



Rich's lesson module checklist

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

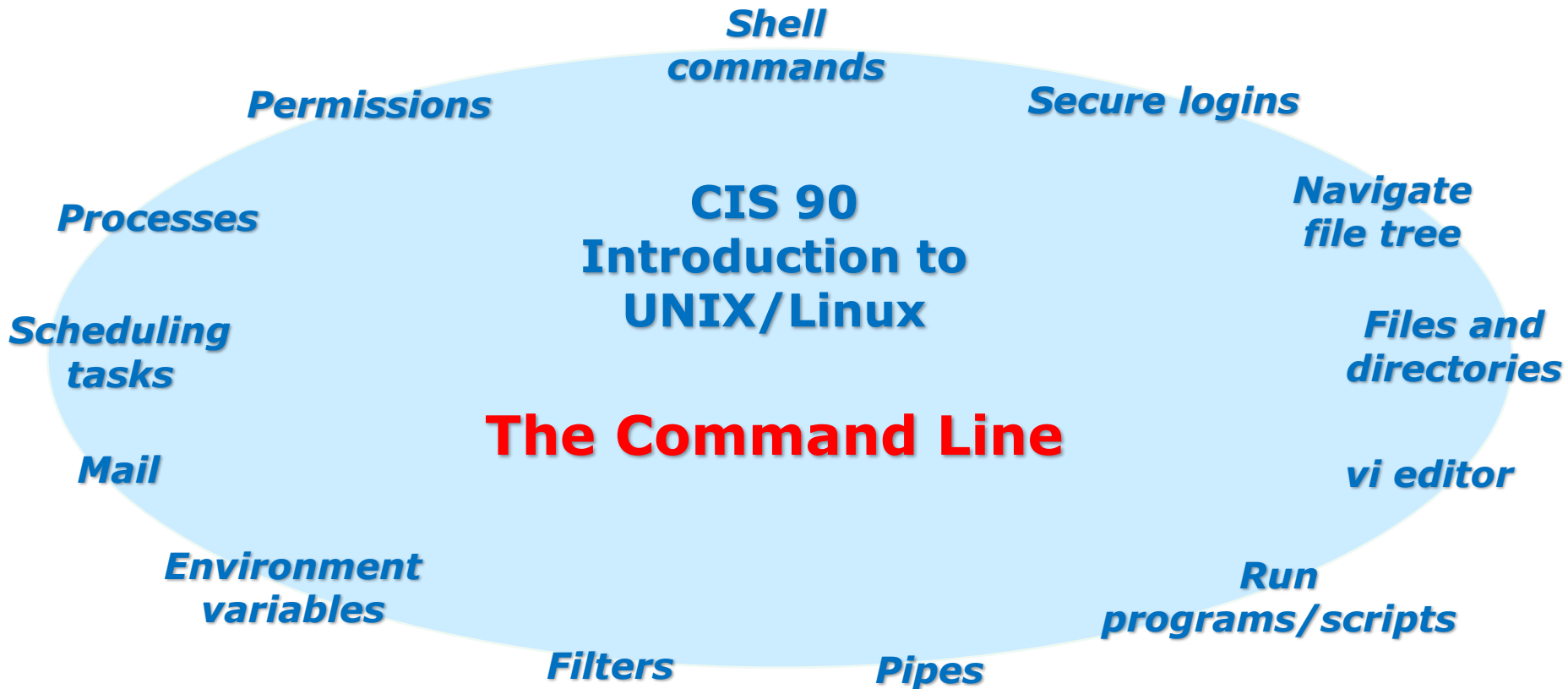
- ☐ Flash cards
- ☐ Page numbers
- ☐ 1st minute quiz
- ☐ Web Calendar summary
- ☐ Web book pages
- ☐ Commands

- ☐ Lock turnin directory at midnight
 - at 12:00 am thursday
 - chmod 700 /home/cis90/bin/submit
 - chmod 700 /home/turnin/cis90
 - ctrl d

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

- ☐ Lab 6 updated and tested
- ☐ Put uhistory in /home/rsimms/uhistory

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



Student Learner Outcomes

1. Navigate and manage the UNIX/Linux file system by viewing, copying, moving, renaming, creating, and removing files and directories.
2. Use the UNIX features of file redirection and pipelines to control the flow of data to and from various commands.
3. With the aid of online manual pages, execute UNIX system commands from either a keyboard or a shell script using correct command syntax.

Introductions and Credits



Jim Griffin

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



Rich Simms

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

And thanks to:

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



Student checklist for attending class

The screenshot shows a web browser at the URL simms-teach.com/cis90calendar.php. The page title is "Rich's Cabrillo College CIS Classes CIS 90 Calendar". On the left sidebar, "CIS 90" is highlighted. The main content area shows a calendar for "CIS 90 (Fall 2014) Calendar" with a "Calendar" link highlighted. Below the calendar, there are sections for "Presentation slides (download)" and "Enter virtual classroom", both highlighted with red boxes.

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

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

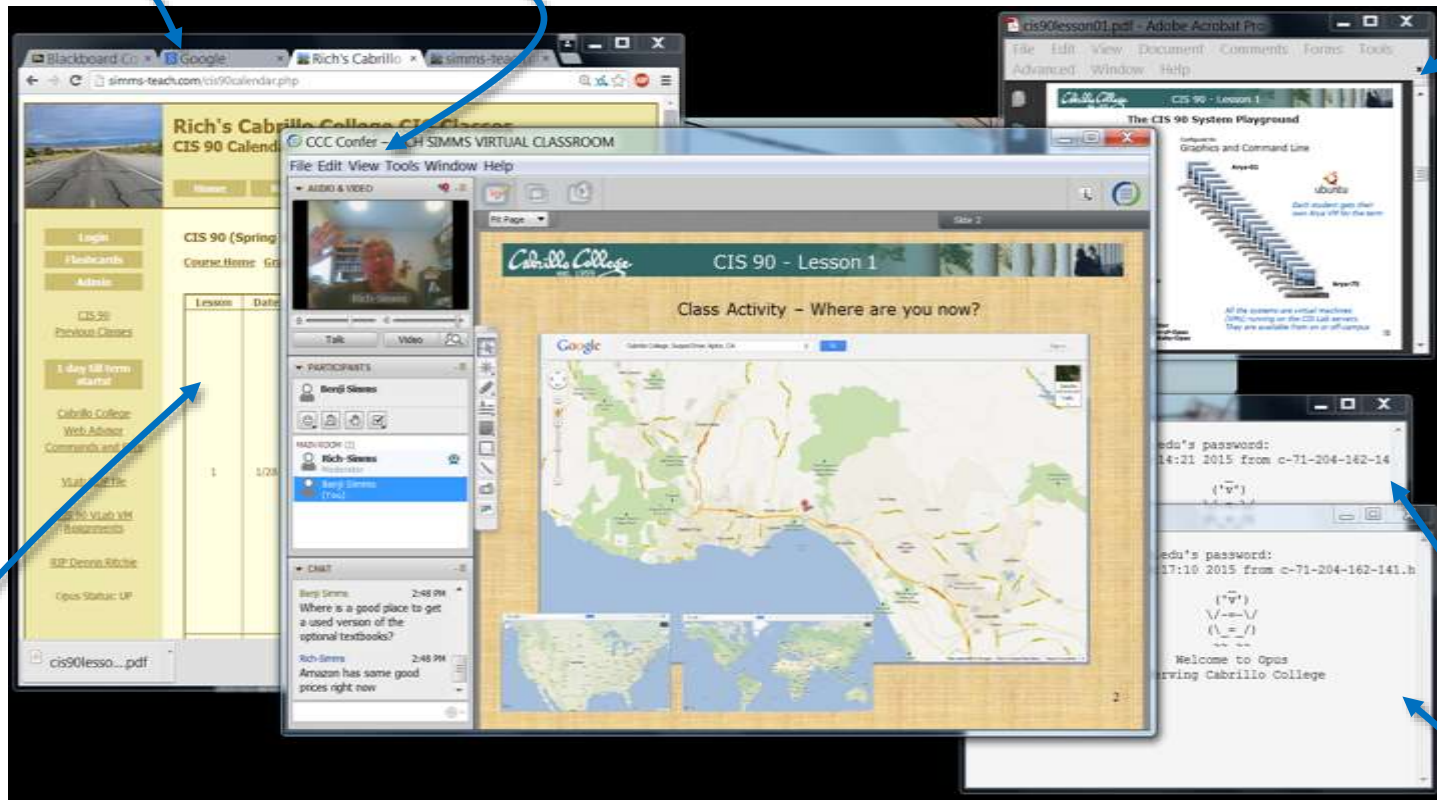


Student checklist for suggested screen layout

☐ Google

☐ CCC Confer

☐ Downloaded PDF of Lesson Slides



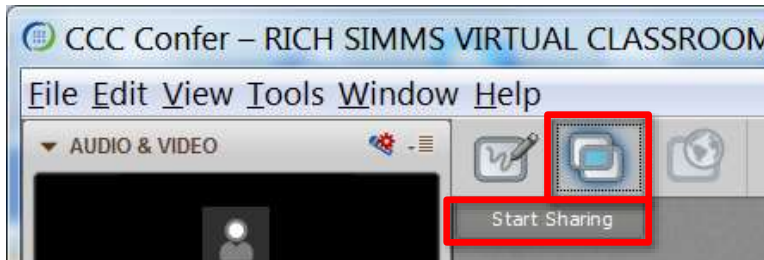
☐ CIS 90 website Calendar page

☐ One or more login sessions to Opus

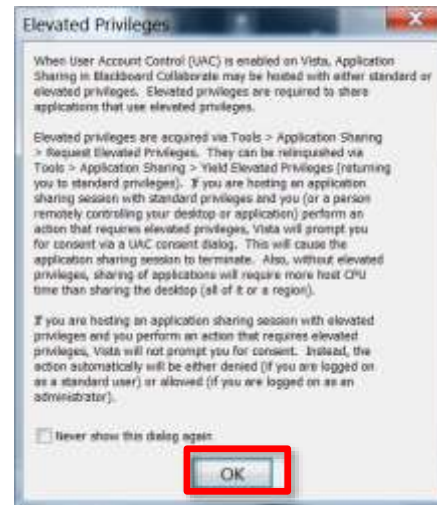


Student checklist for sharing desktop with classmates

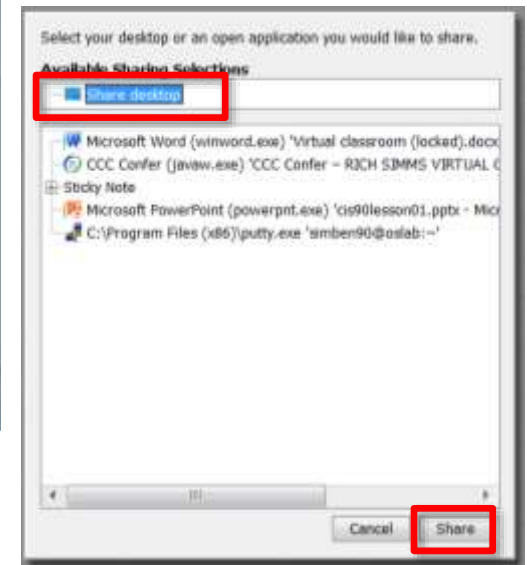
1) Instructor gives you sharing privileges



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



3) Click OK button.



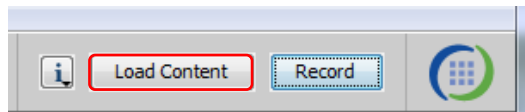
4) Select "Share desktop" and click Share button.



Rich's CCC Confer checklist - setup

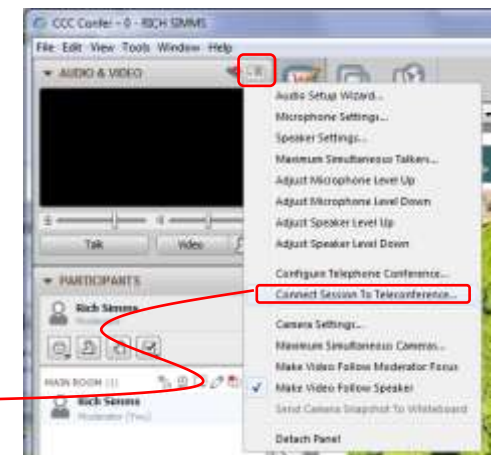


[] Preload White Board



[] Connect session to Teleconference

Session now connected to teleconference



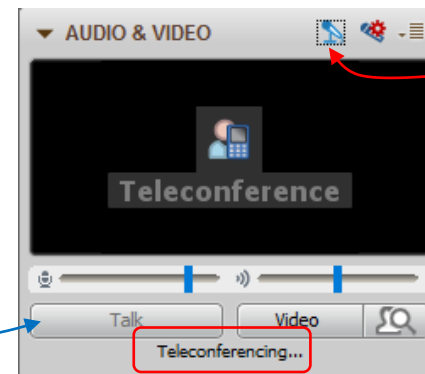
[] Is recording on?



Red dot means recording

[] Use teleconferencing, not mic

Should be grayed out



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



Rich's CCC Confer checklist - screen layout



foxit for slides

chrome

vSphere Client

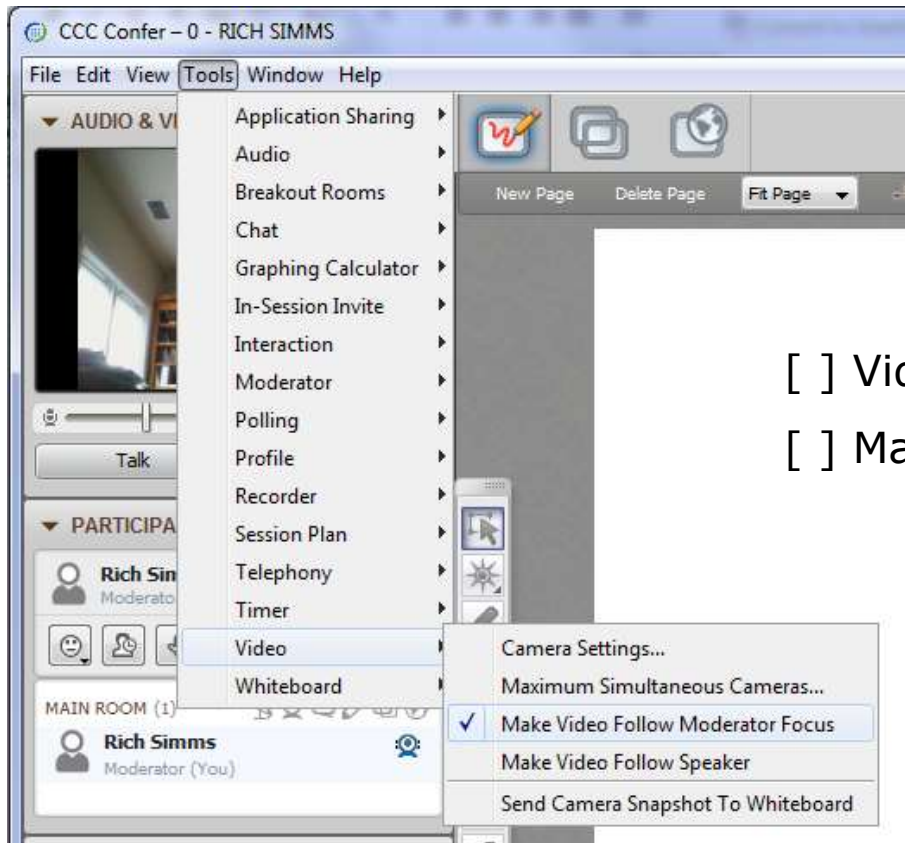
putty

[] layout and share apps





Rich's CCC Confer checklist - webcam setup

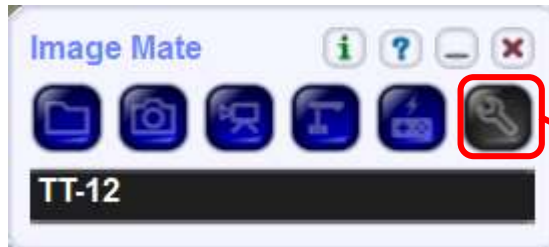


[] Video (webcam)

[] Make Video Follow Moderator Focus



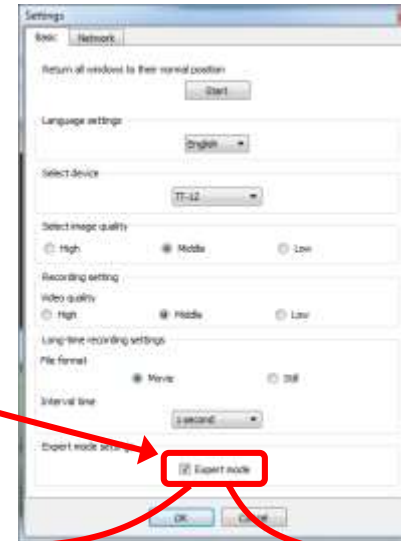
Rich's CCC Confer checklist - Elmo



Elmo rotated down to view side table



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



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 up to view white board





Rich's CCC Confer checklist - universal fixes

Universal Fix for CCC Confer:

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

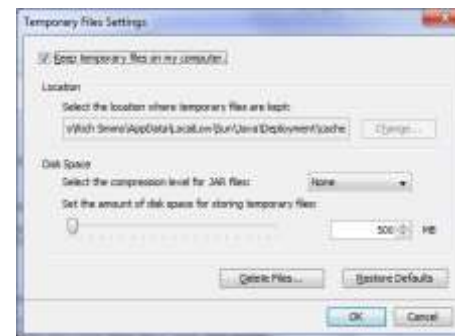
Control Panel (small icons)



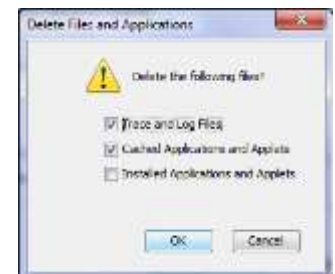
General Tab > Settings...



500MB cache size



Delete these



Google Java download



Start

Sound Check

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

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



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



Jacob



Ethan



Amr



Becca



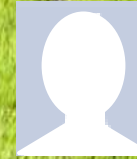
Brenda



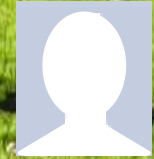
Nikki



Brad



Tyler



Justin



Nick



Cody



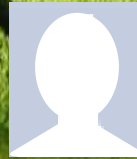
Alan



Carrie



Danny



Steven



Wes



Jade



Brandon



Bryanda



Max



Nicole

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)

File Permissions

Objectives

- Identify permissions for ordinary and directory files
- Be able to reassign user and group file ownerships
- Use chmod to set and change file permissions
- Define the default permissions for new files
- Understand the effect of permissions on directories

Agenda

- Quiz
- Questions
- Test 1 Post Mortem
- Managing files
- Theme and variations & Follow Me
- Housekeeping
- Permissions
- r = read permission
- w = write permission
- x = execute permission
- New file ownership & group membership
- Specifying numeric permissions
- Practice converting to numeric permissions
- Recap
- Letter file in detail
- More practice
- Configuring permissions
- File permissions in action
- POLP and the Hidden treasure
- umask
- The effect of permissions when removing files
- Directory permissions
- The effect of WRITE permission on directories
- The effect of EXECUTE permission on directories
- Assignment
- Wrap up



Questions



Questions?

Lesson material?

Labs? Tests?

How this course works?

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

Who questions much, shall learn much, and retain much.

- Francis Bacon

If you don't ask, you don't get.

- Mahatma Gandhi

Chinese
Proverb

他問一個問題，五分鐘是個傻子，他不問一個問題仍然是一個傻瓜永遠。

He who asks a question is a fool for five minutes; he who does not ask a question remains a fool forever.



Test 1

Post Mortem

Test 1 – Results

Missed Q25 = 17
Missed Q11 = 16
Missed Q4 = 15
Missed Q28 = 14
Missed Q13 = 14
Missed Q24 = 12
Missed Q20 = 12
Missed Q16 = 11
Missed Q27 = 10
Missed Q23 = 10
Missed Q12 = 10
Missed Q10 = 10
Missed Q9 = 8
Missed Q6 = 8
Missed Q30 = 7

Missed Q26 = 6
Missed Q2 = 6
Missed Q22 = 6
Missed Q8 = 5
Missed Q19 = 5
Missed Q17 = 5
Missed Q3 = 4
Missed Q21 = 4
Missed Q15 = 4
Missed Q7 = 3
Missed Q29 = 3
Missed Q14 = 3
Missed Q18 = 1
Missed Q1 = 1
Missed Q5 = 0

Extra Credit

Missed Q31 = 17
Missed Q33 = 15
Missed Q32 = 15

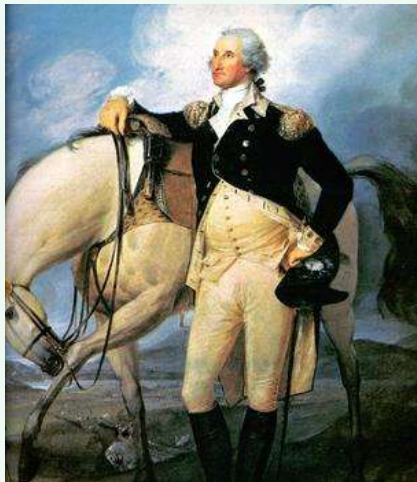


Q17) On sun-hwa-vii, there is a file named *passwd* which resides in the */etc* directory. Cat this file and look at it. Both the file and this question should ring a bell. What is the ABSOLUTE pathname of this file?

Correct answer: */etc/passwd*



<http://kids.britannica.com/comptons/art-55428/General-George-Washington-and-his-staff-welcoming-a-provision-train>



<http://www.sodahead.com/united-states/what-color-was-george-washingtons-white-horse/question-636725/>

Cabrillo College
CIS 90 - Lesson 4

Heads up on a future test question

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

Answer: */etc/passwd*

What is the color of Washington's white horse?

Slide from Lesson 4



<http://www.mountvernon.org/content/revolutionary-war-princeton-white-horse>

Stuck on something or just like some extra help?



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

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

Chris is a STEM tutor and can help you Mondays 3-9 and Wednesdays 4-9.

Mike Matera is the other Linux instructor.

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





Managing Files (review)



Review of lesson 6 commands for your toolbox:

touch	- make a file (or update the timestamp)
mkdir	- make a directory
cp	- copy a file
mv	- move or rename a file
rmdir	- remove a directory
rm	- remove a file
ln	- create a link
tree	- visual list a directory

Redirecting stdout:

> filename - redirecting stdout to create/empty a file

Common mistakes on Lab 5

1) Not using a **relative** or **absolute** pathname as an argument on the mv, cp touch, rm, mkdir, rmdir etc. commands.

