gets replaced by the username

\h gets replaced by the hostname

\W gets replaced by the base working directory

\$ gets replaced by a $ for regular users or # if the root user

```
/home/cis90/simben $ PS1="[\u@\h \W]\$ "
[simben90@oslab ~]$ date
Mon Sep  3 17:38:54 PDT 2012
[simben90@oslab ~]$
```

user name

hostname

working directory (~ is shorthand for the home directory)

indicates regular user

Changing the prompt

Special Codes	Meaning
\!	history command number
\#	session command number
\d	date
\h	hostname
\n	new line
\s	shell name
\t	time
\u	user name
\w	entire path of working directory
\W	only working directory
\$	$ or # (for root user)

The PS1 variable (defines the prompt) can be set to any combination of text, variables and these special codes.

Changing the prompt

Prompt string	**Result**
`PS1='$PWD $ '`	`/home/cis90/simmsben/Poems $`
`PS1="\w $ "`	`~/Poems $`
`PS1="\W $ "`	`Poems $`
`PS1="\u@\h $ "`	`simmsben@opus $`
`PS1='\u@\h $PWD $ '`	`simmsben@opus /home/cis90/simmsben/Poems $`
`PS1='\u@\$HOSTNAME $PWD $ '`	`simmsben@opus.cabrillo.edu /home/cis90/simmsben/Poems $`
`PS1='\u \! $PWD $ '`	`simmsben 825 /home/cis90/simmsben/Poems $`
`PS1="[\u@\h \W] $ "`	`[simmsben@opus Poems] $`

Important: Use single quotes around variables that change. For example if you use $PWD with double quotes, the prompt will not changes as you change directories! More on this later …

Need a fresh start -- just log out and back in again and your prompt will be back to normal!

Listing all the variables

Shell Variables

set command

```
/home/cis90/simben $ set
BASH=/bin/bash
BASHOPTS=checkwinsize:cmdhist:expand_aliases:extquote:force_fignore:hostco
mplete:interactive_comments:login_shell:progcomp:promptvars:sourcepath
BASH_ALIASES=()
BASH_ARGC=()
BASH_ARGV=()
BASH_CMDS=()
BASH_ENV=/home/cis90/simben/.bashrc
BASH_LINENO=()
BASH_SOURCE=()
BASH_VERSINFO=([0]="4" [1]="1" [2]="2" [3]="1" [4]="release" [5]="i386-
redhat-linux-gnu")
BASH_VERSION='4.1.2(1)-release'
COLORS=/etc/DIR_COLORS
COLUMNS=123
CVS_RSH=ssh
DIRSTACK=()
EUID=1001
GROUPS=()
G_BROKEN_FILENAMES=1
HISTCONTROL=ignoredups
HISTFILE=/home/cis90/simben/.bash_history
HISTFILESIZE=1000
HISTSIZE=1000
HOME=/home/cis90/simben
HOSTNAME=oslab.cabrillo.edu
HOSTTYPE=i386
ID=1001
IFS=$' \t\n'
IGNOREEOF=10
LANG=en_US.UTF-8
LESSOPEN='|/usr/bin/lesspipe.sh %s'
LINES=38
LOGNAME=simben90
LS_COLORS='rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;3
3;01:cd=40;33;01:or=40;31;01:mi=01;05;37;41:su=37;41:sg=30;43:ca=30;41:tw=
30;42:ow=34;42:st=37;44:ex=01;32:*.tar=01;31:*.tgz=01;31:*.arj=01;31:*.taz
=01;31:*.lzh=01;31:*.lzma=01;31:*.tlz=01;31:*.txz=01;31:*.zip=01;31:*.z=01
;31:*.Z=01;31:*.dz=01;31:*.gz=01;31:*.lz=01;31:*.xz=01;31:*.bz2=01;31:*.tb
z=01;31:*.tbz2=01;31:*.bz=01;31:*.tz=01;31:*.deb=01;31:*.rpm=01;31:*.jar=0
1;31:*.rar=01;31:*.ace=01;31:*.zoo=01;31:*.cpio=01;31:*.7z=01;31:*.rz=01;3
1:*.jpg=01;35:*.jpeg=01;35:*.gif=01;35:*.bmp=01;35:*.pbm=01;35:*.pgm=01;35
:*.ppm=01;35:*.tga=01;35:*.xbm=01;35:*.xpm=01;35:*.tif=01;35:*.tiff=01;35:
*.png=01;35:*.svg=01;35:*.svgz=01;35:*.mng=01;35:*.pcx=01;35:*.mov=01;35:*
.mpg=01;35:*.mpeg=01;35:*.m2v=01;35:*.mkv=01;35:*.ogm=01;35:*.mp4=01;35:*.
m4v=01;35:*.mp4v=01;35:*.vob=01;35:*.qt=01;35:*.nuv=01;35:*.wmv=01;35:*.as
f=01;35:*.rm=01;35:*.rmvb=01;35:*.flc=01;35:*.avi=01;35:*.fli=01;35:*.flv=
01;35:*.gl=01;35:*.dl=01;35:*.xcf=01;35:*.xwd=01;35:*.yuv=01;35:*.cgm=01;3
5:*.emf=01;35:*.axv=01;35:*.anx=01;35:*.ogv=01;35:*.ogx=01;35:*.aac=01;36:
*.au=01;36:*.flac=01;36:*.mid=01;36:*.midi=01;36:*.mka=01;36:*.mp3=01;36:*
.mpc=01;36:*.ogg=01;36:*.ra=01;36:*.wav=01;36:*.axa=01;36:*.oga=01;36:*.sp
x=01;36:*.xspf=01;36:'
MACHTYPE=i386-redhat-linux-gnu
MAIL=/var/spool/mail/simben90
MAILCHECK=60
OLDPWD=/bin
OPTERR=1
OPTIND=1
OSTYPE=linux-gnu
PATH=/usr/lib/qt-
3.3/bin:/usr/local/bin:/bin:/usr/bin:/usr/local/sbin:/usr/sbin:/sbin:/home
/cis90/simben/../bin:/home/cis90/simben/bin:.
PIPESTATUS=([0]="127")
PPID=17309
PROMPT_COMMAND='printf "\033]0;%s@%s:%s\007" "${USER}" "${HOSTNAME%%.*}"
"${PWD/#$HOME/~}"'
PS1='$PWD $ '
PS2='> '
PS4='+ '
PWD=/home/cis90/simben
QTDIR=/usr/lib/qt-3.3
QTINC=/usr/lib/qt-3.3/include
QTLIB=/usr/lib/qt-3.3/lib
SELINUX_LEVEL_REQUESTED=
SELINUX_ROLE_REQUESTED=
SELINUX_USE_CURRENT_RANGE=
SHELL=/bin/bash
SHELLOPTS=braceexpand:emacs:hashall:histexpand:history:ignoreeof:interacti
ve-comments:monitor
SHLVL=1
SSH_CLIENT='50.0.68.235 51849 2220'
SSH_CONNECTION='50.0.68.235 51849 172.30.5.20 2220'
SSH_TTY=/dev/pts/2
TERM=xterm
UID=1001
USER=simben90
USERNAME=
_=ser
colors=/etc/DIR_COLORS
/home/cis90/simben $
```

*The **set** command shows all shell variables including the special environment variables.*

Shell (Environment) Variables

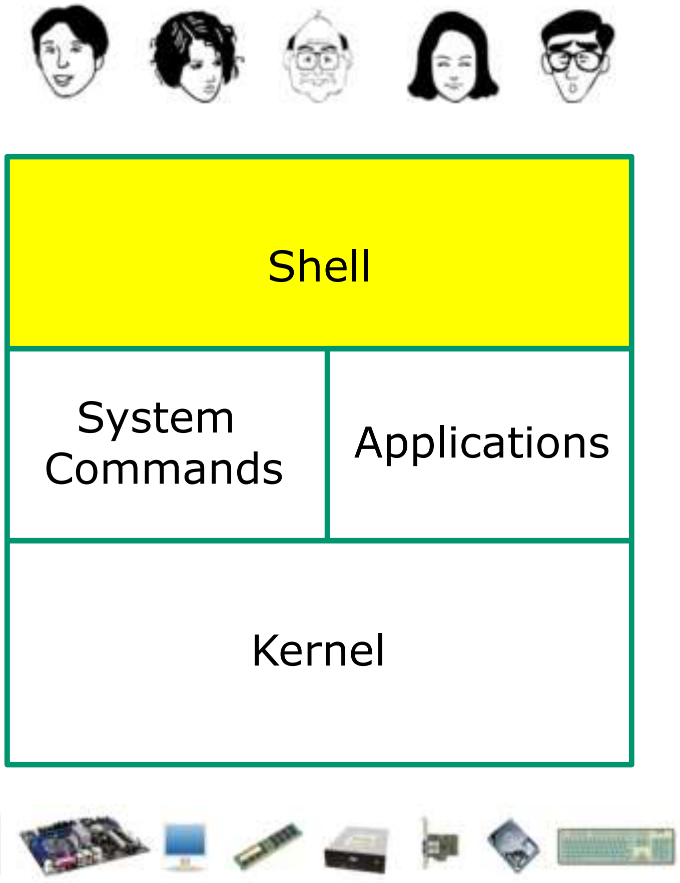
env command

*The **env** command shows just the environment variables (a subset of the shell variables)*

```
/home/cis90/simben $ env
HOSTNAME=oslab.cabrillo.edu
SELINUX_ROLE_REQUESTED=
TERM=xterm
SHELL=/bin/bash
HISTSIZE=1000
SSH_CLIENT=50.0.68.235 51849 2220
SELINUX_USE_CURRENT_RANGE=
QTDIR=/usr/lib/qt-3.3
QTINC=/usr/lib/qt-3.3/include
SSH_TTY=/dev/pts/2
USER=simben90
LS_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:mi=01;05;37;41:su=37;41:sg=30;43:ca=
30;41:tw=30;42:ow=34;42:st=37;44:ex=01;32:*.tar=01;31:*.tgz=01;31:*.arj=01;31:*.taz=01;31:*.lzh=01;31:*.lzma=01;31:*.tlz=01;31:*.txz=01;31
:*.zip=01;31:*.z=01;31:*.Z=01;31:*.dz=01;31:*.gz=01;31:*.lz=01;31:*.xz=01;31:*.bz2=01;31:*.tbz=01;31:*.tbz2=01;31:*.bz=01;31:*.tz=01;31:*.
deb=01;31:*.rpm=01;31:*.jar=01;31:*.rar=01;31:*.ace=01;31:*.zoo=01;31:*.cpio=01;31:*.7z=01;31:*.rz=01;31:*.jpg=01;35:*.jpeg=01;35:*.gif=01
;35:*.bmp=01;35:*.pbm=01;35:*.pgm=01;35:*.ppm=01;35:*.tga=01;35:*.xbm=01;35:*.xpm=01;35:*.tif=01;35:*.tiff=01;35:*.png=01;35:*.svg=01;35:*
.svgz=01;35:*.mng=01;35:*.pcx=01;35:*.mov=01;35:*.mpg=01;35:*.mpeg=01;35:*.m2v=01;35:*.mkv=01;35:*.ogm=01;35:*.mp4=01;35:*.m4v=01;35:*.mp4
v=01;35:*.vob=01;35:*.qt=01;35:*.nuv=01;35:*.wmv=01;35:*.asf=01;35:*.rm=01;35:*.rmvb=01;35:*.flc=01;35:*.avi=01;35:*.fli=01;35:*.flv=01;35
:*.gl=01;35:*.dl=01;35:*.xcf=01;35:*.xwd=01;35:*.yuv=01;35:*.cgm=01;35:*.emf=01;35:*.axv=01;35:*.anx=01;35:*.ogv=01;35:*.ogx=01;35:*.aac=0
1;36:*.au=01;36:*.flac=01;36:*.mid=01;36:*.midi=01;36:*.mka=01;36:*.mp3=01;36:*.mpc=01;36:*.ogg=01;36:*.ra=01;36:*.wav=01;36:*.axa=01;36:*
.oga=01;36:*.spx=01;36:*.xspf=01;36:
USERNAME=
MAIL=/var/spool/mail/simben90
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:.
PWD=/home/cis90/simben
LANG=en_US.UTF-8
SELINUX_LEVEL_REQUESTED=
HISTCONTROL=ignoredups
SHLVL=1
HOME=/home/cis90/simben
BASH_ENV=/home/cis90/simben/.bashrc
LOGNAME=simben90
QTLIB=/usr/lib/qt-3.3/lib
CVS_RSH=ssh
SSH_CONNECTION=50.0.68.235 51849 172.30.5.20 2220
LESSOPEN=|/usr/bin/lesspipe.sh %s
G_BROKEN_FILENAMES=1
_=/bin/env
OLDPWD=/bin
/home/cis90/simben $
```

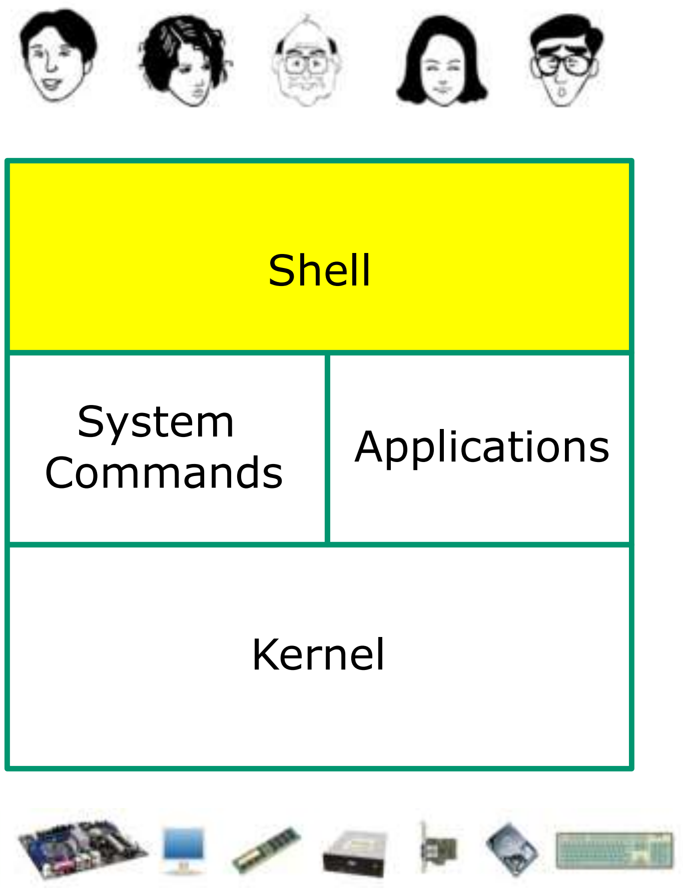
The Shell (six steps)

