Rich's lesson module checklist *Last updated 10/10/2018*

- ❑ Zoom recording named and published for previous lesson

- ❑ Slides and lab posted
- ❑ Print out agenda slide and annotate page numbers

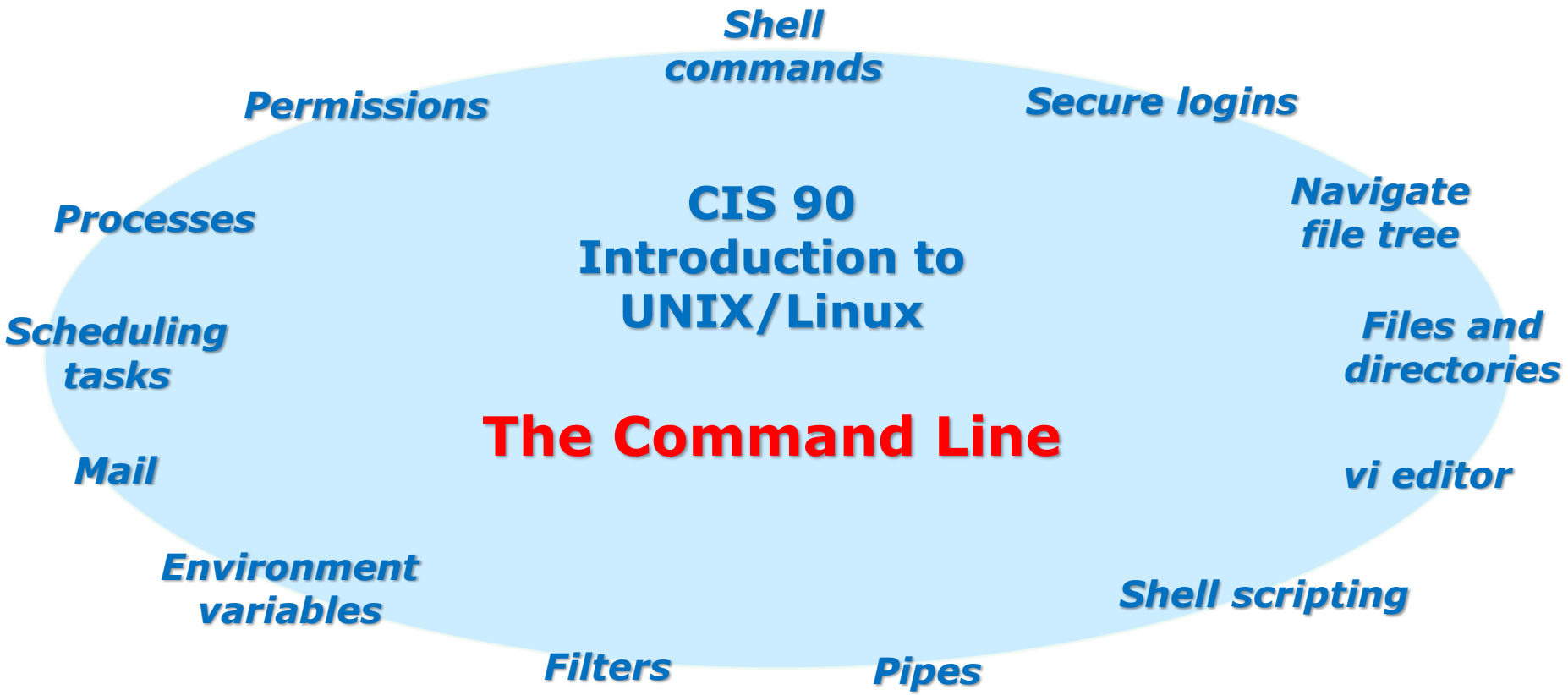
- ❑ 1st minute quiz today
- ❑ Flash cards
- ❑ Calendar page updated

- ❑ Schedule lock of turnin directory and submit
  scripts/schedule-submit-locks
- ❑ Lab 6 updated and tested
  - ❑ Put fresh uhistory (640) in /home/rsimms/uhistory
  - ❑ Lab 6 future fixes
    - ❑ One step requires making no changes!
    - ❑ Assign points for each task completed to improve rubric & grading

- ❑ Distribute bird files: cis90/scripts/lesson07/distribute-birds

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

- ❑ https://zoom.us
  - ❑ Putty, slides, Chrome
  - ❑ Enable/Disable attendee sharing
    ^ > Advanced Sharing Options > Only Host
  - ❑ Enable/Disable attended annotations
    Share > More > Disable Attendee Sharing



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.

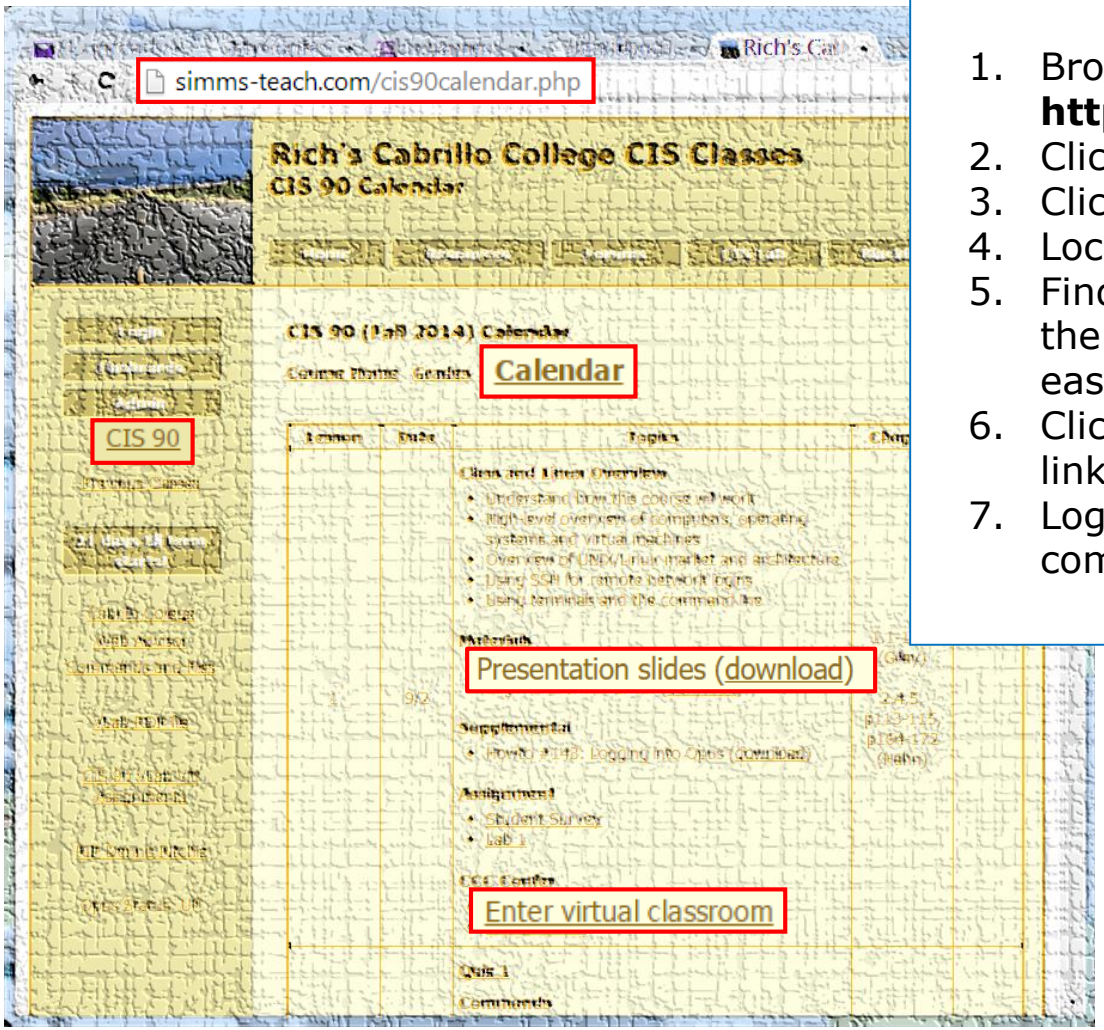
Introductions and Credits

Jim Griffin
- Created this Linux course
- Created Opus and the CIS VLab
- Jim's site: https://web.archive.org/web/20140209023942/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. John's site: http://teacherjohn.com/
- Jaclyn Kostner for many webinar best practices: e.g. mug shot page.

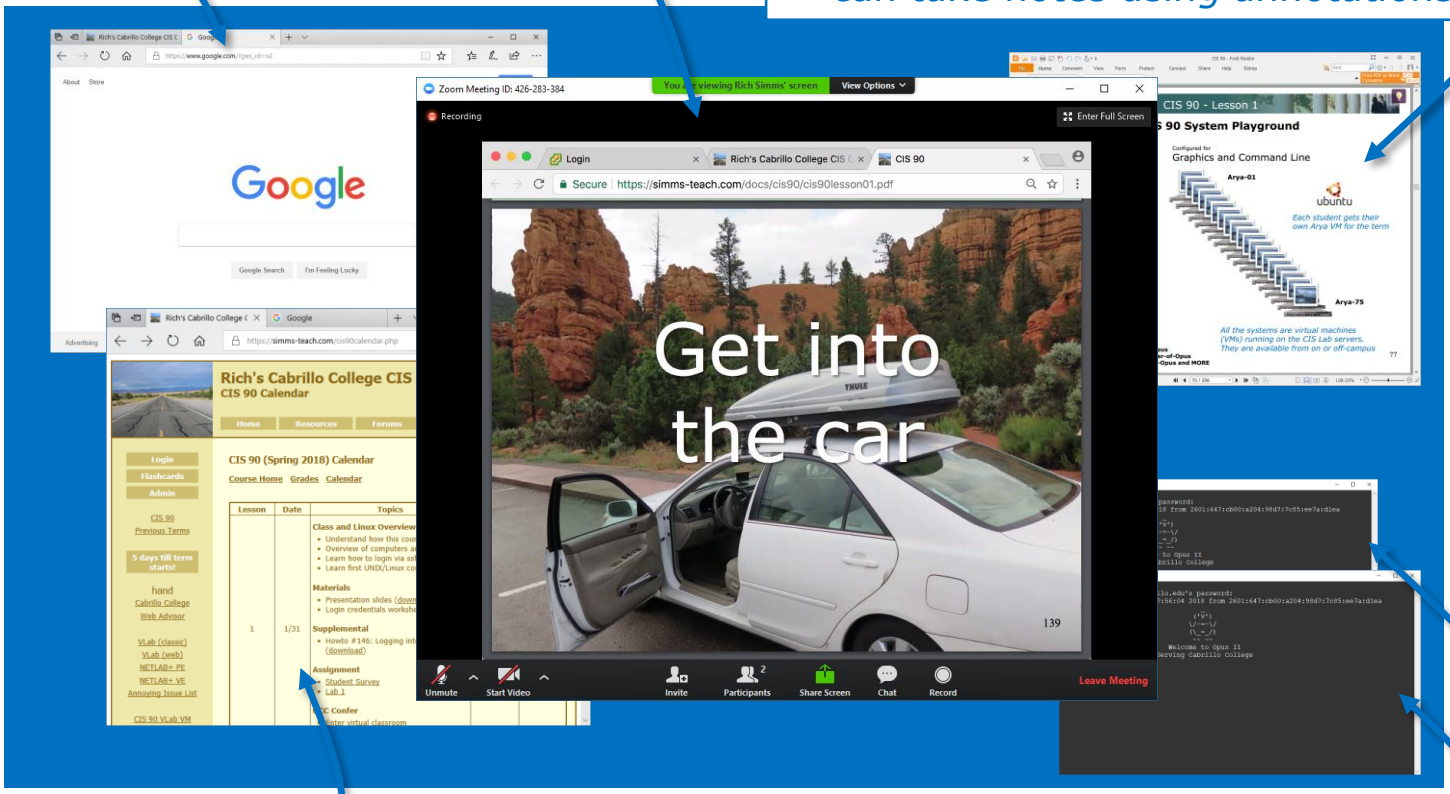
Student checklist - Before class starts



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 ConferZoom.
7. Log into Opus-II with Putty or ssh command.

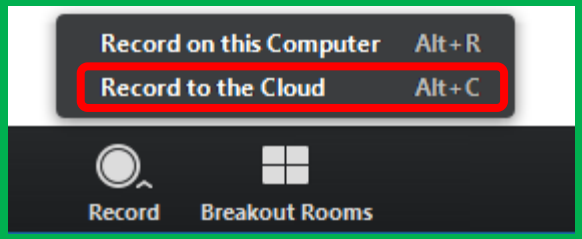
Student checklist - Before class starts

- ❑ *Google*
- ❑ *ConferZoom*
- ❑ *Downloaded PDF of Lesson Slides. I like Foxit Reader so I can take notes using annotations.*



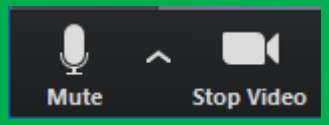
- ❑ *CIS 90 website Calendar page*
- ❑ *One or more login sessions to Opus-II*

Start



Start Recording

Audio Check



Start Recording

Audio & video Check

CIS 90 - Lesson 7

Instructor: **Rich Simms**
Dial-in: **408-638-0968 (toll)**
Meeting ID: **426 283 384**


Mikey

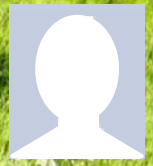
Jona


Joseph

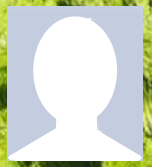

Tara Marie


Fredi

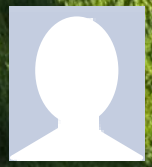

Carina

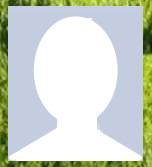

Isaac


Matthew


Erik


Tony


Branden

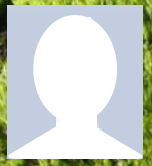

Dominic

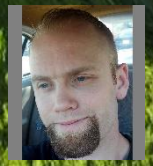

Ryan L.