The ESP method of specifying a file or directory does not work!

2) Not distinguishing system directories like /bin and /etc from local directories with the same names.

A pathname that starts with a / is absolute and starts from the top of the UNIX file tree not your home directory!

3) Not using . to refer to the current working directory.

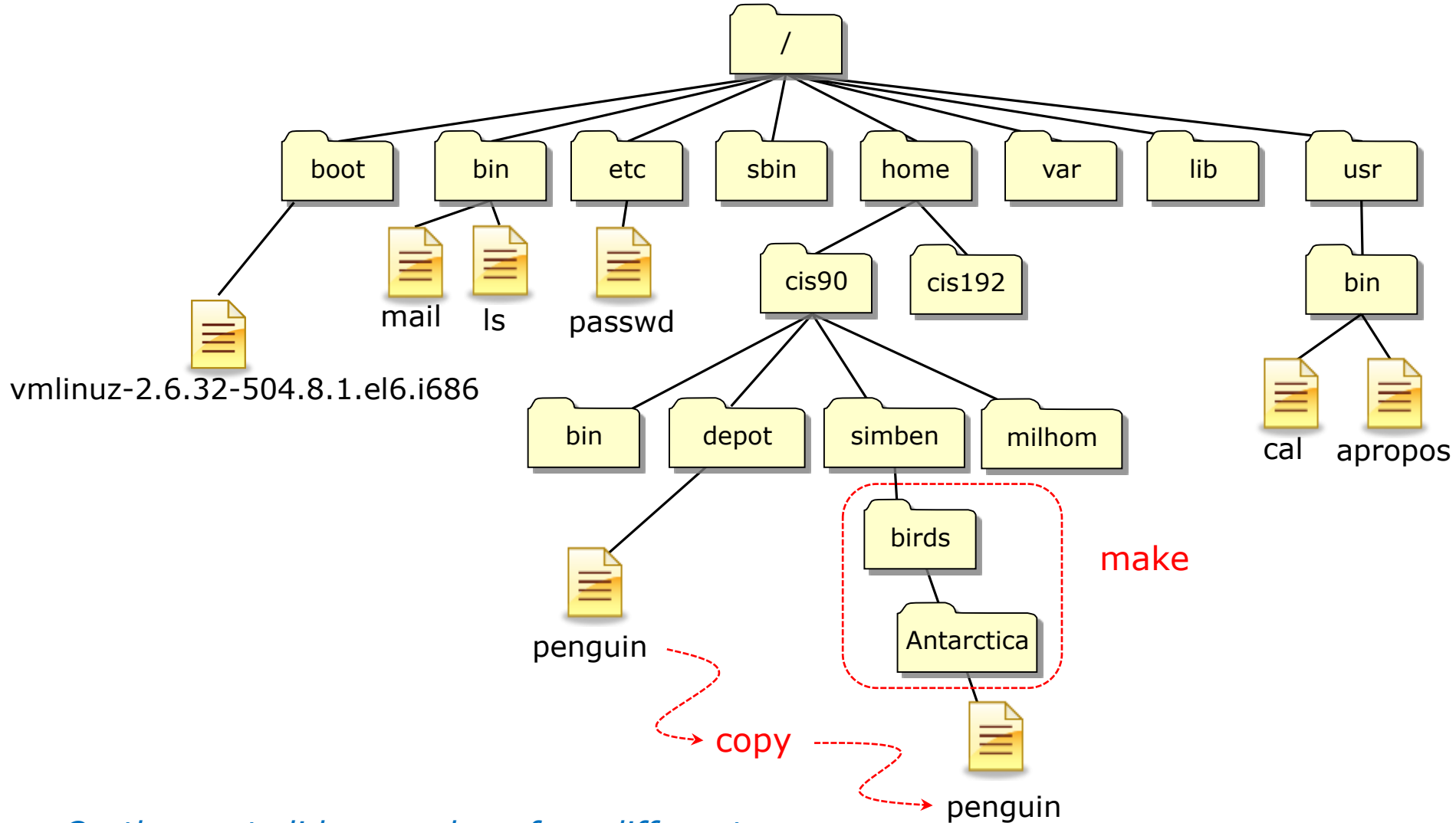
Short and sweet!

4) Not reading the forum and missing out on the **check5** script!



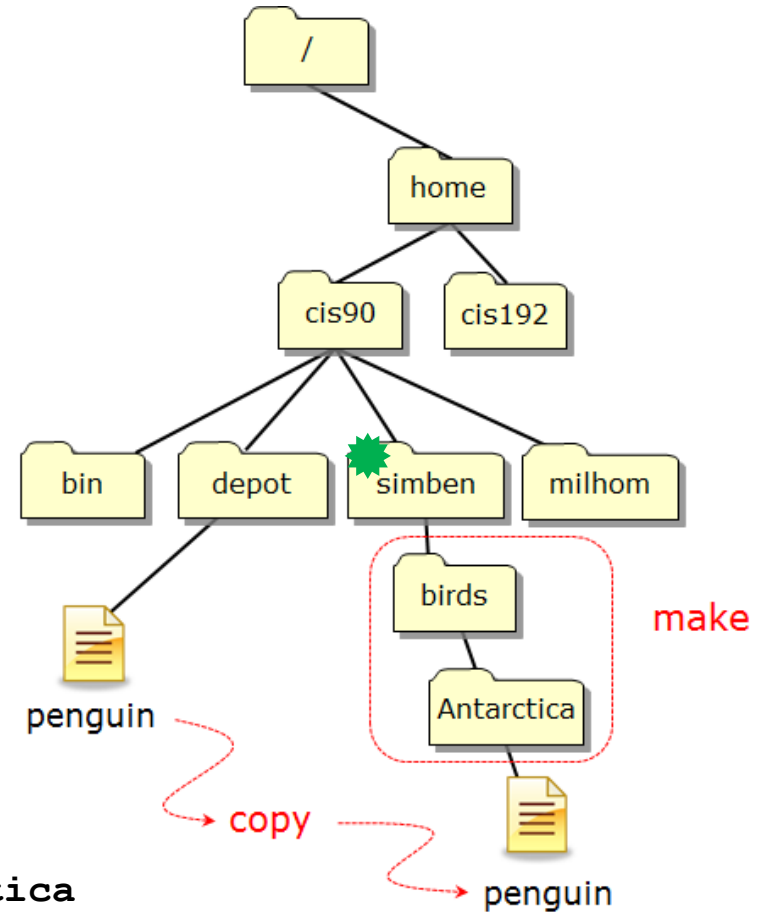
Theme and variations

Many ways to do the same things



On the next slides we show four different ways to make the nested birds/Antarctica directory and copy the penguin file to it

One way



From the home directory make the two new nested directories using the -p option.

```

/home/cis90/simben $ cd
/home/cis90/simben $ mkdir -p birds/Antarctica
    
```

From the home directory copy the penguin file using relative pathnames.

```

/home/cis90/simben $ cp ../depot/penguin birds/Antarctica/
    
```

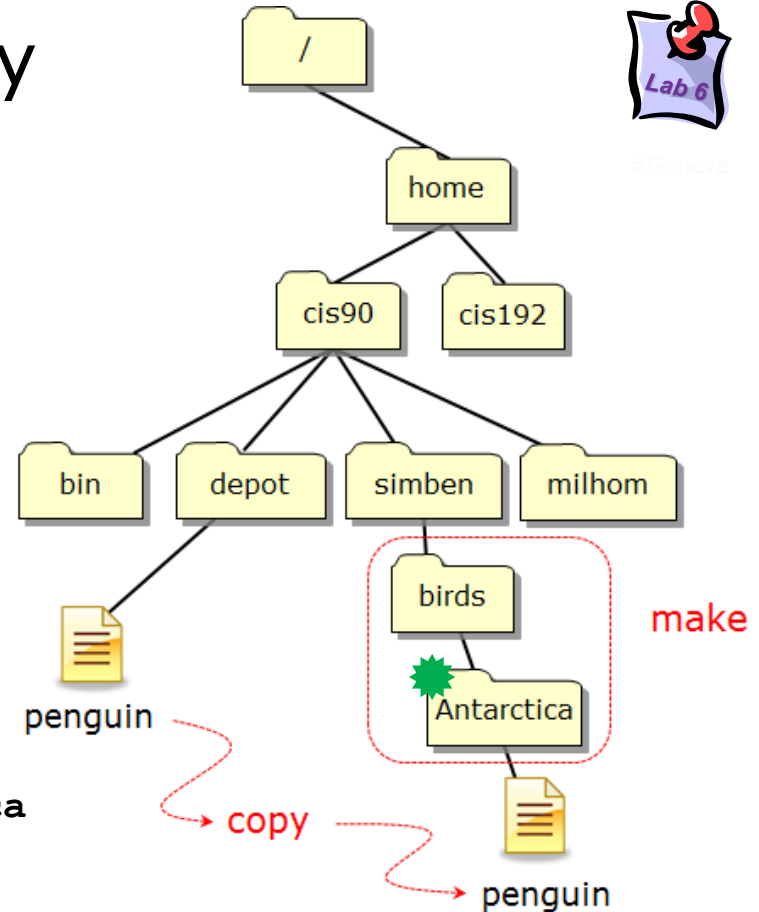
First argument is a relative pathname to the penguin file

Second argument is a relative pathname to the Antarctica directory

Another way



#Geneva



Making the two new nested directories individually.

```
/home/cis90/simben $ cd
/home/cis90/simben $ mkdir birds
/home/cis90/simben $ cd birds
/home/cis90/simben/birds $ mkdir Antarctica
/home/cis90/simben/birds $ cd Antarctica
```

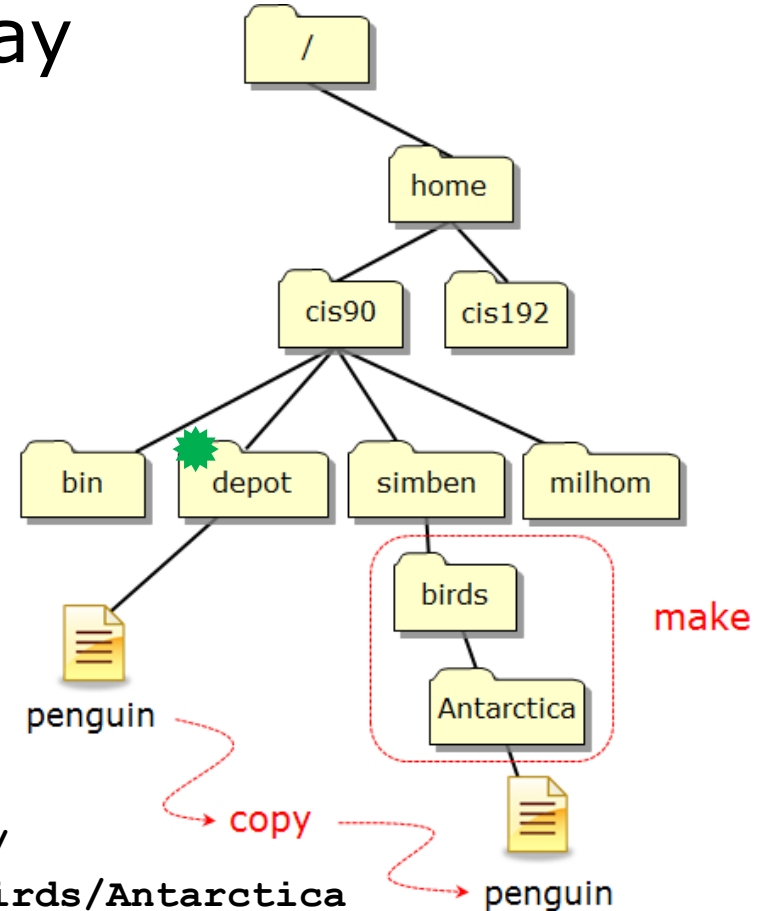
From the Antarctica directory copy the penguin file using an absolute pathname and the . "here" directory.

```
/home/cis90/simben/birds/Antarctica $ cp /home/cis90/depot/penguin .
```

First argument is an absolute pathname to the penguin file

Second argument is the "." directory for "here"

And another way



Make the nested directories from the depot directory.

```
/home/cis90/depot $ cd /home/cis90/depot/
```

```
/home/cis90/depot $ mkdir -p ../simben/birds/Antarctica
```

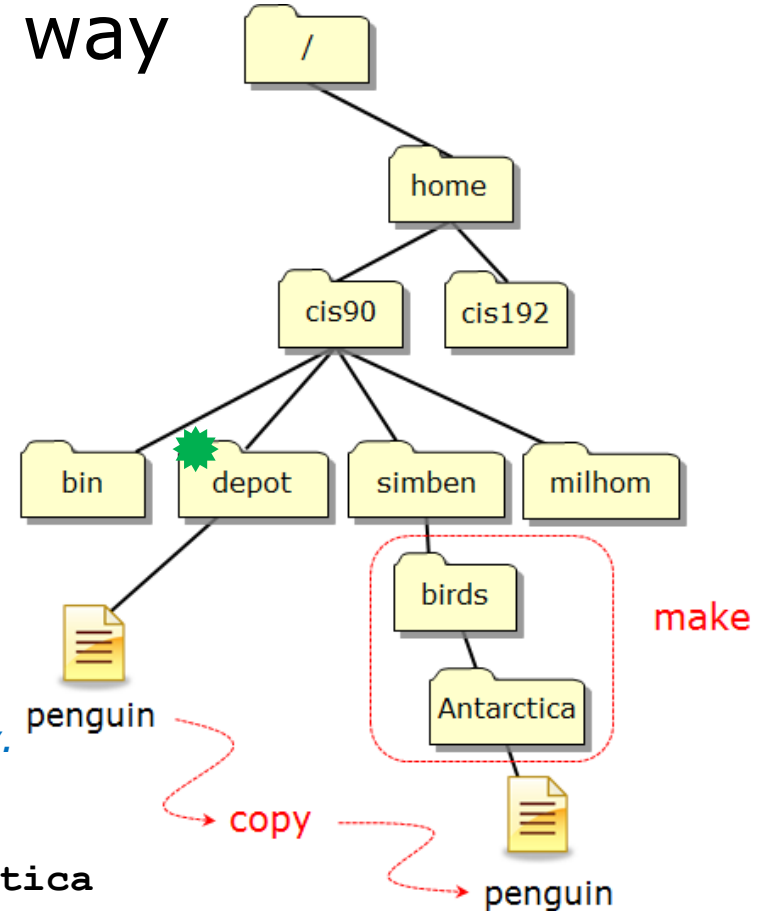
Copy the penguin file to the Antarctica directory.

```
/home/cis90/depot $ cp penguin ../simben/birds/Antarctica/
```

*First argument is a relative
pathname to the penguin file.*

*Second argument is a relative pathname
to the Antarctica directory.*

And yet another way



Make the new nested directories from the depot directory.

```

/home/cis90/depot $ cd
/home/cis90/depot $ cd ../depot/
/home/cis90/depot $ mkdir -p ~/birds/Antarctica
    
```

Copy the penguin from the depot directory to the Antarctica directory.

```

/home/cis90/depot $ cp penguin ~/birds/Antarctica/
    
```

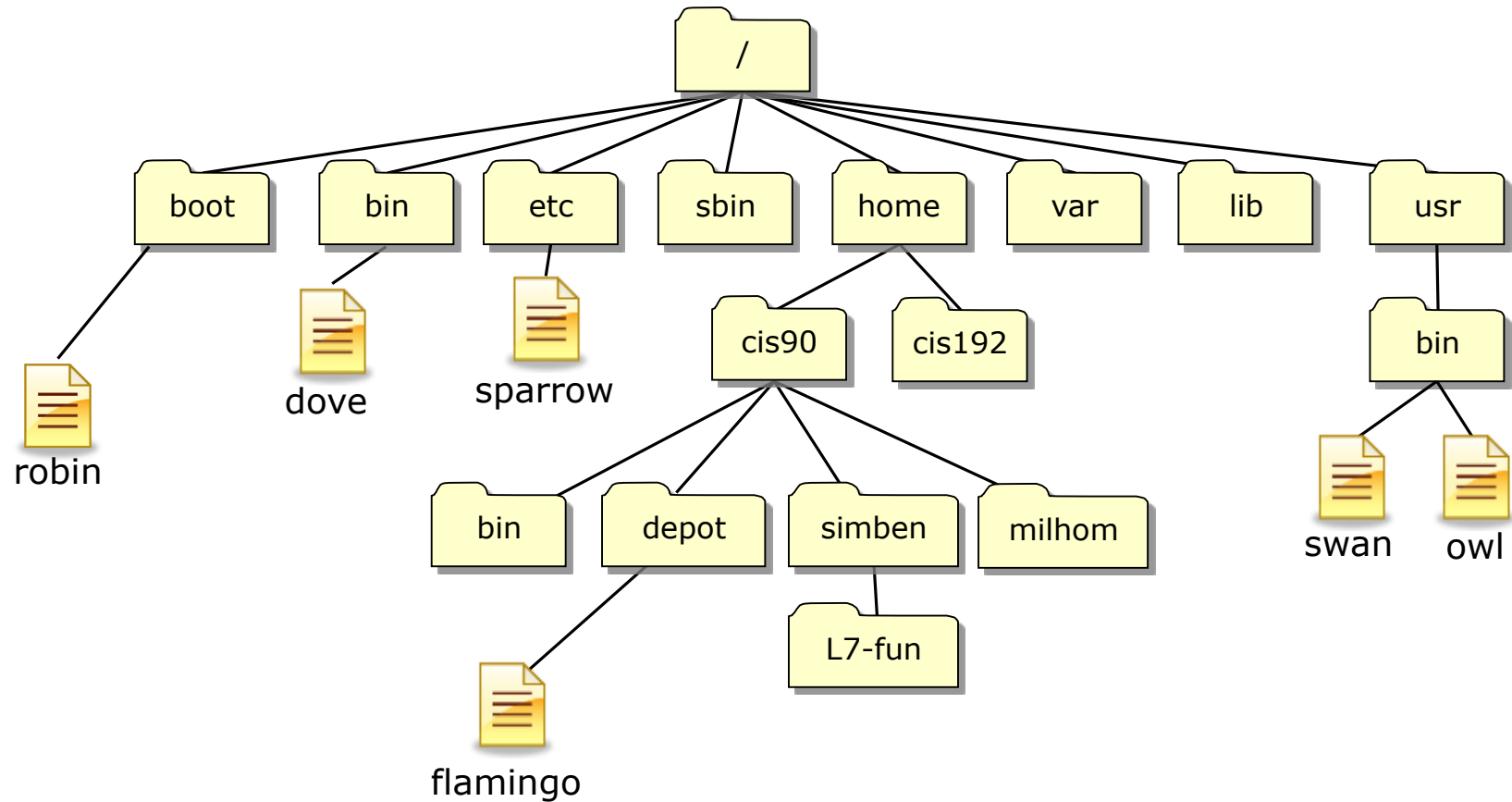
*First argument is a relative
pathname to the penguin file.*

*Second argument is a pathname to
the Antarctica directory. The "~" is
shorthand for the home directory.*



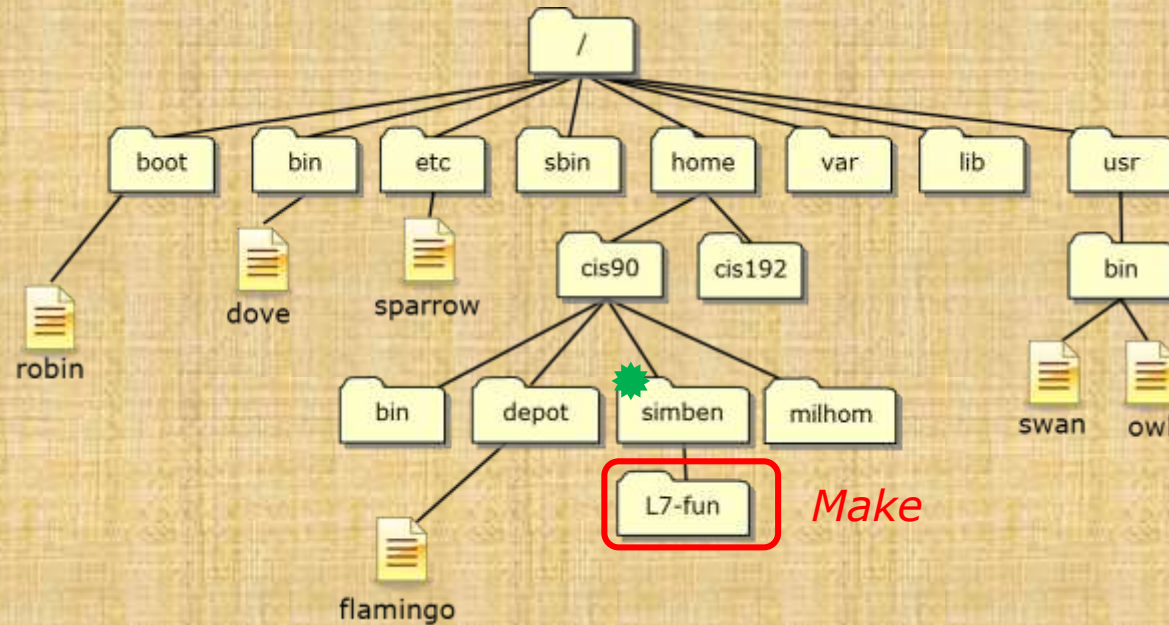
Follow Me

More practice managing files



I've scattered some files named after birds around Opus

Follow Me



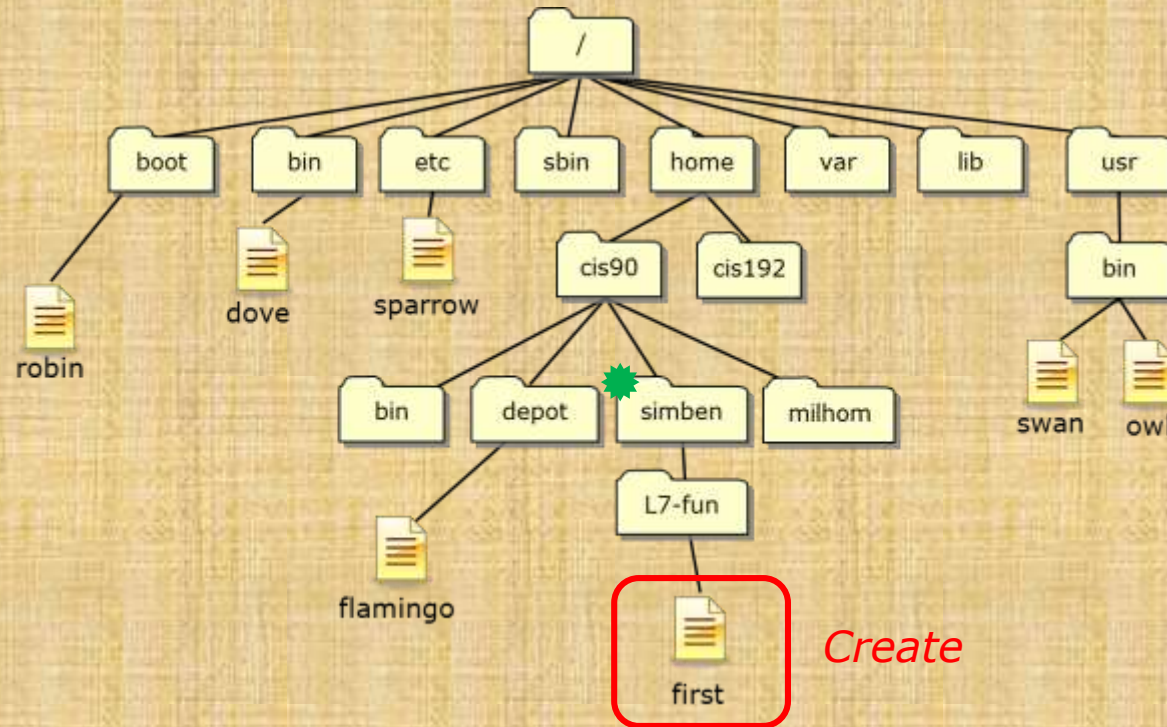
In your home directory make a new directory named L7-fun. Verify it worked.

```

/home/cis90/simben $ mkdir L7-fun
/home/cis90/simben $ ls -dl L7-fun/