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**

Life 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 $
```

to show value of PS1 variable

echo the output of the previous command

was output by the echo command above

was output by the shell (the same output)

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
```

During the parse step the shell identifies all options & arguments, handles any metacharacters and redirection

- Command = ls
- 2 Options = l, t
- 2 Arguments = proposal1, proposal2
- No Redirection

Life of the Shell

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

3) Search path for the program to run

`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 ls command found here
/usr/local/bin        no ls command found here
/bin                  YES! – an ls command is in the /bin directory
/usr/bin
/usr/local/sbin
/usr/sbin
/sbin
/home/cis90/simben/../bin
/home/cis90/simben/bin
     .
```

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
```

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

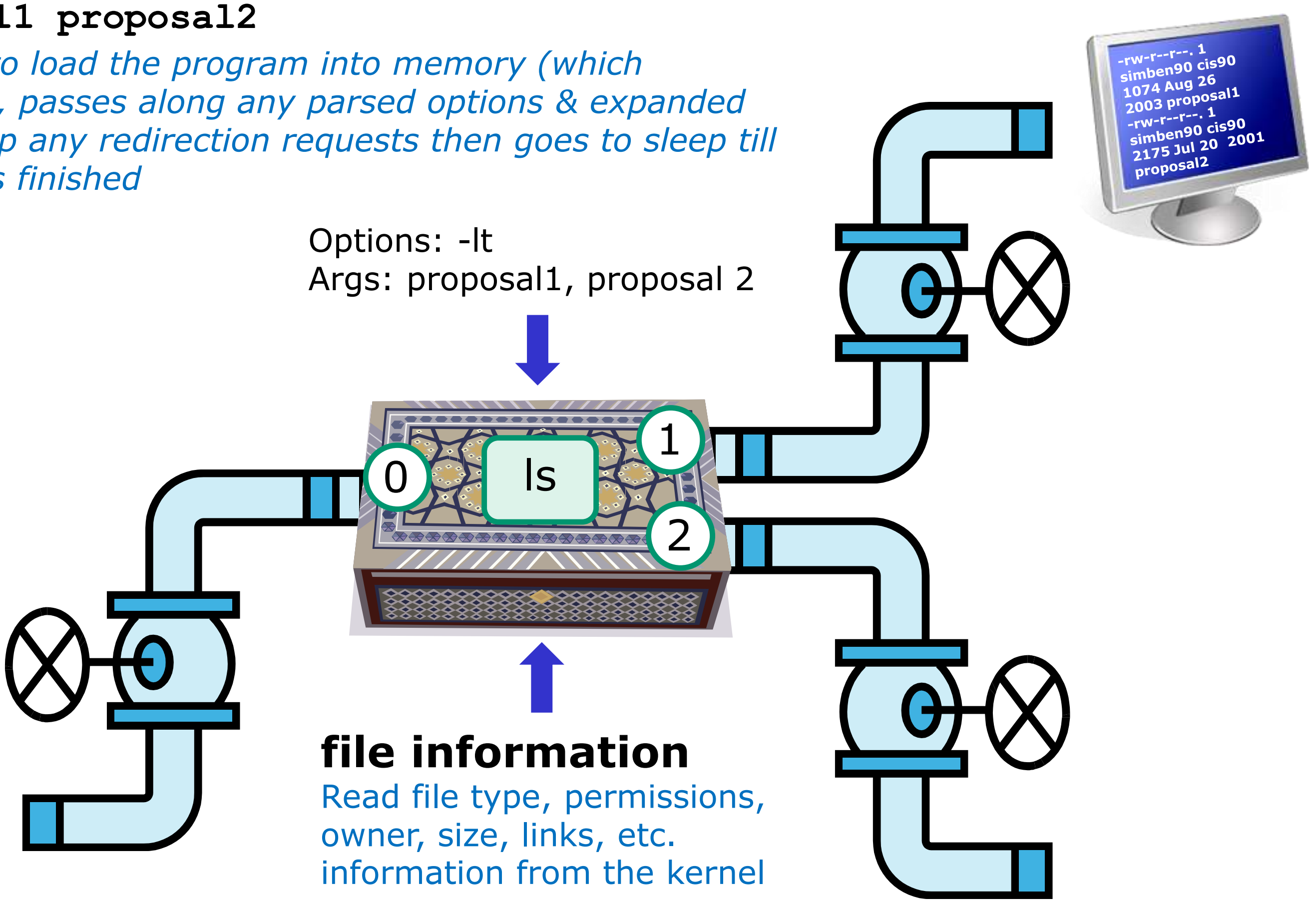
Life of the Shell

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



```
-rw-r--r--. 1
simben90 cis90
1074 Aug 26
2003 proposal1
-rw-r--r--. 1
simben90 cis90
2175 Jul 20  2001
proposal2
```

Read file type, permissions, owner, size, links, etc. information from the kernel

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
```

The shell sleeps while the ls process outputs these two lines

Life of the Shell

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

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

Life of the Shell

A
```
/home/cis90/simben $ Ls -lt proposal1 proposal2
-bash: Ls: command not found
```
What's wrong?
Who output the error?

B
```
/home/cis90/simben $ ls -lt proposal1 proposal5
ls: cannot access proposal5: No such file or directory
-rw-r--r--. 1 simben90 cis90 1074 Aug 26  2003 proposal1
```
What's wrong?
Who output the error?

C
```
/home/cis90/simben $ ls -lw proposal1 proposal2
ls: invalid line width: proposal1
```
What's wrong?
Who output the error?

D
```
/home/cis90/simben $ ls -lt proposal1proposal2
ls: cannot access proposal1proposal2: No such file or directory
```
What's wrong?
Who output the error?

E
```
/home/cis90/simben $ ls-lt proposal1 proposal2
-bash: ls-lt: command not found
```
What's wrong?
Who output the error?

Meta-characters

Metacharacters

When parsing, the shell gives special meaning to metacharacters

" - use double quotes to preserve blanks and allow variable expansion

' - use single quotes to preserve blanks and block variable expansion

$ - use to show the value rather than the name of a variable

; - allows multiple commands on one line

<enter key> - The invisible newline control character marking the end of a command

= - use to set variables to new values

\ - removes (escapes) the special powers of a metacharacter

Other metacharacters we will learn about later include:
*?, *, <, >, >>, !, |, [], {}, &, && and ||*

Metacharacters - quotes

- Double " quotes allow variable expansion
- Single ' quotes block variable expansion
- Both double and single quotes preserve blanks

```
/home/cis90/simben $ echo I am                    $LOGNAME      (3 arguments)
I am simben90 Extra blanks ignored, variable expanded
```

```
/home/cis90/simben $ echo "I am                    $LOGNAME"    (1 argument)
I am                    simben90  Extra blanks preserved, variable expanded to show value
```

```
/home/cis90/simben $ echo 'I am                    $LOGNAME'    (1 argument)
I am                    $LOGNAME  Extra blanks preserved, variable expansion blocked
```

Double quotes called weak quotes because they allow the shell to expand variables. Single quotes are called strong quotes because they block the shell from expanding variables.

Metacharacters - quotes

```
/home/cis90/simben $ echo '"double quotes"'
"double quotes"
```

```
/home/cis90/simben $ echo "'single quotes'"
'single quotes'
```

Tip: single quotes can be used to output double quotes and vice-versa

Metacharacters - <enter key>

<enter key> - The invisible *newline* control character marking the end of a command

```
[rsimms@opus ~]$ ps
  PID TTY          TIME CMD
19015 pts/0    00:00:00 bash
19378 pts/0    00:00:00 ps

[rsimms@opus ~]$ hostname
opus.cabrillo.edu

[rsimms@opus ~]$ echo "Use <enter key> to end the command"
Use <enter key> to end the command
```

Pressing the Enter key here generates an invisible `<newline>` *character*

Metacharacters - \ (backslash)

The back slash \ removes (escapes) the special powers of a metacharacter

```
[rsimms@oslab ~]$ echo a b c d e f
a b c d e f

[rsimms@opus ~]$ echo a b c \
> d e f
a b c d e f
```

Escape the invisible newline <enter key> which marks the end of a command

```
[rsimms@opus ~]$ echo $PS1
[\u@\h \W]\$

[rsimms@opus ~]$ echo \$PS1
$PS1
```

Escape the $ (which shows the value of the variable)

```
[rsimms@opus ~]$ echo "Hello World"
Hello World

[rsimms@opus ~]$ echo \"Hello World\"
"Hello World"
```

Escape the double quote marks

Metacharacters - ; (semi-colon)

The semi-colon ; allows multiple commands on one line

```
[simmsben@opus Poems]$ hostname; uname; echo $LOGNAME; ls
opus.cabrillo.edu
Linux
simmsben
ant  Blake  nursery  Shakespeare  twister  Yeats
```

Four commands on one line

Shortcuts

More on the Command Line

Handy Shortcuts

- Use up and down arrows to “retype” previous commands
- Left and right arrow for editing current command
- Use <tab> to complete filenames automatically

```
/home/cis90/simben $ hostname; name; echo $LOGNAME; ls Poems/Blake/
oslab.cishawks.net
-bash: name: command not found
simben90
jerusalem  tiger
/home/cis90/simben $ hostname; uname; echo $LOGNAME; ls Poems/Blake/
oslab.cishawks.net
Linux
simben90
jerusalem  tiger
```

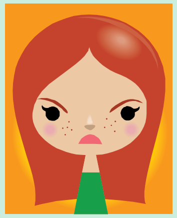
Press <tab> after the P and B and the shell fills in the rest

Press up arrow and the shell retypes the previous command

Use the left arrow to backup and fix the typo (uname instead of name)

Life without a path

-bash: *xxxx*: command not found



Don't get mad, just fix your path!

The Path

The shell uses your path to locate commands to execute

- A path is a ordered set of directories along which the shell will search to locate commands to execute
- The path is defined by the PATH variable
- Show your path with **echo $PATH**
- If you specify a command *xxxx* that the shell cannot find on the path it will print the following error message:

    -bash: *xxxx*: command not found

- To run a command that is not on your path the complete absolute or relative pathname must be specified. e.g. /usr/bin/uname

The Path

Use this command to see the 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/c
is90/simben/../bin:/home/cis90/simben/bin:.
```

The shell will search for the ls command along the path in this order:

```
/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
.
```

yes, . is a directory too and it is whatever directory you have currently changed into

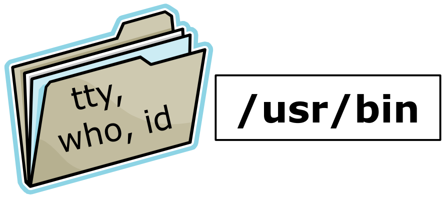
Experiment – Breaking the Path

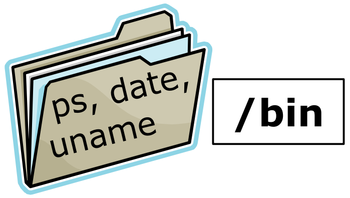
*The **echo** command is built into bash*

```
/home/cis90/simben $ type echo ps tty
echo is a shell builtin
ps is /bin/ps
tty is /usr/bin/tty
```

*the **ps** command is in the /bin directory*

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





Experiment – Breaking the Path

Default path

```
/home/cis90/simben $ echo I love Linux
I love Linux
/home/cis90/simben $ date
Mon Sep  3 15:17:52 PDT 2012
/home/cis90/simben $ tty
/dev/pts/2
/home/cis90/simben $
```

TROUBLE!

```
/home/cis90/simben $ PATH=""
/home/cis90/simben $ echo $PATH

/home/cis90/simben $
```

Break the path by setting it to null

No path

```
/home/cis90/simben $ echo I love Linux
I love Linux
/home/cis90/simben $ date
-bash: date: No such file or directory
/home/cis90/simben $ tty
-bash: tty: No such file or directory
```

*Only **echo** works because it is built into the shell!*

```
/home/cis90/simben $ echo $PATH

/home/cis90/simben $
```

There is nothing on the path!

Experiment – Restoring the Path

```
/home/cis90/simben $ PATH=/bin
/home/cis90/simben $ echo $PATH
/bin
/home/cis90/simben $

/home/cis90/simben $ echo I love Linux
I love Linux
/home/cis90/simben $ date
Mon Sep  3 15:24:19 PDT 2012
/home/cis90/simben $ tty
-bash: tty: No such file or directory
```

Add the /bin directory to the path

***echo** works because it is built into the shell*

***date** works because it resides in the /bin directory which is now on the path*

***tty** does not work because it is in the /usr/bin directory which is not on the path*

```
/home/cis90/simben $ echo $PATH
/bin
/home/cis90/simben $
```

Experiment – Restoring the Path

```
/home/cis90/simben $ PATH=$PATH:/usr/bin
/home/cis90/simben $ echo $PATH
/bin:/usr/bin
/home/cis90/simben $

/home/cis90/simben $ echo I love Linux
I love Linux
/home/cis90/simben $ date
Mon Sep  3 15:24:19 PDT 2012
/home/cis90/simben $ tty
/dev/pts/2
```

Append the /usr/bin directory to the path

All three commands work because /bin and /usr/bin are on the path.