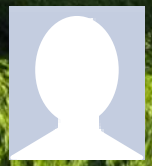

Alejandra

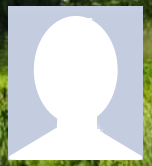

Blair


Zari

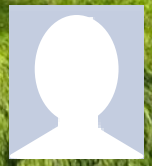

Victor


Danny


Gabriel


Janelly

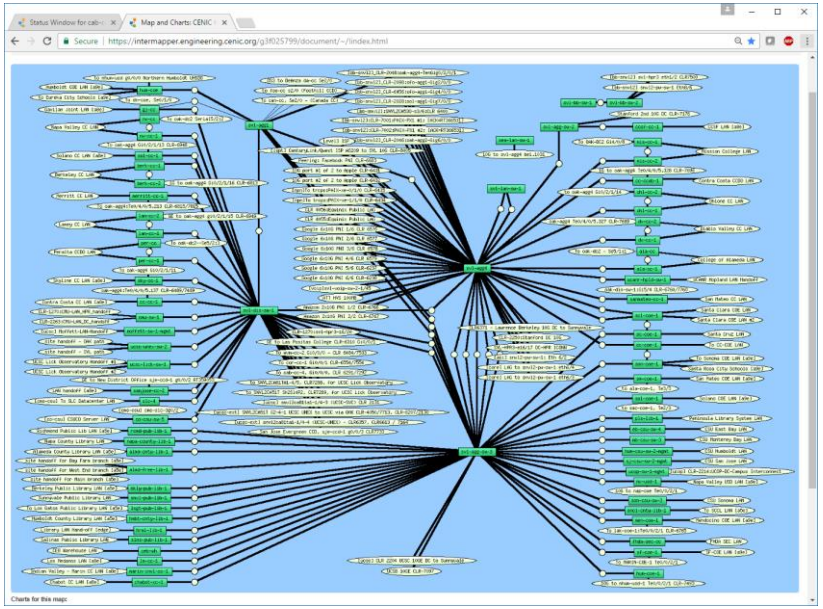

Austin


Aaron


Ryan M.

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

Network Check



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

First Minute Quiz

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

Use CCC Confer White Board

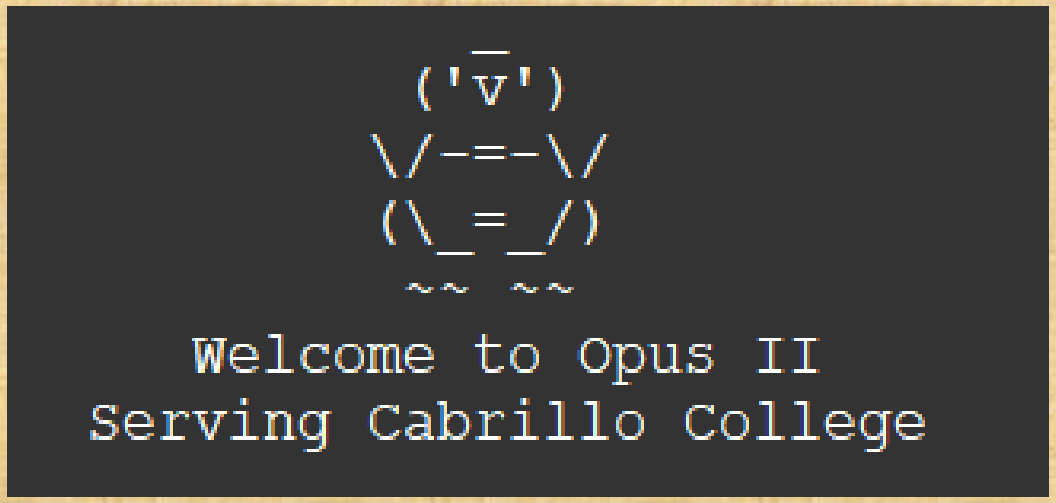
email answers to: risimms@cabrillo.edu

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

File Permissions

Objectives	Agenda
• 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	• Quiz • Questions • Test 1 Post Mortem • Managing files • Theme and variations & Follow Me • Housekeeping • Permissions (read, write, execute) • 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

Class Activity



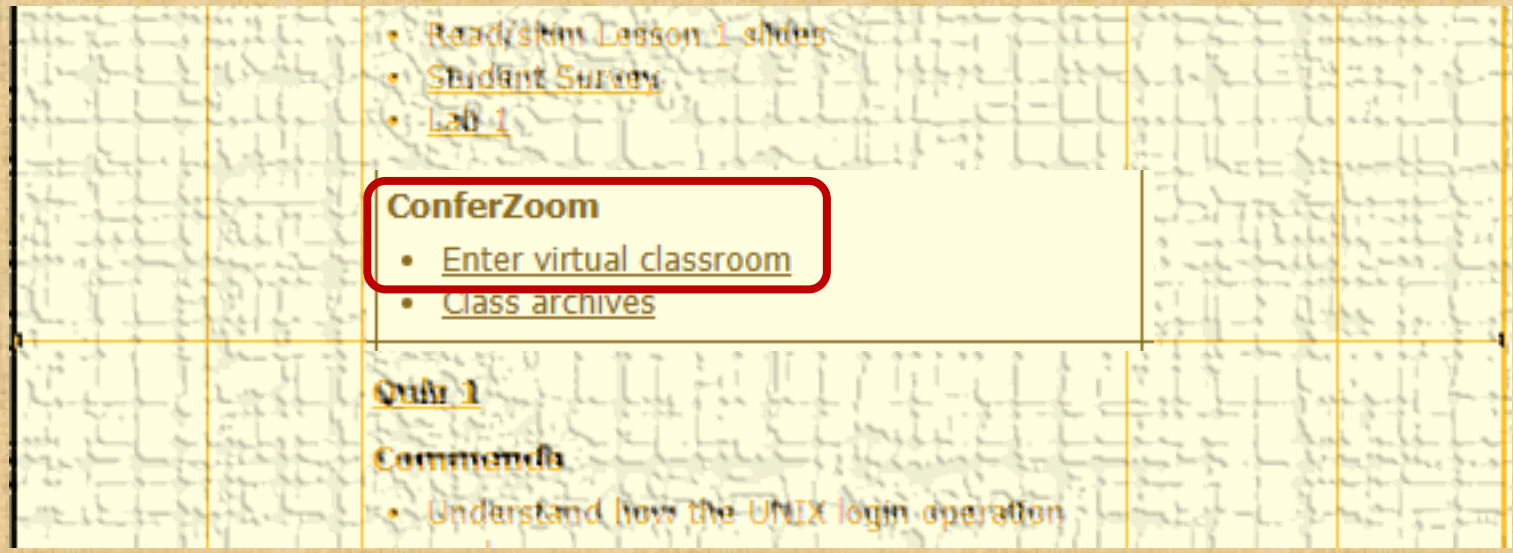
If you haven't already, log into Opus-II

Class Activity

https://simms-teach.com/cis90calendar.php

If you haven't already, download the lesson slides

Class Activity



https://simms-teach.com/cis90calendar.php

If you haven't already, join ConferZoom classroom

Questions

Questions?

Lesson material?

Labs? Tests?

How this course works?

- Graded work & tests 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

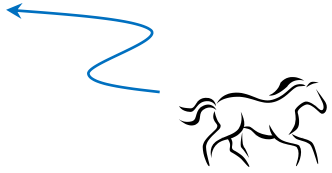
Chinese Proverb	他問一個問題，五分鐘是個傻子，他不問一個問題仍然是一個傻瓜永遠。 *He who asks a question is a fool for five minutes; he who does not ask a question remains a fool forever.*

Test 1 Post Mortem

Test 1 – Results

Missed Q16 = 21
Missed Q25 = 20
Missed Q28 = 17
Missed Q11 = 17
Missed Q4 = 16
Missed Q27 = 13
Missed Q24 = 13
Missed Q22 = 13
Missed Q30 = 12
Missed Q20 = 12
Missed Q6 = 11
Missed Q23 = 9
Missed Q13 = 9
Missed Q7 = 8
Missed Q29 = 7

Missed Q26 = 7
Missed Q12 = 7
Missed Q10 = 7
Missed Q3 = 5
Missed Q17 = 5
Missed Q8 = 4
Missed Q2 = 4
Missed Q21 = 4
Missed Q19 = 4
Missed Q15 = 4
Missed Q9 = 3
Missed Q14 = 3
Missed Q18 = 2
Missed Q1 = 1
Missed Q5 = 0



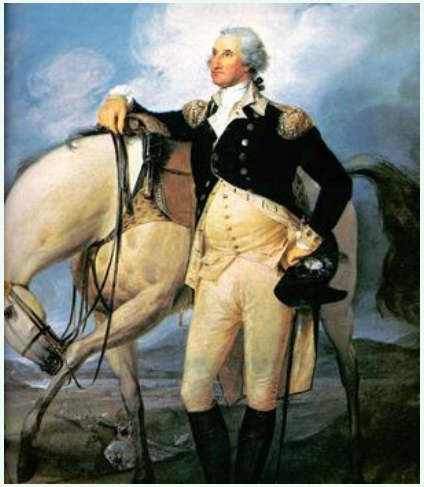
Extra Credit
Missed Q31 = 20
Missed Q33 = 19
Missed Q32 = 19

See test01.graded in your home directory for correct answers

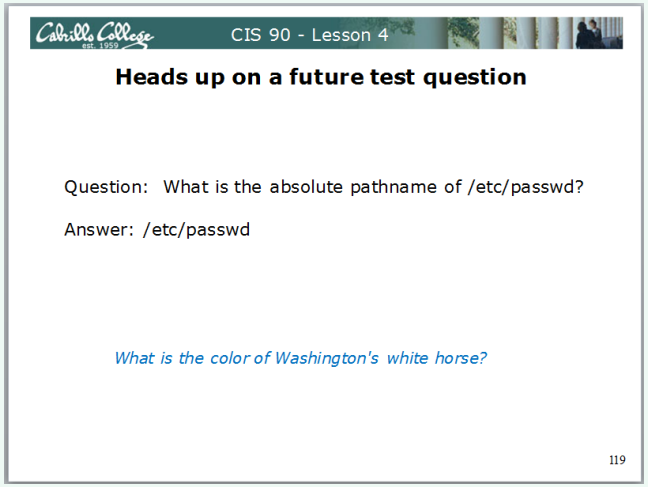
Q17) On sun-hwa-vii, there is a file named *passwd* which resides in the */etc* directory. Cat this file and look at it. Both the file and this question should ring a bell. What is the ABSOLUTE pathname of this file?

Correct answer: */etc/passwd*

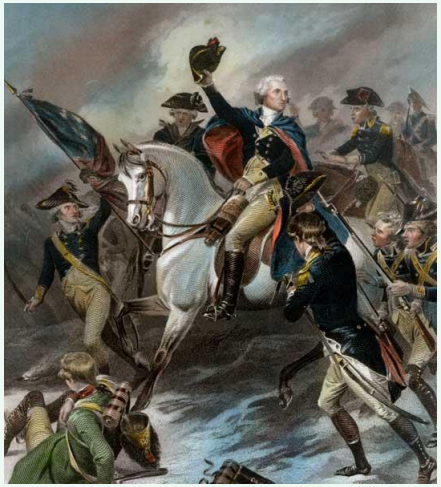
http://kids.britannica.com/comptons/art-55428/General-George-Washington-and-his-staff-welcoming-a-provision-train



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



Slide from Lesson 4



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

More questions?

On any part of Test 1 or lab 5?

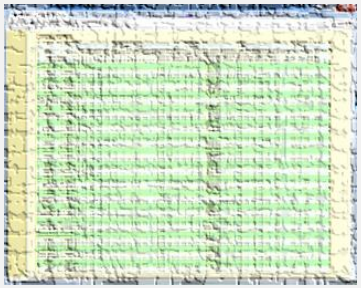
Better ask them now as the most missed questions could appear on the next test 

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.*

Review your progress in the course

Check the website Grades page

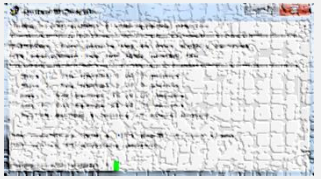
http://simms-teach.com/cis90grades.php



Or check on Opus-II

checkgrades *codename*

(where codename is your LOR codename)



Written by Jesse Warren a past CIS 90 Alumnus

- **Send me your survey to get your LOR codename.**
- **Graded labs and tests are in your home directories.**

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

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**

Extra Credit

On the forum

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

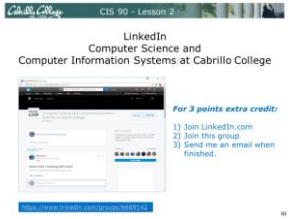
On some labs

Extra credit (2 points)

For a small taste of what you would learn in CIS 191 let's add a new user to your Arya VM. Once added we will see how the new account is represented in */etc/passwd* and */etc/shadow*.