```

Follow Me



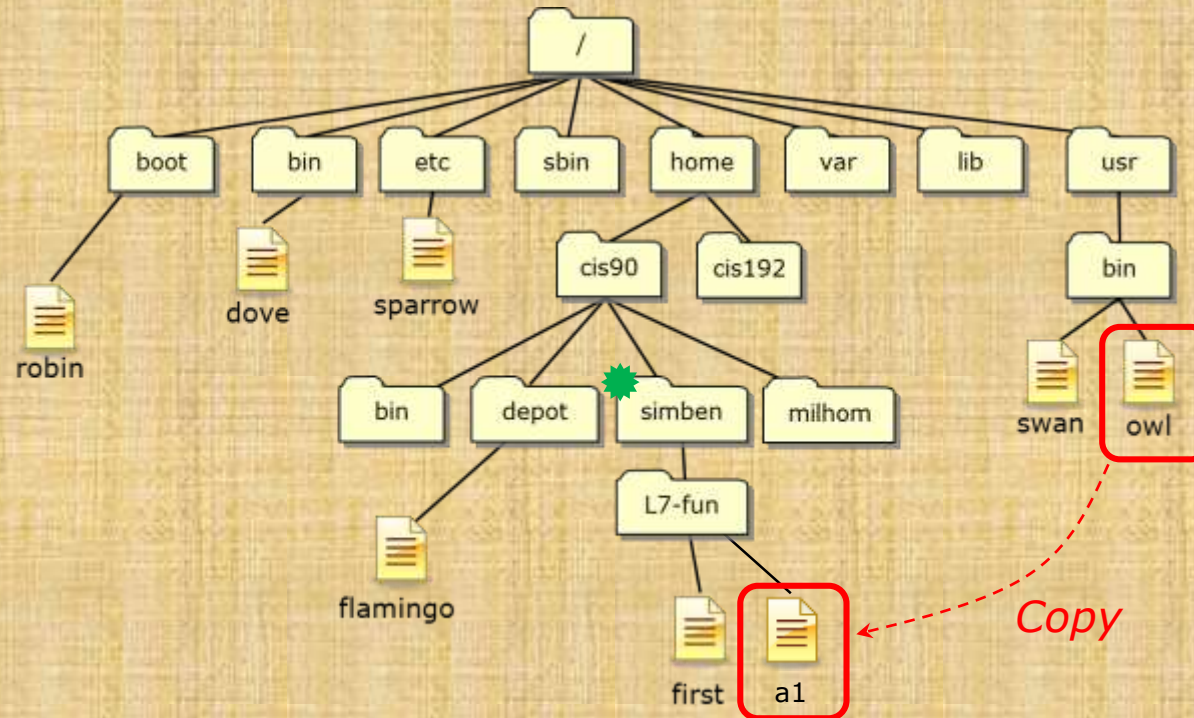
Create new file named first in your L7-fun directory containing a banner version of your name. Verify it worked.

```

/home/cis90/simben $ banner Benji > L7-fun/first
/home/cis90/simben $ ls L7-fun/

```

Follow Me



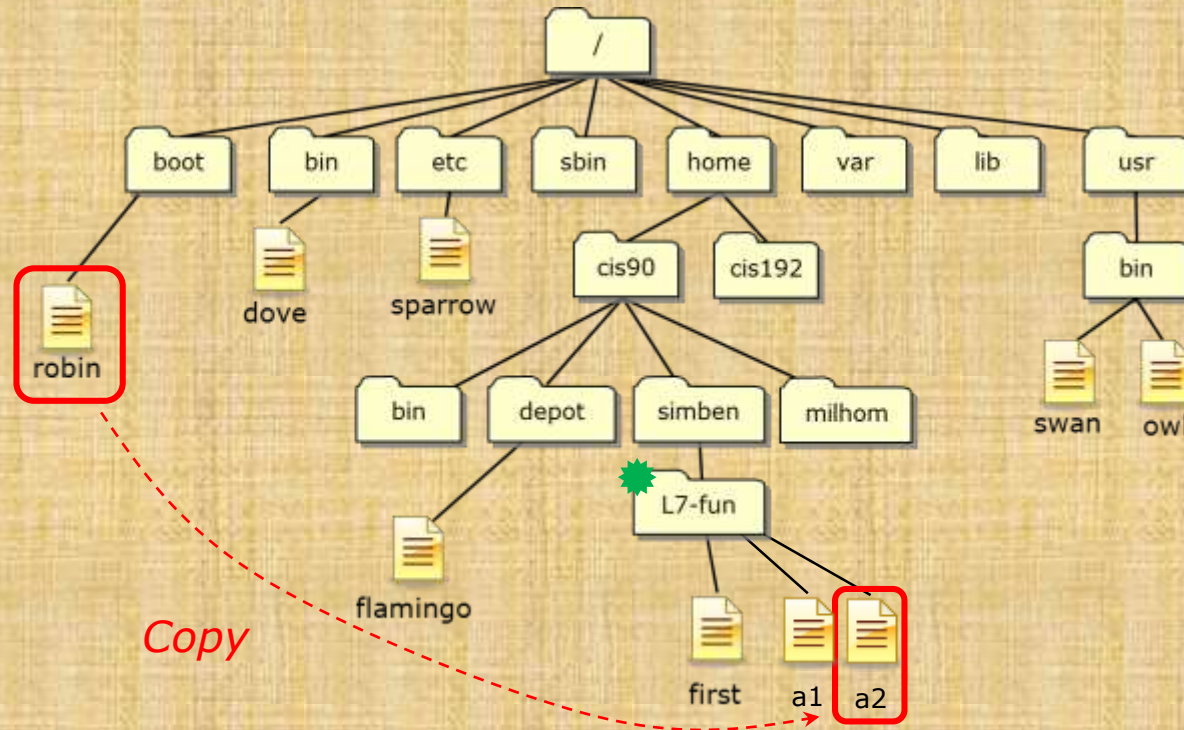
*Copy the owl file to your new directory and rename it to a1.
Verify it worked.*

```

/home/cis90/simben $ cp /usr/bin/owl L7-fun/a1
/home/cis90/simben $ ls L7-fun/

```

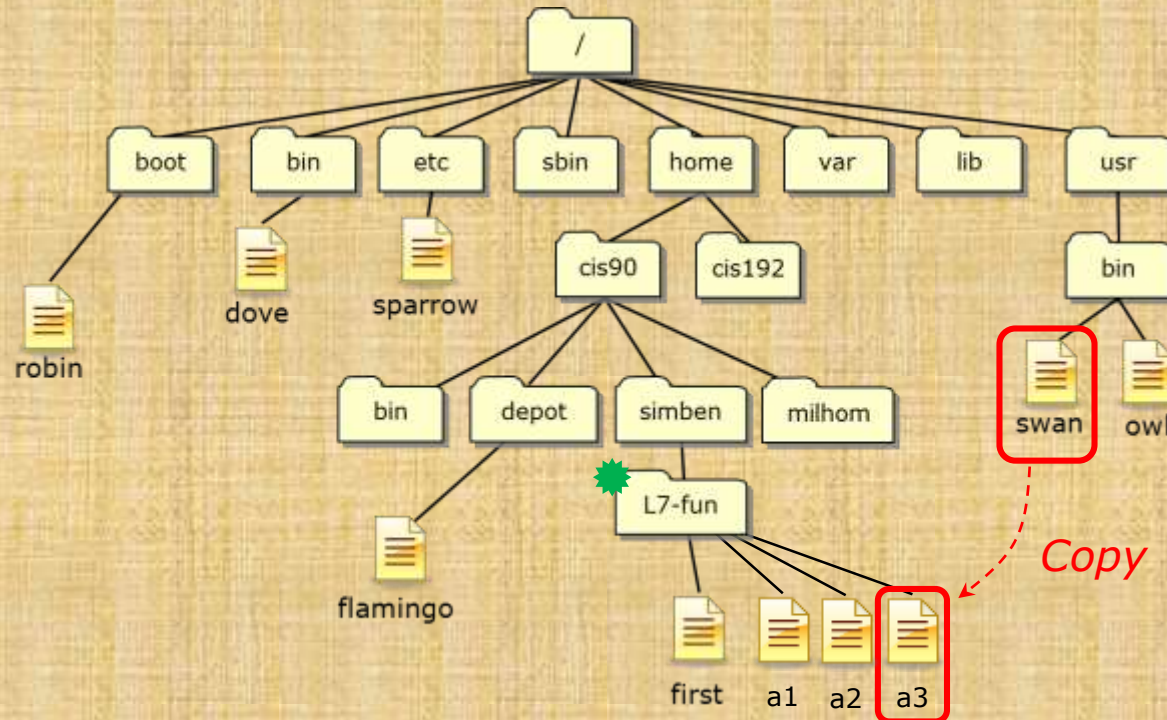
Follow Me



Change to your L7-fun directory. From there copy the robin file renaming it a2. Verify it worked.

```
/home/cis90/simben $ cd L7-fun/
/home/cis90/simben/L7-fun $ cp /boot/robin a2
/home/cis90/simben/L7-fun $ ls
```

Follow Me

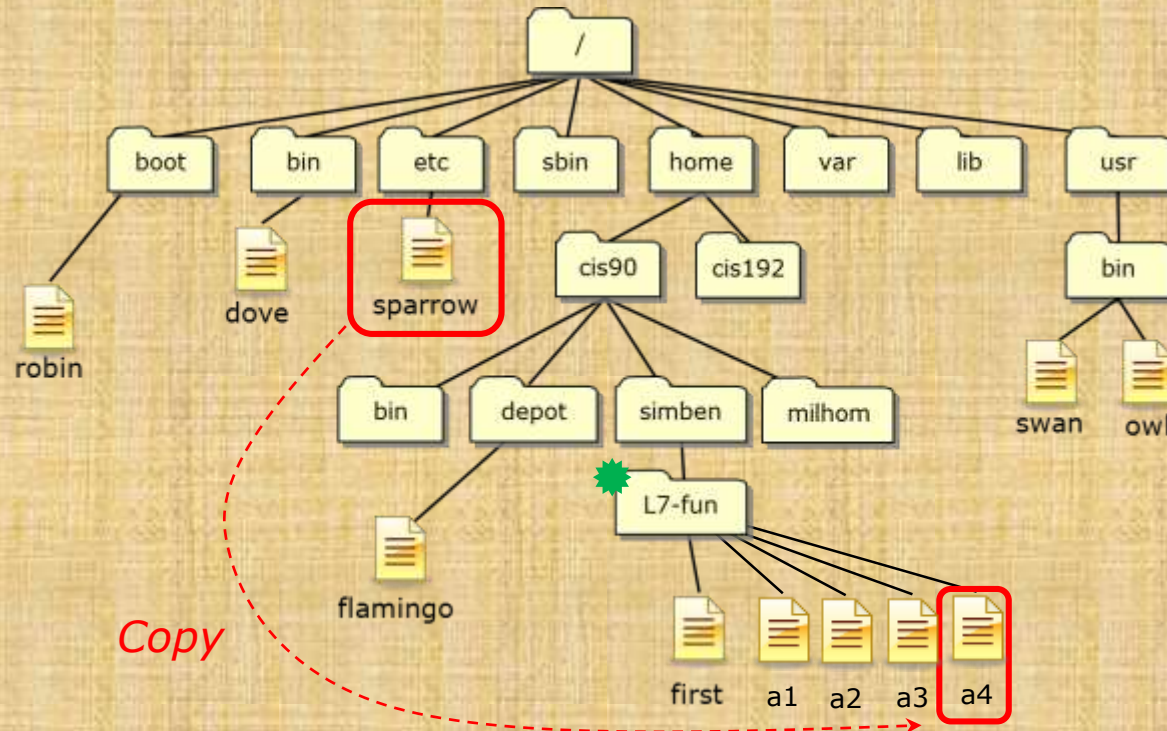


Copy the swan file to your L7-fun directory. Then rename it to a3 and verify it worked.

```

/home/cis90/simben/L7-fun $ cp /usr/bin/swan .
/home/cis90/simben/L7-fun $ mv swan a3
/home/cis90/simben/L7-fun $ ls
  
```

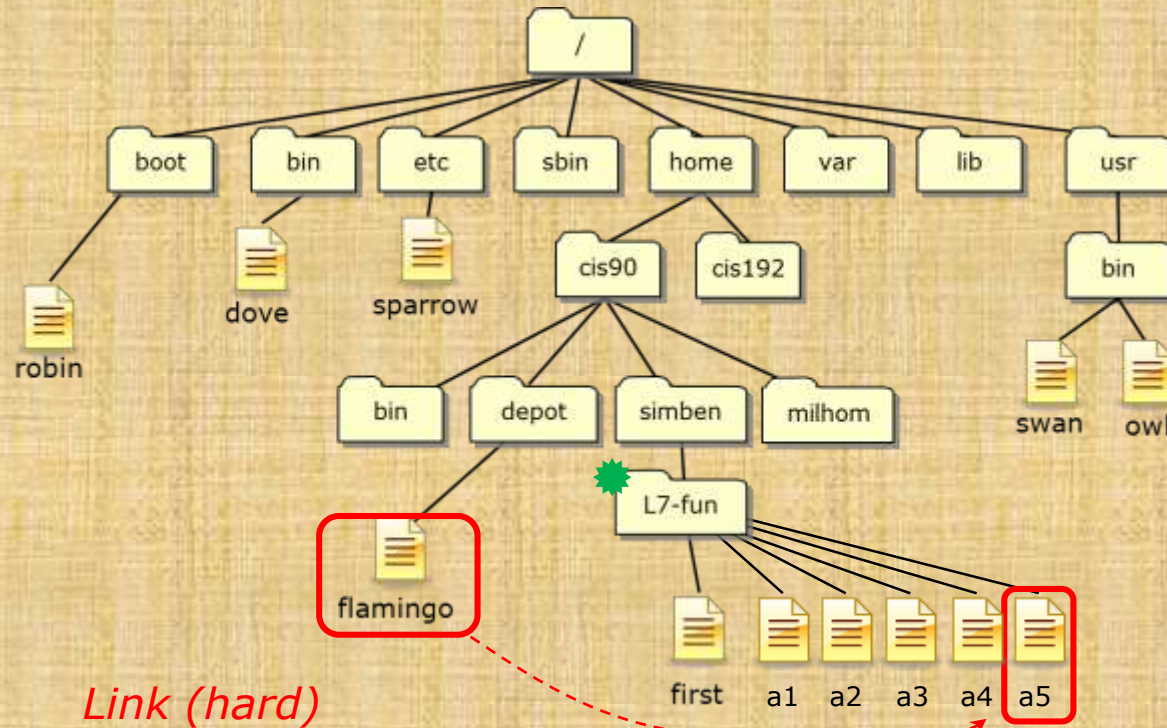
Follow Me



Copy the sparrow file to your L7-fun directory renaming it to a4. Verify it worked.

```
/home/cis90/simben/L7-fun $ cp /etc/sparrow a4
/home/cis90/simben/L7-fun $ ls
```

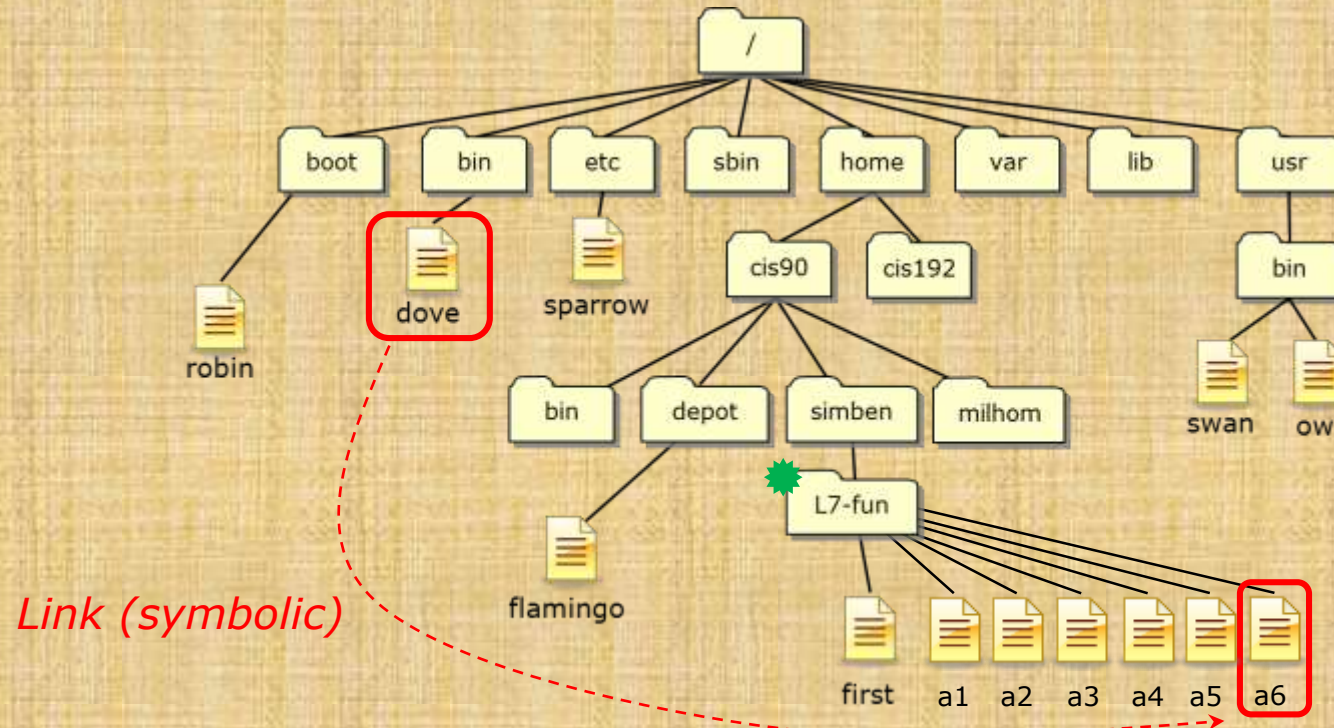
Follow Me



Create a new hard link named a5 to the flamingo file. Verify it worked.

```
/home/cis90/simben/L7-fun $ ln ../../depot/flamingo a5
/home/cis90/simben/L7-fun $ ls
/home/cis90/simben/L7-fun $ ls -l
```

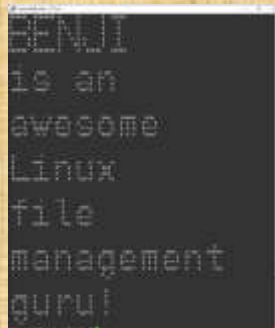
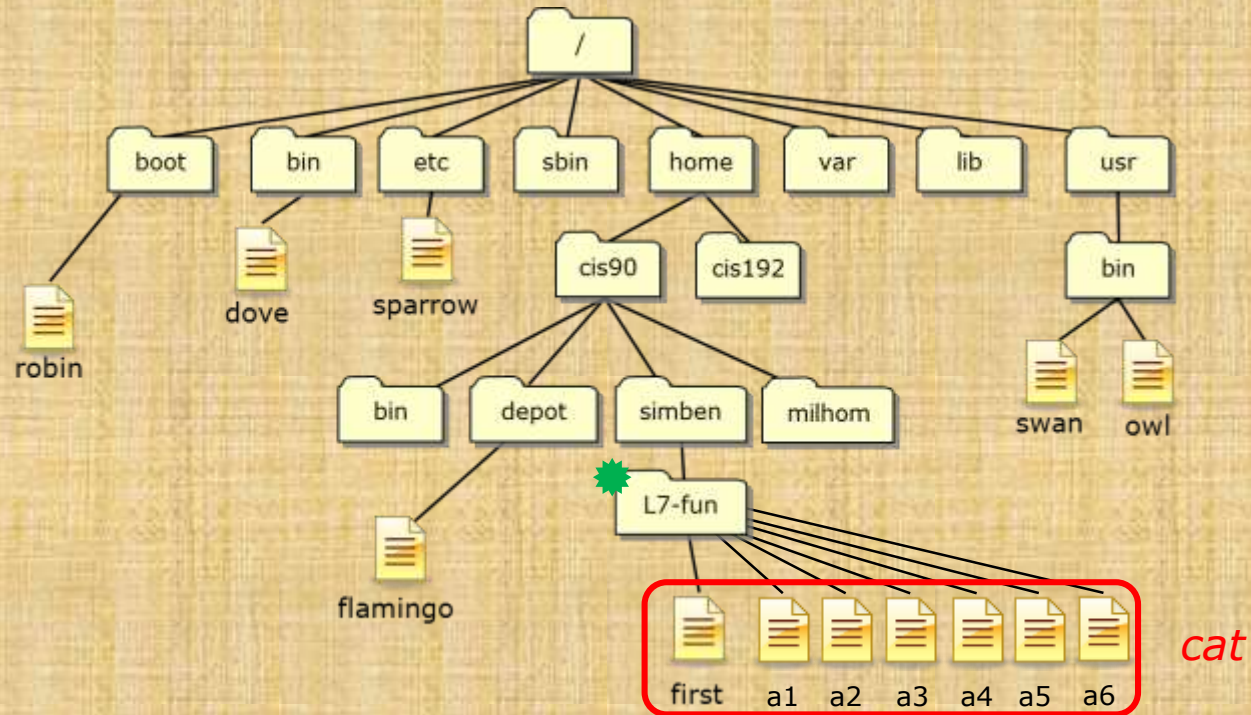
Follow Me



*Create a symbolic link file named a6 which references the dove file.
Verify it worked.*

```
/home/cis90/simben/L7-fun $ ln -s /bin/dove a6
/home/cis90/simben/L7-fun $ ls
/home/cis90/simben/L7-fun $ ls -l
```

Follow Me



Did you do each step correctly?