The shell will only run commands found in the directories that make up the path

```
/home/cis90/simben $ echo $PATH
/bin:/usr/bin
/home/cis90/simben $
```

tty, who, id
/usr/bin
ps, date, uname
/bin

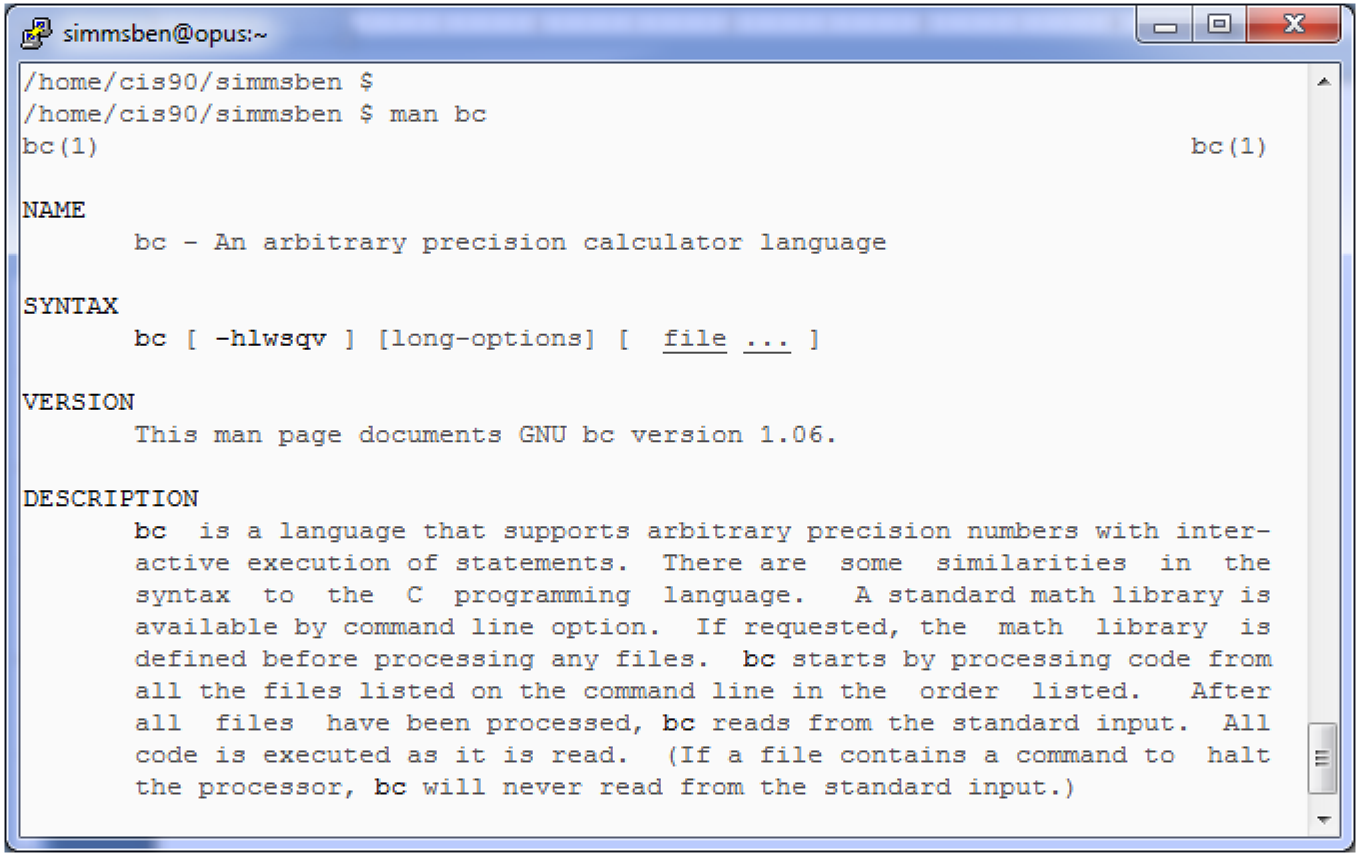
Need a fresh start -- just log out and back in again and your path will be back to normal!

Docs

Using man (manual) pages

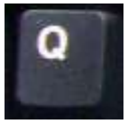
*Type the **man** command followed by the name of the command you want documentation on.*

Example: **man bc**



```
/home/cis90/simmsben $
/home/cis90/simmsben $ man bc
bc(1)                                                                    bc(1)

NAME
       bc - An arbitrary precision calculator language

SYNTAX
       bc [ -hlwsqv ] [long-options] [  file ... ]

VERSION
       This man page documents GNU bc version 1.06.

DESCRIPTION
       bc  is a language that supports arbitrary precision numbers with inter-
       active execution of statements.  There are  some  similarities  in  the
       syntax  to  the  C  programming  language.   A standard math library is
       available by command line option.  If requested, the  math  library  is
       defined before processing any files.  bc starts by processing code from
       all the files listed on the command line in the  order  listed.   After
       all  files  have been processed, bc reads from the standard input.  All
       code is executed as it is read.  (If a file contains a command to  halt
       the processor, bc will never read from the standard input.)
```

Use these keys to scroll

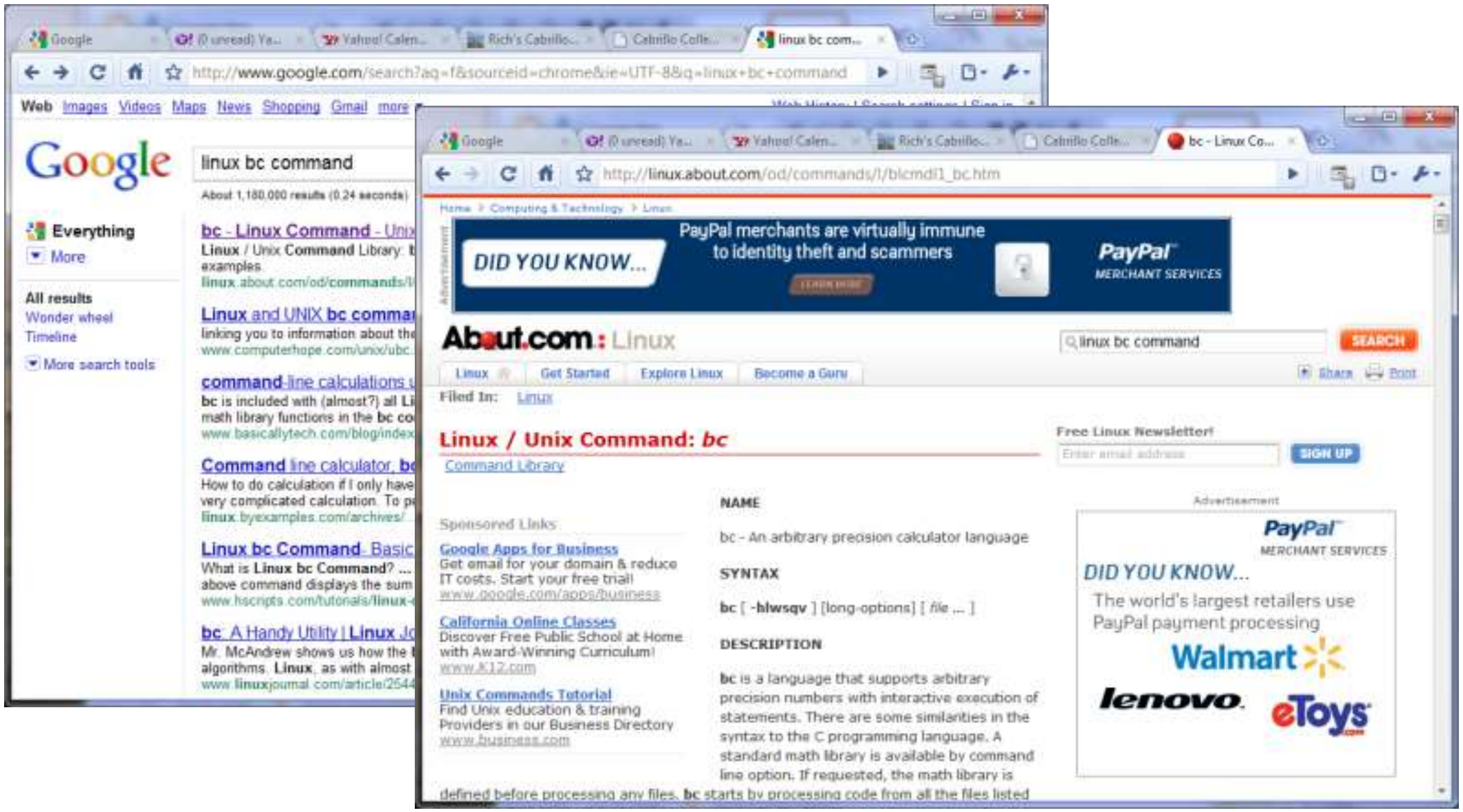


Use q key to quit

Using Google

Do a Google search on "linux xxx command" where xxx is the command you want documentation for.

Example: **google** linux bc command



http://www.google.com/search?aq=f&sourceid=chrome&ie=UTF-8&q=linux+bc+command

linux bc command

About 1,180,000 results (0.24 seconds)

bc - Linux Command - Unix
Linux / Unix Command Library: b
examples
linux.about.com/od/commands/l/

Linux and UNIX bc comma
linking you to information about the
www.computerhope.com/unix/ubc

command-line calculations u
bc is included with (almost?) all Li
math library functions in the bc co
www.basicallytech.com/blog/index

Command line calculator, bc
How to do calculation if I only have
very complicated calculation. To p
linux.byexamples.com/archives/

Linux bc Command. Basic
What is Linux bc Command? ...
above command displays the sum
www.hscripts.com/tutorials/linux-

bc: A Handy Utility | Linux Jo
Mr. McAndrew shows us how the b
algorithms. Linux, as with almost
www.linuxjournal.com/article/2544

http://linux.about.com/od/commands/l/blcmdl1_bc.htm

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About.com: Linux

linux bc command

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Linux / Unix Command: bc

Command Library

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www.business.com

NAME

bc - An arbitrary precision calculator language

SYNTAX

bc [-hlwsqv] [long-options] [*file* ...]

DESCRIPTION

bc is a language that supports arbitrary precision numbers with interactive execution of statements. There are some similarities in the syntax to the C programming language. A standard math library is available by command line option. If requested, the math library is defined before processing any files. bc starts by processing code from all the files listed

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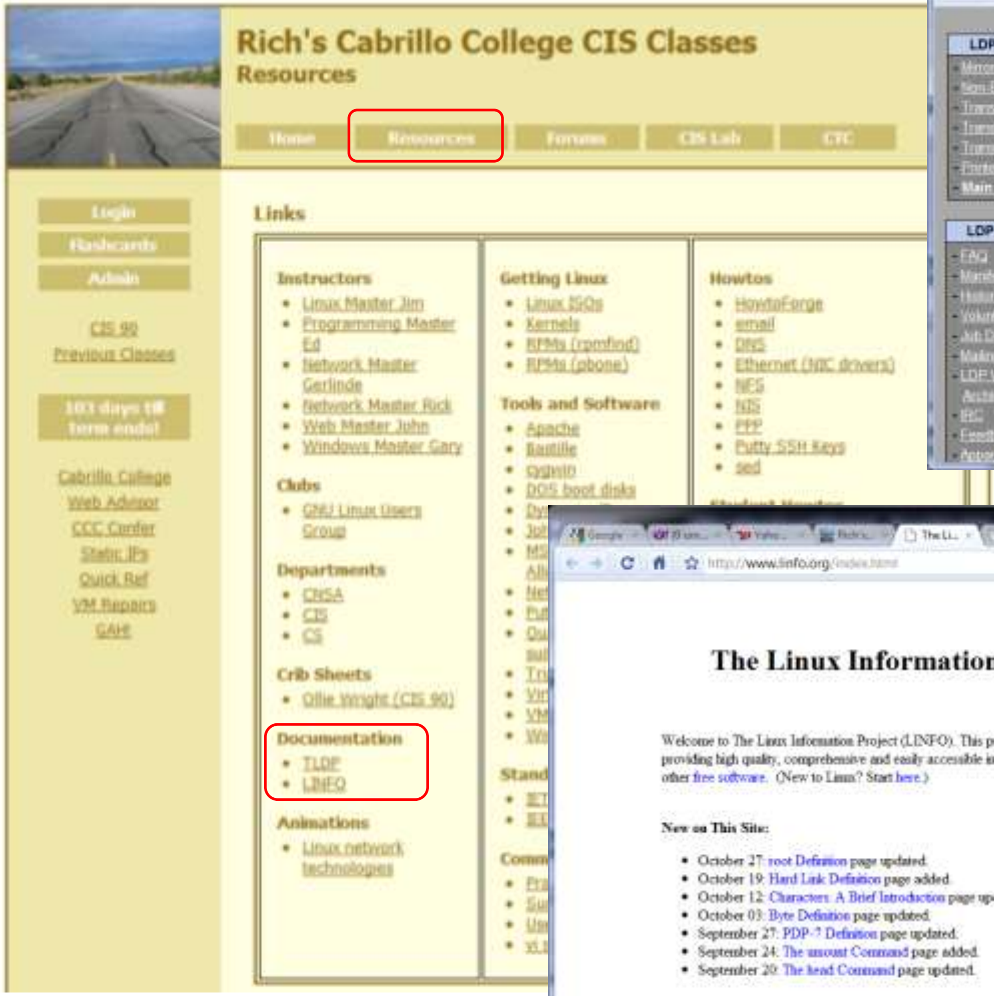
Other Documentation

- **whatis** *command* *same as the **man –f** command*
- **apropos** *command* *same as the **man –k** command*
- **info** *command*

Documentation

Two of my favorite documentation links



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Resources

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Login
Flashcards
Admin

CIS 90
Previous Classes

103 days till term ends!

Cabrillo College
Web Advisor
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Static IPs
Quick Ref
VM Repairs
GAH!