1. Log into your Arya VM as the cis90 user. Make sure it's your VM and not someone else's.
2. Install the latest updates:
   ```
   sudo apt-get update
   sudo apt-get upgrade
   ```
3. Add a new user account for yourself. You may make whatever username you wish. The example below shows how Benji would make the same username he uses on Opus:
   ```
   sudo useradd -G sudo -c "Benji Simms" -m -s /bin/bash simben90
   ```

In lesson slides (search for extra credit)

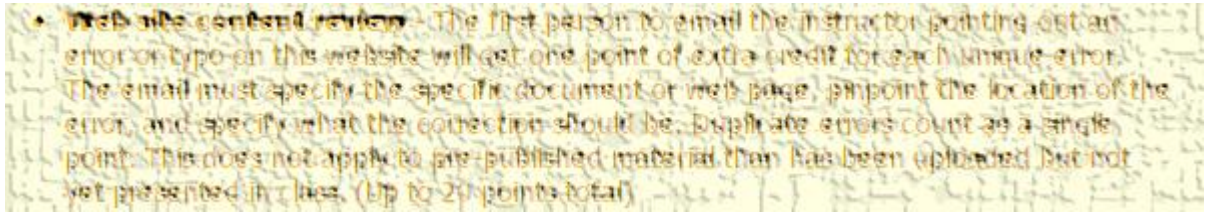


On the website

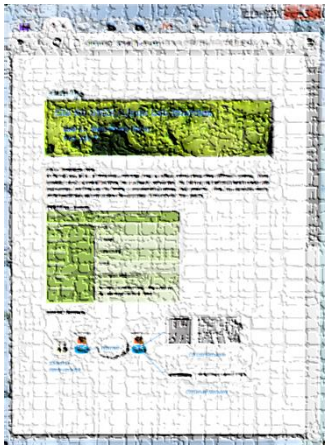
http://simms-teach.com/cis90grades.php

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

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



Lab Assignments -- Pearls of Wisdom



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

Getting Help When Stuck on an Assignment

- Google the topic/error message.
- Search the Lesson Slides (they are PDFs) for a relevant example on how to do something.
- Check the forum. Someone else may have run into the same issue and found a way past it. If not start a new topic, explain what you are trying to do and what you have tried so far.
- Talk to a STEM center tutor/assistant.
- Come see me during my office or lab hours:
  https://www.cabrillo.edu/salsa/listing.php?staffId=1426
  I'm in the CTC (room 1403) every Tuesday from 3:30-5:00 pm.
- Make use of the Open Questions time at the start of every class.
- Make a cheat sheet of commands and examples so you never again get stuck on the same thing!

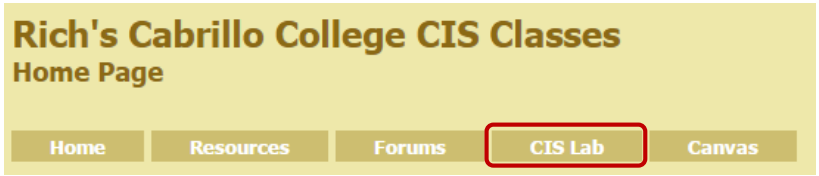
CIS Labs always involve some troubleshooting!

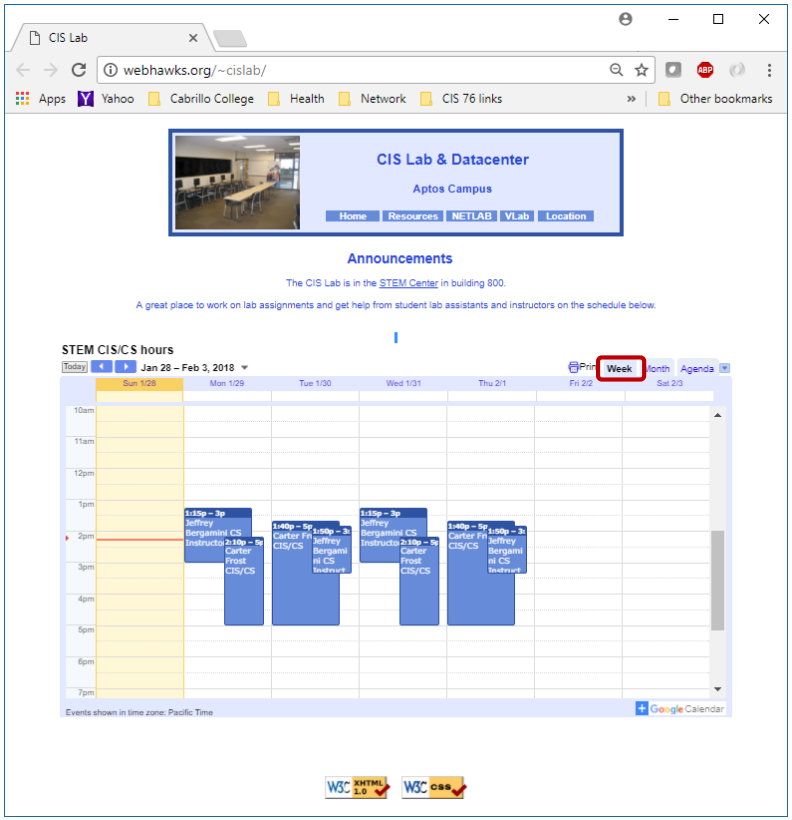
CTC - Building 1400
On lower campus

I will be in the CTC (room 1403) every Tuesday afternoon from 3:30-5.

Help Available in the CIS Lab (inside STEM Center)

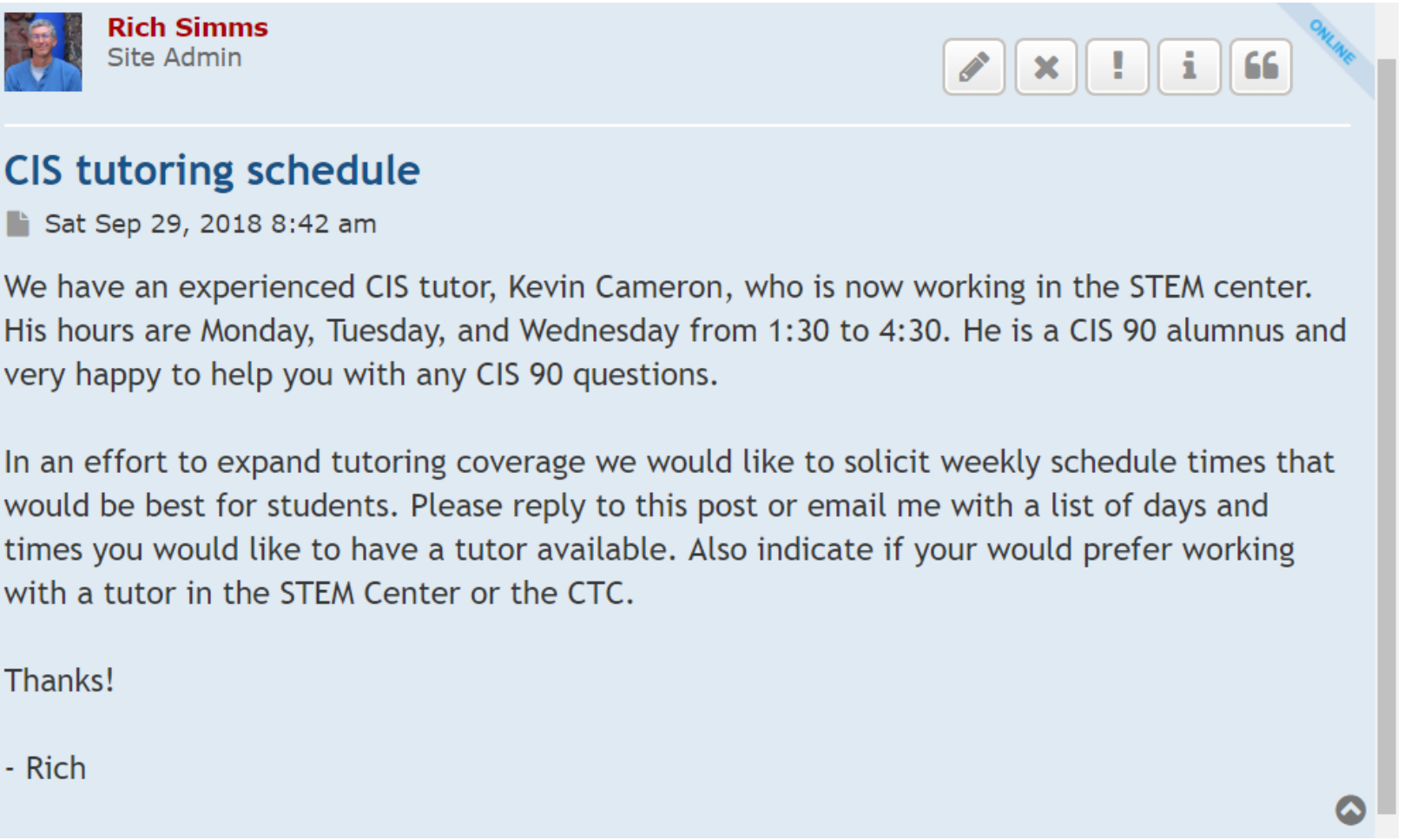
Instructors, lab assistants and equipment are available for CIS students to work on assignments.





To see schedule, click the CIS Lab link on the website and use the "Week" calendar view.

Fall '18 Announcement



Rich Simms
Site Admin

ONLINE

CIS tutoring schedule

Sat Sep 29, 2018 8:42 am

We have an experienced CIS tutor, Kevin Cameron, who is now working in the STEM center. His hours are Monday, Tuesday, and Wednesday from 1:30 to 4:30. He is a CIS 90 alumnus and very happy to help you with any CIS 90 questions.

In an effort to expand tutoring coverage we would like to solicit weekly schedule times that would be best for students. Please reply to this post or email me with a list of days and times you would like to have a tutor available. Also indicate if your would prefer working with a tutor in the STEM Center or the CTC.

Thanks!

- Rich

Recent forum post if you missed it

The slippery slope

1) If you didn't submit the last lab ...
2) If you were in class and didn't submit the last quiz ...
3) If you didn't send me the student survey assigned in Lesson 1 ...
4) If you haven't made a forum post in the last quarter of the course ...
5) If you had trouble doing the last test ...

Please contact me by email, see me during my office hours or when I'm in the CTC

Email: risimms@cabrillo.edu

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!

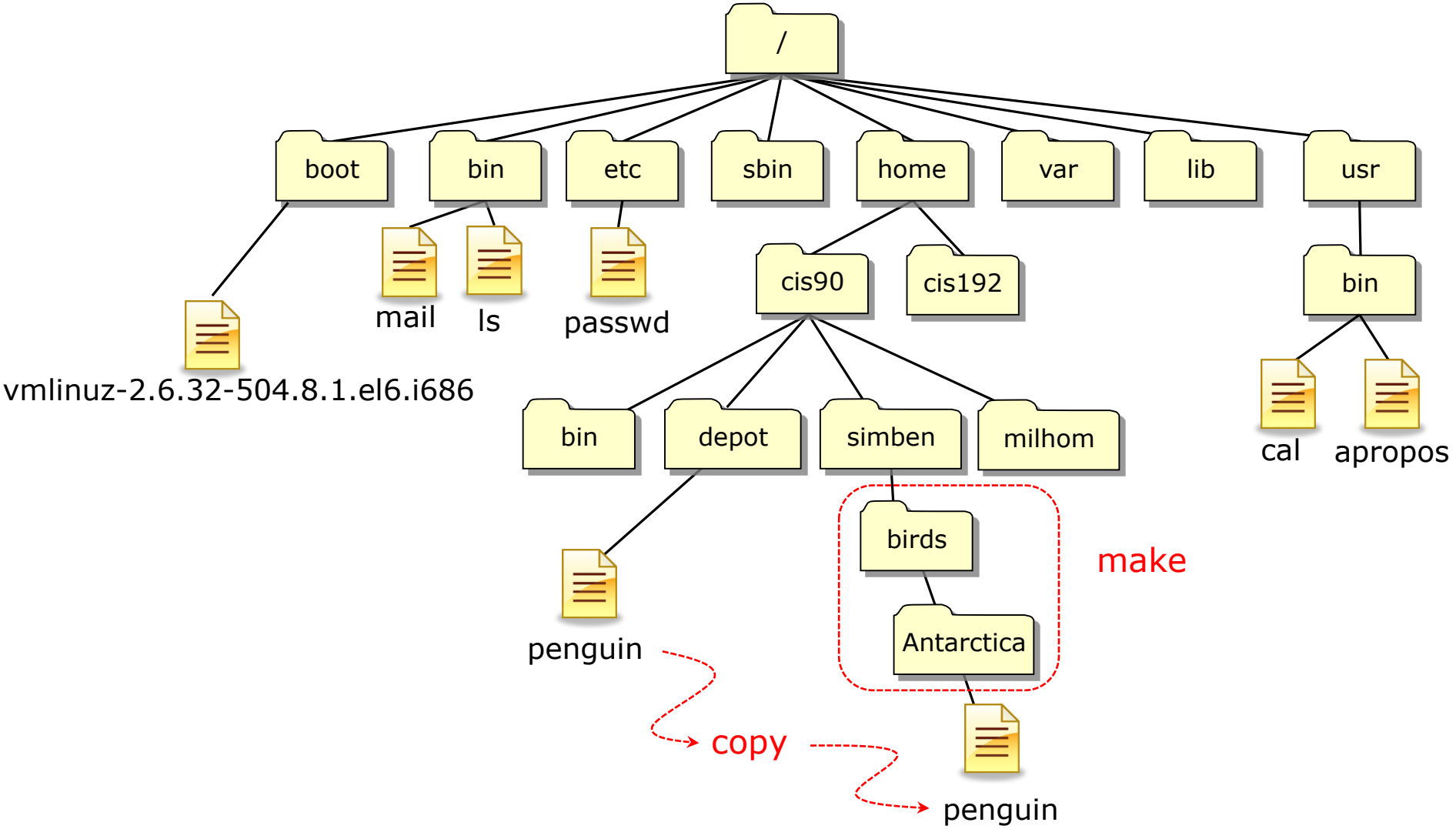
3) Not using . to refer to the current working directory.