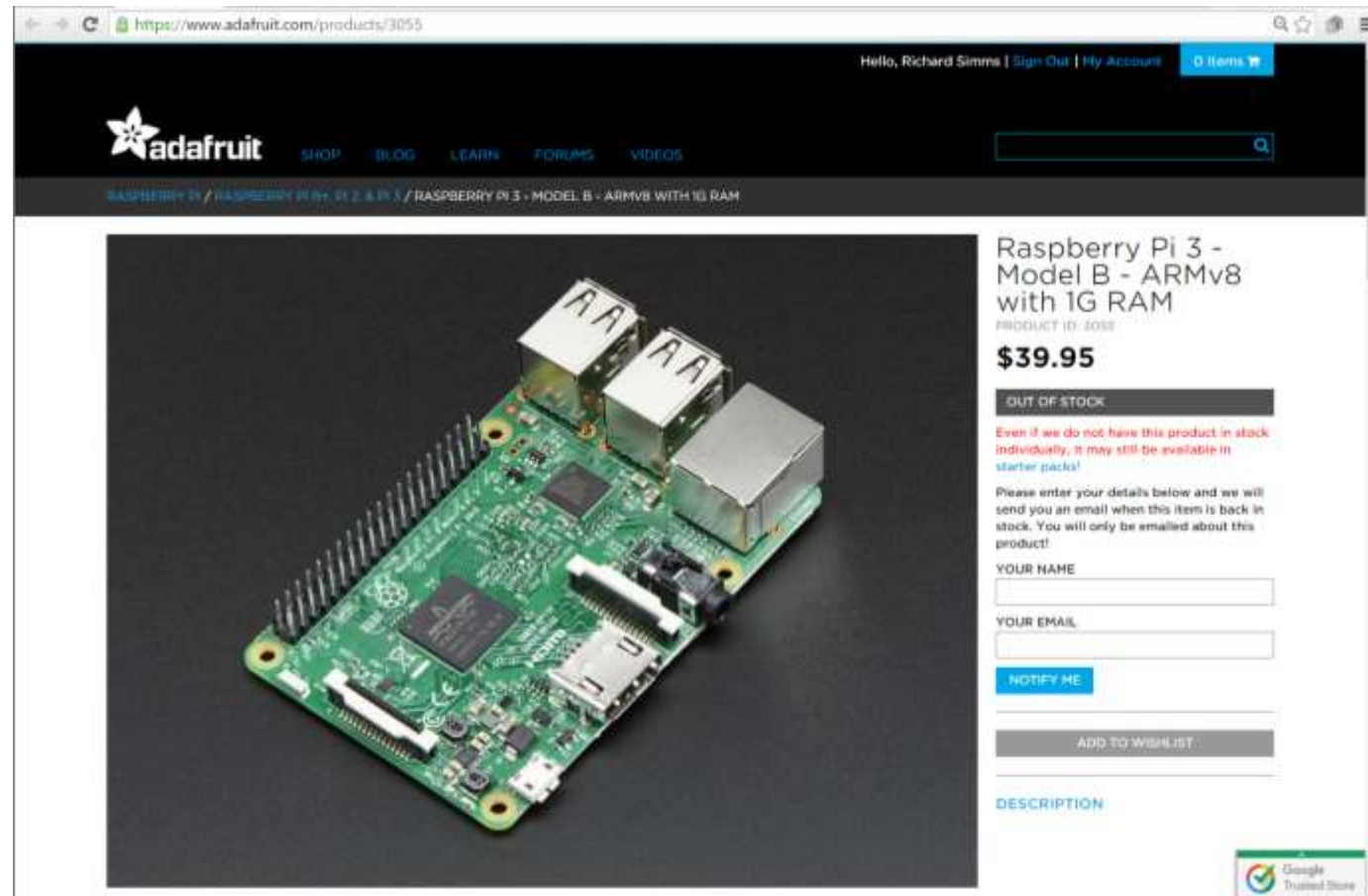
`/home/cis90/simben/L7-fun $ cat first a*`

Use the chat window to indicate what happened

Housekeeping



The latest Raspberry Pi was just announced!



And they are selling like hotcakes. I bought one yesterday and when I checked back again they were already sold out!

- 1) Lab 5 is due tonight at 11:59PM.
- 2) A **check5** script is available (see forum).
- 3) Don't forget to use the **submit** command to submit your Lab 5 work for grading.
- 4) Finished Lab 5 already? Please monitor the forum and help anyone with questions.
- 5) Next week five forum posts are due!

Don't Forget -- Perkins/VTEA Survey

phpBB® Cabrillo College: Computer and Information Systems
Forum for students in the Computer Networking and System Administration, and/or Computer Support Specialist programs

Search...

Quick links: FAQ Register Login

Board Index • Cabrillo College Fall 2015 Courses • CIS 90 - Fall 2015

Carl D. Perkins Vocational and Technical Education Act

Post Reply Search this topic...

5 posts • Page 1 of 1

Carl D. Perkins Vocational and Technical Education Act
by **Rich Wilson** • Tue Sep 22, 2015 2:34 pm

The Carl D. Perkins Vocational and Technical Education Act was originally authorized by Congress in 1964. It was reauthorized in 1996 and again in 2006. This act provides federal funding for improving career technical education (CTE) within the United States in order to help the economy.

For Cabrillo College to receive a portion of this funding students in technical classes must fill out a survey. The more surveys completed the more funds the college will receive. The survey only needs to be completed once per term by each student.

This survey can be completed online using web advisor:

Log on to WEBADVISOR at <https://web.cabrillo.edu>

Select "STUDENTS: Click Here" (navy blue bar)
• Under "Academic Profile" Click on "Student Update Form"
• Use drop down list under "Select the earliest term for which you are registered" and click on the current term.
• Select "SUBMIT"

Scroll down to the "Career Technical Information"

- Answer questions by clicking on the circle to the left of your "Yes" or "No" answers
- You can get details about a question by clicking on blue underlined phrase
- After answering all questions Select "SUBMIT"

Then "LOG OUT"

Thank you for taking a few minutes to help Cabrillo College CIS/CIS program!

- Rich

Rich Wilson
Posts: 1793
Joined: Sat Jan 03, 2005 5:47 pm
Contact: [email]

This is an important source of funding for Cabrillo College.

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

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

Are you currently receiving benefits from:

TAFICALWORKS:

☐ Yes ☐ No

UIA (Unemployment Insurance Agency):

☐ Yes ☐ No

GA (General Assistance):

☐ Yes ☐ No

Does your [SSN](#) qualify you for a tax break?

☐ Yes ☐ No

Are you a single parent with custody of one or more minor children?

☐ Yes ☐ No

Are you a [dependent student](#) attending Cabrillo to receive job aid?

☐ Yes ☐ No

Have you moved in the preceding 36 months to attend, or to accompany parents or spouses to attend, temporary or seasonal employment in agriculture, dairy, or fishing?

☐ Yes ☐ No

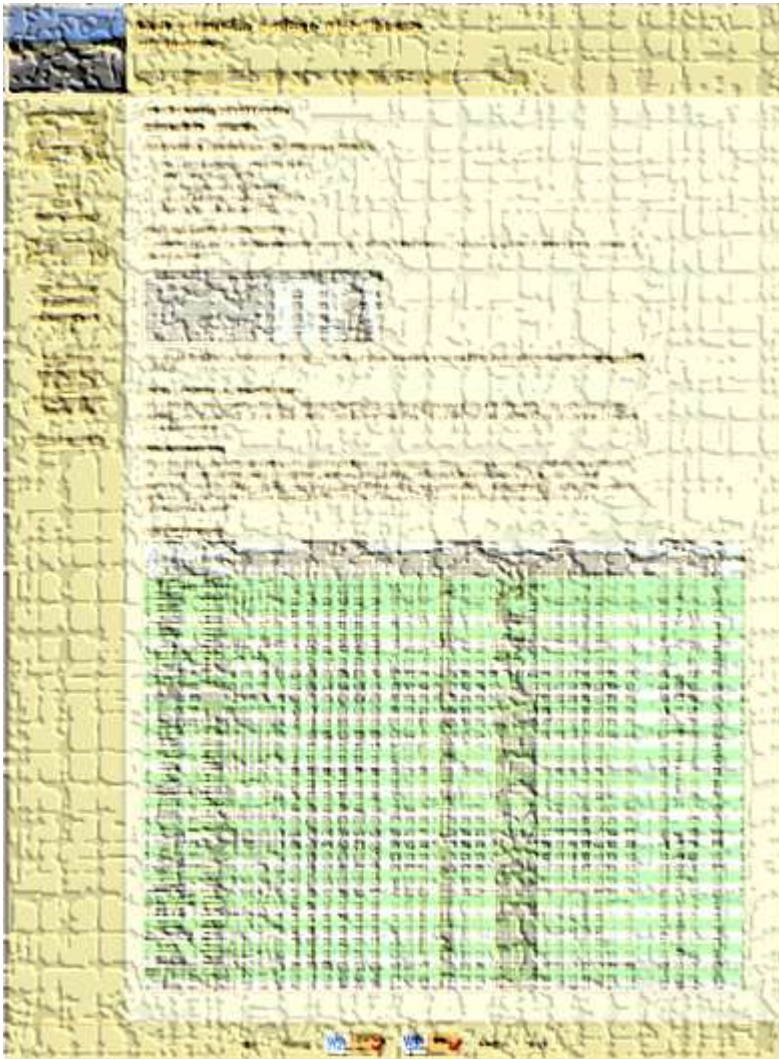
<http://oslab.cis.cabrillo.edu/forum/viewtopic.php?f=114&t=3863>

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

GRADES

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

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



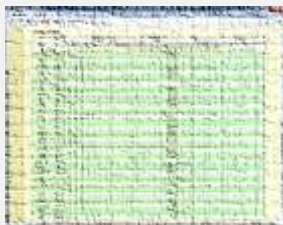
The screenshot shows a web page with a yellow textured background. At the top, there is a header with the text "CIS 90 - Grades" and "simms-teach.com". Below the header, there is a section titled "Welcome to the CIS 90 Grades page" with some introductory text. The main part of the page is a large table with many rows and columns, displaying student names and their grades. The table is divided into sections by color: a green section at the top, a yellow section in the middle, and a green section at the bottom. The table contains a large amount of data, including student names, course numbers, and grades.

Where to find your grades

Send me your survey to get your LOR code name.

The CIS 90 website Grades page

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



Points that could have been earned:

4 quizzes:	12 points
4 labs:	120 points
1 test:	30 points
1 forum quarter:	20 points
Total:	182 points

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

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

Or check on Opus

checkgrades *codename*
(where codename is your LOR codename)



Written by Jesse Warren a past CIS 90 Alumnus

grades *codename*
(where codename is your LOR codename)



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

Don't forget to grade me today!

<https://www.surveymonkey.com/r/RichardSimms-Spring2016>

			<u>Quiz 5</u> File Permissions - Viewing and configuring - Users (owners), groups and others - Inode information - Effect on commands - File creation defaults Materials - Presentation slides (download) Instructor evaluation Assignment Lab 6 CCC Confer Enter virtual classroom Class archives	8 (Gillay) 25 p729-738 (Hahn)	Lab 5
	7	3/9			

Permissions

R=Read

W=Write

X=Execute

File Permissions

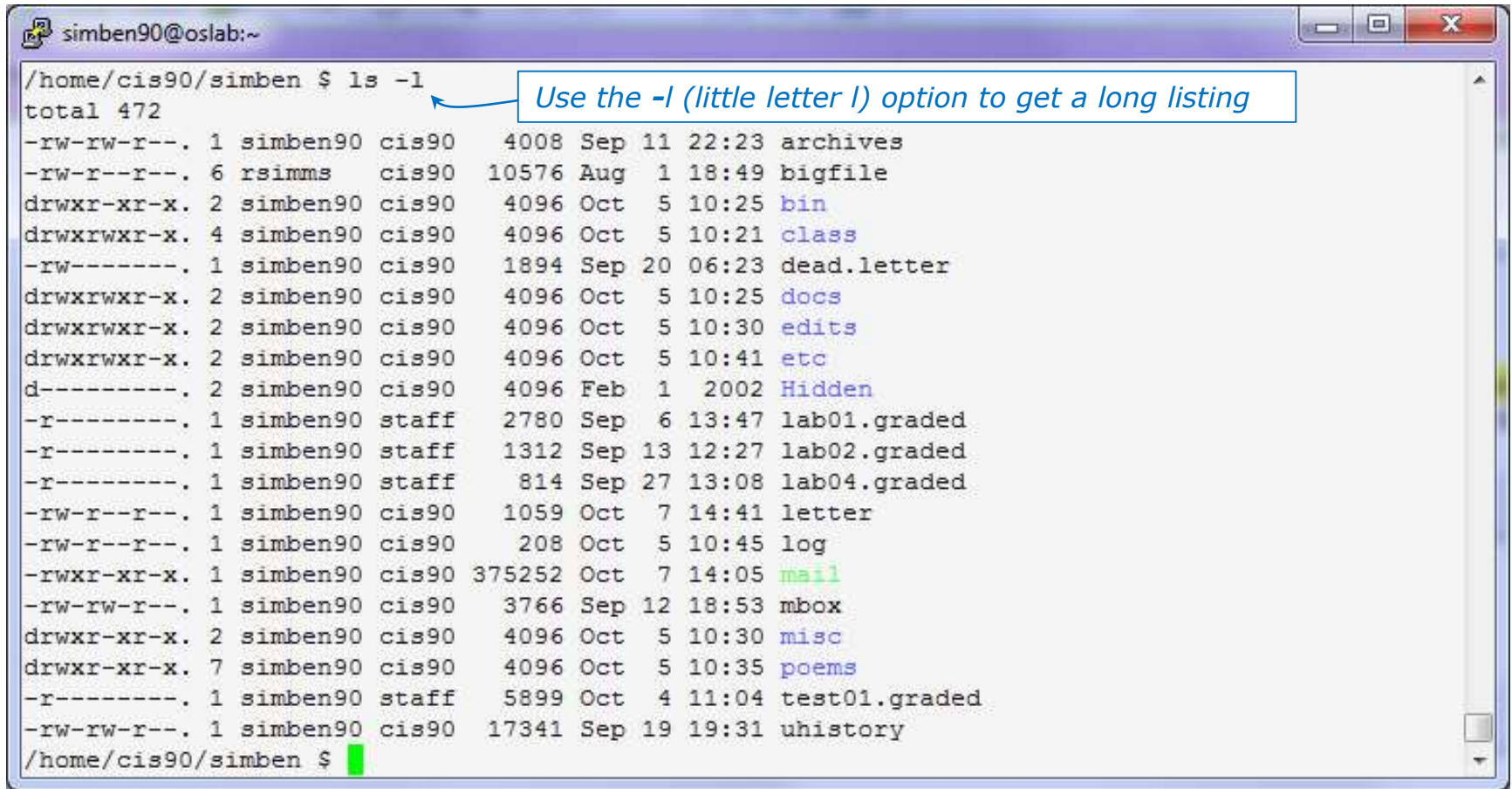
File permissions are used to control access to files and directories

There are three basic permissions: **read, write and execute**

Which can be applied to:

- 1) a **user** - the owner of the file
- 2) a **group** of users
- 3) **others** - everyone else

Use a long listing to see file permissions, user and group information



```

simben90@oslab:~
/home/cis90/simben $ ls -l
total 472
-rw-rw-r--. 1 simben90 cis90  4096 Sep 11 22:23 archives
-rw-r--r--. 6 rsimms  cis90 10576 Aug  1 18:49 bigfile
drwxr-xr-x. 2 simben90 cis90  4096 Oct  5 10:25 bin
drwxrwxr-x. 4 simben90 cis90  4096 Oct  5 10:21 class
-rw-----. 1 simben90 cis90  1894 Sep 20 06:23 dead.letter
drwxrwxr-x. 2 simben90 cis90  4096 Oct  5 10:25 docs
drwxrwxr-x. 2 simben90 cis90  4096 Oct  5 10:30 edits
drwxrwxr-x. 2 simben90 cis90  4096 Oct  5 10:41 etc
d-----. 2 simben90 cis90  4096 Feb  1 2002 Hidden
-r-----. 1 simben90 staff  2780 Sep  6 13:47 lab01.graded
-r-----. 1 simben90 staff  1312 Sep 13 12:27 lab02.graded
-r-----. 1 simben90 staff   814 Sep 27 13:08 lab04.graded
-rw-r--r--. 1 simben90 cis90  1059 Oct  7 14:41 letter
-rw-r--r--. 1 simben90 cis90   208 Oct  5 10:45 log
-rwxr-xr-x. 1 simben90 cis90 375252 Oct  7 14:05 mail
-rw-rw-r--. 1 simben90 cis90  3766 Sep 12 18:53 mbox
drwxr-xr-x. 2 simben90 cis90  4096 Oct  5 10:30 misc
drwxr-xr-x. 7 simben90 cis90  4096 Oct  5 10:35 poems
-r-----. 1 simben90 staff  5899 Oct  4 11:04 test01.graded
-rw-rw-r--. 1 simben90 cis90 17341 Sep 19 19:31 uhistory
/home/cis90/simben $
  
```

Use the -l (little letter l) option to get a long listing

*Use **long listings** to view file permissions*

The permissions

```
simben90@oslab:~  
/home/cis90/simben $ ls -l  
total 472  
-rw-rw-r-- 1 simben90 cis90 4008 Sep 11 22:23 archives  
-rw-r--r-- 6 rsimms cis90 10576 Aug 1 18:49 bigfile  
-rwxr-xr-x 2 simben90 cis90 4096 Oct 5 10:25 bin  
-rwxrwxr-x 4 simben90 cis90 4096 Oct 5 10:21 class  
-rw----- 1 simben90 cis90 1894 Sep 20 06:23 dead.letter  
-rwxrwxr-x 2 simben90 cis90 4096 Oct 5 10:25 docs  
-rwxrwxr-x 2 simben90 cis90 4096 Oct 5 10:30 edits  
-rwxrwxr-x 2 simben90 cis90 4096 Oct 5 10:41 etc  
-r----- 2 simben90 cis90 4096 Feb 1 2002 Hidden  
-r----- 1 simben90 staff 2780 Sep 6 13:47 lab01.graded  
-r----- 1 simben90 staff 1312 Sep 13 12:27 lab02.graded  
-r----- 1 simben90 staff 814 Sep 27 13:08 lab04.graded  
-rw-r--r-- 1 simben90 cis90 1059 Oct 7 14:41 letter  
-rw-r--r-- 1 simben90 cis90 208 Oct 5 10:45 log  
-rwxr-xr-x 1 simben90 cis90 375252 Oct 7 14:05 mail  
-rw-rw-r-- 1 simben90 cis90 3766 Sep 12 18:53 mbox  
-rwxr-xr-x 2 simben90 cis90 4096 Oct 5 10:30 misc  
-rwxr-xr-x 7 simben90 cis90 4096 Oct 5 10:35 poems  
-r----- 1 simben90 staff 5899 Oct 4 11:04 test01.graded  
-rw-rw-r-- 1 simben90 cis90 17341 Sep 19 19:31 uhistory  
/home/cis90/simben $
```

Columns 2-10 of a long listing show the **permissions**

r (read), **w** (write), **x** (execute) or **-** (no permission)

The user that owns a file

```
simben90@oslab:~  
/home/cis90/simben $ ls -l  
total 472  
-rw-rw-r--. 1 simben90 cis90 4008 Sep 11 22:23 archives  
-rw-r--r--. 6 rsimms cis90 10576 Aug 1 18:49 bigfile  
drwxr-xr-x. 2 simben90 cis90 4096 Oct 5 10:25 bin  
drwxrwxr-x. 4 simben90 cis90 4096 Oct 5 10:21 class  
-rw-----. 1 simben90 cis90 1894 Sep 20 06:23 dead.letter  
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:25 docs  
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:30 edits  
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:41 etc  
d-----.. 2 simben90 cis90 4096 Feb 1 2002 Hidden  
-r-----. 1 simben90 staff 2780 Sep 6 13:47 lab01.graded  
-r-----. 1 simben90 staff 1312 Sep 13 12:27 lab02.graded  
-r-----. 1 simben90 staff 814 Sep 27 13:08 lab04.graded  
-rw-r--r--. 1 simben90 cis90 1059 Oct 7 14:41 letter  
-rw-r--r--. 1 simben90 cis90 208 Oct 5 10:45 log  
-rwxr-xr-x. 1 simben90 cis90 375252 Oct 7 14:05 mail  
-rw-rw-r--. 1 simben90 cis90 3766 Sep 12 18:53 mbox  
drwxr-xr-x. 2 simben90 cis90 4096 Oct 5 10:30 misc  
drwxr-xr-x. 7 simben90 cis90 4096 Oct 5 10:35 poems  
-r-----. 1 simben90 staff 5899 Oct 4 11:04 test01.graded  
-rw-rw-r--. 1 simben90 cis90 17341 Sep 19 19:31 uhistory  
/home/cis90/simben $
```