Links

Instructors
- Linux Master Jim
- Programming Master Ed
- Network Master Gerlinde
- Network Master Rick
- Web Master John
- Windows Master Gary

Clubs
- GNU Linux Users Group

Departments
- CNSA
- CIS
- CS

Crib Sheets
- Ollie Wright (CIS 90)

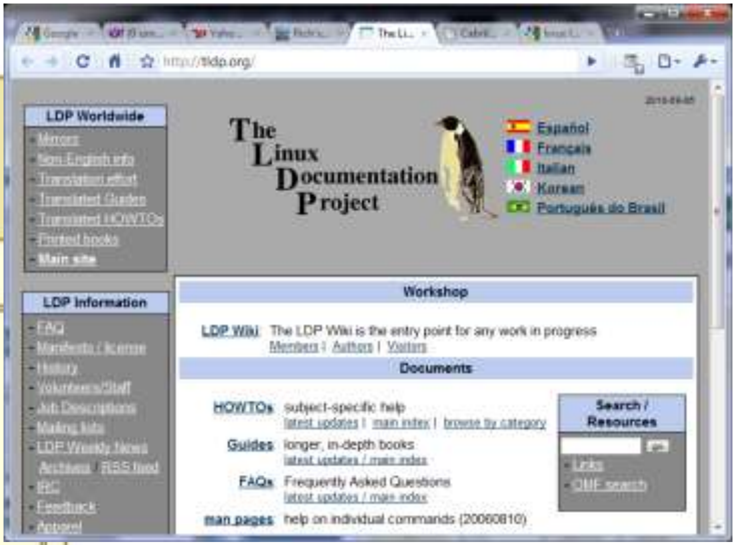
Documentation
- TLDP
- LINFO

Animations
- Linux network technologies

Getting Linux
- Linux ISOs
- Kernels
- RPMs (rpmfind)
- RPMs (pbone)

Tools and Software
- Apache
- Bastille
- cygwin
- DOS boot disks

Howtos
- HowtoForge
- email
- DNS
- Ethernet (NIC drivers)
- NFS
- NIS
- PPP
- Putty SSH Keys
- sed



http://tldp.org/

LDP Worldwide
- Mirrors
- Non-English info
- Translation effort
- Translated Guides
- Translated HOWTOs
- Printed books
- Main site

The Linux Documentation Project

Español
Français
Italian
Korean
Português do Brasil

LDP Information
- FAQ
- Manifesto / license
- History
- Volunteers/Staff
- Job Descriptions
- Mailing lists
- LDP Weekly News
  Archives / RSS feed
- IRC
- Feedback
- Apparel

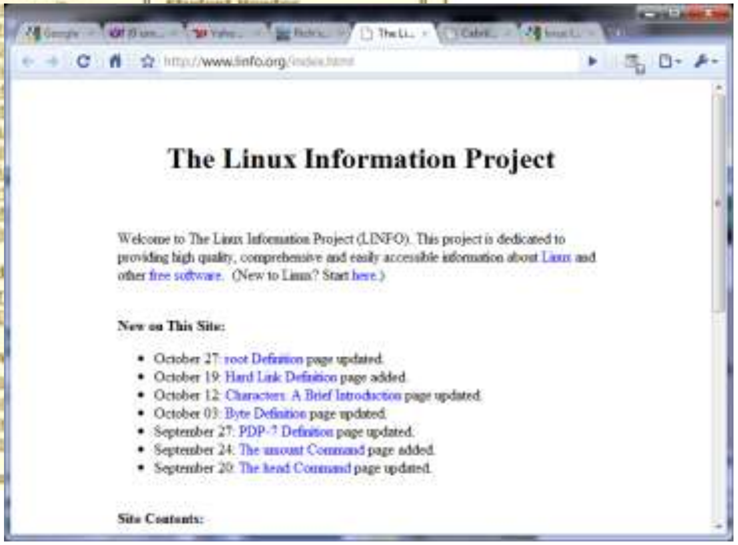
Workshop

LDP Wiki	The LDP Wiki is the entry point for any work in progress Members | Authors | Visitors

Documents

HOWTOs	subject-specific help latest updates | main index | browse by category
Guides	longer, in-depth books latest updates / main index
FAQs	Frequently Asked Questions latest updates / main index
man pages	help on individual commands (20060810)

Search / Resources
- Links
- OMF search



http://www.linfo.org/index.html

The Linux Information Project

Welcome to The Linux Information Project (LINFO). This project is dedicated to providing high quality, comprehensive and easily accessible information about Linux and other free software. (New to Linux? Start here.)

New on This Site:

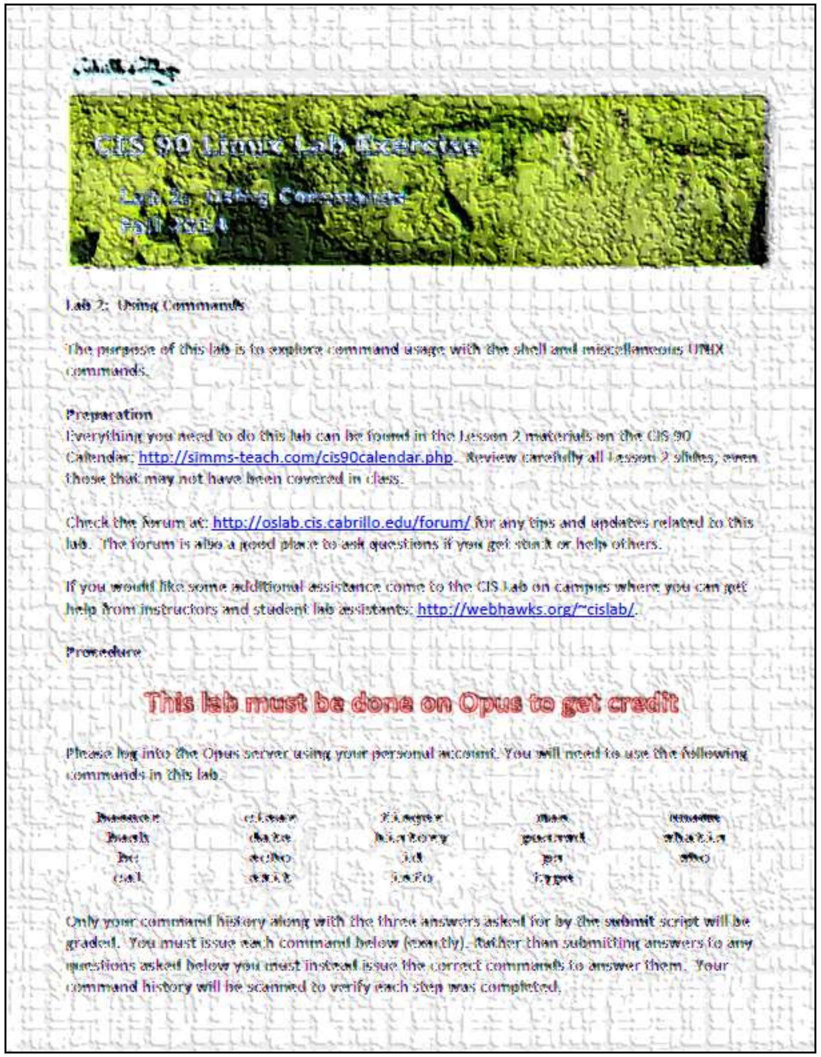
- October 27: root Definition page updated.
- October 19: Hard Link Definition page added.
- October 12: Characters: A Brief Introduction page updated.
- October 03: Byte Definition page updated.
- September 27: PDP-7 Definition page updated.
- September 24: The umount Command page added.
- September 20: The head Command page updated.

Site Contents:

The Linux Documentation and Information Projects

Assignment

Lab 2 - Using Commands



CIS 90 Linux Lab Exercise

Lab 2: Using Commands
Fall 2014

Lab 2: Using Commands

The purpose of this lab is to explore command usage with the shell and miscellaneous UNIX commands.

Preparation
Everything you need to do this lab can be found in the Lesson 2 materials on the CIS 90 Calendar: http://simms-teach.com/cis90calendar.php. Review carefully all Lesson 2 slides, even those that may not have been covered in class.

Check the forum at: http://oslab.cis.cabrillo.edu/forum/ for any tips and updates related to this lab. The forum is also a good place to ask questions if you get stuck or help others.

If you would like some additional assistance come to the CIS Lab on campus where you can get help from instructors and student lab assistants: http://webhawks.org/~cislab/.

Procedure

This lab must be done on Opus to get credit

Please log into the Opus server using your personal account. You will need to use the following commands in this lab.

banner	clear	finger	man	uname
bash	date	history	passwd	whatis
bc	echo	id	ps	who
cal	exit	info	type	

Only your command history along with the three answers asked for by the **submit** script will be graded. You must issue each command below (exactly). Rather than submitting answers to any questions asked below you must instead issue the correct commands to answer them. Your command history will be scanned to verify each step was completed.

- This lab MUST be done on Opus to get credit
- You don't need to turn in answers for steps 1-22. However I will check your command history to verify you entered the correct commands to answer those questions.
- There are three questions to answer on the **submit** script.

Wrap up

New commands:

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

New Files and Directories:

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

Next Class

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

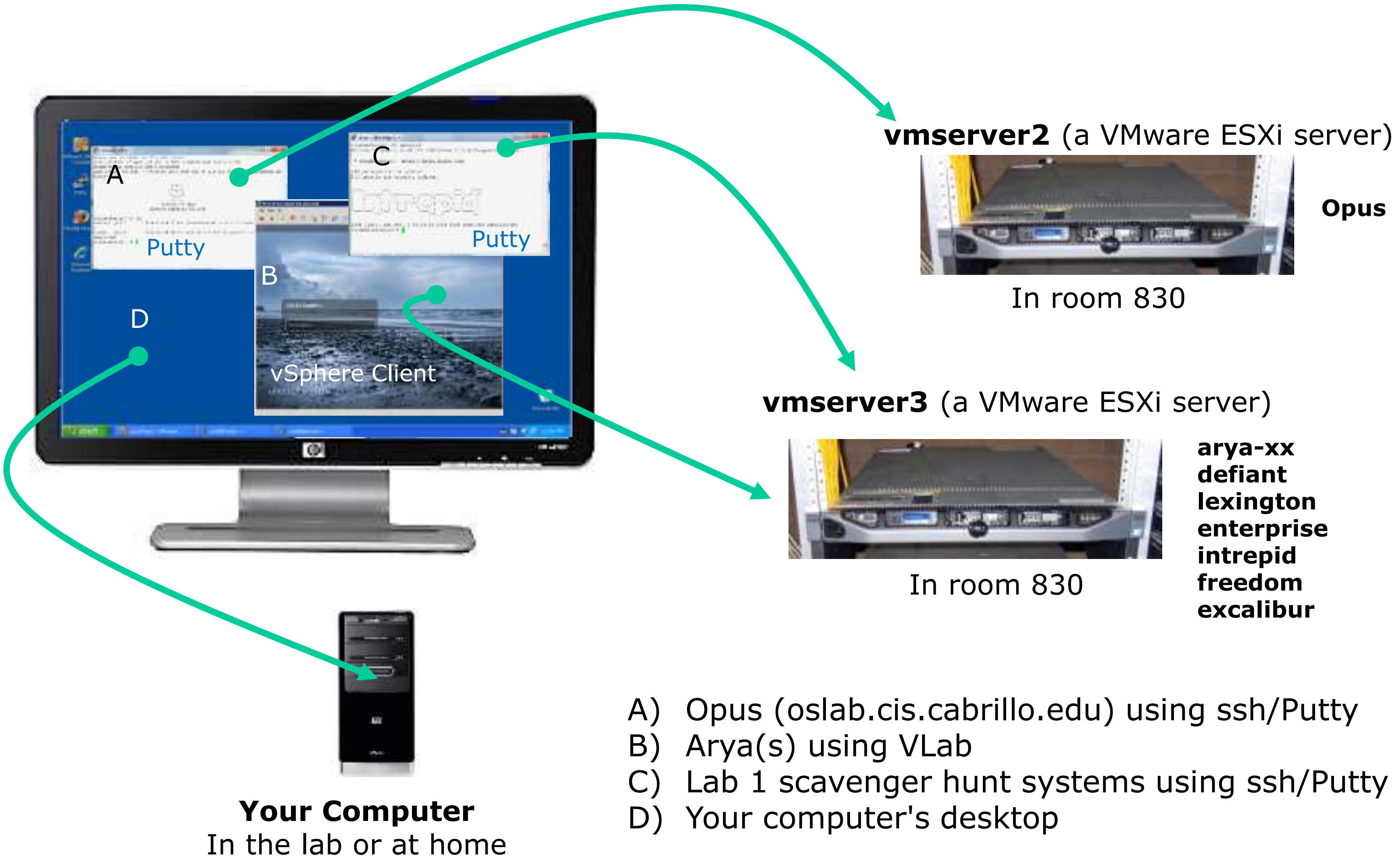
Lab #2

Quiz questions for next class:

- Which four directories typically contain the majority of the UNIX/Linux system commands?
- How do you show your path?
- What command would allow you to view the manual page for the who command?