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

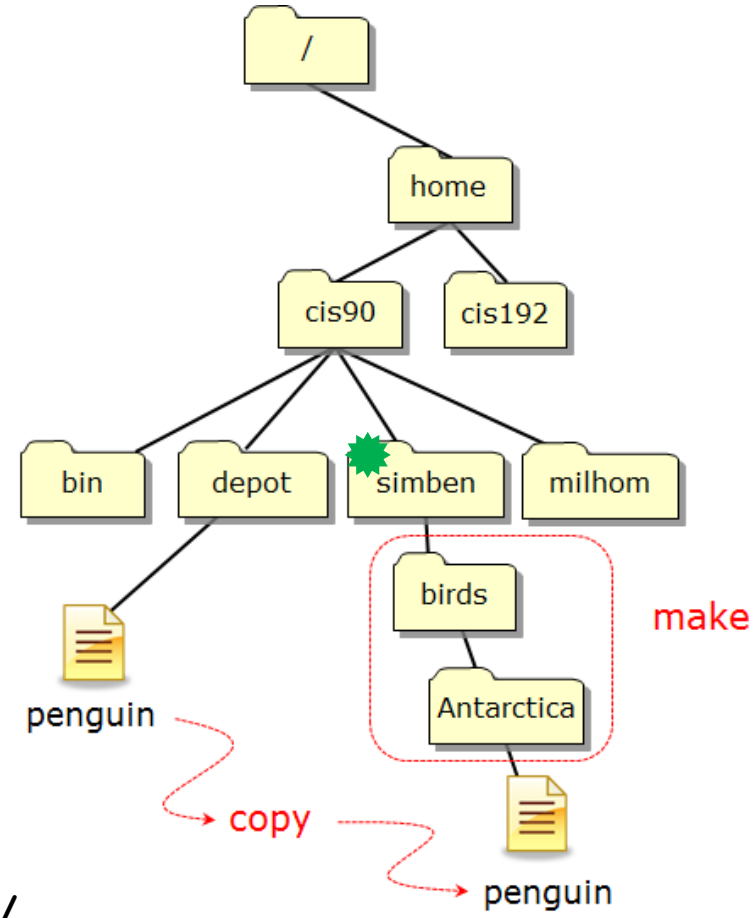


On the next slides we show four different ways the simben90 user could make the nested birds/Antarctica directory and copy the penguin file to it.

One way

1) From the home directory make the two new nested directories using the -p option:

```
cd
mkdir -p birds/Antarctica
```



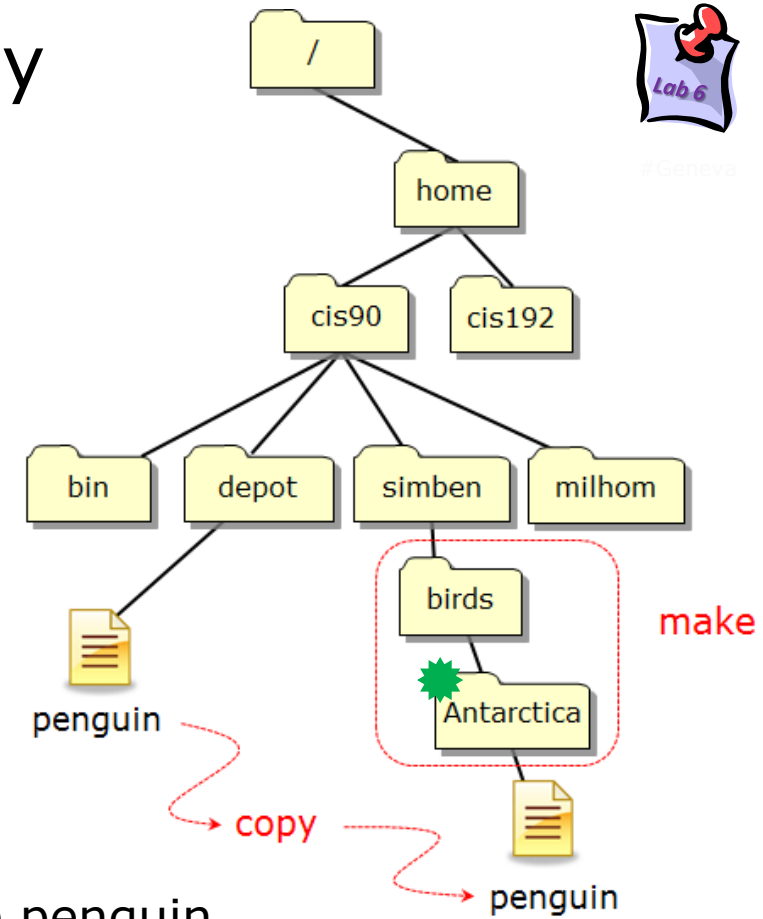
2) From the home directory copy the penguin file using relative pathnames.

```
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



1) Making the two new nested directories individually.

```
cd
mkdir birds
cd birds
mkdir Antarctica
cd Antarctica
```

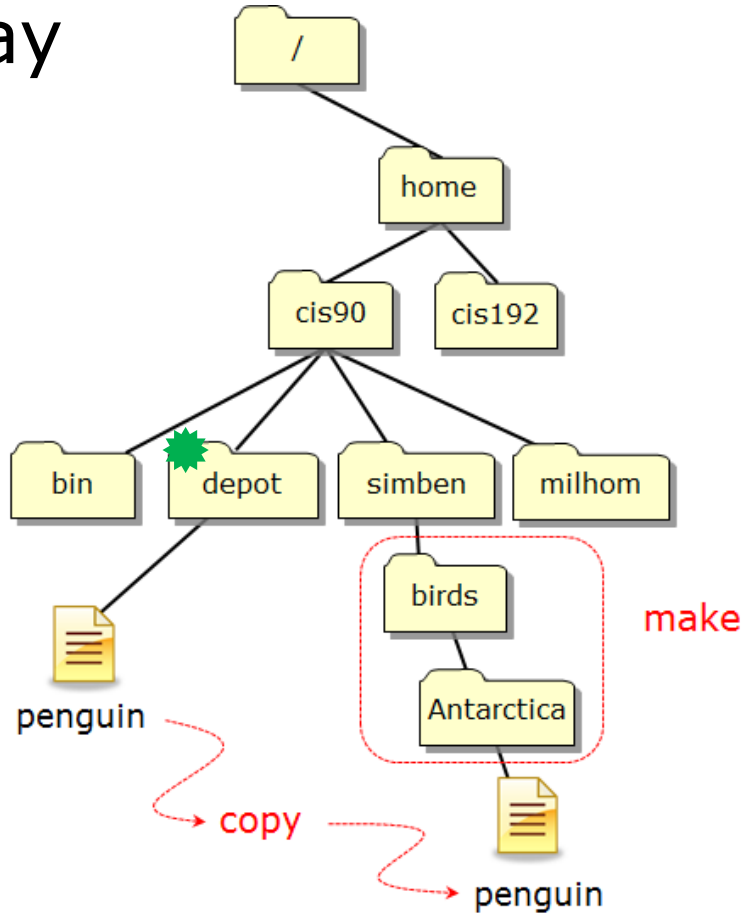
2) From the Antarctica directory copy the penguin file using an absolute pathname and the . "here" directory.

```
cp /home/cis90/depot/penguin .
```

Absolute pathname to penguin file

The "." directory for "here"

And another way



1) Make the nested directories from the depot directory.

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

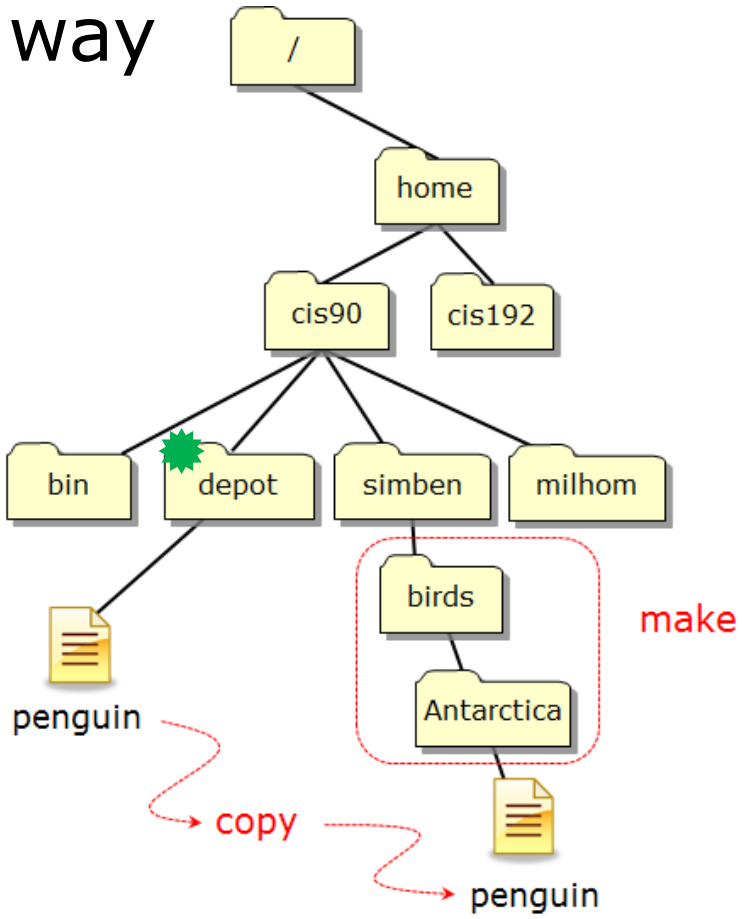
2) Copy the penguin file to the Antarctica directory.

```
cp penguin ../simben/birds/Antarctica/
```

Relative pathname to the penguin file.

Relative pathname to the Antarctica directory.

And yet another way



1) Make the new nested directories from the depot directory.