*This column shows the **username** that **owns** the file*

The group a file belongs to

```
simben90@oslab:~  
/home/cis90/simben $ ls -l  
total 472  
-rw-rw-r--. 1 simben90 cis90 4008 Sep 11 22:23 archives  
-rw-r--r--. 6 rsimms cis90 10576 Aug 1 18:49 bigfile  
drwxr-xr-x. 2 simben90 cis90 4096 Oct 5 10:25 bin  
drwxrwxr-x. 4 simben90 cis90 4096 Oct 5 10:21 class  
-rw-----. 1 simben90 cis90 1894 Sep 20 06:23 dead.letter  
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:25 docs  
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:30 edits  
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:41 etc  
d-----. 2 simben90 cis90 4096 Feb 1 2002 Hidden  
-r-----. 1 simben90 staff 2780 Sep 6 13:47 lab01.graded  
-r-----. 1 simben90 staff 1312 Sep 13 12:27 lab02.graded  
-r-----. 1 simben90 staff 814 Sep 27 13:08 lab04.graded  
-rw-r--r--. 1 simben90 cis90 1059 Oct 7 14:41 letter  
-rw-r--r--. 1 simben90 cis90 208 Oct 5 10:45 log  
-rwxr-xr-x. 1 simben90 cis90 375252 Oct 7 14:05 mail  
-rw-rw-r--. 1 simben90 cis90 3766 Sep 12 18:53 mbox  
drwxr-xr-x. 2 simben90 cis90 4096 Oct 5 10:30 misc  
drwxr-xr-x. 7 simben90 cis90 4096 Oct 5 10:35 poems  
-r-----. 1 simben90 staff 5899 Oct 4 11:04 test01.graded  
-rw-rw-r--. 1 simben90 cis90 17341 Sep 19 19:31 uhistory  
/home/cis90/simben $
```

*This column shows the **group** each file belong to*

The file permissions are broken down into permissions for the user, the group and others

```
simben90@oslab:~
/home/cis90/simben $ ls -l
total 472
-rw-rw-r--. 1 simben90 cis90 4008 Sep 11 22:23 archives
-rw-r--r-- 6 rsimms cis90 10576 Aug 1 18:49 bigfile
-rwxr-xr-x. 2 simben90 cis90 4096 Oct 5 10:25 bin
-rwxrwxr-x. 4 simben90
-rw----- 1 simben90
-rwxrwxr-x. 2 simben90
-rwxrwxr-x. 2 simben90
-rwxrwxr-x. 2 simben90
d----- 2 simben90
-r----- 1 simben90
-r----- 1 simben90
-r----- 1 simben90
-rw-r--r-- 1 simben90
-rw-r--r-- 1 simben90
-rwxr-xr-x. 1 simben90
-rw-rw-r-- 1 simben90
-rwxr-xr-x. 2 simben90
-rwxr-xr-x. 7 simben90
-r----- 1 simben90
-rw-rw-r-- 1 simben90
/home/cis90/simben $
```

user (owner)			group			others		
r	w	-	r	-	-	r	-	-
read	write	execute	read	write	execute	read	write	execute

The permissions on bigfile:
 The **user rsimms** has read and write permission
 The **group cis90** has read permission
 All **others** have read permission

The permissions on bigfile are shown in columns 2-10 of the long listing

Three users on Opus

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

/home/cis90/simben $ id bincam90
uid=1244(bincam90) gid=190(cis90) groups=190(cis90),100(users)

/home/cis90/simben $ id bincam172
uid=1425(bincam172) gid=172(cis172) groups=172(cis172),100(users)
```

Group	cis90	cis172	users
Members	simben90 bincam90	bincam172	simben90 bincam90 bincam172

Activity

```
simben90@oslab:~
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=190(cis90) groups=190(cis90),100(users)
/home/cis90/simben $ id bincam90
uid=1244(bincam90) gid=190(cis90) groups=190(cis90),100(users)
/home/cis90/simben $ id bincam172
uid=1425(bincam172) gid=172(cis172) groups=172(cis172),100(users)
/home/cis90/simben $
/home/cis90/simben $ ls -ld . .. .bash_profile bin dead.letter lab01.graded letter
drwxr-xr-x. 12 simben90 cis90 4096 Oct 13 09:39 .
drwxr-xr-x. 56 rsimms cis90 4096 Sep 22 09:22 ..
-rw-----. 1 simben90 cis90 354 Sep 17 2003 .bash_profile
drwxr-xr-x. 2 simben90 cis90 4096 Oct 6 14:33 bin
-rw-----. 1 simben90 cis90 575 Sep 21 21:27 dead.letter
-r-----. 1 simben90 staff 7512 Sep 10 15:19 lab01.graded
-rw-r--r--. 1 simben90 cis90 1044 Jul 20 2001 letter
/home/cis90/simben $
```

Which user owns the .. directory above?

Write your answer in the chat window

Activity

```
simben90@oslab:~
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=190(cis90) groups=190(cis90),100(users)
/home/cis90/simben $ id bincam90
uid=1244(bincam90) gid=190(cis90) groups=190(cis90),100(users)
/home/cis90/simben $ id bincam172
uid=1425(bincam172) gid=172(cis172) groups=172(cis172),100(users)
/home/cis90/simben $
/home/cis90/simben $ ls -ld . .. .bash_profile bin dead.letter lab01.graded letter
drwxr-xr-x. 12 simben90 cis90 4096 Oct 13 09:39 .
drwxr-xr-x. 56 rsimms cis90 4096 Sep 22 09:22 ..
-rw-----. 1 simben90 cis90 354 Sep 17 2003 .bash_profile
drwxr-xr-x. 2 simben90 cis90 4096 Oct 6 14:33 bin
-rw-----. 1 simben90 cis90 575 Sep 21 21:27 dead.letter
-r-----. 1 simben90 staff 7512 Sep 10 15:19 lab01.graded
-rw-r--r--. 1 simben90 cis90 1044 Jul 20 2001 letter
/home/cis90/simben $
```

Which group does the dead.letter file belong to?

Write your answer in the chat window

Activity

```
simben90@oslab:~
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=190(cis90) groups=190(cis90),100(users)
/home/cis90/simben $ id bincam90
uid=1244(bincam90) gid=190(cis90) groups=190(cis90),100(users)
/home/cis90/simben $ id bincam172
uid=1425(bincam172) gid=172(cis172) groups=172(cis172),100(users)
/home/cis90/simben $ ls -ld . .. .bash_profile bin dead.letter lab01.graded letter cruz
drwxr-xr-x. 12 simben90 cis90 4096 Oct 13 10:11 .
drwxr-xr-x. 56 rsimms cis90 4096 Sep 22 09:22 ..
-rw-----. 1 simben90 cis90 354 Sep 17 2003 .bash_profile
drwxr-xr-x. 2 simben90 cis90 4096 Oct 6 14:33 bin
-rw-r-----. 1 simben90 cis90 29 Oct 13 10:10 cruz
-rw-----. 1 simben90 cis90 575 Sep 21 21:27 dead.letter
-r-----. 1 simben90 staff 7512 Sep 10 15:19 lab01.graded
-rw-r--r--. 1 simben90 cis90 1044 Jul 20 2001 letter
/home/cis90/simben $
```

What are the permissions for the user simben90 on the *cruz* file

Write your answer in the chat window

Activity

```
simben90@oslab:~
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=190(cis90) groups=190(cis90),100(users)
/home/cis90/simben $ id bincam90
uid=1244(bincam90) gid=190(cis90) groups=190(cis90),100(users)
/home/cis90/simben $ id bincam172
uid=1425(bincam172) gid=172(cis172) groups=172(cis172),100(users)
/home/cis90/simben $ ls -ld . .. .bash_profile bin dead.letter lab01.graded letter cruz
drwxr-xr-x. 12 simben90 cis90 4096 Oct 13 10:11 .
drwxr-xr-x. 56 rsimms cis90 4096 Sep 22 09:22 ..
-rw-----. 1 simben90 cis90 354 Sep 17 2003 .bash_profile
drwxr-xr-x. 2 simben90 cis90 4096 Oct 6 14:33 bin
-rw-r-----. 1 simben90 cis90 29 Oct 13 10:10 cruz
-rw-----. 1 simben90 cis90 575 Sep 21 21:27 dead.letter
-r-----. 1 simben90 staff 7512 Sep 10 15:19 lab01.graded
-rw-r--r--. 1 simben90 cis90 1044 Jul 20 2001 letter
/home/cis90/simben $
```

What are the permissions for the user bincam90 on the *cruz* file

Write your answer in the chat window

Activity

```
simben90@oslab:~
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=190(cis90) groups=190(cis90),100(users)
/home/cis90/simben $ id bincam90
uid=1244(bincam90) gid=190(cis90) groups=190(cis90),100(users)
/home/cis90/simben $ id bincam172
uid=1425(bincam172) gid=172(cis172) groups=172(cis172),100(users)
/home/cis90/simben $ ls -ld . .. .bash_profile bin dead.letter lab01.graded letter cruz
drwxr-xr-x. 12 simben90 cis90 4096 Oct 13 10:11 .
drwxr-xr-x. 56 rsimms cis90 4096 Sep 22 09:22 ..
-rw----- 1 simben90 cis90 354 Sep 17 2003 .bash_profile
drwxr-xr-x. 2 simben90 cis90 4096 Oct 6 14:33 bin
-rw-r----- 1 simben90 cis90 29 Oct 13 10:10 cruz
-rw----- 1 simben90 cis90 575 Sep 21 21:27 dead.letter
-r----- 1 simben90 staff 7512 Sep 10 15:19 lab01.graded
-rw-r--r-- 1 simben90 cis90 1044 Jul 20 2001 letter
/home/cis90/simben $
```

What are the permissions for the user bincam172 on the *cruz* file

Write your answer in the chat window

Activity

```
simben90@oslab:~  
/home/cis90/simben $ ls -ld bigfile letter bin/datecal edits/* poems docs  
-rw-r--r--. 21 rsimms  cis90 10576 Aug  1  2012 bigfile  
-rwxr-xr-x.  1 simben90 cis90   519 Aug  6 11:53 bin/datecal  
drwxrwxr-x.  2 simben90 cis90  4096 Oct  6 14:33 docs  
-rw-r--r--.  1 simben90 cis90  1382 Feb  1  2002 edits/better_town  
-rw-r--r--.  1 simben90 cis90  1580 Nov 16  2004 edits/small_town  
-rw-r--r--.  1 simben90 cis90   485 Aug 26  2003 edits/spellk  
-rw-r--r--.  1 simben90 cis90   250 Jul 20  2001 edits/text.err  
-rw-r--r--.  1 simben90 cis90   231 Jul 20  2001 edits/text.fxd  
-rw-r--r--.  1 simben90 cis90  1044 Jul 20  2001 letter  
drwxr-xr-x.  9 simben90 cis90  4096 Oct  6 14:46 poems  
/home/cis90/simben $
```

When a regular file has execute permissions what color is used by the ls command to show the filename?

Write your answer in the chat window



R=Read Permission



Read Permission

Read permission is necessary ...

to read the data contents of a file.

The following example commands would require read permission on the file named *myfile*

```
cat myfile  
head myfile  
tail myfile  
xxd myfile  
less myfile  
more myfile  
cp myfile myfile.bak  
mail -f myfile
```

Read Permission

```
/home/cis90/simben $ ls -l /etc/passwd /etc/shadow
-rw-r--r--. 1 root root 7990 Oct  4 08:02 /etc/passwd
-----. 1 root root 11944 Oct  3 11:48 /etc/shadow
```

```
/home/cis90/simben $ head -n3 /etc/passwd
```



*Can the simben90 user
print the first three lines
of the /etc/passwd file?*

Put your answer in the chat window

Read Permission

```
/home/cis90/simben $ ls -l /etc/passwd /etc/shadow
-rw-r--r--. 1 root root 7990 Oct  4 08:02 /etc/passwd
-----. 1 root root 11944 Oct  3 11:48 /etc/shadow
```

```
/home/cis90/simben $ head -n3 /etc/passwd
root:x:0:0:root:/root:/bin/bash
bin:x:1:1:bin:/bin:/sbin/nologin
daemon:x:2:2:daemon:/sbin:/sbin/nologin
```

Yes, the simben90 user would fall under the "Other" category which has read permission on /etc/passwd.

Read Permission

```
/home/cis90/simben $ ls -l /etc/passwd /etc/shadow
-rw-r--r--. 1 root root 7990 Oct  4 08:02 /etc/passwd
-----. 1 root root 11944 Oct  3 11:48 /etc/shadow
```

```
/home/cis90/simben $ cat /etc/shadow
```



*Can the simben90
user cat the
/etc/shadow file?*

Put your answer in the chat window

Read Permission

```
/home/cis90/simben $ ls -l /etc/passwd /etc/shadow
-rw-r--r--. 1 root root 7990 Oct 4 08:02 /etc/passwd
-----[ ]--. 1 root root 11944 Oct 3 11:48 /etc/shadow
```

```
/home/cis90/simben $ cat /etc/shadow
cat: /etc/shadow: Permission denied
```

No, the simben90 user would fall under the "Other" category which does not have read permission on /etc/shadow.

Permissions

W = Write



Write Permission

Write permission is necessary ...

to write the contents of a file

The following example commands would require write permission on the file named *myfile*

```
echo "I Love Linux" > myfile  
cp myfile.bak myfile
```

Write Permission

```
/home/cis90/simben $ ls -l letter ../milhom/letter  
-rw-r--r--. 1 simben90 cis90 1059 Oct  7 15:05 letter  
-rw-r--r--. 1 milhom90 cis90 1044 Jul 20  2001 ../milhom/letter
```

```
/home/cis90/simben $ echo "Benji was here" >> letter
```



*Can the simben90
user write to his own
letter file?*

Put your answer in the chat window

Write Permission

```
/home/cis90/simben $ ls -l letter ../milhom/letter
-rw-r--r--. 1 simben90 cis90 1059 Oct  7 15:05 letter
-rw-r--r--. 1 milhom90 cis90 1044 Jul 20  2001 ../milhom/letter
```

```
/home/cis90/simben $ echo "Benji was here" >> letter
/home/cis90/simben $ tail -n2 letter
```

Alan Sherman

Benji was here

Yes, Benji S. has write access to his letter file

Write Permission

```
/home/cis90/simben $ ls -l letter ../milhom/letter
-rw-r--r--. 1 simben90 cis90 1059 Oct  7 15:05 letter
-rw-r--r--. 1 milhom90 cis90 1044 Jul 20  2001 ../milhom/letter
```

```
/home/cis90/simben $ echo "Benji was here" >> ../milhom/letter
```



*Can the simben90
user write to Homer's
letter file?*

Put your answer in the chat window

Write Permission

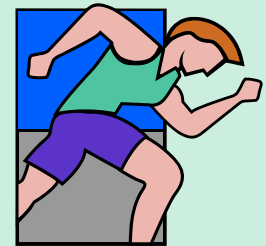
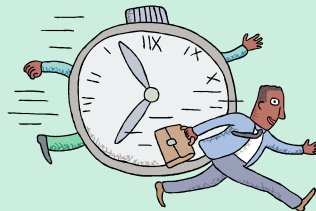
```
/home/cis90/simben $ ls -l letter ../milhom/letter
-rw-r--r--. 1 simben90 cis90 1059 Oct  7 15:05 letter
-rw-r[red box]-r--. 1 milhom90 cis90 1044 Jul 20  2001 ../milhom/letter
```

```
/home/cis90/simben $ echo "Benji was here" >> ../milhom/letter
-bash: ../milhom/letter: Permission denied
```

No, Benji S. does not have write access to Homer's letter file

Permissions

X=eXecute



Execute Permission

Both read and execute permissions are necessary ...
to run a file (i.e. a program, command or script)

The following example command would require read and execute permission on the file named *myfile*

myfile

Execute Permission

```
/home/cis90/simben $ ls -l bin/tryme ../bin/randomFile
-rwx-----. 1 rsimms    cis90 1162 Sep 30  2014 ../bin/randomFile
-rwxr-xr-x. 1 simben90  cis90  174 Mar  4  2004 bin/tryme
```

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



*Can the simben90 execute
the randomFile file in the
/home/cis90/bin directory?*

Put your answer in the chat window

Execute Permission

```
/home/cis90/simben $ ls -l bin/tryme ../bin/randomFile
-rwx[red box]-[red box]---. 1 rsimms cis90 1162 Sep 30 2014 ../bin/randomFile
-rwxr-xr-x. 1 simben90 cis90 174 Mar 4 2004 bin/tryme
```

```
/home/cis90/simben $ randomFile
-bash: /home/cis90/simben/../bin/randomFile: Permission denied
```

No, simben90 falls under the "group" category which does not have read or execute permission on randomFile

Execute Permission

```
/home/cis90/simben $ ls -l bin/tryme ../bin/randomFile  
-rwx-----. 1 rsimms    cis90 1162 Sep 30  2014 ../bin/randomFile  
-rwxr-xr-x. 1 simben90  cis90  174 Mar  4  2004 bin/tryme
```

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



*Can the simben90 execute
the tryme file in his own
bin directory?*

Execute Permission

```
/home/cis90/simben $ ls -l bin/tryme ../bin/randomFile  
-rwx-----. 1 rsimms    cis90 1162 Sep 30  2014 ../bin/randomFile  
-rwxr-xr-x. 1 simben90  cis90  174 Mar  4  2004 bin/tryme
```

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

My name is "tryme"

I am pleased to make your acquaintance, Benji Simms

/tmp

Yes, simben90 has both read and execute permissions on tryme

New files

ownership & group membership



Lesson 7 commands for your toolbox



groups

- displays file inode information (status) and more

id

- displays information about a user

Group Membership

Use either **id** or **groups** command to determine what groups a user belongs to

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

*simben90's
primary
group (GID) is
cis90*

```
/home/cis90/simben $ groups simben90  
simben90 : cis90 users
```

*simben90's
secondary
group is
users*

Groups

```
/home/cis90/simben $ touch mydogs  
/home/cis90/simben $ ls -l mydogs  
-rw-rw-r--. 1 simben90 cis90 0 Oct 7 15:12 mydogs
```

When a new file is created:

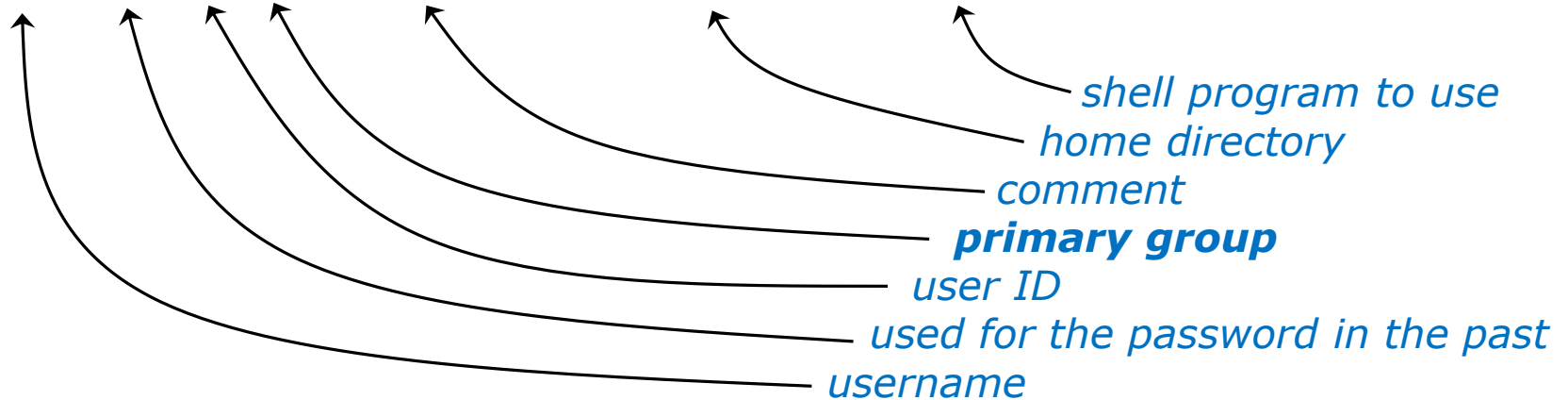
- *the user is set to the user creating the file*
- *the group is set to the user's primary group*

Primary group recorded in /etc/passwd

The user's primary group is stored in the 4th field of /etc/passwd

Excerpt from /etc/passwd

```
cis90:x:1000:190:CIS 90 Student:/home/cis90/cis:/bin/bash
simben90:x:1001:190:Benji Simms:/home/cis90/simben:/bin/bash
milhom90:x:1002:190:Homer Miller:/home/cis90/milhom:/bin/bash
rodduk90:x:1003:190:Duke Roddy:/home/cis90/rodduk:/bin/bash
```



Secondary groups recorded in /etc/group

Secondary group membership is recorded in /etc/group

Excerpts from **/etc/group**

audio:x:63:

nobody:x:99:

users:x:100:guest,jimg,rsimms,gerlinde,cis90,simben90,milhom90,rodduk90,calsea90,davd
on90,ellcar90,frocar90,hendaj90,kanbry90,kenrit90,libkel90,lyoben90,marray90,menfid90
,mesmic90,noreva90,potjos90,ramgus90,wiljac90,zamhum90,fyosea90,verevi90,rawjes90,mes
cha90,evaand90,ahrmat98,calsea98,capchr98,colabd98,dinchr98,doucor98,drybry98,flamat9
8,goothe98,lewzar98,mccmic98,roclea98,shidev98,sonely98,srelau98,syljos98,thePAT98,va
rana98,veleli98,wildan98,alvdes98,musdav98,luztas98,visgab98,fareli98,ramcar90,chiand
98,farsha90,arcmat172,balcor172,bodian172,deddil172,dusaar172,evaand172,sha172,galgwy
172,gilgab172,hilsco172,juarub172,mic172,lemrya172,maradr172,matmar172,melale172,menf
id172,monlui172,mordav172,pallar172,perstel172,rodchr172,rutsam172,schjon172,weltod172
,wiltyrl72,wismar172,bramar172,172,acctes172,bermic172,lejmich172,farsha172,ianbod172

dbus:x:81:

utmp:x:22:

< snipped >

guest:x:506:

staff:x:503:rsimms,gerlinde,jimg,rick

cis90:x:190:guest,rsimms,jimg

cis98:x:130:jimg,rsimms

cis172:x:172:gerlinde

cis191:x:191:rsimms,jimg

cis192:x:192:rsimms,jimg

Activity

What is your primary group?

(Write your answer in the chat window)



Activity

What other groups do you
belong to?

(Write your answer in the chat window)

Specifying Numeric Permissions

File Permissions

Binary and Decimal

Permissions are stored internally using binary numbers and they can be specified using decimal numbers

rwX	Binary	Convert	Decimal
— — —	0 0 0	0 + 0 + 0	0
— — x	0 0 1	0 + 0 + 1	1
— w —	0 1 0	0 + 2 + 0	2
— w x	0 1 1	0 + 2 + 1	3
r — —	1 0 0	4 + 0 + 0	4
r — x	1 0 1	4 + 0 + 1	5
r w —	1 1 0	4 + 2 + 0	6
r w x	1 1 1	4 + 2 + 1	7

4's column ———→
 2's column ———→
 1's column ———→

File Permissions

Example: rw-

rwX	Binary	Convert	Decimal
_ _ _	0 0 0	0 + 0 + 0	0
_ _ x	0 0 1	0 + 0 + 1	1
_ w _	0 1 0	0 + 2 + 0	2
_ w x	0 1 1	0 + 2 + 1	3
r _ _	1 0 0	4 + 0 + 0	4
r _ x	1 0 1	4 + 0 + 1	5
r w _	1 1 0	4 + 2 + 0	6
r w x	1 1 1	4 + 2 + 1	7

Example: **rw-** (read, write, no execute)

= 110 or 4+2+0 = 6
binary *decimal* *decimal*

File Permissions

Example: -wx

rwX	Binary	Convert	Decimal
_ _ _	0 0 0	0 + 0 + 0	0
_ _ x	0 0 1	0 + 0 + 1	1
_ w _	0 1 0	0 + 2 + 0	2
_ w x	0 1 1	0 + 2 + 1	3
r _ _	1 0 0	4 + 0 + 0	4
r _ x	1 0 1	4 + 0 + 1	5
r w _	1 1 0	4 + 2 + 0	6
r w x	1 1 1	4 + 2 + 1	7

Example: **-wx** (no read, write, execute)

= 011 or 0+2+1 = 3
binary *decimal* *decimal*

Practice converting to numeric permissions

File Permissions

Use long Listings to show permissions