Backup

Logging into the various CIS 90 systems from home or the lab

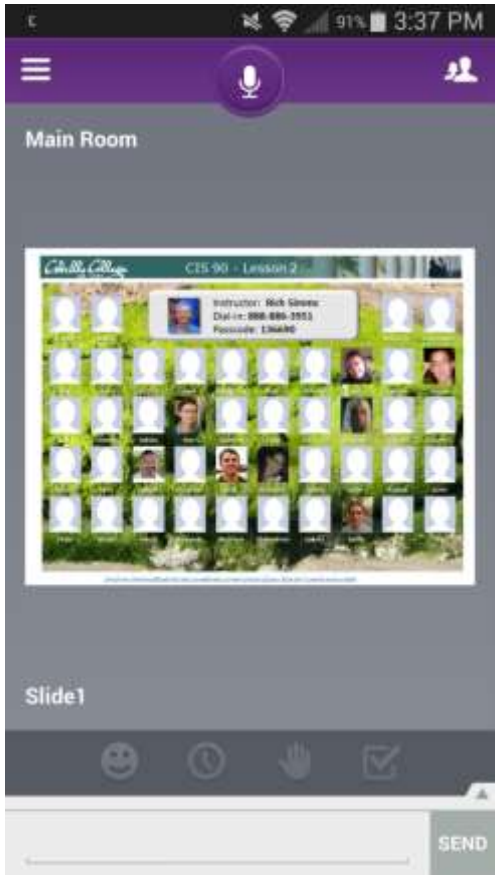


A) Opus (oslab.cis.cabrillo.edu) using ssh/Putty
B) Arya(s) using VLab
C) Lab 1 scavenger hunt systems using ssh/Putty
D) Your computer's desktop

FYI

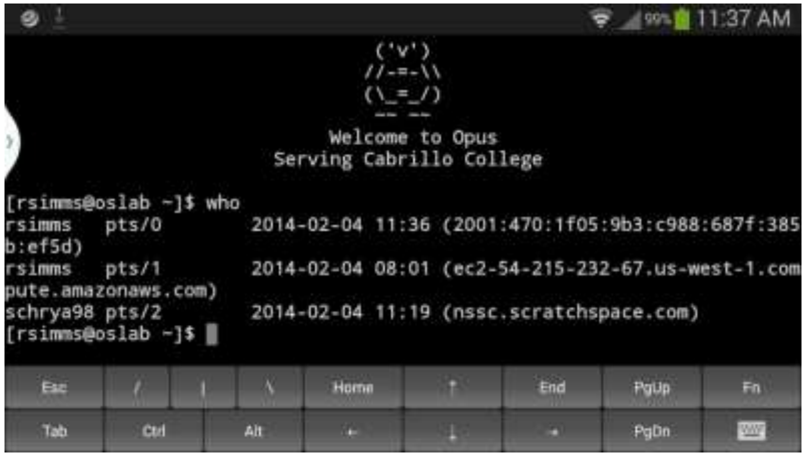
CIS 90 and Smartphones (Android)

Blackboard Collaborate App



Join CCC Confer virtual classroom

JuiceSSH - SSH Client app

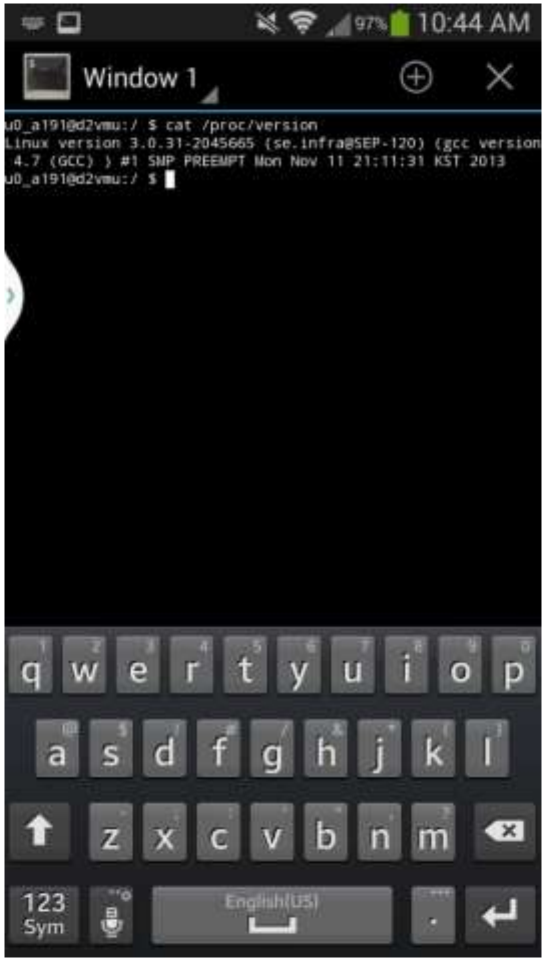


```
                    ('v')
                   //-=-\\
                   (\_=_/)
                    ^^ ^^
              Welcome to Opus
          Serving Cabrillo College

[rsimms@oslab ~]$ who
rsimms   pts/0        2014-02-04 11:36 (2001:470:1f05:9b3:c988:687f:385
b:ef5d)
rsimms   pts/1        2014-02-04 08:01 (ec2-54-215-232-67.us-west-1.com
pute.amazonaws.com)
schrya98 pts/2        2014-02-04 11:19 (nssc.scratchspace.com)
[rsimms@oslab ~]$
```

Login to to Opus

CIS 90 and Smartphones (Android)

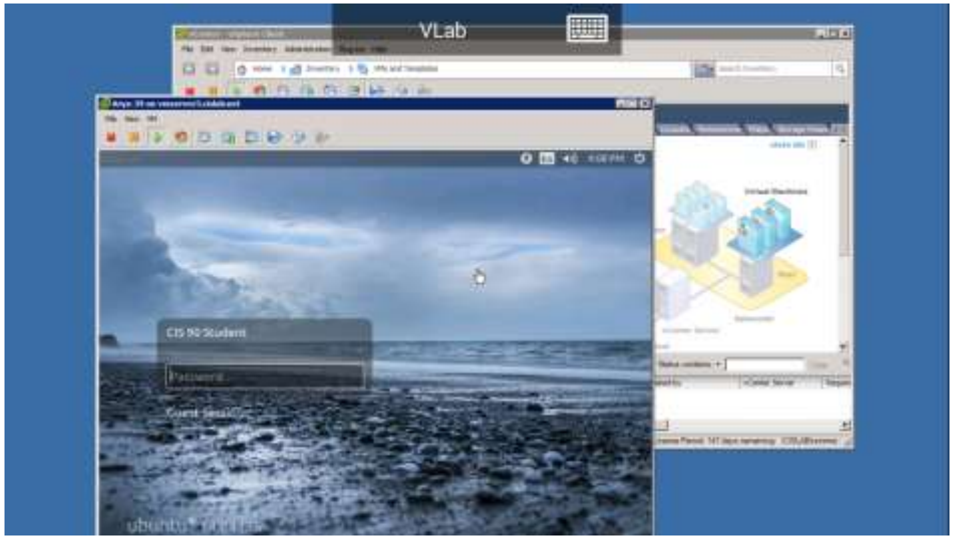
Android Terminal App



```
u0_a191@d2vmu:/ $ cat /proc/version
Linux version 3.0.31-2045665 (se.infra@SEP-120) (gcc version
 4.7 (GCC) ) #1 SMP PREEMPT Mon Nov 11 21:11:31 KST 2013
u0_a191@d2vmu:/ $ 
```

Viewing kernel version on smartphone

Microsoft RDP App



Running Arya VM in VLab

Terminals

Hardware Terminals

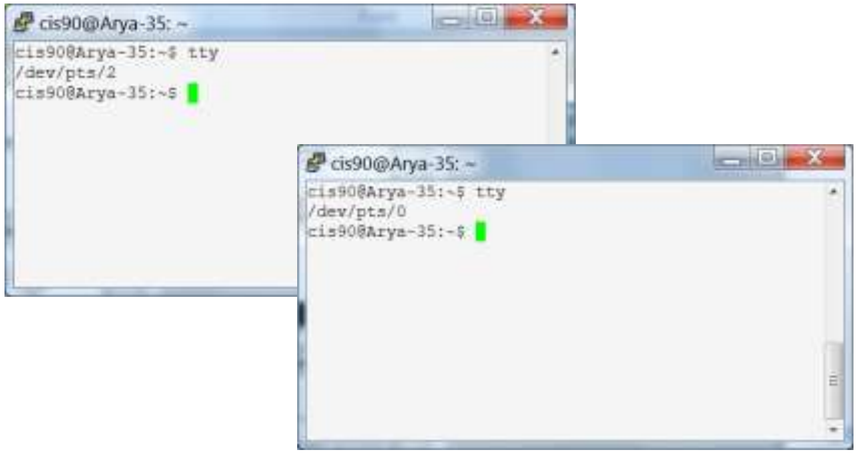
Teletype (TTY)

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.

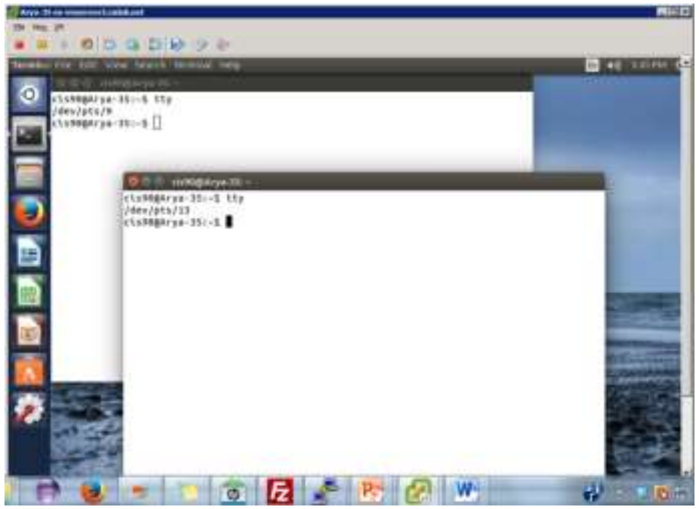
Software Terminals



```
cis90@Arya-35:~$ tty
/dev/pts/2
cis90@Arya-35:~$
```

```
cis90@Arya-35:~$ tty
/dev/pts/0
cis90@Arya-35:~$
```

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

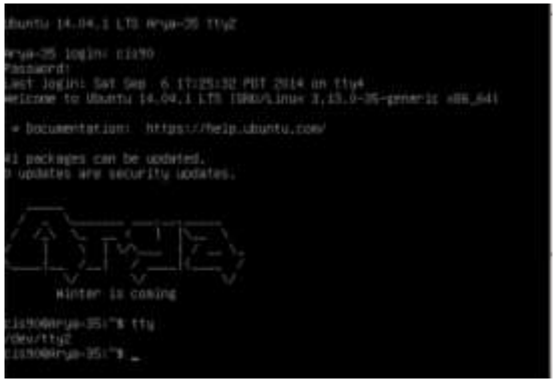


```
cis90@Arya-35:~$ tty
/dev/pts/9
cis90@Arya-35:~$
```

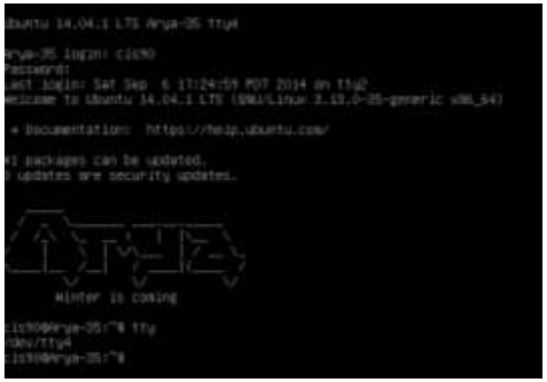
```
cis90@Arya-35:~$ tty
/dev/pts/13
cis90@Arya-35:~$
```

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



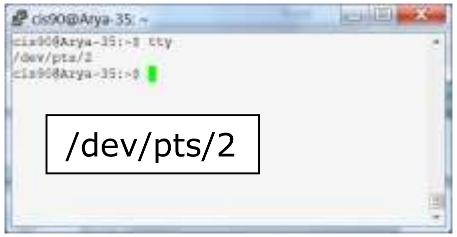
```
Ubuntu 14.04.1 LTS Arya-35 tty2

Arya-35 login: cis90
Password:
Last login: Sat Sep  6 17:25:32 PDT 2014 on tty4
Welcome to Ubuntu 14.04.1 LTS (GNU/Linux 3.13.0-35-generic x86_64)

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

41 packages can be updated.
0 updates are security updates.

      Winter is coming

cis90@Arya-35:~$ tty
/dev/tty2
cis90@Arya-35:~$ _
```

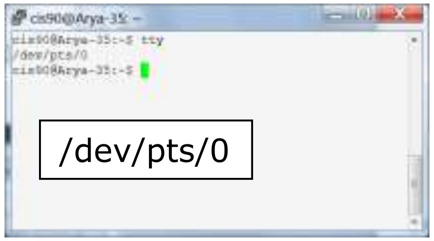


```
Ubuntu 14.04.1 LTS Arya-35 tty4

Arya-35 login: cis90
Password:
Last login: Sat Sep  6 17:24:59 PDT 2014 on tty2
Welcome to Ubuntu 14.04.1 LTS (GNU/Linux 3.13.0-35-generic x86_64)

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

41 packages can be updated.
0 updates are security updates.

      Winter is coming

cis90@Arya-35:~$ tty
/dev/tty4
cis90@Arya-35:~$
```

Various terminal devices on an Arya VM

Terminal emulators (e.g. Putty)

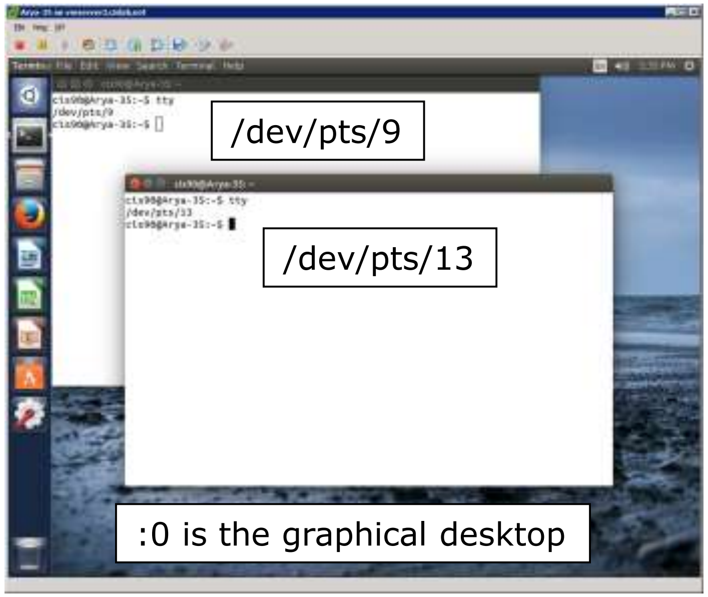

```
cis90@Arya-35:~$ tty
/dev/pts/2
cis90@Arya-35:~$
```


```
cis90@Arya-35:~$ tty
/dev/pts/0
cis90@Arya-35:~$
```

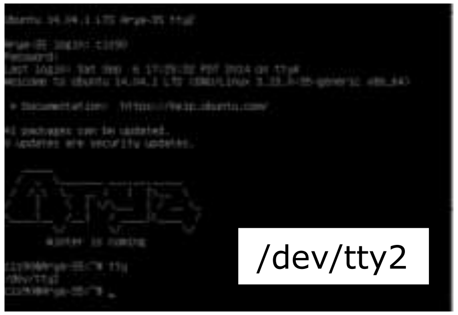
```
cis90@Arya-35:~$ who
cis90    tty4         2014-09-06 17:25
cis90    tty2         2014-09-06 17:25
cis90    pts/2        2014-09-06 17:20 (enterprise.cis.cabrillo.edu)
cis90    :0           2014-09-06 17:20 (:0)
cis90    pts/0        2014-09-06 17:21 (2601:9:6680:53b:4d09:e2b6:e7fc:d999)
cis90  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

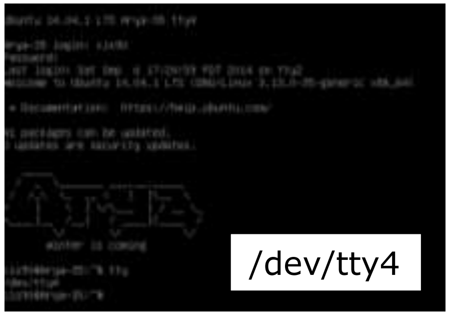
pts=pseudo terminal,
tty=teletype
:n=an X window display number

Graphical terminals on graphical desktop