```
cd
cd ../depot/
mkdir -p ~/birds/Antarctica
```

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

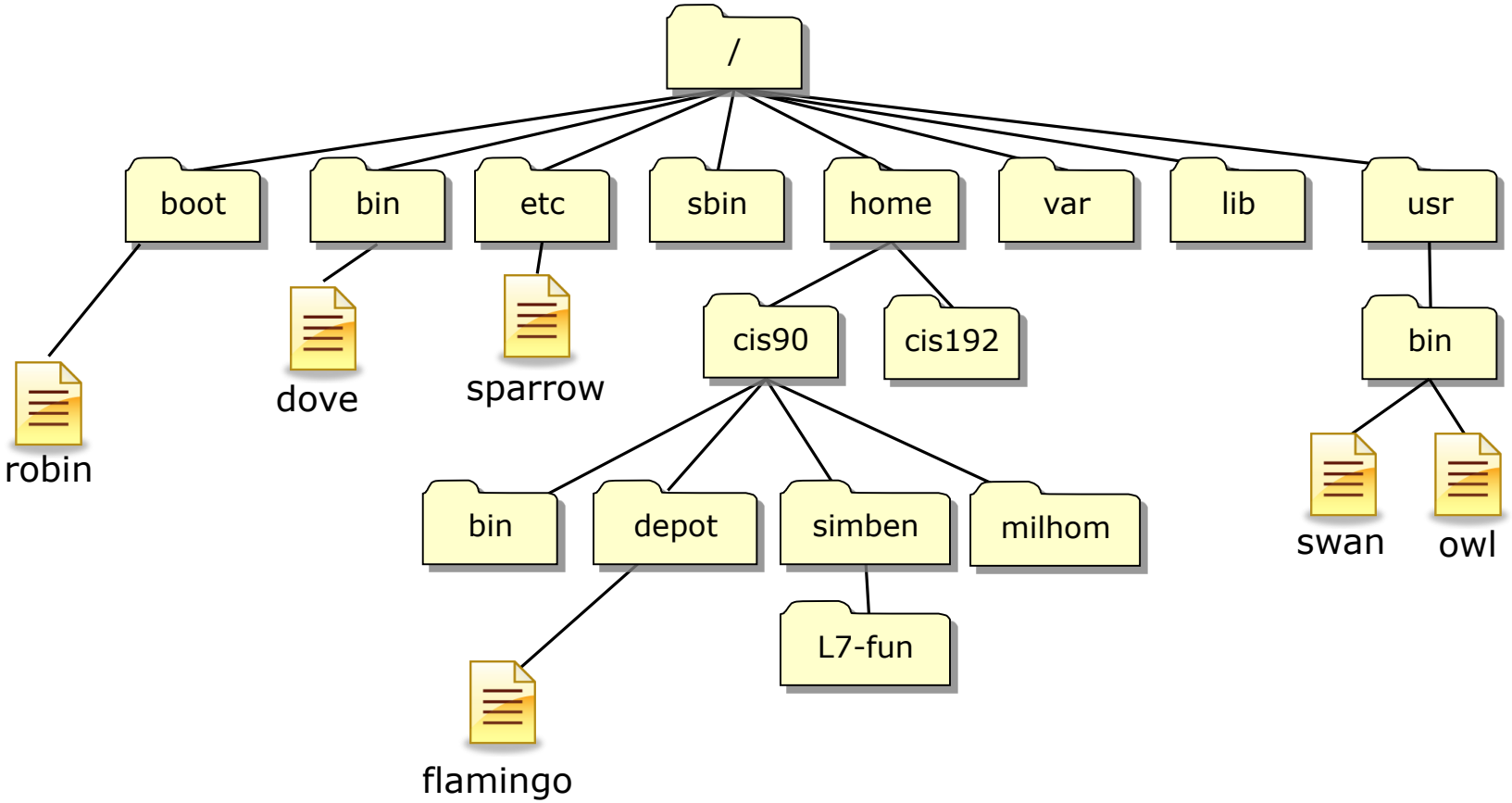
```
cp penguin ~/birds/Antarctica/
```

Relative pathname to the penguin file.

A pathname to the Antarctica directory. The "~" is shorthand for your home directory.

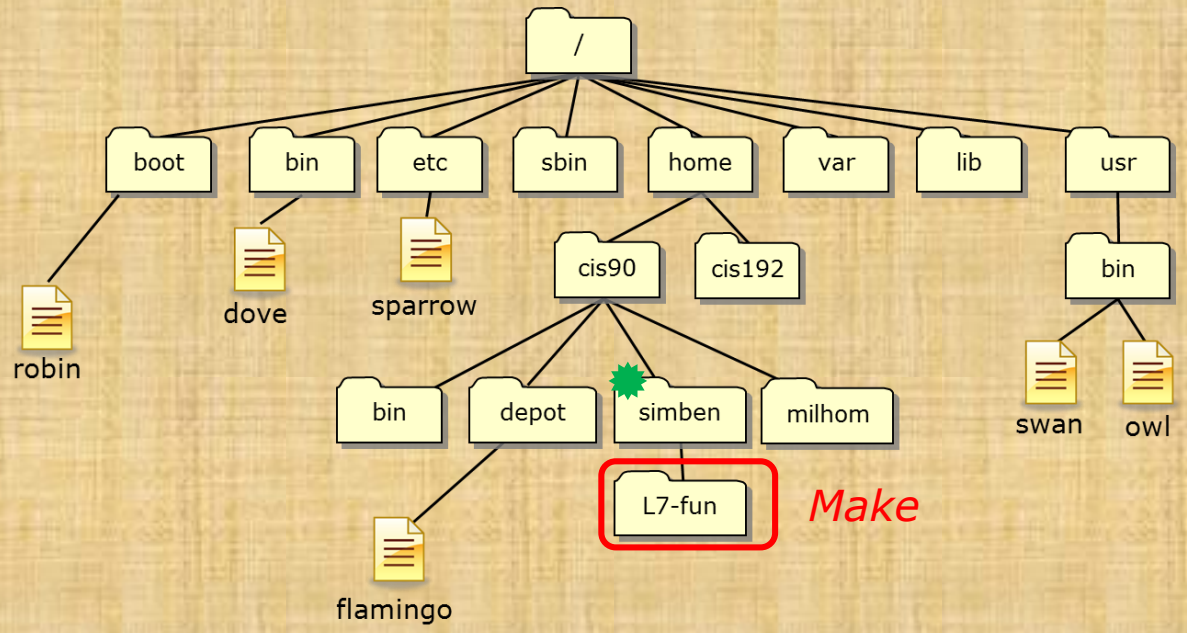
Follow Me

More practice managing files



I've scattered some files named after birds around Opus-II

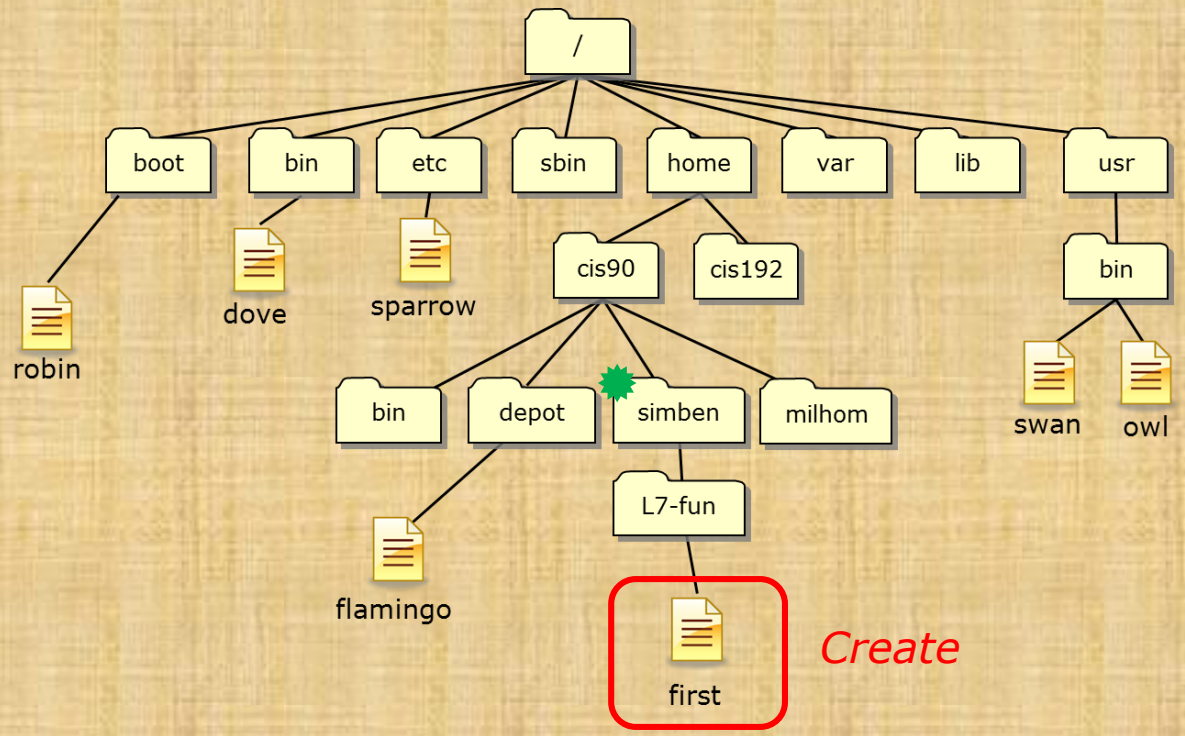
Follow Me



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

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

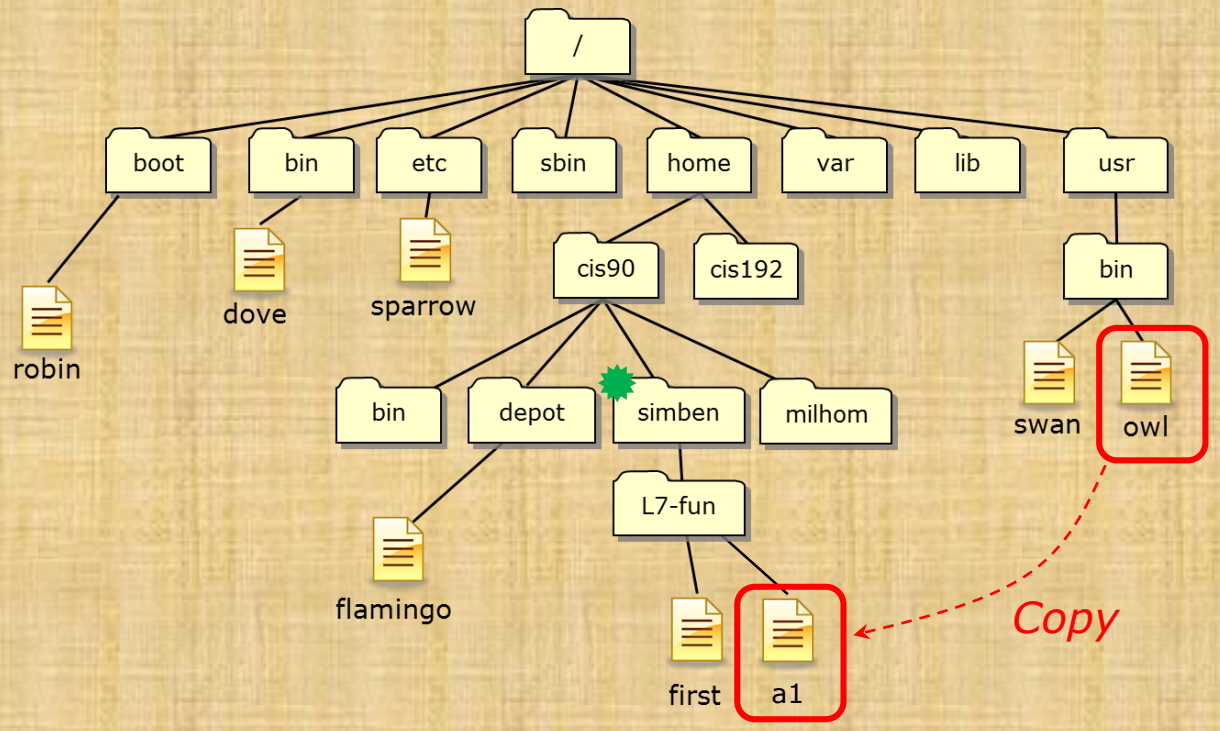
Follow Me



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/
```

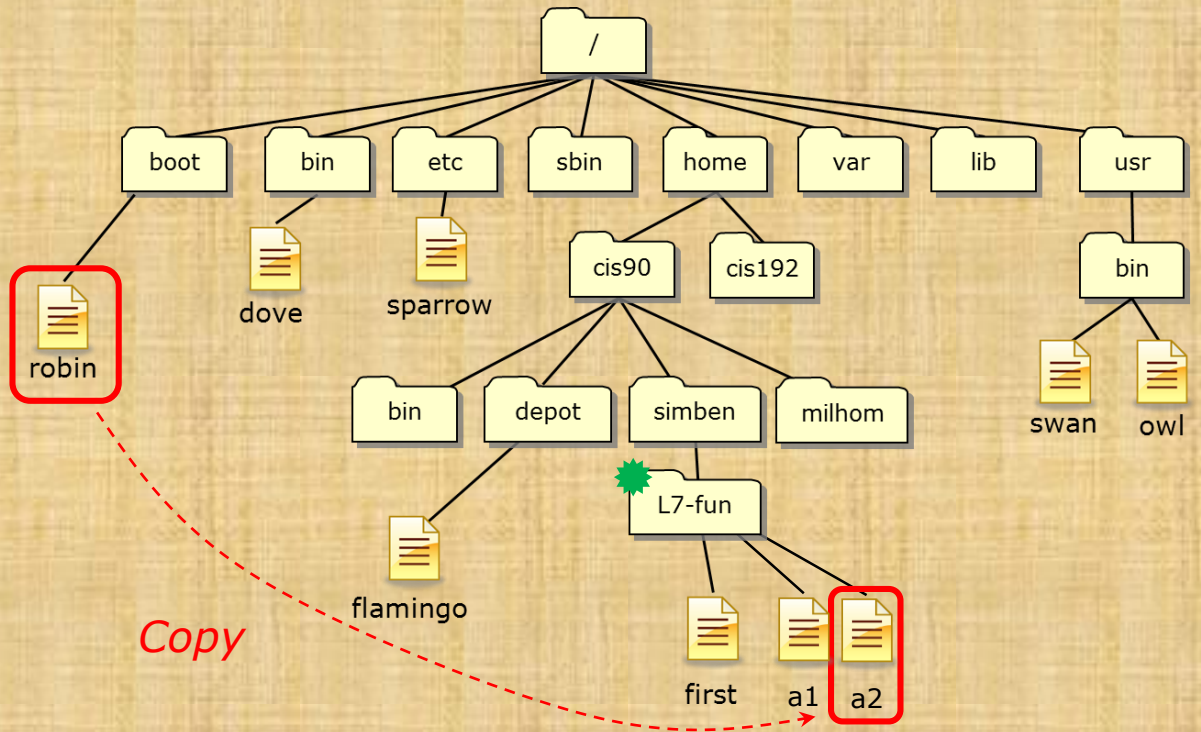
Follow Me



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/
```

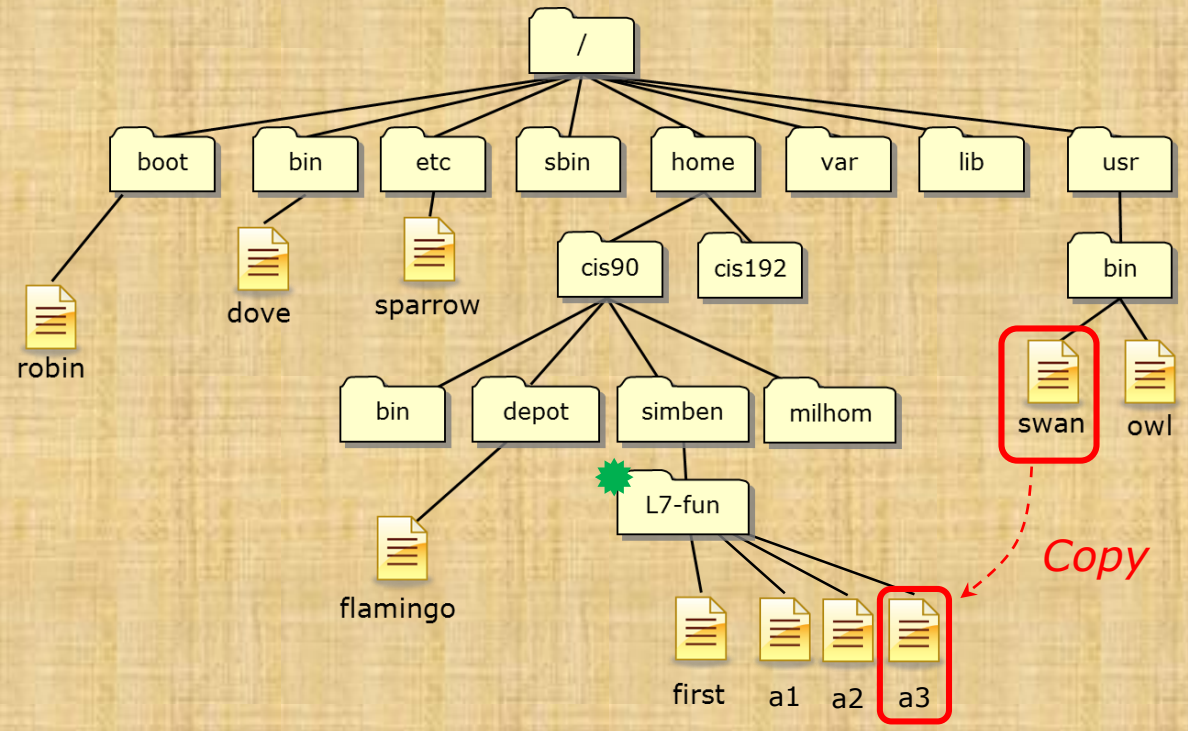
Follow Me



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
```