```
simben90@oslab:~  
/home/cis90/simben $ ls -l  
total 472  
-rw-rw-r--. 1 simben90 cis90  4008 Sep 11 22:23 archives  
-rw-r--r--. 6 rsimms  cis90 10576 Aug  1 18:49 bigfile  
drwxr-xr-x. 2 simben90 cis90  4096 Oct  5 10:25 bin  
drwxrwxr-x. 4 simben90 cis90  4096 Oct  5 10:21 class  
-rw-----. 1 simben90 cis90  1894 Sep 20 06:23 dead.letter  
drwxrwxr-x. 2 simben90 cis90  4096 Oct  5 10:25 docs  
drwxrwxr-x. 2 simben90 cis90  4096 Oct  5 10:30 edits  
drwxrwxr-x. 2 simben90 cis90  4096 Oct  5 10:41 etc  
d-----.. 2 simben90 cis90  4096 Feb  1 2002 Hidden  
-r-----. 1 simben90 staff  2780 Sep  6 13:47 lab01.graded  
-r-----. 1 simben90 staff  1312 Sep 13 12:27 lab02.graded  
-r-----. 1 simben90 staff   814 Sep 27 13:08 lab04.graded  
-rw-r--r--. 1 simben90 cis90  1059 Oct  7 14:41 letter  
-rw-r--r--. 1 simben90 cis90   208 Oct  5 10:45 log  
-rwxr-xr-x. 1 simben90 cis90 375252 Oct  7 14:05 mail  
-rw-rw-r--. 1 simben90 cis90  3766 Sep 12 18:53 mbox  
drwxr-xr-x. 2 simben90 cis90  4096 Oct  5 10:30 misc  
drwxr-xr-x. 7 simben90 cis90  4096 Oct  5 10:35 poems  
-r-----. 1 simben90 staff  5899 Oct  4 11:04 test01.graded  
-rw-rw-r--. 1 simben90 cis90 17341 Sep 19 19:31 uhistory  
/home/cis90/simben $
```

Converting mnemonic permissions to numeric

What are the numerical permissions on class?

$rwx \mid rwx \mid r-x$

Example 1

Converting mnemonic permissions to numeric

```
simben90@oslab:~  
/home/cis90/simben $ ls -l  
total 472  
-rw-rw-r--. 1 simben90 cis90 4008 Sep 11 22:23 archives  
-rw-r--r--. 6 rsimms cis90 10576 Aug 1 18:49 bigfile  
drwxr-xr-x. 2 simben90 cis90 4096 Oct 5 10:25 bin  
drwxrwxr-x. 4 simben90 cis90 4096 Oct 5 10:21 class  
-rw-----. 1 simben90 cis90 1894 Sep 20 06:23 dead.letter  
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:25 docs  
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:30 edits  
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:25 files  
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:25 images  
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:25 music  
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:25 videos  
-rw-rw-r--. 1 simben90 cis90 17341 Sep 19 19:31 uhistory  
/home/cis90/simben $
```

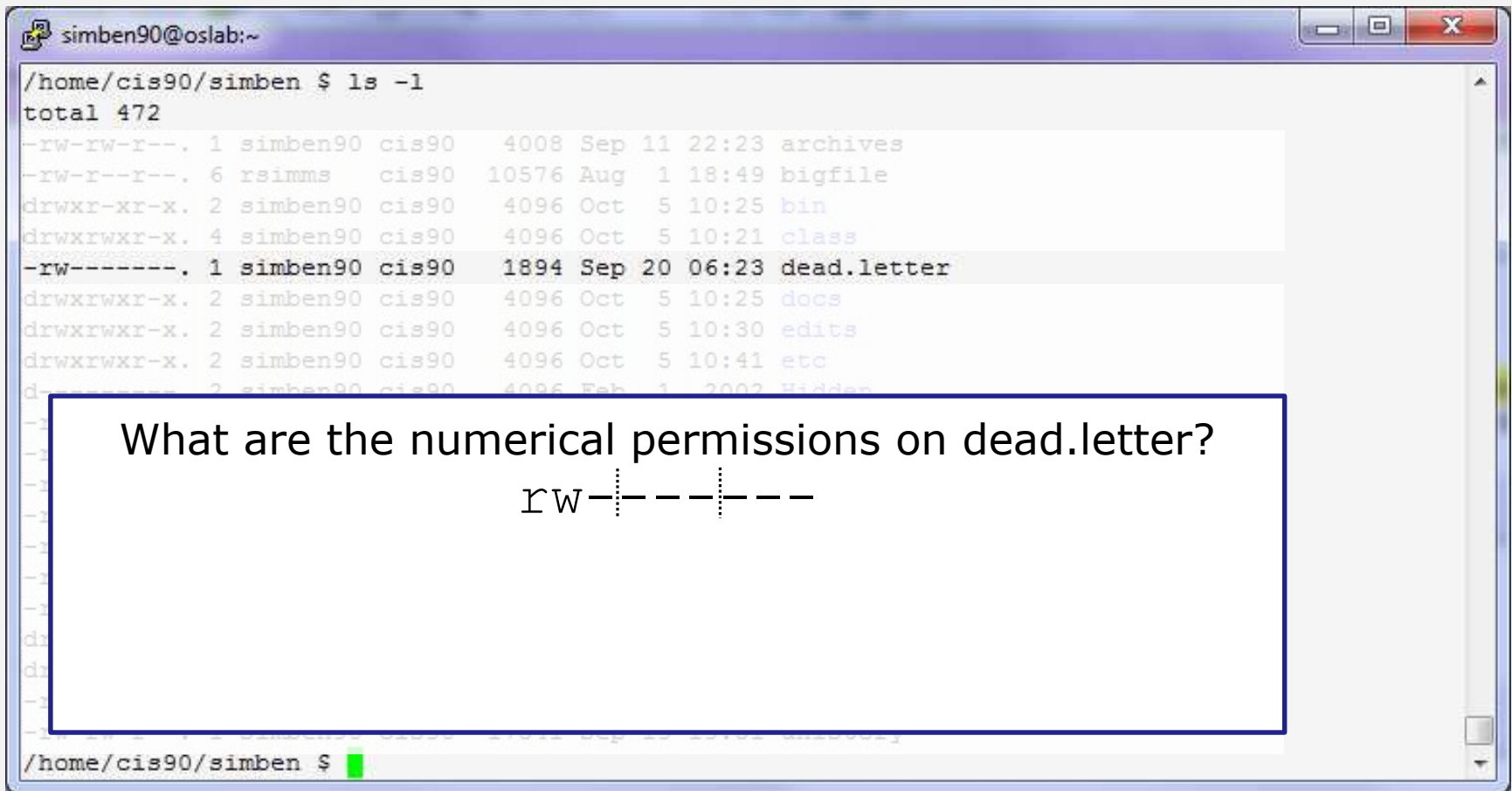
What are the numerical permissions on class?

rwx	rwx	r-x
111	111	101
7	7	5

simben90's class (directory) permissions are 775

Example 2

Converting mnemonic permissions to numeric



A terminal window titled 'simben90@oslab:~' showing the output of the command 'ls -l'. The output lists several files and directories. The file 'dead.letter' is highlighted with a blue background. A blue-bordered box is overlaid on the terminal, containing the question 'What are the numerical permissions on dead.letter?' and the mnemonic permissions 'rw-|- - -|- - -' with vertical lines pointing to the 'r', 'w', and the first '-' in the second and third permission sets.

```
simben90@oslab:~
/home/cis90/simben $ ls -l
total 472
-rw-rw-r--. 1 simben90 cis90  4008 Sep 11 22:23 archives
-rw-r--r--. 6 rsimms    cis90 10576 Aug  1 18:49 bigfile
drwxr-xr-x. 2 simben90 cis90  4096 Oct  5 10:25 bin
drwxrwxr-x. 4 simben90 cis90  4096 Oct  5 10:21 class
-rw-|- - -|- - - 1 simben90 cis90 1894 Sep 20 06:23 dead.letter
drwxrwxr-x. 2 simben90 cis90  4096 Oct  5 10:25 docs
drwxrwxr-x. 2 simben90 cis90  4096 Oct  5 10:30 edits
drwxrwxr-x. 2 simben90 cis90  4096 Oct  5 10:41 etc
d- - - - - 2 simben90 cis90  4096 Feb  1 2002 Hidden
-rw-rw-r--. 1 simben90 cis90  4096 Oct  5 10:25 ...
-rw-rw-r--. 1 simben90 cis90  4096 Oct  5 10:25 ...
-rw-rw-r--. 1 simben90 cis90  4096 Oct  5 10:25 ...
drwxrwxr-x. 2 simben90 cis90  4096 Oct  5 10:25 ...
drwxrwxr-x. 2 simben90 cis90  4096 Oct  5 10:25 ...
-rw-rw-r--. 1 simben90 cis90  4096 Oct  5 10:25 ...
-rw-rw-r--. 1 simben90 cis90  4096 Oct  5 10:25 ...
/home/cis90/simben $
```

What are the numerical permissions on dead.letter?

rw-|- - -|- - -

simben90's dead.letter (regular file)

Example 2

Converting mnemonic permissions to numeric

The terminal window shows the command `ls -l` output. The file `dead.letter` has permissions `-rw-----`. A box highlights the conversion process:

```

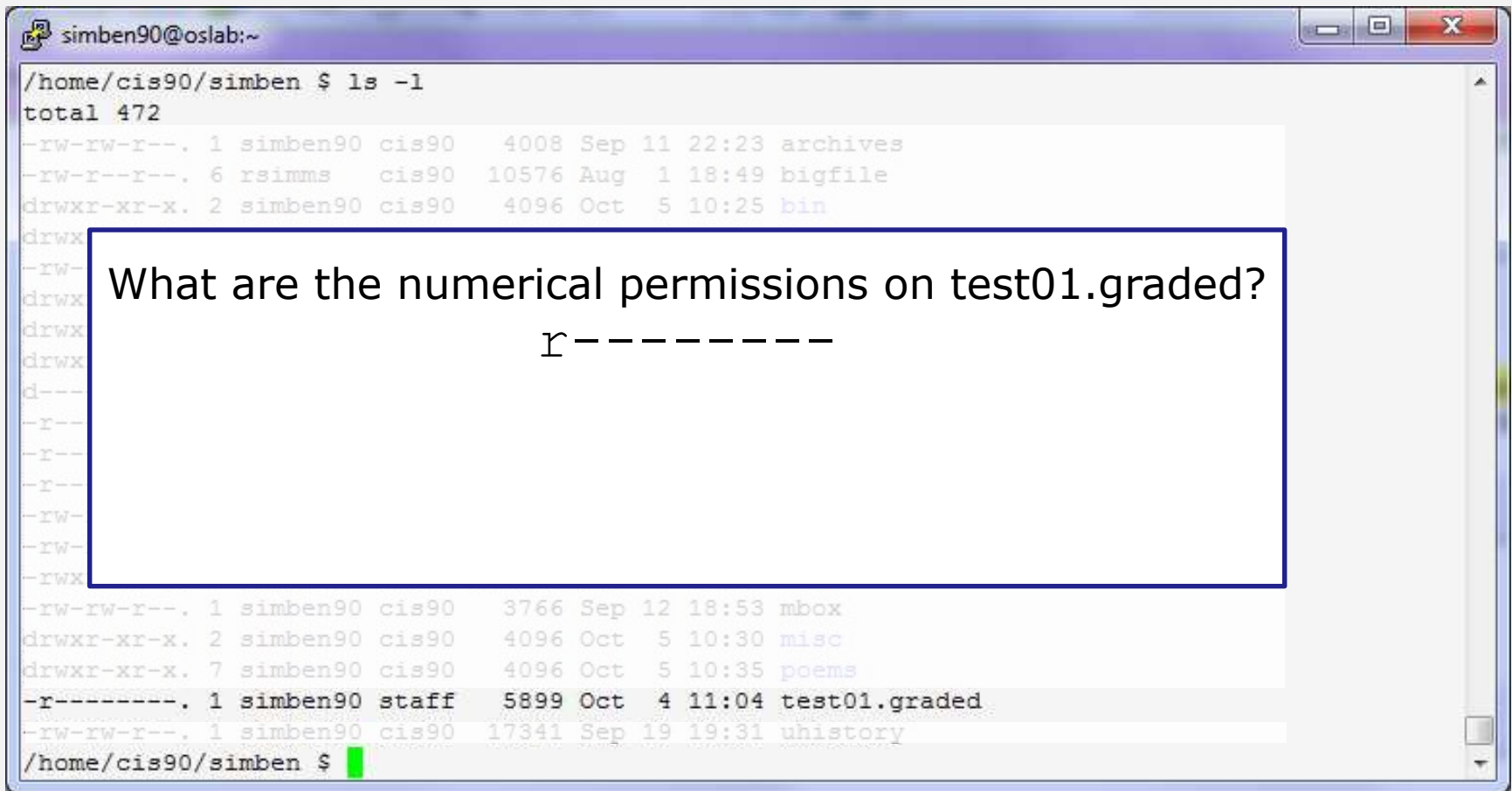
What are the numerical permissions on dead.letter?
  rw-----
  110000000
  6  0  0
  
```

The terminal window also shows the command prompt `/home/cis90/simben $` at the bottom.

simben90's dead.letter (regular file) permissions are 600

Example 3

Converting mnemonic permissions to numeric



A terminal window titled 'simben90@oslab:~' showing the output of the command 'ls -l'. The output lists several files and directories. A blue box highlights the line for 'test01.graded' and the text 'What are the numerical permissions on test01.graded?' with the mnemonic 'r-----' below it.

```

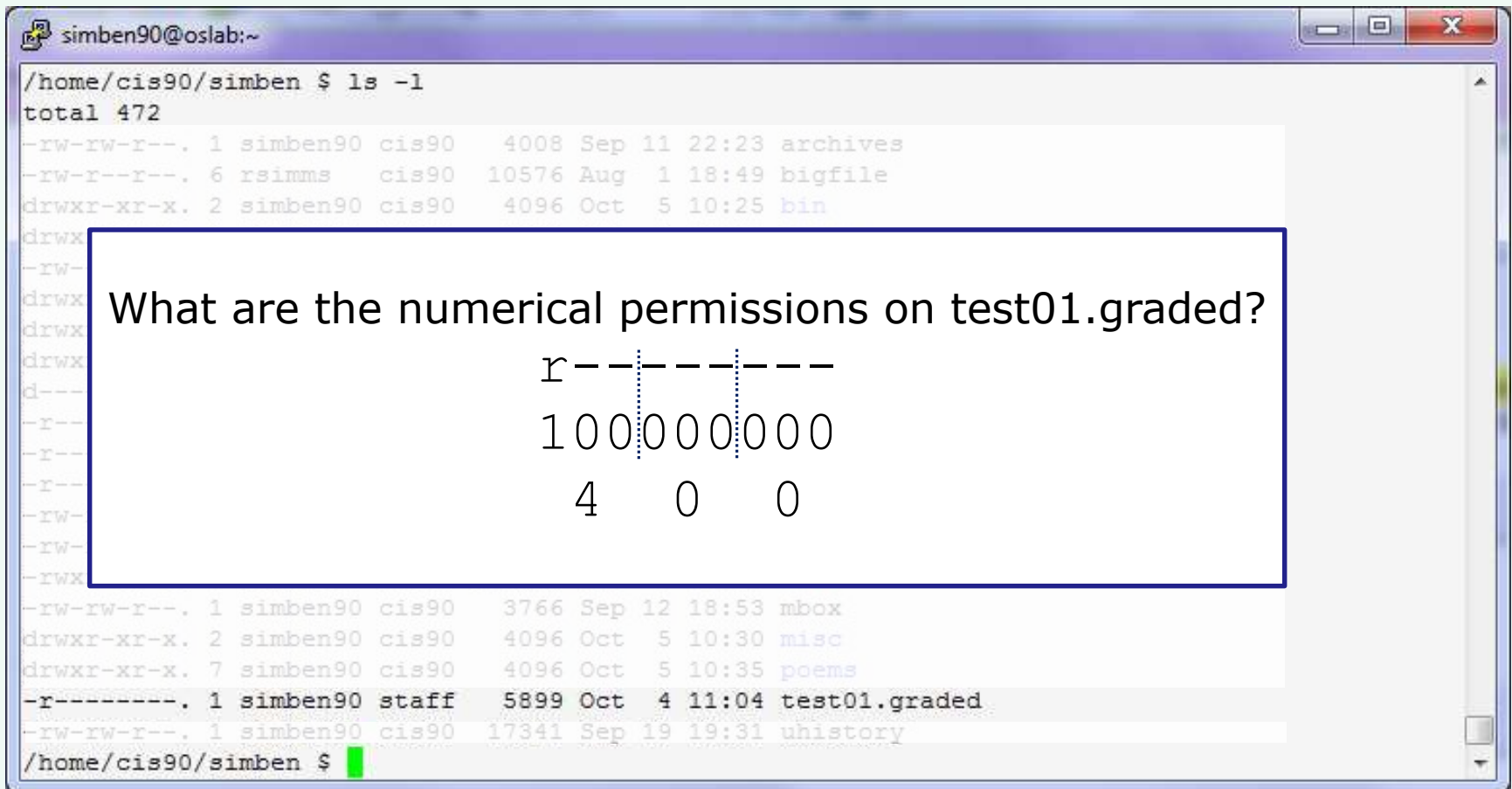
simben90@oslab:~
/home/cis90/simben $ ls -l
total 472
-rw-rw-r--. 1 simben90 cis90  4008 Sep 11 22:23 archives
-rw-r--r--. 6 rsimms    cis90 10576 Aug  1 18:49 bigfile
drwxr-xr-x. 2 simben90 cis90  4096 Oct  5 10:25 bin
drwxr-xr-x. 2 simben90 cis90  4096 Oct  5 10:25 misc
-rw-rw-r--. 1 simben90 cis90  3766 Sep 12 18:53 mbox
drwxr-xr-x. 2 simben90 cis90  4096 Oct  5 10:30 misc
drwxr-xr-x. 7 simben90 cis90  4096 Oct  5 10:35 poems
-r-----. 1 simben90 staff  5899 Oct  4 11:04 test01.graded
-rw-rw-r--. 1 simben90 cis90 17341 Sep 19 19:31 uhistory
/home/cis90/simben $
  
```

What are the numerical permissions on test01.graded?
r-----

simben90's test01.graded (regular file)

Example 3

Converting mnemonic permissions to numeric



```

simben90@oslab:~
/home/cis90/simben $ ls -l
total 472
-rw-rw-r--. 1 simben90 cis90  4008 Sep 11 22:23 archives
-rw-r--r--. 6 rsimms   cis90 10576 Aug  1 18:49 bigfile
drwxr-xr-x. 2 simben90 cis90  4096 Oct  5 10:25 bin
drwxr-xr-x. 2 simben90 cis90  4096 Oct  5 10:25 misc
-rw-rw-r--. 1 simben90 cis90  3766 Sep 12 18:53 mbox
drwxr-xr-x. 2 simben90 cis90  4096 Oct  5 10:30 misc
drwxr-xr-x. 7 simben90 cis90  4096 Oct  5 10:35 poems
-r-----. 1 simben90 staff  5899 Oct  4 11:04 test01.graded
-rw-rw-r--. 1 simben90 cis90 17341 Sep 19 19:31 uhistory
/home/cis90/simben $
  
```

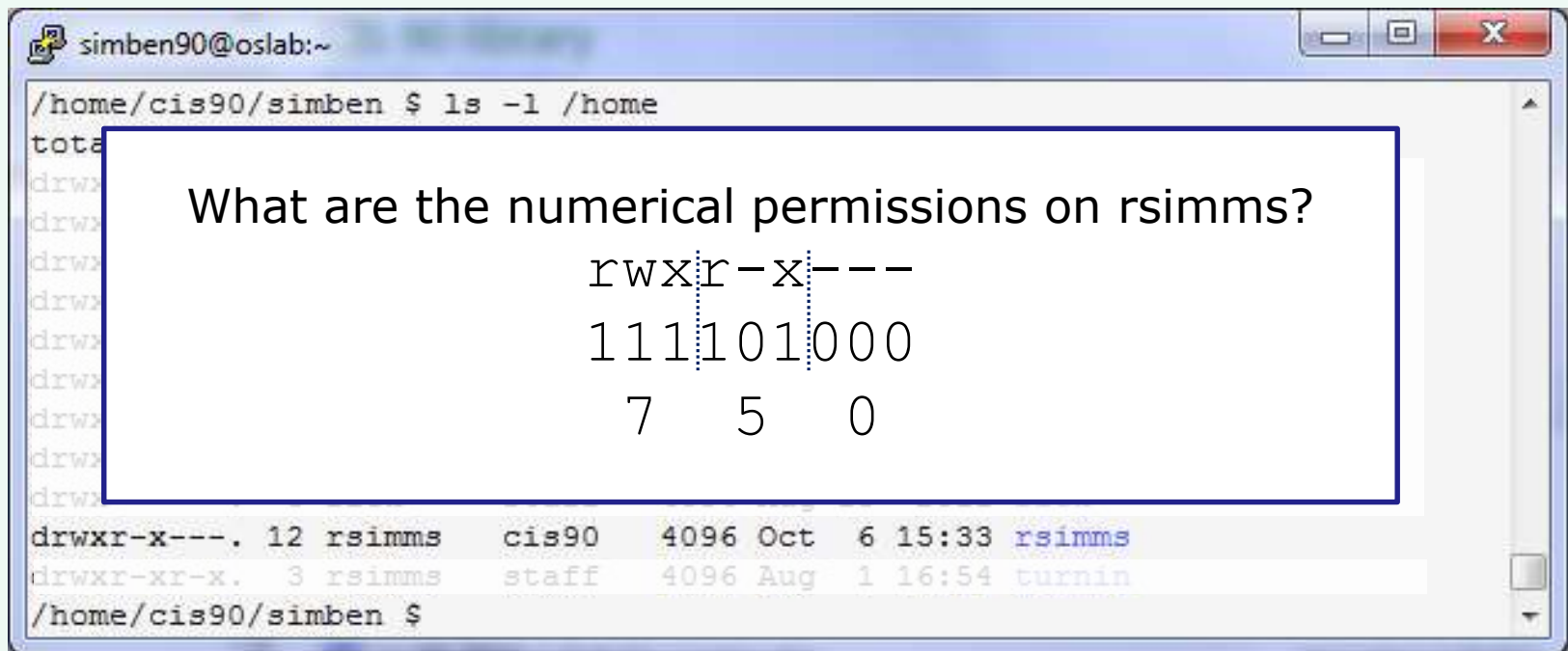
What are the numerical permissions on test01.graded?

r	--	--	--	--
1	0	0	0	0
4	0	0		

simben90's test01.graded permissions are 400

Example 4

Converting mnemonic permissions to numeric



A terminal window titled 'simben90@oslab:~' shows the command `ls -l /home` being executed. The output lists several files with permissions like `drwxr-x---`. A blue-bordered box is overlaid on the terminal, containing the text 'What are the numerical permissions on rsimms?' followed by a conversion example for `rwXr-x---` to `750`. The example shows the mapping: `rwX` to `7`, `r-x` to `5`, and `---` to `0`. Below the box, the terminal output for `rsimms` is visible, showing permissions `drwxr-x---`.