```
cis90@Arya-35:~$ tty
/dev/pts/9
cis90@Arya-35:~$
```
```
cis90@Arya-35:~$ tty
/dev/pts/13
cis90@Arya-35:~$
```

Virtual terminals

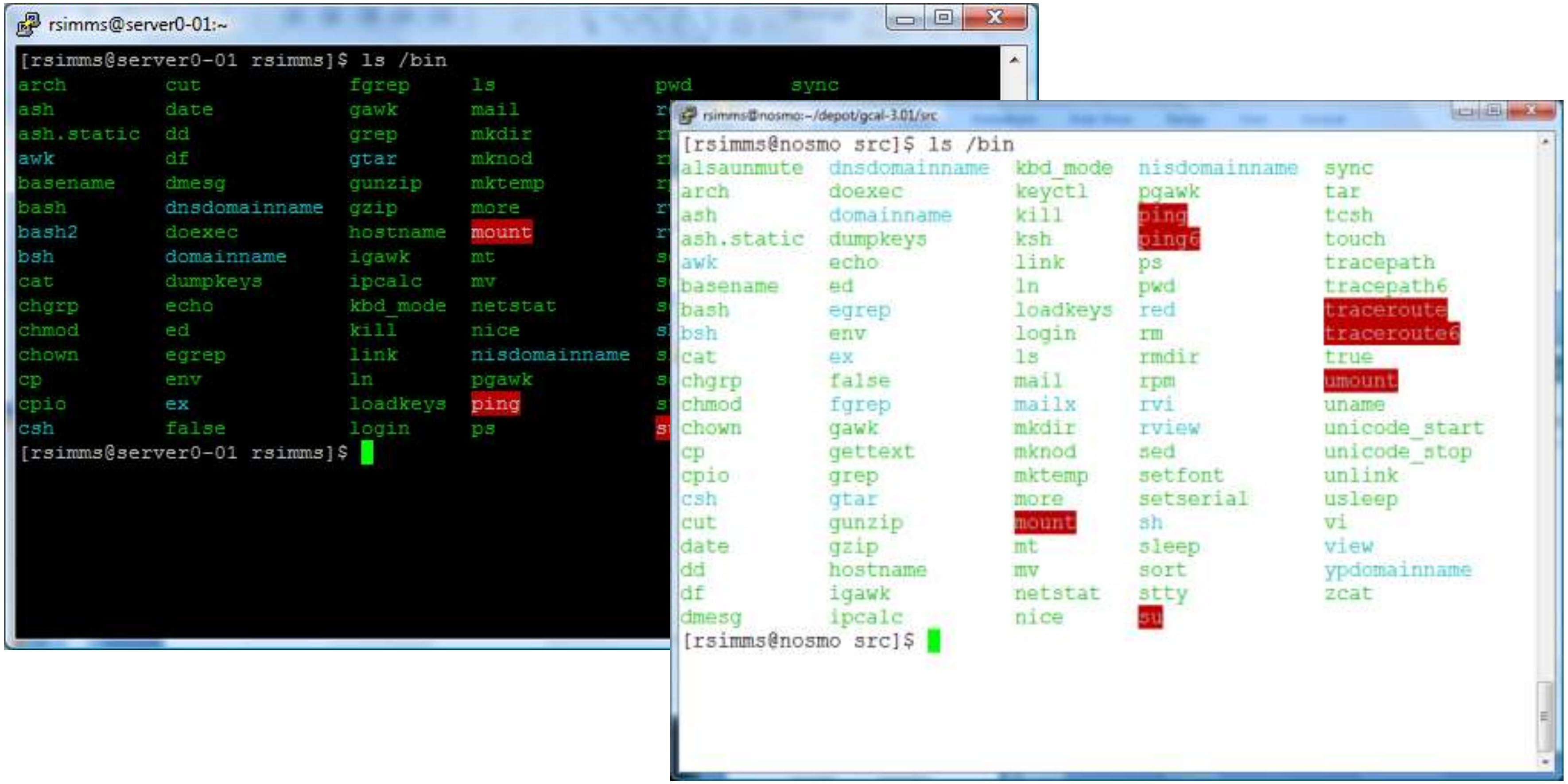




Putty
Tips

(Note: tty = teletype)

The Putty program



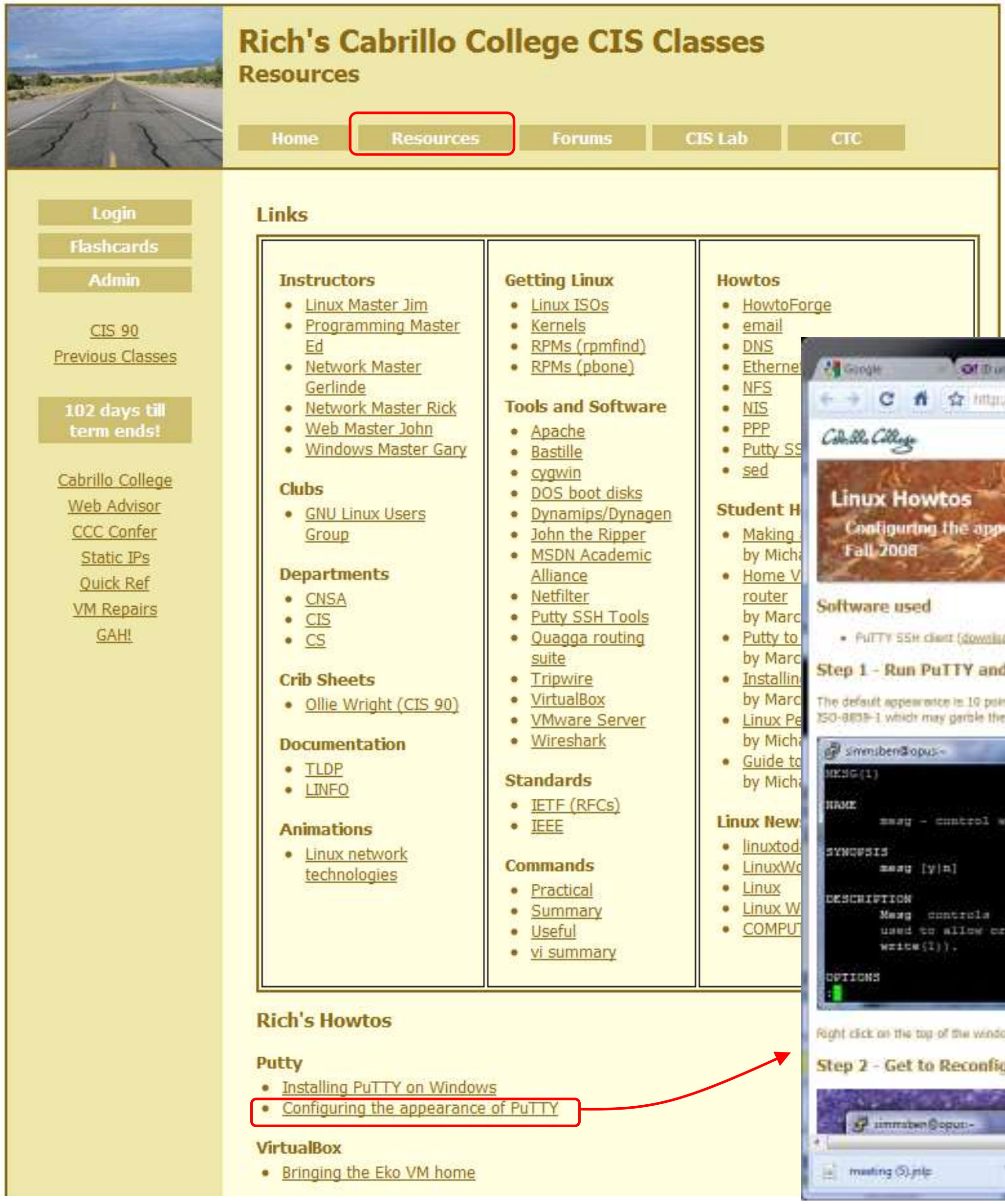
```
rsimms@server0-01:~
[rsimms@server0-01 rsimms]$ ls /bin
arch         cut             fgrep       ls              pwd        sync
ash          date            gawk        mail            r
ash.static   dd              grep        mkdir           r
awk          df              gtar        mknod           r
basename     dmesg           gunzip      mktemp          r
bash         dnsdomainname   gzip        more            r
bash2        doexec          hostname    mount           r
bsh          domainname      igawk       mt              s
cat          dumpkeys        ipcalc      mv              s
chgrp        echo            kbd_mode    netstat         s
chmod        ed              kill        nice            s
chown        egrep           link        nisdomainname   s
cp           env             ln          pgawk           s
cpio         ex              loadkeys    ping            s
csh          false           login       ps              s
[rsimms@server0-01 rsimms]$
```

```
rsimms@nosmo:~/depot/gcal-3.01/src
[rsimms@nosmo src]$ ls /bin
alsaunmute   dnsdomainname  kbd_mode   nisdomainname  sync
arch         doexec         keyctl     pgawk          tar
ash          domainname     kill       ping           tcsh
ash.static   dumpkeys       ksh        ping6          touch
awk          echo           link       ps             tracepath
basename     ed             ln         pwd            tracepath6
bash         egrep          loadkeys   red            traceroute
bsh          env            login      rm             traceroute6
cat          ex             ls         rmdir          true
chgrp        false          mail       rpm            umount
chmod        fgrep          mailx      rvi            uname
chown        gawk           mkdir      rview          unicode_start
cp           gettext        mknod      sed            unicode_stop
cpio         grep           mktemp     setfont        unlink
csh          gtar           more       setserial      usleep
cut          gunzip         mount      sh             vi
date         gzip           mt         sleep          view
dd           hostname       mv         sort           ypdomainname
df           igawk          netstat    stty           zcat
dmesg        ipcalc         nice       su
[rsimms@nosmo src]$
```

*Why does Putty sometimes have a **black background** and sometimes a **white background**?*

CIS 90 - Lesson 2

There is a Howto on the Resource page to walk you through customizing Putty



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GAH!

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- Network Master Gerlinde
- Network Master Rick
- Web Master John
- Windows Master Gary

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- CS

Crib Sheets
- Ollie Wright (CIS 90)

Documentation
- TLDP
- LINFO

Animations
- Linux network technologies

Getting Linux
- Linux ISOs
- Kernels
- RPMs (rpmfind)
- RPMs (pbone)

Tools and Software
- Apache
- Bastille
- cygwin
- DOS boot disks
- Dynamips/Dynagen
- John the Ripper
- MSDN Academic Alliance
- Netfilter
- Putty SSH Tools
- Quagga routing suite
- Tripwire
- VirtualBox
- VMware Server
- Wireshark

Standards
- IETF (RFCs)
- IEEE

Commands
- Practical
- Summary
- Useful
- vi summary

Howtos
- HowtoForge
- email
- DNS
- Etherne
- NFS
- NIS
- PPP
- Putty SS
- sed

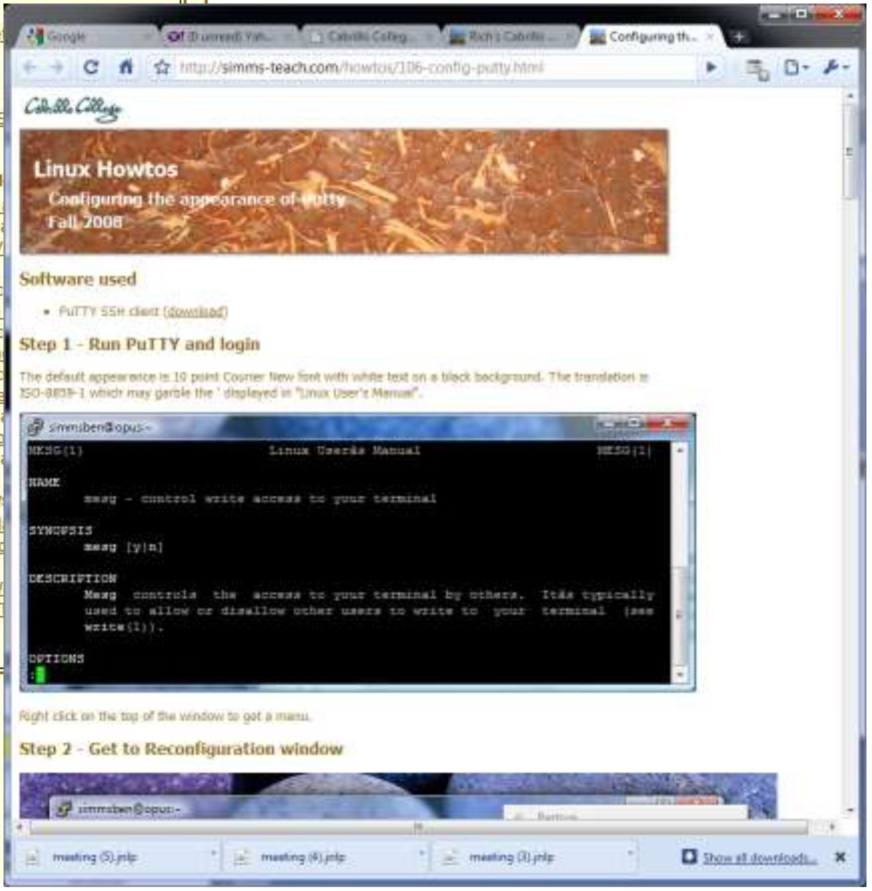
Student H
- Making by Micha
- Home V router by Marc
- Putty to by Marc
- Installin by Marc
- Linux Pe by Micha
- Guide to by Micha

Linux New
- linuxtod
- LinuxWo
- Linux
- Linux W
- COMPU

Rich's Howtos

Putty
- Installing PuTTY on Windows
- Configuring the appearance of PuTTY

VirtualBox
- Bringing the Eko VM home



Google | (1 unread) Yah... | Cabrillo Colleg... | Rich's Cabrillo ... | Configuring th...

http://simms-teach.com/howtos/106-config-putty.html

Linux Howtos
Configuring the appearance of Putty
Fall 2008

Software used
- PuTTY SSH client (download)

Step 1 - Run PuTTY and login

The default appearance is 10 point Courier New font with white text on a black background. The translation is ISO-8859-1 which may garble the ' displayed in "Linux User's Manual".

simmsben@opus:~

```
MESG(1)                    Linux Userâs Manual                    MESG(1)

NAME
       mesg - control write access to your terminal

SYNOPSIS
       mesg [y|n]

DESCRIPTION
       Mesg  controls  the  access to your terminal by others.  Itâs typically
       used to allow or disallow other users to write to  your  terminal  (see
       write(1)).