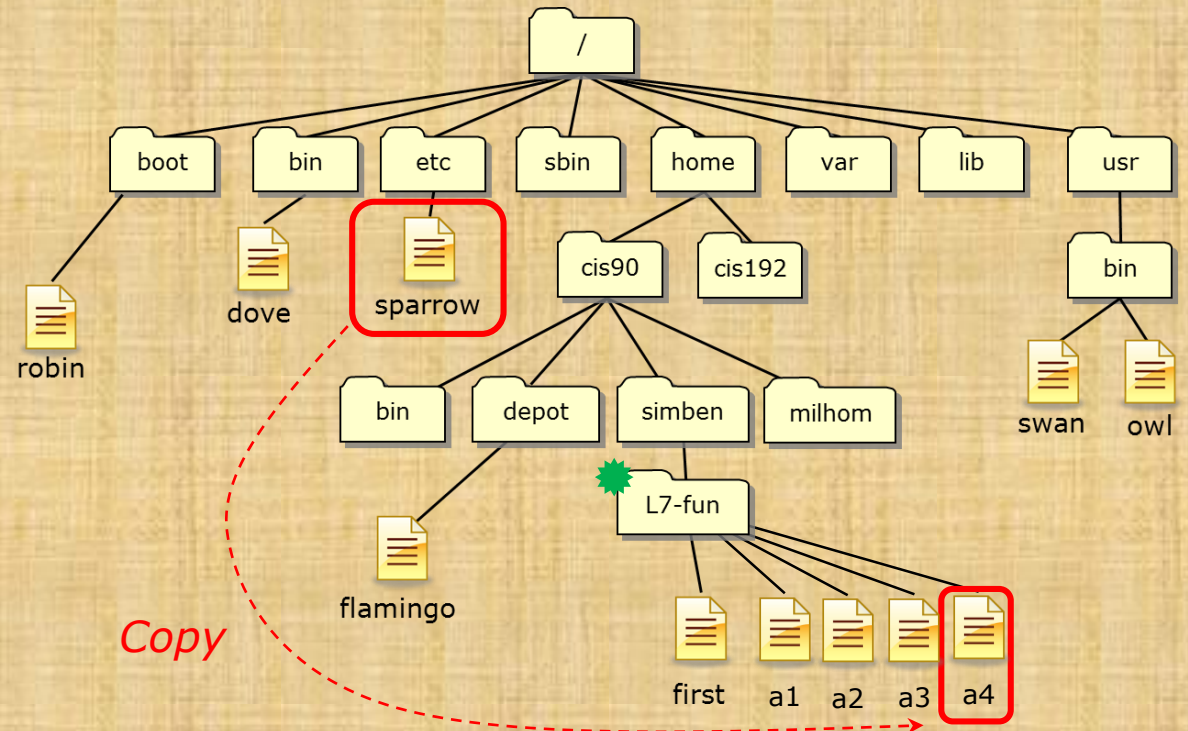
Follow Me



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
```

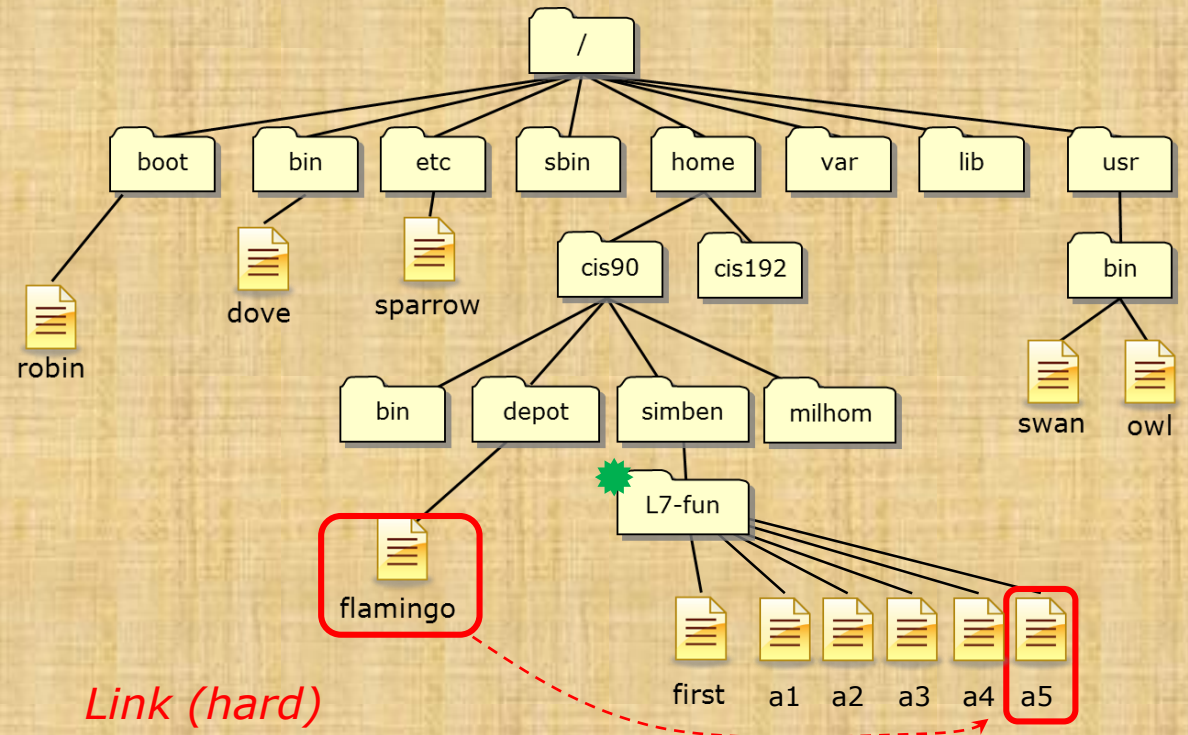
Follow Me



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
```

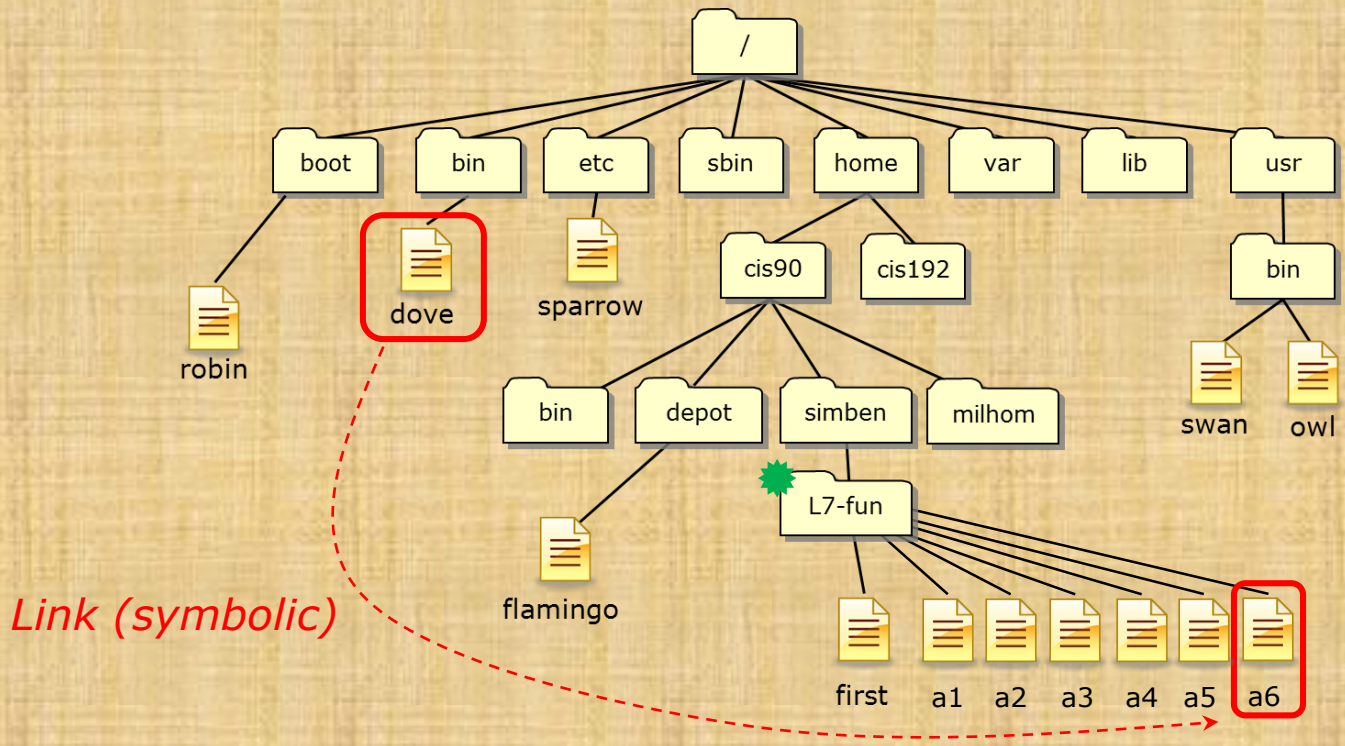
Follow Me



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
```

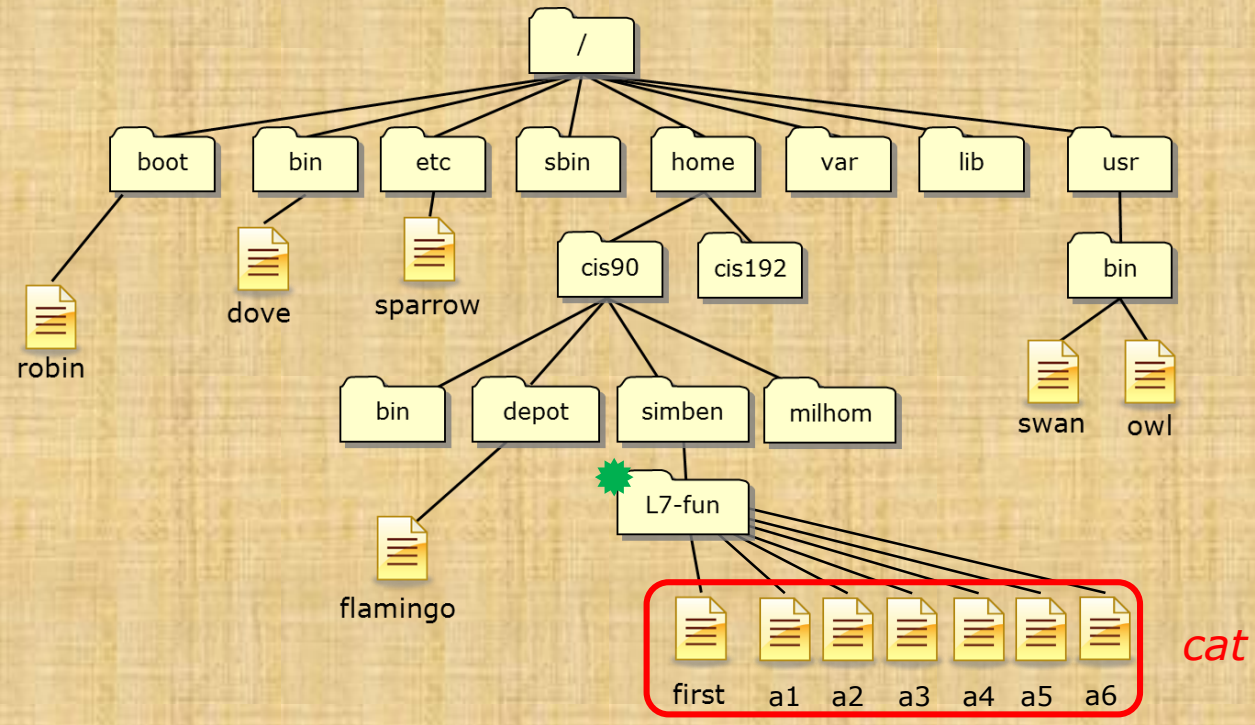
Follow Me



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
```

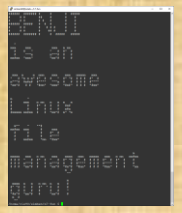
Follow Me



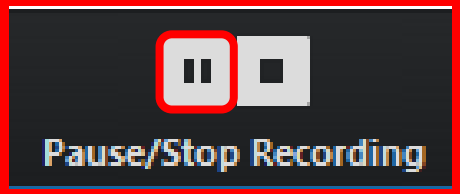
Did you do each step correctly?