```

simben90@oslab:~
/home/cis90/simben $ ls -l /home
total
drwxr-x---. 12 rsimms  cis90  4096 Oct  6 15:33 rsimms
drwxr-xr-x.  3 rsimms  staff 4096 Aug  1 16:54 turnin
/home/cis90/simben $

```

What are the numerical permissions on rsimms?

```

rwXr-x---
111101000
 7  5  0

```

/home/rsimms permissions are 750

Example 5

Converting mnemonic permissions to numeric

```
simben90@oslab:~  
/home/cis90/simben $ ls -l /dev/pts  
total 0  
crw--w----. 1 mesmic90 tty 136, 0 Oct 7 16:32 0  
crw--w----. 1 mesmic90 tty 136, 2 Oct 7 16:24 2  
crw--w----. 1 rawjes90 tty 136, 6 Oct 7 16:26 6  
crw--w----. 1 simben90 tty 136, 7 Oct 7 16:32 7  
c-----. 1 root root 5, 2 Jul 30 21:25 ptmx  
/home/cis90/simben $
```

What are the numerical permissions on /dev/pts/7?

rw- -w- - -

/dev/pts/7 (character special device file)

Example 5

Converting mnemonic permissions to numeric

```
simben90@oslab:~  
/home/cis90/simben $ ls -l /dev/pts  
total 0  
crw--w----. 1 mesmic90 tty 136, 0 Oct 7 16:32 0  
crw--w----. 1 mesmic90 tty 136, 2 Oct 7 16:24 2  
crw--w----. 1 rawjes90 tty 136, 6 Oct 7 16:26 6  
crw--w----. 1 simben90 tty 136, 7 Oct 7 16:32 7  
c----- . 1 root root 5, 2 Jul 30 21:25 ptmx  
/home/cis90/simben $
```

What are the numerical permissions on /dev/pts/7?

r	w	-	-	-	-
1	1	0	0	1	0
6	2	0			

/dev/pts/7 permissions are 620

Recap

File Permissions

Summary

How do we control access to files and directories?



How do we control access to files and directories?

Answer: **file permissions**

File Permissions

Summary

What permissions are there?

File Permissions

Summary

What permissions are there?

Answer: **read, write and execute**

File Permissions

Summary

Who do permissions apply to?

File Permissions

Summary

Who do permissions apply to?

Answer:

The **user** (owner) of the file
The **group** the file belongs to
and everyone else (**others**)

Letter file in detail



More Lesson 7 commands for your toolbox

ls -l – produces a “long listing” showing some of the inode information



stat – file “status” which displays additional inode information and more

File Permissions

Relevant fields from the inode

```
/home/cis90/simmsben $ ls -l
```

```
total 176
```

```
total 472
```

```
-rw-rw-r--. 1 simben90 cis90 4008 Sep 11 22:23 archives
-rw-r--r--. 6 rsimms cis90 10576 Aug 1 18:49 bigfile
drwxr-xr-x. 2 simben90 cis90 4096 Oct 5 10:25 bin
drwxrwxr-x. 4 simben90 cis90 4096 Oct 5 10:21 class
-rw-----. 1 simben90 cis90 1894 Sep 20 06:23 dead.letter
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:25 docs
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:30 edits
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:41 etc
d-----. 2 simben90 cis90 4096 Feb 1 2002 Hidden
-r-----. 1 simben90 staff 2780 Sep 6 13:47 lab01.graded
-r-----. 1 simben90 staff 1312 Sep 13 12:27 lab02.graded
-r-----. 1 simben90 staff 814 Sep 27 13:08 lab04.graded
-rw-r--r--. 1 simben90 cis90 1059 Oct 7 15:05 letter
-rw-r--r--. 1 simben90 cis90 208 Oct 5 10:45 log
-rwxr-xr-x. 1 simben90 cis90 375252 Oct 7 14:05 mail
-rw-rw-r--. 1 simben90 cis90 3766 Sep 12 18:53 mbox
drwxr-xr-x. 2 simben90 cis90 4096 Oct 5 10:30 misc
-rw-rw-r--. 1 simben90 cis90 0 Oct 7 15:12 mydogs
drwxr-xr-x. 7 simben90 cis90 4096 Oct 5 10:35 poems
-r-----. 1 simben90 staff 5899 Oct 4 11:04 test01.graded
-rw-rw-r--. 1 simben90 cis90 17341 Sep 19 19:31 uhistory
```

FYI:

In newer distros, GNU ls uses a '.' character to indicate a file with an SELinux security context, but no other alternate access method.

http://www.gnu.org/software/coreutils/manual/html_node/What-information-is-listed.html#What-information-is-listed

Permissions → Owner → Group

File Permissions

Relevant fields from the inode

```
/home/cis90/simmsben $ ls -l
```

```
total 176
```

```
total 472
```

```
-rw-rw-r--. 1 simben90 cis90 4008 Sep 11 22:23 archives
-rw-r--r--. 6 rsimms cis90 10576 Aug 1 18:49 bigfile
drwxr-xr-x. 2 simben90 cis90 4096 Oct 5 10:25 bin
drwxrwxr-x. 4 simben90 cis90 4096 Oct 5 10:21 class
-rw-----. 1 simben90 cis90 1894 Sep 20 06:23 dead.letter
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:25 docs
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:30 edits
drwxrwxr-x. 2 simben90 cis90 4096 Oct 5 10:41 etc
d-----. 2 simben90 cis90 4096 Feb 1 2002 Hidden
-r-----. 1 simben90 staff 2780 Sep 6 13:47 lab01.graded
-r-----. 1 simben90 staff 1312 Sep 13 12:27 lab02.graded
-r-----. 1 simben90 staff 814 Sep 27 13:08 lab04.graded
-rw-r--r--. 1 simben90 cis90 1059 Oct 7 15:05 letter
-rw-r--r--. 1 simben90 cis90 208 Oct 5 10:45 log
-rwxr-xr-x. 1 simben90 cis90 375252 Oct 7 14:05 mail
-rw-rw-r--. 1 simben90 cis90 3766 Sep 12 18:53 mbox
drwxr-xr-x. 2 simben90 cis90 4096 Oct 5 10:30 misc
-rw-rw-r--. 1 simben90 cis90 0 Oct 7 15:12 mydogs
drwxr-xr-x. 7 simben90 cis90 4096 Oct 5 10:35 poems
-r-----. 1 simben90 staff 5899 Oct 4 11:04 test01.graded
-rw-rw-r--. 1 simben90 cis90 17341 Sep 19 19:31 uhistory
```

*The owner of letter
is simben90 and
the group is cis90*

Permissions → Owner → Group

The permissions on letter are `rw-r--r--` or **110 100 100** or **644**

The filename is kept in the directory

Permissions, owner, group, etc. are kept in the inode

bigfile 12687
bin 12067
letter 10574

Hello Mother! Hello Father!

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

All the counselors hate the waiters, and the lake has alligators. You remember Leonard Skinner? He got ptomaine poisoning last night after dinner.

Now I don't want this to scare you, but my bunk mate has malaria. You remember Jeffrey Hardy? Their about to organize a searching party.

Take me home, oh Mother, Father, take me home! I hate Granada.
Don't leave me out in the forest where I might get eaten by a bear! Take me home, I promise that I won't make noise, or mess the house with other boys, oh please don't make me stay -- I've been here one whole day.

Dearest Father, darling Mother, how's my precious little brother? I will come home if you miss me. I will even let Aunt Bertha hug and kiss me!

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

Alan Sherman

ext2 file system

Superblock

Inode Table

Data Blocks

10574	inode number
-	Type
rw-r--r--	Permissions
1	Number of links
simben90	User
cis90	Group
1059	Size
2012-10-07	Modification time
2012-10-07	Access Time
2012-10-07	Change time
Pointer(s) to data blocks	Pointer(s) to data blocks

The actual content is kept in a data block

```
/home/cis90/simmsben $ ls -il letter
10574 -rw-r--r--. 1 simben90 cis90 1059 Oct 7 15:05 letter
```

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File Permissions

Example: letter file

*The **stat** command shows permissions in both formats*

```
/home/cis90/simben $ stat letter
  File: `letter'
  Size: 1059          Blocks: 8          IO Block:
    4096   regular file
Device: 805h/2053d    Inode: 10574        Links: 1
Access: (0644/-rw-r--r--)  Uid: ( 1001/simben90)   Gid:
    ( 190/   cis90)
Access: 2012-10-07 15:06:09.922703386 -0700
Modify: 2012-10-07 15:05:57.856733896 -0700
Change: 2012-10-07 15:05:57.856733896 -0700
/home/cis90/simben $
```

The permissions on letter are 110100100
rw-r--r-- or 644

owner has read and write

group has only read

others have only read

numeric form

More Practice

File Permissions

What is the numeric form of `r--r-----`?

File Permissions

What is the numeric form of $r--r-----$?

100100000
4 4 0

Answer: 440

Owner has read

Group has read

Others have no permissions

File Permissions

What is the mnemonic form of 755?

File Permissions

What is the mnemonic form of 755?

7	5	5
111	101	101
rw	r-x	r-x

Answer: `rwxr-xr-x`

*Owner has read, write and execute
Group has read and execute
Others have read and execute*

File Permissions

What is the numeric form of `rwXrw-r--?`

File Permissions

What is the numeric form of `rwXrw-r--?`

`111110100`
`7 6 4`

Answer: 764

*Owner has read, write and execute
Group has read and write
Others have read only*

File Permissions

What are the mnemonic permissions are 644?

File Permissions

What are the mnemonic permissions are 644?

```
110100100  
rw-r--r--
```

Answer: `rw-r--r--`

*owner has read and write
group has read
others have read*

File Permissions

Does the simben90 user have read access to /etc/samba/smb.conf?

File Permissions

Does the simben90 user have read access to /etc/samba/smb.conf?

Answer: yes

```
/home/cis90/simben $ ls -l /etc/samba/smb.conf  
-rw-r--r--. 1 root root 9778 Apr 30 11:35 /etc/samba/smb.conf
```

root has read & write

root group has read

all other users, including simben90, have read



Configuring Permissions



More Lesson 7 commands for your toolbox



chown - Changes the ownership of a file. (Only the superuser has this privilege)



chgrp - Changes the group of a file. (Only groups that you belong to)



chmod - Changes the file mode "permission" bits of a file.

- Numeric: **chmod 640 letter** (sets the permissions)
- Mnemonic: **chmod ug+rw letter** (changes the permissions)
u=user(owner), **g**=group, **o**=other
r=read, **w**=write, **x**=execute



umask - Allows you to fully control the permissions new files and directories are created with

chown

chown – change owner

Syntax:

chown *newowner pathname(s)*

Examples:

- **chown rsimms letter**
- **chown simben90 lab*.graded**
- **chown rsimms /home/cis90/bin/***

chown – change owner

```
/home/cis90/milhom $ touch myfile
/home/cis90/milhom $ ls -l myfile
-rw-rw-r--. 1 milhom90 cis90 0 Oct  9 10:23 myfile
```

*Make a test file
and try to change
the owner*

```
/home/cis90/milhom $ chown simben90 myfile
chown: changing ownership of `myfile': Operation not permitted
```



*Only root can use the **chown** command*

```
/home/cis90/milhom $ su -
Password:
[root@oslab ~]# chown simben90 /home/cis90/milhom/myfile
[root@oslab ~]# ls -l /home/cis90/milhom/myfile
-rw-rw-r--. 1 simben90 cis90 0 Oct  9 10:23 /home/cis90/milhom/myfile
```

chgrp

chgrp – change group

Syntax:

chgrp *group pathname(s)*

Examples:

- **chgrp users letter**
- **chgrp cis90 /home/cis90/bin/***

chgrp – change group

```
/home/cis90/milhom $ ls -l myfile  
-rw-rw-r--. 1 milhom90 cis90 0 Oct  9 10:23 myfile
```

change group to users

```
/home/cis90/milhom $ chgrp users myfile  
/home/cis90/milhom $ ls -l myfile  
-rw-rw-r--. 1 milhom90 users 0 Oct  9 10:23 myfile
```

change group back to cis90

```
/home/cis90/milhom $ chgrp cis90 myfile  
/home/cis90/milhom $ ls -l myfile  
-rw-rw-r--. 1 milhom90 cis90 0 Oct  9 10:23 myfile
```

You can only change the group to one you belong to

chmod

chmod – change permissions

Syntax:

chmod permissions *pathname(s)*

↑
*may be specified numerically
or mnemonically*

Examples:

- **chmod 750 check5 check6**
 - **chmod 644 poems/*/***
- } *numeric*
-
- **chmod +x myscript**
 - **chmod g+rw share/***
- } *mnemonic*

chmod
(mnemonic)

Mnemonic permission specifications

Relative changes to existing permissions

Examples:

u+w = add write permission to user

u-w = remove write permission from user

u+wx = add write and execute permission to user

g+r = add read permission to group

g-rwx = remove read, write, execute permissions
from group

o+rw = add read, write permissions to others

o-r = remove read permission from others

+x = add execute permission to user, group and
others

+rw = add read & write permissions to user, group
and others

uo+w = add write permission to user and others

u+rwx,o-rwx = add read, write, execute
permissions to user but remove them from others

Definitions:

u=user (owner)

g=group

o=other

r=read permission

w=write permission

x=execute permission

*combinations allowed
but **no blanks** around
the commas!*

Using chmod to change permissions (mnemonic)

```
/home/cis90/milhom $ ls -l myfile
-rw-rw-r--. 1 milhom90 cis90 0 Oct  9 10:23 myfile
  ↑  ↑
```

The file does not currently have execute permission for the user or group

With chmod command use "u" for user (owner), "g" for group and "o" for others

```
/home/cis90/milhom $ chmod u+x myfile
/home/cis90/milhom $ ls -l myfile
-rwxrw-r--. 1 milhom90 cis90 0 Oct  9 10:23 myfile
  ↑
```

add execute permission for user (owner)

```
/home/cis90/milhom $ chmod g+x myfile
/home/cis90/milhom $ ls -l myfile
-rwxrwxr--. 1 milhom90 cis90 0 Oct  9 10:23 myfile
  ↑
```

add execute permission for group

Using chmod to change permissions (mnemonic)

```
/home/cis90/milhom $ ls -l myfile
```

```
-rwxrwxr--. 1 milhom90 cis90 0 Oct  9 10:23 myfile
```

```
/home/cis90/milhom $ chmod -x myfile remove execute from all
```

```
/home/cis90/milhom $ ls -l myfile
```

```
-rw-rw-r--. 1 milhom90 cis90 0 Oct  9 10:23 myfile
```

```
/home/cis90/milhom $ chmod go+x myfile add execute to others and group
```

```
/home/cis90/milhom $ ls -l myfile
```

```
-rw-rwxr-x. 1 milhom90 cis90 0 Oct  9 10:23 myfile
```

```
/home/cis90/milhom $ chmod go-rwx myfile remove read, write, execute  
from groups and others
```

```
-rw-----. 1 milhom90 cis90 0 Oct  9 10:23 myfile
```

chmod (numerical)

chmod using numerical method

```
/home/cis90/milhom $ ls -l myfile
-rw-----. 1 milhom90 cis90 0 Oct  9 10:23 myfile
```

↙

```
/home/cis90/milhom $ chmod 664 myfile
/home/cis90/milhom $ ls -l myfile
-rw-rw-r--. 1 milhom90 cis90 0 Oct  9 10:23 myfile
```

You can also specify each permission directly using the numeric mode of the command

chmod using numerical method

```

/home/cis90/milhom $ chmod 777 myfile
/home/cis90/milhom $ ls -l myfile
-rwxrwxrwx. 1 milhom90 cis90 0 Oct  9 10:23 myfile

/home/cis90/milhom $ chmod 640 myfile
/home/cis90/milhom $ ls -l myfile
-rw-r-----. 1 milhom90 cis90 0 Oct  9 10:23 myfile

/home/cis90/milhom $ chmod 000 myfile
/home/cis90/milhom $ ls -l myfile
-----. 1 milhom90 cis90 0 Oct  9 10:23 myfile

/home/cis90/milhom $ chmod 644 myfile
/home/cis90/milhom $ ls -l myfile
-rw-r--r--. 1 milhom90 cis90 0 Oct  9 10:23 myfile

```

*More examples using the numeric mode of the **chmod** command*

File Permissions in action

File Permissions

Commands that use file permissions



```
inodeNum1 fileName1
inodeNum2 fileName2
:
:
```

Permission	File	Directory
Read (4)	cat, more, head, tail, cp (from)	ls
Write (2)	cp (into), vi, saving mail	cp (into), mv, rm, ln
Execute (1)	\$ command	cd, ls -l, find

read permission is required whenever file contents must be accessed



Read Permission

Make a directory named Directory3, cd into it, and create myfile:

```
/home/cis90/simmsben $ mkdir Directory3
/home/cis90/simmsben $ cd Directory3/
/home/cis90/simmsben/Directory3 $ touch myfile
/home/cis90/simmsben/Directory3 $ ls -l myfile
-rw-r--r-- 1 simmsben cis90 0 Oct 13 07:16 myfile
```

Add some data to myfile and try reading with and without read permission:

```
/home/cis90/simmsben/Directory3 $ echo Blah Blah Blah > myfile
/home/cis90/simmsben/Directory3 $ cat myfile
Blah Blah Blah
/home/cis90/simmsben/Directory3 $ chmod u-r myfile
/home/cis90/simmsben/Directory3 $ ls -l myfile
--w-r--r-- 1 simmsben cis90 15 Oct 13 08:50 myfile
/home/cis90/simmsben/Directory3 $ cat myfile
cat: myfile: Permission denied
```

removes read permission for user owning the file

Can you fix this so you can read your own file again?

File Permissions

Commands that use file permissions



```
inodeNum1 fileName1
inodeNum2 fileName2
:
:
```

Permission	File	Directory
Read (4)	cat, more, head, tail, cp (from)	ls
Write (2)	cp (into), vi, saving mail	cp (into), mv, rm, ln
Execute (1)	\$ command	cd, ls -l, find

write permission is required whenever file contents are written



Write Permission

Start with a fresh version of myfile:

```
/home/cis90/simmsben/Directory3 $ rm myfile
/home/cis90/simmsben/Directory3 $ touch myfile
/home/cis90/simmsben/Directory3 $ ls -l myfile
-rw-rw-r-- 1 simmsben cis90 0 Oct 13 08:58 myfile
```

Add some data to myfile :

```
/home/cis90/simmsben/Directory3 $ echo Blah Blah Blah > myfile
/home/cis90/simmsben/Directory3 $ chmod 444 myfile write permission removed
/home/cis90/simmsben/Directory3 $ ls -l myfile
-r--r--r-- 1 simmsben cis90 15 Oct 13 09:02 myfile
/home/cis90/simmsben/Directory3 $ echo Blah Blah Blah > myfile
-bash: myfile: Permission denied
```

Can you fix this so you can write to your own file again?

File Permissions

Commands that use file permissions



```
inodeNum1 fileName1
inodeNum2 fileName2
:
:
```

Permission	File	Directory
Read (4)	cat, more, head, tail, cp (from)	ls
Write (2)	cp (into), vi, saving mail	cp (into), mv, rm, ln
Execute (1)	\$ command	cd, ls -l, find

execute permission is required to load and run a file

Execute Permission

Start with a fresh version of myfile:

```
/home/cis90/simmsben/Directory3 $ rm myfile
rm: remove write-protected regular file `myfile'? yes
/home/cis90/simmsben/Directory3 $ touch myfile
/home/cis90/simmsben/Directory3 $ ls -l myfile
-rw-rw-r-- 1 simmsben cis90 0 Oct 13 09:12 myfile
```

Make a little script and give it execute permission:

```
/home/cis90/simmsben/Directory3 $ echo 'banner $LOGNAME is cool' > myfile
/home/cis90/simmsben/Directory3 $ cat myfile
banner $LOGNAME is cool
/home/cis90/simmsben/Directory3 $ myfile
-bash: ./myfile: Permission denied
/home/cis90/simmsben/Directory3 $ chmod +x myfile
/home/cis90/simmsben/Directory3 $ ls -l myfile
-rwxrwxr-x 1 simmsben cis90 24 Oct 13 09:27 myfile
/home/cis90/simmsben/Directory3 $ myfile
```

*add execute permission
for all users*

What happens now when you type myfile?



POLP and hidden treasure fun

Go slowly and follow
all directions

principle of least privilege (POLP)



Posted by
Margaret Rouse
WhatIs.com



The principle of least privilege (POLP) is the practice of limiting access to the minimal level that will allow normal functioning. Applied to employees, the principle of least privilege translates to giving people the lowest level of user rights that they can have and still do their jobs.

<http://searchsecurity.techtarget.com/definition/principle-of-least-privilege-POLP>

Permissions Exercise

Find the hidden treasure trove



- Find the buried treasure in your Hidden folder.
- Beware! - once you find it, make sure you set permissions to protect your treasure from *everyone!*

To play again:

```
/home/cis90/simben $ chmod 700 Hidden/  
/home/cis90/simben $ tar xf ../depot/Hidden.tar  
/home/cis90/simben $ ls Hidden/  
ls: cannot open directory Hidden/: Permission denied
```

umask

Used for setting the default
permissions on new files
and directories

umask – user file-creation mask

Syntax:

umask [*mask*]

a bitmask used to strip permission bits off newly created files and directories

Examples:

- **umask**
- **umask 002**
- **umask 777**

If the mask is not specified, the current umask setting is displayed

File Permissions

Default Permissions

Default system permissions

- Default permissions for an ordinary file: `rw-rw-rw-` **666**
- Default permissions for directories: `rwXrwXrwX` **777**

When new files or directories are created they start with the default permissions above, then the current setting of the umask is applied to strip away any unwanted permissions.

For example, if the umask setting is:

777 – then all permissions are stripped off the default

000 – then no permissions are stripped off the default

022 - strips off just the write permissions from group and other users from the default

File Permissions

umask - examples

[simmsben@opus Directory3]\$ **umask** *With no argument, the current umask setting is shown*
0002

this umask setting will strip write permission from Others

```
[simmsben@opus Directory3]$ rm myfile
[simmsben@opus Directory3]$ touch myfile
[simmsben@opus Directory3]$ ls -l
total 4
-rw-rw-r-- 1 simmsben cis90 0 Oct 15 14:59 myfile
```

666	rw-rw-rw-	<i>default system permissions for a file</i>
002	-----w-	<i>umask setting (strips these permissions from default)</i>
664	rw-rw-r--	<i>result after masking</i>

File Permissions

umask - examples

```
[simmsben@opus Directory3]$ umask 000           Change umask to 000
[simmsben@opus Directory3]$ rm myfile
[simmsben@opus Directory3]$ touch myfile
[simmsben@opus Directory3]$ ls -l
total 4
-rw-rw-rw- 1 simmsben cis90 0 Oct 15 15:00 myfile
```

```
666  rw-rw-rw-  default system permissions for a file
000  - - - - -  umask setting (strips these permissions from default)
666  rw-rw-rw-  result after masking
```

File Permissions

umask - examples

```
[simmsben@opus Directory3]$ umask 022 Change umask to 022
```

```
[simmsben@opus Directory3]$ rm myfile
```

```
[simmsben@opus Directory3]$ touch myfile
```

```
[simmsben@opus Directory3]$ ls -l
```

```
total 4
```

```
-rw-r--r-- 1 simmsben cis90 0 Oct 15 15:00 myfile
```

666 rw-rw-rw- *default system permissions for a file*

022 ----w--w- *umask setting (strips these permissions from default)*

644 **rw-r--r--** *result after masking*

When new files are created

```
/home/cis90/roddyduk $ touch mydogs  
/home/cis90/roddyduk $ ls -l mydogs  
-rw-rw-r-- 1 roddyduk cis90 0 Oct 19 13:16 mydogs
```

When a new file is created:

- the **permissions** are based on the umask value
- the **owner** is set to the user creating the file
- the **group** is set to the user's primary group



The effect of permissions when removing files

Directory Write Permission



```
inodeNum1 fileName1
inodeNum2 fileName2
:                :
```

Permission	File	Directory
Read (4)	cat, more, file, head, tail, cp	ls
Write (2)	vi, saving mail	cp, mv, rm , ln
Execute (1)	\$ command	cd, ls -l, find

*Removing a file requires write permission on the **directory** that contains the file. The permissions on the file itself do not apply.*

Directory with no write permission example 1

```
[simben@opus ~]$ ls -ld Directory3
```

```
dr-xrwxr-x 2 simmsben cis90 4096 Oct 15 15:00 Directory3
```

```
[simmsben@opus ~]$ cd Directory3
```

```
[simmsben@opus Directory3]$ ls -l myfile
```

```
-rw-r--r-- 1 simmsben cis90 0 Oct 15 15:00 myfile
```

*Benji has read and
write permission
on myfile*

```
[simmsben@opus Directory3]$ rm myfile
```

```
rm: cannot remove `myfile': Permission denied
```

```
[simmsben@opus Directory3]$ chmod 777 myfile
```

```
[simmsben@opus Directory3]$ ls -l myfile
```

```
-rwxrwxrwx 1 simmsben cis90 0 Oct 15 15:00 myfile
```

*Benji (and
everyone else) has
all permissions.*

```
[simmsben@opus Directory3]$ rm myfile
```

```
rm: cannot remove `myfile': Permission denied
```

So why can't Benji remove his own file?



Answer:

Removing a file requires write permission on the directory containing the file.

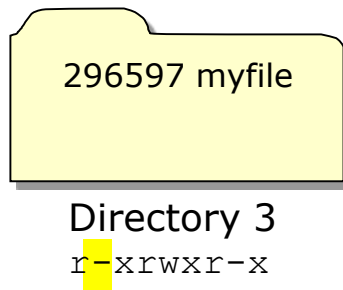
This is so you can write the revised file contents (with the file removed) to the directory. Remember that directories are like phone books and only contain file names and inode numbers.

The permissions on the file being removed do not apply!

```
[simmsben@opus ~]$ ls -ld Directory3
dr-xrwxr-x 2 simmsben cis90 4096 Oct 15 15:00 Directory3
```



Without write permission, Benji cannot remove any files from this directory



Owner tries to write revised file contents to Directory3

**Permission
denied**

Directory with write permission example 2

```
[simmsben@opus ~]$ ls -ld Directory3
drwxr-xr-x 2 simmsben cis90 4096 Oct 15 15:00 Directory3
```

```
[simmsben@opus ~]$ cd Directory3
[simmsben@opus Directory3]$ chmod 000 myfile
[simmsben@opus Directory3]$ ls -l myfile
----- 1 simmsben cis90 0 Oct 15 15:00 myfile
```

*Now Benji has
no permissions
on this file*

```
[simmsben@opus Directory3]$ rm myfile
rm: remove write-protected regular empty file `myfile'? yes
[simmsben@opus Directory3]$
```

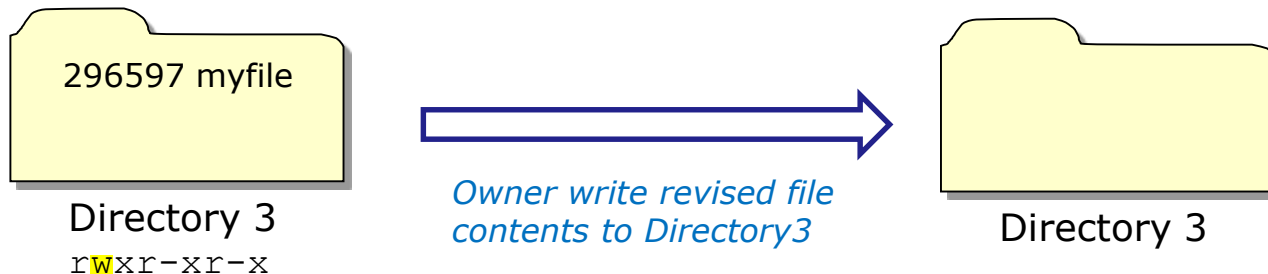
So how come he can delete it?



Answer: Removing a file requires write permission on the directory that contains the file. The permissions on the file itself do not apply.

```
[simmsben@opus ~]$ ls -ld Directory3
drwxr-xr-x 2 simmsben cis90 4096 Oct 15 15:00 Directory3
```

With write permission, Benji can remove any of the files from this directory ... even the ones he does not have read & write permission for.

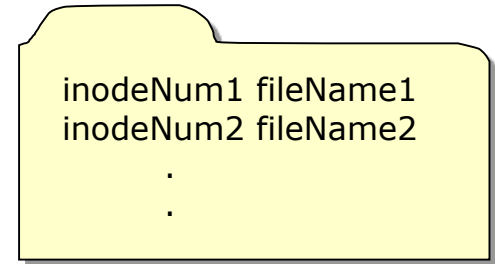


Directory Permissions

Directory Read Permission



rwX



rwX

Permission	File	Directory
Read (4)	cat, more, file, head, tail, cp (from)	ls
Write (2)	cp (into), vi, saving mail	cp (into), mv, rm, ln
Execute (1)	\$ command	cd, ls -l, find

Removing directory READ permission

- can't list files in directory

Directory Read Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Start with normal directory permissions:

```
/home/cis90/roddyduk $ ls -ld examples/  
drwxrwxr-x 5 roddyduk cis90 4096 Oct 19 13:49 examples/
```

```
/home/cis90/roddyduk $ ls -i examples/  
2525532 birds 2525533 dogs
```

2525532 birds
2525533 dogs

examples

If read permission is removed from the directory ... can we still list the directory contents?

Directory Read Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Remove read permission and confirm it's gone

```
/home/cis90/roddyduk $ chmod u-r examples
/home/cis90/roddyduk $ ls -ld examples
d-wxrwxr-x 4 roddyduk cis90 4096 Oct 19 13:59 examples
```

2525532 birds
2525533 dogs

examples

Can we still list the directory contents?

```
/home/cis90/roddyduk $ ls -l examples/
ls: examples/: Permission denied
/home/cis90/roddyduk $
```

NO!

Directory Read Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Start with normal directory permissions:

```
/home/cis90/roddyduk $ ls -ld examples/  
drwxrwxr-x 5 roddyduk cis90 4096 Oct 19 13:49 examples/
```

```
/home/cis90/roddyduk $ ls -li examples/  
2525532 birds 2525533 dogs
```

2525532 birds
2525533 dogs

examples

*If read permission is removed from the directory ... can we still **cd** into the directory?*

Directory Read Permission

r	w	x	r	w	x	r	w	x
read	write	execute	read	write	execute	read	write	execute
user			group			others		

Remove read permission and confirm it's gone

```
/home/cis90/roddyduk $ chmod u-r examples
/home/cis90/roddyduk $ ls -ld examples
d-wxrwxr-x 4 roddyduk cis90 4096 Oct 19 13:59 examples
```

2525532 birds
2525533 dogs

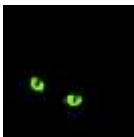
examples

*Can we still **cd** into the directory?*

```
/home/cis90/roddyduk $ cd examples/
/home/cis90/roddyduk/examples $ ls
ls: .: Permission denied
/home/cis90/roddyduk/examples $ ls birds
abby nibbie
```

Yes, but ...

- *we still can't list the contents,*
- *yet we can still access anything in the directory!*



It's like walking into a pitch black room. You can't see anything, but if you know where things are you can still use them.

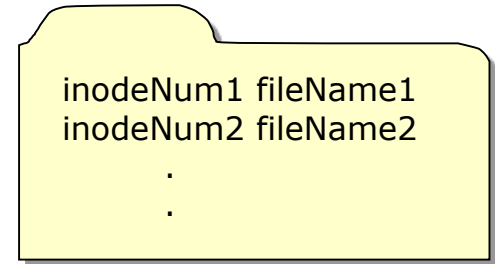


The effect of WRITE permission on directories

Directory Write Permission



rwx



rwx

Permission	File	Directory
Read (4)	cat, more, file, head, tail, cp	ls
Write (2)	vi, saving mail	cp, mv, rm, ln
Execute (1)	\$ command	cd, ls -l, find

Removing directory WRITE permission

- can't copy files to it
- can't remove files from it
- can't move files out of it
- can't add links to it

Directory Write Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Start with normal directory permissions:

```
/home/cis90/roddyduk $ ls -ld examples/
drwxrwxr-x 5 roddyduk cis90 4096 Oct 19 13:49 examples/
```

```
/home/cis90/roddyduk $ ls -li examples/
2525532 birds 2525533 dogs
```

2525532 birds
2525533 dogs

examples

*If write permission is removed
from the directory ... can we
remove files from the directory?*

Directory Write Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Remove write permission and confirm it's gone

```
/home/cis90/roddyduk $ chmod u-w examples
/home/cis90/roddyduk $ ls -ld examples
dr-xrwxr-x 4 roddyduk cis90 4096 Oct 19 13:59 examples/
```

2525532 birds
2525533 dogs

examples

Can we remove files from the directory?

```
/home/cis90/roddyduk/examples $ rmdir dogs
rmdir: dogs: Permission denied
```

NO!

```
/home/cis90/roddyduk $ cd examples/
/home/cis90/roddyduk/examples $ ls
birds dogs
```

*Yet we can still cd
into and list
directory contents*

Directory Write Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Start with normal directory permissions:

```
/home/cis90/roddyduk $ ls -ld examples/
drwxrwxr-x 5 roddyduk cis90 4096 Oct 19 13:49 examples/
```

```
/home/cis90/roddyduk $ ls -i examples/
2525532 birds 2525533 dogs
```

2525532 birds
2525533 dogs

examples

*If write permission is removed from the directory ... can we **create new files or copy/move files** into the directory?*

Directory Write Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Remove write permission and confirm it's gone

```
/home/cis90/roddyduk $ chmod u-w examples
/home/cis90/roddyduk $ ls -ld examples
dr-xrwxr-x 4 roddyduk cis90 4096 Oct 19 13:59 examples/
```

2525532 birds
2525533 dogs

examples

Can we create new files or copy/move files into the directory?

```
/home/cis90/roddyduk $ cp letter examples/
cp: cannot create regular file `examples/letter': Permission denied
/home/cis90/roddyduk $ mv letter examples/
mv: cannot move `letter' to `examples/letter': Permission denied
/home/cis90/roddyduk $ touch examples/newfile
touch: cannot touch `examples/newfile': Permission denied
/home/cis90/roddyduk $
```

NO!

To change the contents of a directory (either add or remove files) requires write permission

Directory Write Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Start with normal directory permissions:

```
/home/cis90/roddyduk $ ls -ld examples/  
drwxrwxr-x 5 roddyduk cis90 4096 Oct 19 13:49 examples/
```

```
/home/cis90/roddyduk $ ls -li examples/  
2525532 birds 2525533 dogs
```

2525532 birds
2525533 dogs

examples

If write permission is removed from the directory ... can we move files out of the directory?

Directory Write Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Remove write permission and confirm it's gone

```
/home/cis90/roddyduk $ chmod u-w examples
/home/cis90/roddyduk $ ls -ld examples
dr-xrwxr-x 4 roddyduk cis90 4096 Oct 19 13:59 examples/
```

2525532 birds
2525533 dogs

examples

Can we move files out of the directory?

```
/home/cis90/roddyduk $ mv examples/birds .
mv: cannot move `examples/birds' to `./birds': Permission denied
```

NO!

To change the contents of a directory (either add or remove files) requires write permission

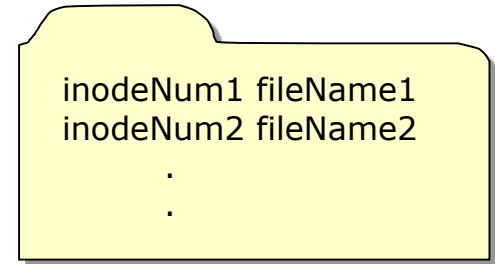


The effect of EXECUTE permission on directories

Directory Execute Permission



rwX



rwX

Permission	File	Directory
Read (4)	cat, more, file, head, tail, cp	ls
Write (2)	vi, saving mail	cp, mv, rm, ln
Execute (1)	\$ command	cd, ls -l, find

Removing directory EXECUTE permission

- can't retrieve inode information (long listing) or data (content)
- can't cd into directory

Directory Execute Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Start with normal directory permissions:

```
/home/cis90/roddyduk $ ls -ld examples/  
drwxrwxr-x 5 roddyduk cis90 4096 Oct 19 13:49 examples/
```

```
/home/cis90/roddyduk $ ls -li examples/  
2525532 birds 2525533 dogs
```

2525532 birds
2525533 dogs

examples

*If execute permission is removed
from the directory ... can we change
into (cd) the directory?*

Directory Execute Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Remove execute permission and confirm it's gone

```
/home/cis90/roddyduk $ chmod u-x examples
/home/cis90/roddyduk $ ls -ld examples
drw-rwxr-x 4 roddyduk cis90 4096 Oct 19 13:59 examples/
```

2525532 birds
2525533 dogs

examples

Can we change into (cd) the directory?

```
/home/cis90/roddyduk $ cd examples/
-bash: cd: examples/: Permission denied
/home/cis90/roddyduk $
```

NO!

Execute permission is required to change into a directory or to get inode based information for any of the files in the directory. Note, without inode information you can't get to a file's data.

Directory Execute Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Start with normal directory permissions:

```
/home/cis90/roddyduk $ ls -ld examples/
drwxrwxr-x 5 roddyduk cis90 4096 Oct 19 13:49 examples/
```

```
/home/cis90/roddyduk $ ls -li examples/
2525532 birds 2525533 dogs
```

2525532 birds
2525533 dogs

examples

If execute permission is removed from the directory ... can we list directory contents?

Directory Execute Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Remove execute permission and confirm it's gone

```
/home/cis90/roddyduk $ chmod u-x examples  
/home/cis90/roddyduk $ ls -ld examples  
drw-rwxr-x 4 roddyduk cis90 4096 Oct 19 13:59 examples/
```

2525532 birds
2525533 dogs

examples

Can list directory contents?

```
/home/cis90/roddyduk $ ls examples/  
birds dogs
```

Yes

Directory Execute Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Start with normal directory permissions:

```
/home/cis90/roddyduk $ ls -ld examples/  
drwxrwxr-x 5 roddyduk cis90 4096 Oct 19 13:49 examples/
```

```
/home/cis90/roddyduk $ ls -i examples/  
2525532 birds 2525533 dogs
```

2525532 birds
2525533 dogs

examples

If execute permission is removed from the directory ... can we do a long listing of the directory?

Directory Execute Permission

r w x read write execute	r w x read write execute	r w x read write execute
user (owner)	group	others

Remove execute permission and confirm it's gone

```
/home/cis90/roddyduk $ chmod u-x examples
/home/cis90/roddyduk $ ls -ld examples
drw-rwxr-x 4 roddyduk cis90 4096 Oct 19 13:59 examples/
```

2525532 birds
2525533 dogs

examples

Can we do a long listing (show inode information) of the directory?

```
/home/cis90/roddyduk $ ls -l examples/
total 0
?----- ? ? ? ?
?----- ? ? ? ?
```

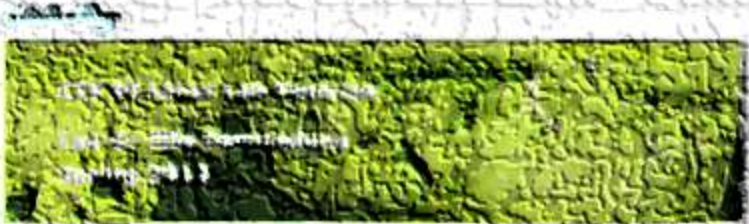
? **birds**
? **dogs**

Incomplete!
Only file names. No information kept in the file's inode is shown!

We can read the filenames, but without execute permission we can't retrieve information from the inode

Assignment





Lab 6: File Permissions

In this lab you will learn how to assign permissions to files and directories to provide a measure of security and privacy to your files on a Unix-like system.

Forum

Discuss in: <http://opus.cabrillo.edu/forum/viewforum.php?f=46>

Check the forum for any file permissions news about this lab. The forum is also the place to go if you get stuck, have a question or want to share something you have learned about this lab.

Overview

Log on to Opus so that you have a confirmed file shell at your school. Once you are in your home directory in that file shell, using the `ls`, `chmod` and `chown` commands, you will modify the permissions on files and subdirectories in your home directory.

Part A: Finding Directories

1. From your home directory, do a long listing with the `ls -l` command. Who owns these files? To which group do they belong? How can you distinguish file entries from directory entries?
2. Do a long listing of the file `/home/username/mysite`. Who owns it? Can you reach this file in your home directory? Why or why not? Can you copy the file to your home directory? Why or why not?
3. Now that you have copied the file history to your home directory, who owns it? What are the permissions?
4. Display the contents of the file `history` on your screen. Now take away read permission using the command `chmod -r history`.
5. Try to display the contents of the file as you did above. Does it work?
6. Now take read permission back but take away write permissions: `chmod -w history`. Verify the success of the above commands.
7. Take away execute (search) permission from the `mysite` directory: `chmod -x mysite`. Do short and long listings of the `mysite` directory using the `ls` and `ls -l` commands.

Lab 6

In this lab you will assign permissions to your files to provide a measure of security

Be sure and finish Lab 5 before starting Lab 6!

A full-page background image showing a sunset over a beach. The sky is filled with vibrant orange, pink, and purple clouds. The sun is low on the horizon, casting a warm glow. To the right, a dark, silhouetted cliff rises from the beach. The foreground shows the wet sand of the beach reflecting the colors of the sky, with some dark rocks scattered about.

Wrap up

New commands:

chgrp

chmod

chown

groups

stat

umask

change file's group

change file permissions

change file owner (superuser only)

show group membership

show all file inode information

change permission mask

New Files and Directories:

/etc/group

Next Class

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

Quiz questions for next class:

Lab 6
Five posts

- With a umask of 002 what permissions would a newly created file have?
- What is the numeric permission equivalent of `rwxr-xr--` ?
- Does **chmod o+w** give write permission to the owner or to other users?



Backup

Activity

From your home directory

How would you copy the *stage1* and *stage2* files in the */boot/grub* directory to your *bin* directory?

Write your answer in the chat window

Activity

From your *bin* directory

How would you remove the *stage1* and *stage2* files you just copied to your *bin* directory?

Write your answer in the chat window

```
rm bin/stage[12]
```

Activity

From your *bin* directory

How would you copy the *stage1* and *stage2* files in the */boot/grub* directory to your *bin* directory?

Write your answer in the chat window

```
cp /boot/grub/stage* .
```

Activity

From the /home/cis90 directory

How would you do a binary dump of the *stage1* file you just copied to your *bin* directory?

Write your answer in the chat window

```
xxd simben/bin/stage1
```

Activity

From Benji's *poems* directory

How would you remove the *stage1* and *stage2* files you copied to your *bin* directory using a filename expansion character?

Write your answer in the chat window

```
rm ../../simben/bin/stage*
```