OPTIONS
:
```

Right click on the top of the window to get a menu.

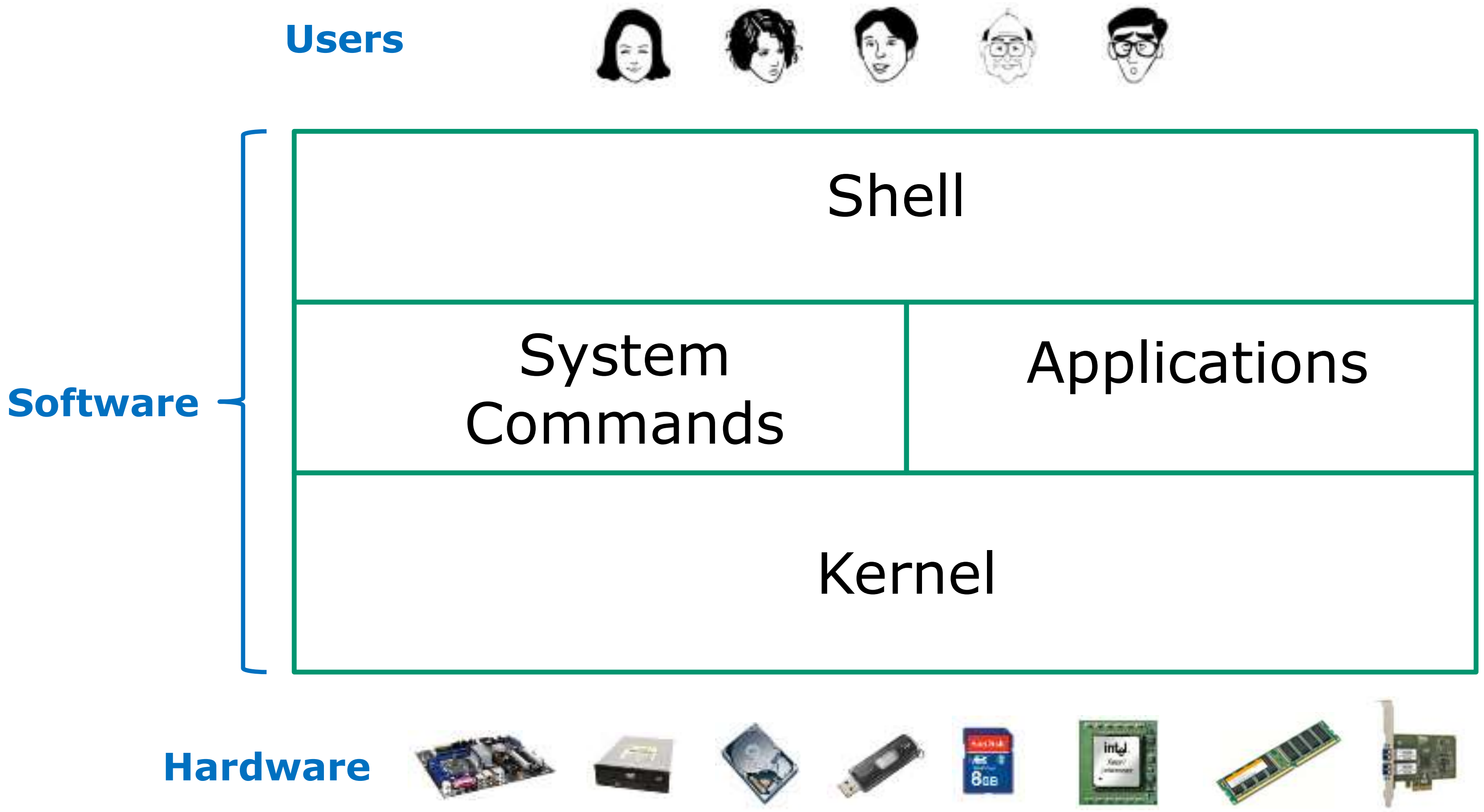
Step 2 - Get to Reconfiguration window

simmsben@opus:~

meeting (5).jnlp | meeting (4).jnlp | meeting (3).jnlp | Show all downloads...

Lesson 1 Review

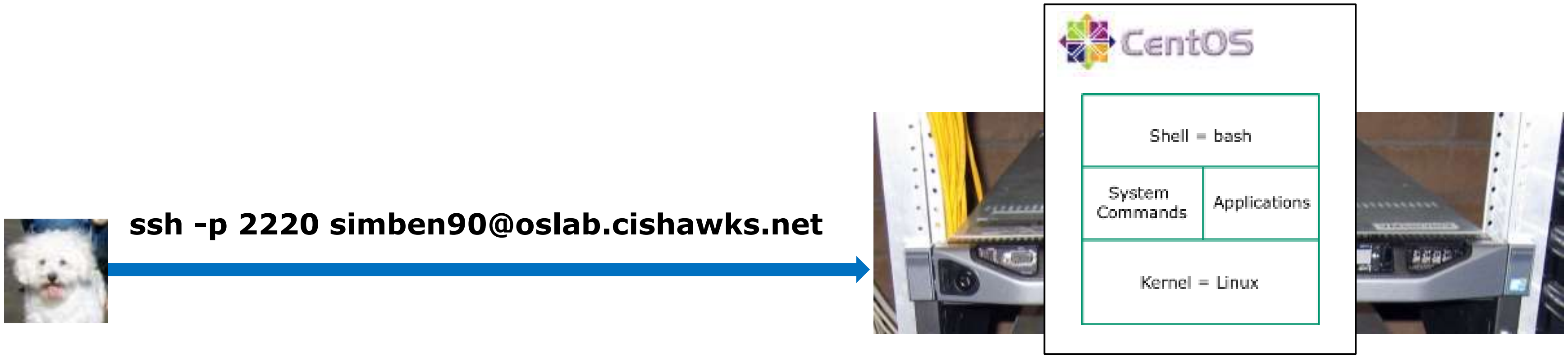
UNIX/Linux Architecture
Simplified View - Four Major Components



The Lesson 1 commands for your toolbox

cal	*Prints calendars*
date	*Shows the time and date*
clear	*Clears the screen*
exit	*Exits login session*
history	*Shows commands used previously*
id	*Shows your username and UID (and more)*
ps	*Shows your processes (including the name of the shell)*
ssh	*For connecting and logging into a remote computer*
hostname	*Shows the name of the computer being used*
uname	*Shows name of the operating system kernel*
cat /etc/issue	*Shows name of the "distro" (distribution)*
tty	*Shows which terminal device is being used*
who	*Shows all users who are logged in and from where*
who am i	*Like **who**, but only shows your login session*

"Name" Terminology



Opus AKA **oslab.cishawks.net** AKA **oslab.cis.cabrillo.edu**

Various "names" bandied about:	**To view:**
User's first and last **name**: Benji Simms	*/etc/passwd*
user**name** = simben90	**id**
name of terminal device used = /dev/pts/2	**tty**
(terminal type = xterm)	**echo $TERM**
host**name** = oslab.cishawks.net	**hostname**
Name of distro = CentOS	*/etc/issue*
Name of shell = bash	**ps**
Name of kernel = Linux	**uname**

Terminals types and devices

```
login as: simben90
simben90@oslab.cabrillo.edu's password:
Last login: Sat Sep  1 09:26:51 2012 from 50-0-68-
235.dsl.dynamic.fusionbroadband.com

                                    _
                                  ('v')
                                 //-=-\\
                                 (\_=_/)
                                  ~~ ~~
                            Welcome to Opus
                       Serving Cabrillo College

Terminal type? [xterm]
Terminal type is xterm.
/home/cis90/simben $ tty
/dev/pts/3
```

Hit Enter to accept

*The terminal type is **xterm***

*The terminal device for this session is **/dev/pts/3***

The **terminal type** is not the same as the **terminal device**

How can I print a calendar?

```
/home/cis90/simben $ cal
   September 2012
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 $ 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 $
```

*The **cal** command*

*Month and year **arguments***

A command can have arguments

What is the current time and date?

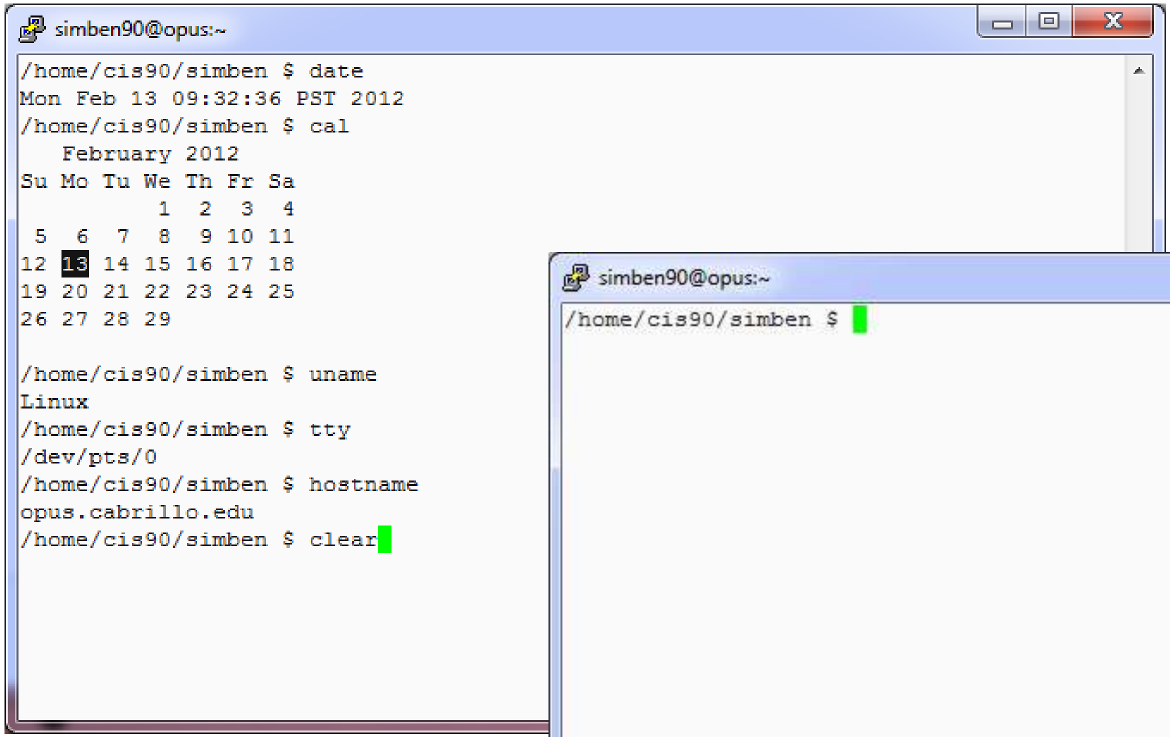
The shell "prompt"

The "command"

```
/home/cis90/simben $ date
Sat Sep  1 14:03:33 PDT 2012
/home/cis90/simben $
```

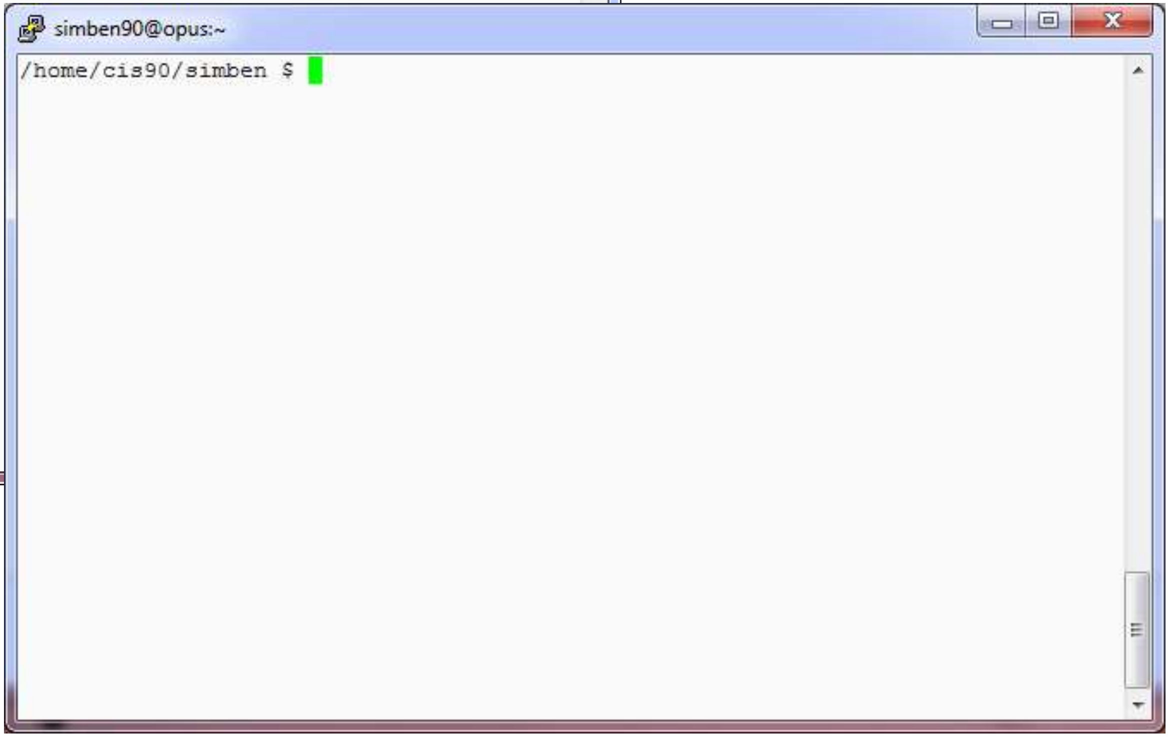
The prompt is output by the shell, you type the command

How do I clear the screen?



simben90@opus:~