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

Use the chat window to indicate what happened



Housekeeping



Pause Recording

Audio Check

Roll Call

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

risimms@cabrillo.edu

Resume Recording

Audio Check

1) Lab 5 is due tonight at 11:59PM.

2) Use the **check5** script to check your work.

3) Don't forget to use the **submit** command to submit your Lab 5 work for grading.

4) Use **verify** command to see what you sent me to grade.

5) Finished Lab 5 already? Please monitor the forum and help anyone with questions.

6) Next week five forum posts are due!

Note Taker Wanted

Up to $100 reward

Please contact me if you would be interested in letting me publish your notes on the CIS 90 website.

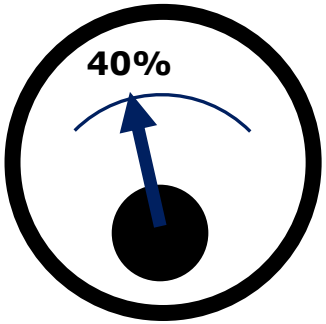
Linux Computer Home Loans

https://docs.google.com/a/cabrillo.edu/spreadsheets/d/1ljwkXZ7BYcCCo3UwqHz0EPm2I3OMSYMYrfYv43C2MBc/edit?usp=sharing

Email me if you are interested in getting a Linux PC home loan. Based on the number of requests I'll determine how long they can be checked out for.

CIS Fundraising "Bake Sale"

Donate by answering seven yes/no questions on an online Perkins/VTEA survey!



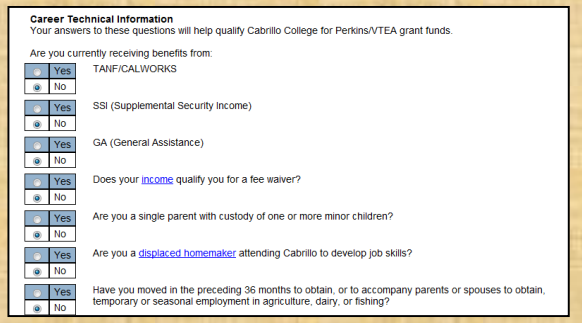
Perkins/VTEA Survey

https://opus-ii.cis.cabrillo.edu/forum/viewtopic.php?f=7&t=559

This is an important source of funding for Cabrillo College.

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

Even if you took the survey in another CIS class!



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

Are you currently receiving benefits from:

Yes / No	TANF/CALWORKS	
Yes / No	SSI (Supplemental Security Income)	
Yes / No	GA (General Assistance)	
Yes / No	Does your income qualify you for a fee waiver?	
Yes / No	Are you a single parent with custody of one or more minor children?	
Yes / No	Are you a displaced homemaker attending Cabrillo to develop job skills?	
Yes / No	Have you moved in the preceding 36 months to obtain, or to accompany parents or spouses to obtain, temporary or seasonal employment in agriculture, dairy, or fishing?	

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

Viewing file permissions

ls -l

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 $
```

*Use the **-l** option on the **ls** command for a long listing*

*Use a **long listing** to view file permissions*

The permissions

ls -l

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
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-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 $
```

*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

ls -l

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 **user** that **owns** the file*

The group a file belongs to

ls -l

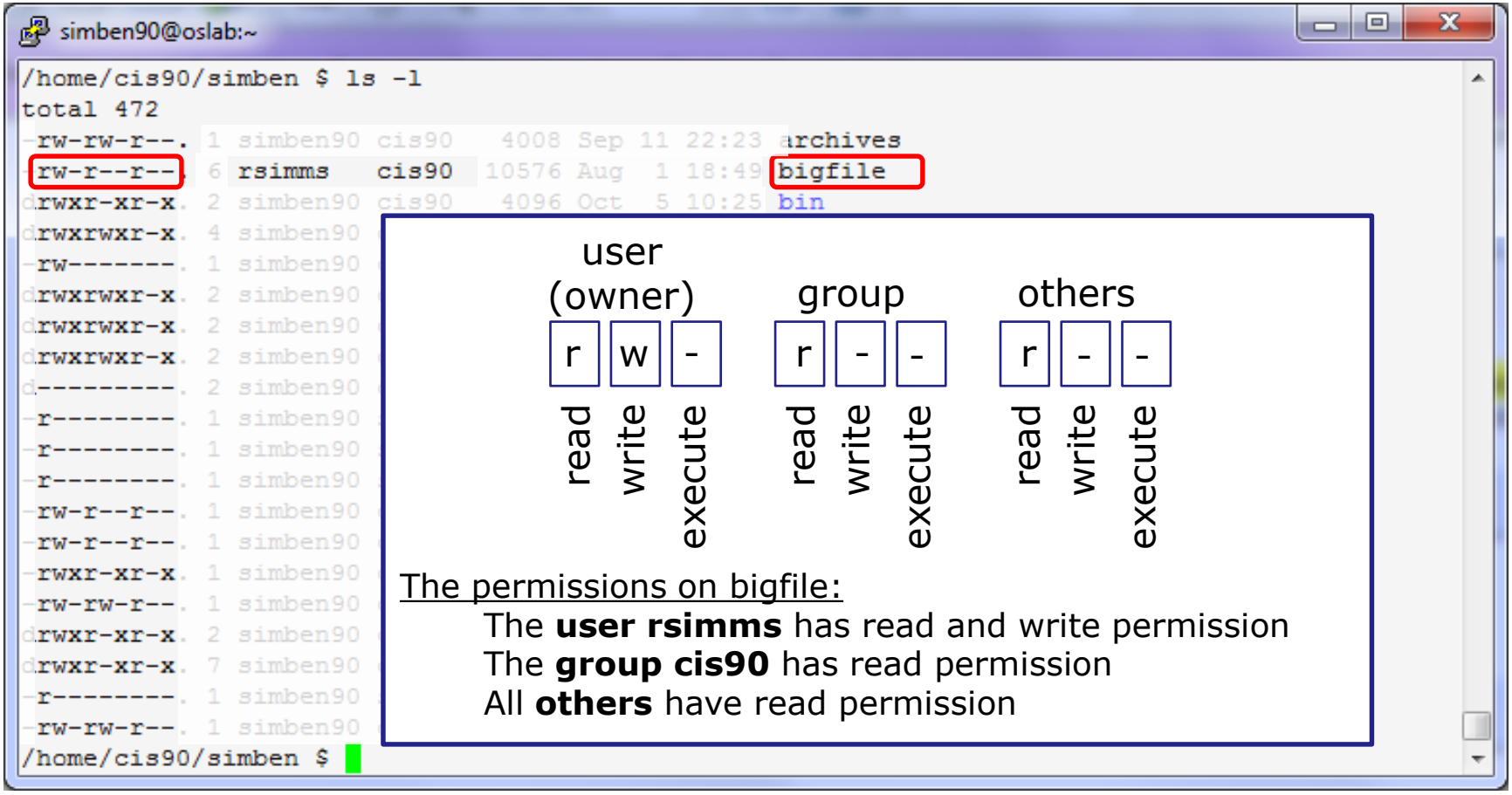
simben90@oslab:~

```
/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

`ls -l`



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

Three users on Opus-II

```
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=1090(cis90) groups=1090(cis90),100(users)

/home/cis90/simben $ id galaar90
uid=1228(galaar90) gid=1090(cis90) groups=1090(cis90),100(users)

/home/cis90/simben $ id milhom76
uid=1502(milhom76) gid=1076(cis76) groups=1076(cis76),100(users)
```

Group	cis90	cis76	users
Members	simben90 galaar90	milhom76	simben90 galaar90 milhom76

Activity

```
id simben90
id galaar90
id milhom90
ls -ld . .. .bash_profile bin cruz lab01.graded letter
```

simben90@opus-ii:~

```
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id galaar90
uid=1228(galaar90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id milhom76
uid=1502(milhom76) gid=1076(cis76) groups=1076(cis76),100(users)
/home/cis90/simben $
/home/cis90/simben $ ls -ld . .. .bash_profile bin cruz lab01.graded letter
drwxr-xr-x. 15 simben90 cis90 4096 Oct  7 16:21 .
drwxr-xr-x. 48 rsimms   cis90 4096 Oct  5 15:40 ..
-rw-------.  1 simben90 cis90  354 Sep 17  2003 .bash_profile
drwxr-xr-x.  2 simben90 cis90  124 Oct  4 17:34 bin
-rw-r-----.  1 simben90 cis90    0 Oct  7 16:21 cruz
-r--------.  1 simben90 staff 2723 Sep  6 12:54 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

```
id simben90
id galaar90
id milhom90
ls -ld . .. .bash_profile bin cruz lab01.graded letter
```

simben90@opus-ii:~

```
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id galaar90
uid=1228(galaar90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id milhom76
uid=1502(milhom76) gid=1076(cis76) groups=1076(cis76),100(users)
/home/cis90/simben $
/home/cis90/simben $ ls -ld . .. .bash_profile bin cruz lab01.graded letter
drwxr-xr-x. 15 simben90 cis90 4096 Oct  7 16:21 .
drwxr-xr-x. 48 rsimms   cis90 4096 Oct  5 15:40 ..
-rw-------.  1 simben90 cis90  354 Sep 17  2003 .bash_profile
drwxr-xr-x.  2 simben90 cis90  124 Oct  4 17:34 bin
-rw-r-----.  1 simben90 cis90    0 Oct  7 16:21 cruz
-r--------.  1 simben90 staff 2723 Sep  6 12:54 lab01.graded
-rw-r--r--.  1 simben90 cis90 1044 Jul 20  2001 letter
/home/cis90/simben $
```

Which group does the *bin/* directory belong to?

Write your answer in the chat window

Activity

```
id simben90
id galaar90
id milhom90
ls -ld . .. .bash_profile bin cruz lab01.graded letter
```

simben90@opus-ii:~

```
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id galaar90
uid=1228(galaar90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id milhom76
uid=1502(milhom76) gid=1076(cis76) groups=1076(cis76),100(users)
/home/cis90/simben $
/home/cis90/simben $ ls -ld . .. .bash_profile bin cruz lab01.graded letter
drwxr-xr-x. 15 simben90 cis90 4096 Oct  7 16:21 .
drwxr-xr-x. 48 rsimms   cis90 4096 Oct  5 15:40 ..
-rw-------.  1 simben90 cis90  354 Sep 17  2003 .bash_profile
drwxr-xr-x.  2 simben90 cis90  124 Oct  4 17:34 bin
-rw-r-----.  1 simben90 cis90    0 Oct  7 16:21 cruz
-r--------.  1 simben90 staff 2723 Sep  6 12:54 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 *letter* file?

Write your answer in the chat window

Activity

```
id simben90
id galaar90
id milhom90
ls -ld . .. .bash_profile bin cruz lab01.graded letter
```

simben90@opus-ii:~

```
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id galaar90
uid=1228(galaar90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id milhom76
uid=1502(milhom76) gid=1076(cis76) groups=1076(cis76),100(users)
/home/cis90/simben $
/home/cis90/simben $ ls -ld . .. .bash_profile bin cruz lab01.graded letter
drwxr-xr-x. 15 simben90 cis90 4096 Oct  7 16:21 .
drwxr-xr-x. 48 rsimms   cis90 4096 Oct  5 15:40 ..
-rw-------.  1 simben90 cis90  354 Sep 17  2003 .bash_profile
drwxr-xr-x.  2 simben90 cis90  124 Oct  4 17:34 bin
-rw-r-----.  1 simben90 cis90    0 Oct  7 16:21 cruz
-r--------.  1 simben90 staff 2723 Sep  6 12:54 lab01.graded
-rw-r--r--.  1 simben90 cis90 1044 Jul 20  2001 letter
/home/cis90/simben $
```

What are the permissions for the user galaar90 on the *letter* file?

Write your answer in the chat window

Activity