```
/home/cis90/simben $ date
Mon Feb 13 09:32:36 PST 2012
/home/cis90/simben $ cal
   February 2012
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

/home/cis90/simben $ uname
Linux
/home/cis90/simben $ tty
/dev/pts/0
/home/cis90/simben $ hostname
opus.cabrillo.edu
/home/cis90/simben $ clear
```



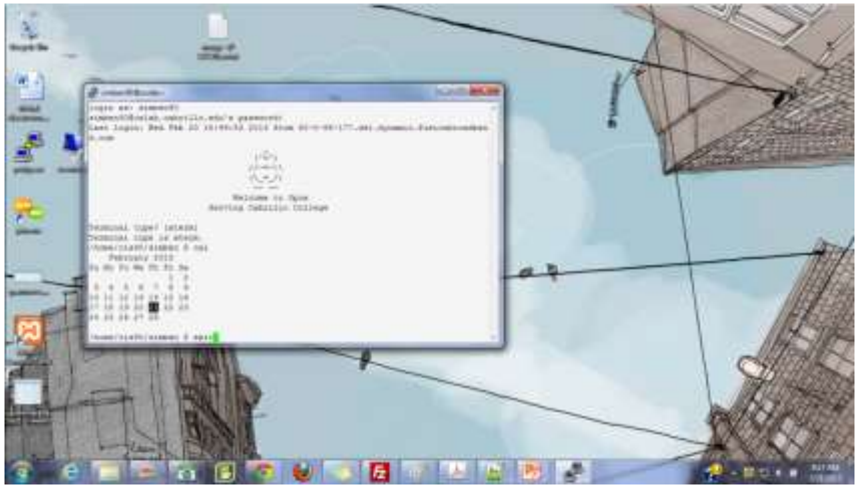
simben90@opus:~

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

The **clear** command scrolls previous commands out of sight

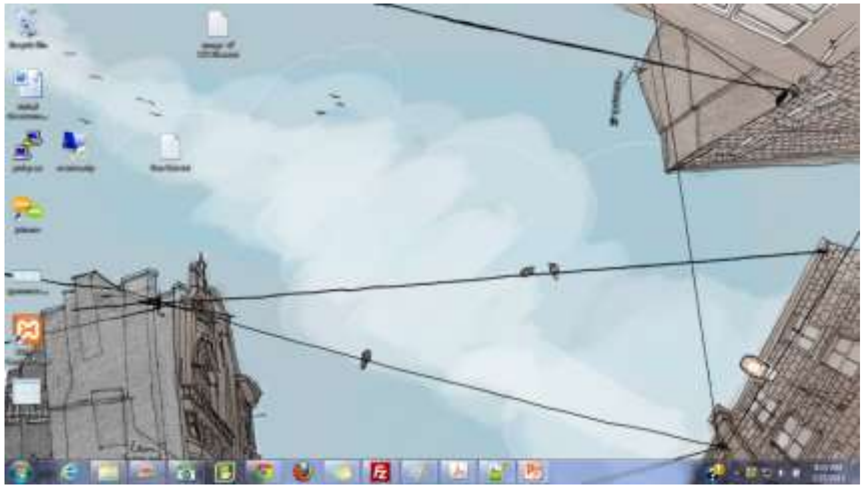
How do I end this login session?

before **exit**



```
login as: [illegible]
[illegible]@oslab.cabrillo.edu's password:
Last login: [illegible]

                    Welcome to Opus
                 Serving Cabrillo College

Terminal type? [xterm]
Terminal type is xterm.
[illegible] $ cal
    February 2013
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

[illegible] $ exit
```

after **exit**



The **exit** command ends the session and the terminal window disappears ... POOF!

Viewing your command history

```
/home/cis90/simben $ history
    1  hostname
    2  exit
    3  who
    4  who -q
    5  ps -e
< snipped >
  177  cal 9 2001
  178  exit
  179  who
  180  cal
  181  tty
  182  uname
  183  ps
  184  id
  185  exit
  186  history
/home/cis90/simben $
```

*The **history** command outputs the commands used previously … even from previous login sessions*

Tip: Use the "Up Arrow" key to quickly re-issue a previous command!

What is the UID (User ID) for my account or other accounts?

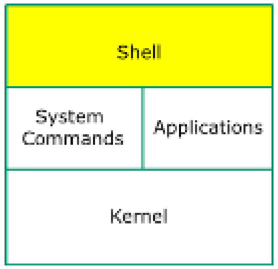
```
/home/cis90/simben $ id
uid=1001(simben90) gid=190(cis90) groups=190(cis90),100(users)
context=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023

/home/cis90/simben $ id milhom90
uid=1002(milhom90) gid=190(cis90) groups=190(cis90),100(users)

/home/cis90/simben $ id simben90
uid=1001(simben90) gid=190(cis90) groups=190(cis90),100(users)
```

Usernames

UID's (user ID numbers)

We are all just numbers to the Linux kernel

What shell am I using?



```
/home/cis90/simben $ ps
  PID TTY          TIME CMD
28994 pts/0    00:00:00 bash
29093 pts/0    00:00:00 ps
```

Process ID numbers

Terminal device being used

*the shell is sleeping and waiting for **ps** command to finish*

***ps** command is running as it outputs this*

The **ps** command outputs the current processes you own including the shell program you are using

How do I log into another computer system?

*Method 1: The **ssh** command using a hostname*

username on remote computer

Hostname of remote computer

Notice how the prompt changes on the remote computer

```
/home/cis90/simben $ ssh cis90@p06-arwen
cis90@p06-arwen's password:
Welcome to Linux Mint 15 Olivia (GNU/Linux 3.8.0-26-generic x86_64)

Welcome to Linux Mint
 * Documentation:  http://www.linuxmint.com
Last login: Sun Sep  8 09:52:00 2013
cis90@p06-arwen:~ >
```

*Note: You can also **ssh** into the same computer you are currently using for an additional session.*

How do I log into another computer system?

*Method 1: The **ssh** command using am IP address*

username on remote computer *IP address of remote computer*

Notice how the prompt changes on the remote computer

```
/home/cis90/simben $ ssh cis90@172.20.4.34
cis90@172.20.4.34's password:
Welcome to Ubuntu 12.04.1 LTS (GNU/Linux 3.2.0-29-generic x86_64)

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

361 packages can be updated.
109 updates are security updates.

Last login: Wed Feb 20 17:26:25 2013 from oslab.cabrillo.edu
cis90@frodo-108:~$
```

What is the name of the computer I'm interacting with?

```
/home/cis90/simben $ **hostname**
oslab.cishawks.net
```

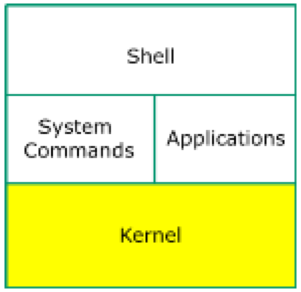
```
         _
       ('v')
      //-=-\\
      (\_=_/)
       ~~ ~~
  Welcome to Opus
Serving Cabrillo College
```

We still refer to Opus as "Opus" in this class however it's official hostname on the Internet is "oslab". This may change in the future after some network changes are made.

Opus is a member of two overlapping Internet domains:

- The **cis.cabrillo.edu** domain is a sub-domain of the college's domain.
- The **cishawks.net** domain is an alternate domain put in place to alleviate some DNS issues experienced during the CIS Lab move to building 800.

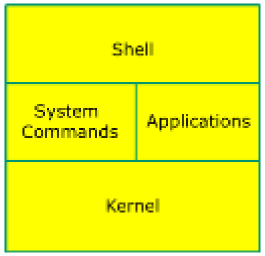
What kernel am I running on?



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

The **uname** command (with no arguments) outputs the name of the operating system kernel

What "distro" has been installed?



```
/home/cis90/simben $ cat /etc/issue
CentOS release 6.2 (Final)
Kernel \r on \l

/home/cis90/simben $ cat /etc/*-release
CentOS release 6.2 (Final)
CentOS release 6.2 (Final)
CentOS release 6.2 (Final)
```

Catting out these files *usually* will show the distro name

What terminal device am I using?

```
/home/cis90/simben $ tty
/dev/pts/5
```

The **terminal type** is not the same as the **terminal device**

Who else is logged in and from where?

when they logged in

```
/home/cis90/simben $ who
simben90 pts/0        2013-02-21 08:17 (50-0-68-28.dsl.dynamic.fusion.com)
simben90 pts/1        2013-02-21 08:45 (50-0-68-28.dsl.dynamic.fusion.com)
milhom90 pts/2        2013-02-21 08:46 (50-0-68-28.dsl.dynamic.fusion.com)
rsimms   pts/4        2013-02-21 08:46 (50-0-68-28.dsl.dynamic.fusion.com)
rodduk90 pts/7        2013-02-21 08:46 (50-0-68-28.dsl.dynamic.fusion.com)
simben90 pts/8        2013-02-21 08:49 (172.20.4.34)
milhom90 pts/9        2013-02-21 08:50 (sun-hwa.cislab.net)
```

username

terminal device (pts/5 = /dev/pts/5)

where they logged in from (hostname or IP address)

The who command shows who is logged in, their terminal device, when they logged in and from where they logged in

Which is my login session?

```
/home/cis90/simben $ who
simben90 pts/0        2013-02-21 08:17 (50-0-68-28.dsl.dynamic.fusion.com)
simben90 pts/1        2013-02-21 08:45 (50-0-68-28.dsl.dynamic.fusion.com)
milhom90 pts/2        2013-02-21 08:46 (50-0-68-28.dsl.dynamic.fusion.com)
rsimms   pts/4        2013-02-21 08:46 (50-0-68-28.dsl.dynamic.fusion.com)
rodduk90 pts/7        2013-02-21 08:46 (50-0-68-28.dsl.dynamic.fusion.com)
simben90 pts/8        2013-02-21 08:49 (172.20.4.34)
milhom90 pts/9        2013-02-21 08:50 (sun-hwa.cislab.net)

/home/cis90/simben $ who am i
simben90 pts/0        2013-02-21 08:17 (50-0-68-177.dsl.dynamic.fusion.com)

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

When logged in multiple times use the terminal device to distinguish the sessions

Test your knowledge

What's the name of the terminal device I'm using right now?

```
login as: simben90
simben90@oslab.cabrillo.edu's password:
Last login: Sat Sep  1 09:26:51 2012 from 172.30.90.83

                                 _
                               ('v')
                              //-=-\\
                              (\_=_/)
                               ~~ ~~
                           Welcome to Opus
                       Serving Cabrillo College

Terminal type? [xterm]
Terminal type is xterm.
/home/cis90/simben $
```

What's the name of the terminal device I'm using right now?

```
login as: simben90
simben90@oslab.cabrillo.edu's password:
Last login: Sat Sep  1 09:26:51 2012 from 172.30.90.83

                                   _
                                 ('v')
                                //-=-\\
                                (\_=_/)
                                 ~~ ~~
                            Welcome to Opus
                        Serving Cabrillo College

Terminal type? [xterm]
Terminal type is xterm.
/home/cis90/simben $
/home/cis90/simben $ tty
/dev/pts/0
/home/cis90/simben $
```

Answer: /dev/pts/0

*Use the **tty** command to find out*

What type of terminal am I using right now?

```
login as: simben90
simben90@oslab.cabrillo.edu's password:
Last login: Sat Sep  1 09:26:51 2012 from 172.30.90.83

                                   _
                                 ('v')
                                //-=-\\
                                (\_=_/)
                                 ~~ ~~
                            Welcome to Opus
                        Serving Cabrillo College

Terminal type? [xterm]
Terminal type is xterm.
/home/cis90/simben $
```

What type of terminal am I using right now?

```
login as: simben90
simben90@oslab.cabrillo.edu's password:
Last login: Sat Sep  1 09:26:51 2012 from 172.30.90.83
                                  _
                                ('v')
                               //-=-\\
                               (\_=_/)
                                ~~ ~~
                            Welcome to Opus
                        Serving Cabrillo College

Terminal type? [xterm]
Terminal type is xterm.
/home/cis90/simben $
```

Answer: xterm

We have the answer already!

What is the hostname of the computer I'm using?

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

What is the hostname of the computer I'm using?

```
/home/cis90/simben $
/home/cis90/simben $ hostname
oslab.cabrillo.edu
/home/cis90/simben $
```

Answer: oslab.cabrillo.edu

*Use the **hostname** command to find out*

What is the name of the OS (operating System) kernel?

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

What is the name of the OS (operating System) kernel?

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

*Use the **uname** command to find out*

Answer: Linux

What is the name of the Linux Distribution being run?

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

What is the name of the Linux Distribution being run?

```
/home/cis90/simben $ cat /etc/issue
CentOS release 6.2 (Final)
Kernel \r on \l

/home/cis90/simben $ cat /etc/*-release
CentOS release 6.2 (Final)
CentOS release 6.2 (Final)
CentOS release 6.2 (Final)
/home/cis90/simben $
```

Answer: CentOS

*Use either **cat /etc/issue** or **cat /etc/*-release** to find out*

What is my username and uid (user ID number)?

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

What is my username and uid (user ID number)?

```
/home/cis90/simben $
/home/cis90/simben $ id
uid=1001(simben90) gid=190(cis90)
groups=190(cis90),100(users)
context=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023
/home/cis90/simben $
```

Answer: username=simben90 and the uid=1001

*Use the **id** command to find out*

What is the name of the shell I’m using?

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

What is the name of the shell I’m using?

```
/home/cis90/simben $
/home/cis90/simben $ ps
  PID TTY          TIME CMD
28237 pts/0    00:00:00 bash
28752 pts/0    00:00:00 ps
/home/cis90/simben $
```

Answer: bash

*Use the **ps** command to find out.*

We will soon learn another command for doing this.