```
id simben90
id galaar90
id milhom90
ls -ld . .. .bash_profile bin cruz lab01.graded letter
```

simben90@opus-ii:~

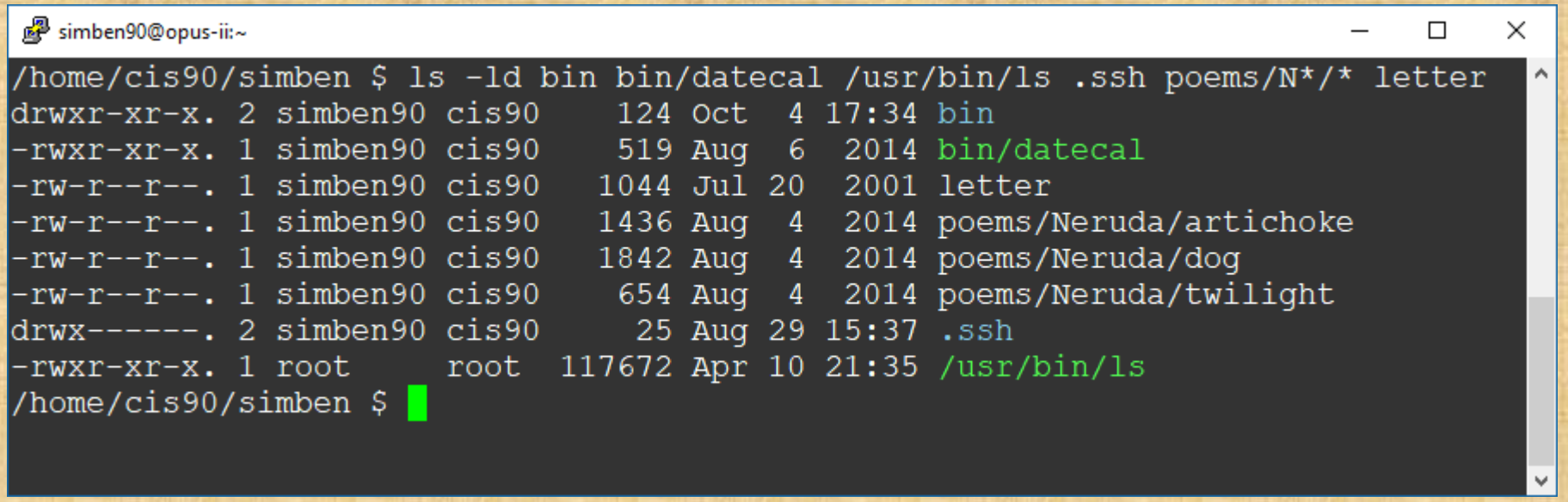
```
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id galaar90
uid=1228(galaar90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id milhom76
uid=1502(milhom76) gid=1076(cis76) groups=1076(cis76),100(users)
/home/cis90/simben $
/home/cis90/simben $ ls -ld . .. .bash_profile bin cruz lab01.graded letter
drwxr-xr-x. 15 simben90 cis90 4096 Oct  7 16:21 .
drwxr-xr-x. 48 rsimms   cis90 4096 Oct  5 15:40 ..
-rw-------.  1 simben90 cis90  354 Sep 17  2003 .bash_profile
drwxr-xr-x.  2 simben90 cis90  124 Oct  4 17:34 bin
-rw-r-----.  1 simben90 cis90    0 Oct  7 16:21 cruz
-r--------.  1 simben90 staff 2723 Sep  6 12:54 lab01.graded
-rw-r--r--.  1 simben90 cis90 1044 Jul 20  2001 letter
/home/cis90/simben $
```

What are the permissions for the user milhom76 on the *cruz* file?

Write your answer in the chat window

Activity

```
ls -ld bin bin/datecal /usr/bin/ls .ssh poems/N*/* letter
```



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

green

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
-------r--. 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

mail

Heirloom Mail version 12.5 7/5/10. Type ? for help.
"/var/spool/mail/simben90": 1 message 1 unread
>U 1 Rich Simms Wed Sep 26 16:05 23/731 "Benji food (P1-Q29)"

& s 1 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

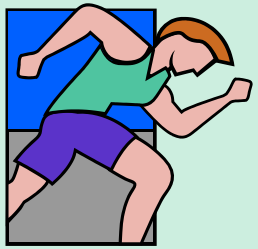
```
/home/cis90/simben $ ls -l letter ../milhom/letter
-rw-r--r--. 1 simben90 cis90 1059 Oct  7 15:05 letter
-rw-r--r--. 1 milhom90 cis90 1044 Jul 20  2001 ../milhom/letter

/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 user 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---r-x. 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 lacks both read and execute permissions 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=1201(simben90) gid=1090(cis90) groups=1090(cis90),100(users)
```

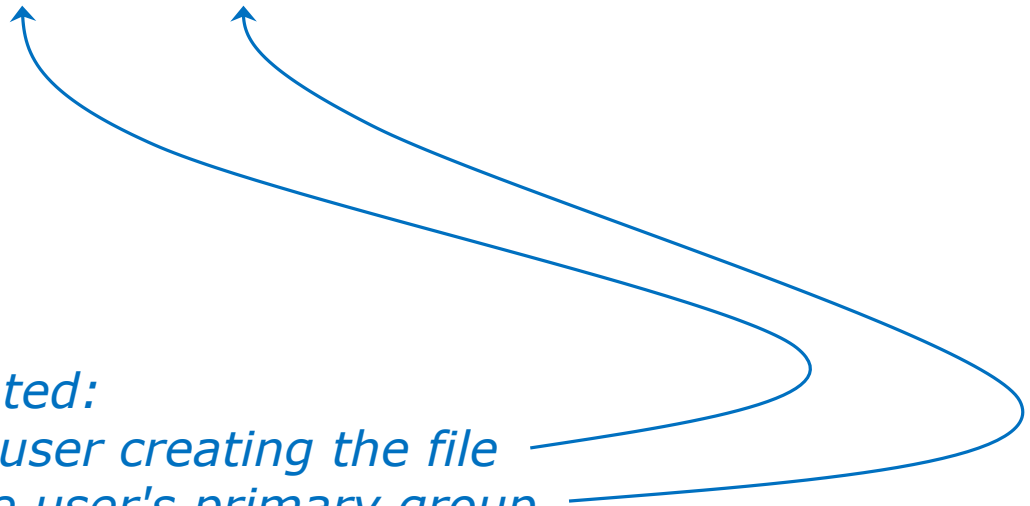
*simben90's primary group is **cis90***

```
/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:

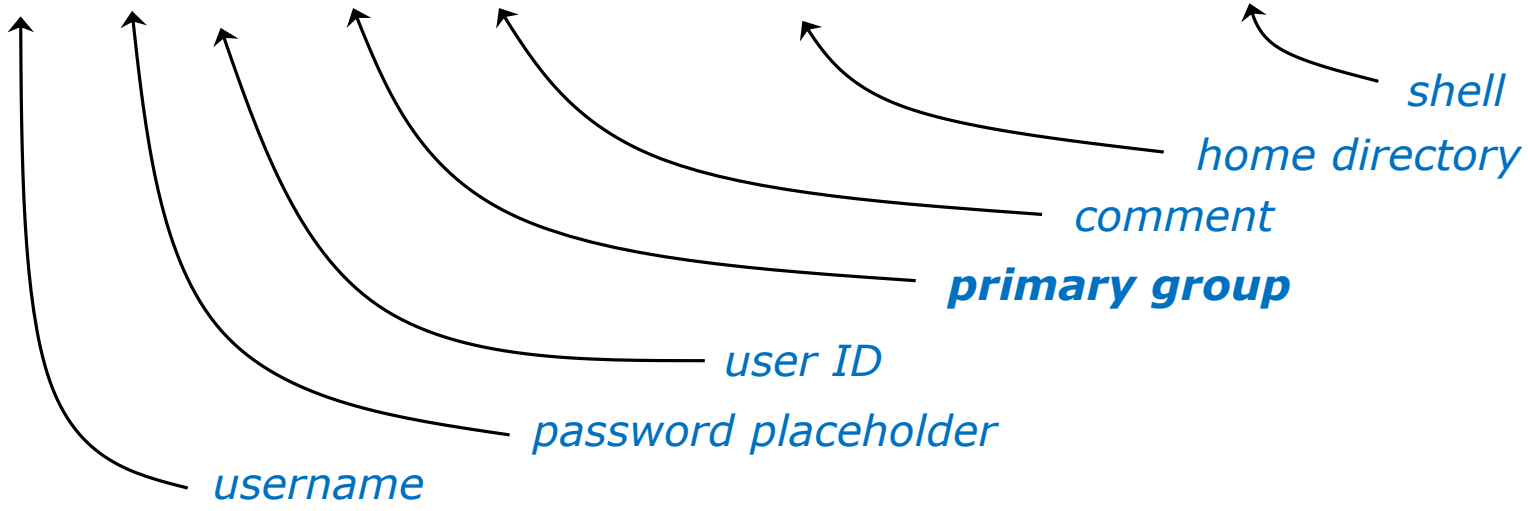
- *the user is set to the user creating the file*
- *the group is set to the user's primary group*

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:1200:1090:CIS90 Student:/home/cis90/cis:/bin/bash
simben90:x:1201:1090:Benji Simms:/home/cis90/simben:/bin/bash
milhom90:x:1202:1090:Homer Miller:/home/cis90/milhom:/bin/bash
rodduk90:x:1203:1090:Duke Roddy:/home/cis90/rodduk:/bin/bash
```



Secondary groups stored in /etc/group

Excerpts from **/etc/group**

simben90 is also a member of the users group, GID=100

```
audio:x:63:
nobody:x:99:
users:x:100:rsimms,warjes76,simben76,milhom76,rodduk76,watshe76,seasky76,cis90,simben90
,milhom90,rodduk90,berale90,cireri90,espdom90,evabla90,farton90,giotar90,johbra90,lewau
s90,mocrya90,navvic90,pindan90,siecar90,steisa90,vasmig90,caljos90,climat90,galaar90,go
ngab90,learya90,lewali90,rojfre90,serjan90,tbd0290,tbd0390,tbd0490,tbd0590,tbd0690,tbd0
790,tbd0890,tbd0990,tbd1090,tbd1190,tbd1290,tbd1390,tbd1490,tbd1590,watshe90,seasky90,a
lvjon90
stapusr:x:156:
stapsys:x:157:
< snipped >
rsimms:x:1000:rsimms
staff:x:503:rsimms
cis54:x:1054:
cis72:x:1072:
cis75:x:1075:
cis76:x:1076:rsimms
cis77:x:1077:
cis90:x:1090:rsimms
```

/etc/group stores information about all groups used on the system. This information includes the name of the group, the GID and secondary membership.

name of group

placeholder for the password

GID (Group ID number)

Secondary group members (primary group membership shown in /etc/passwd

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)

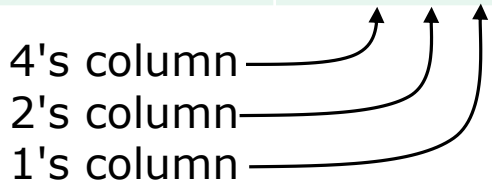
Specifying Numeric Permissions

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



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 *binary* or 4+2+0 *decimal* = 6 *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 *binary* or 0+2+1 *decimal* = 3 *decimal*

Practice converting to numeric permissions

File Permissions

`ls -l`

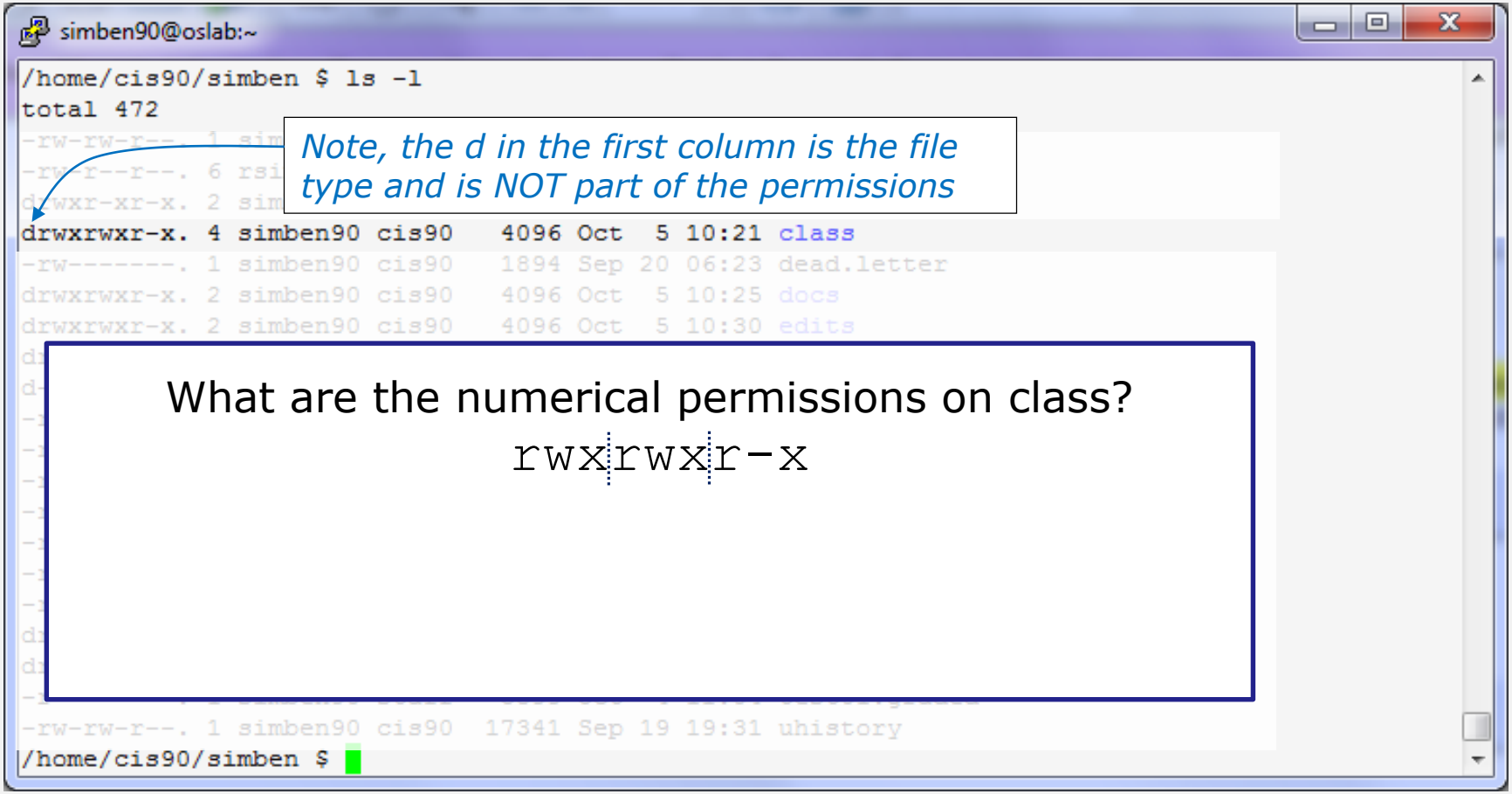
simben90@oslab:~

```
/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 $
```

Use long Listings to show permissions

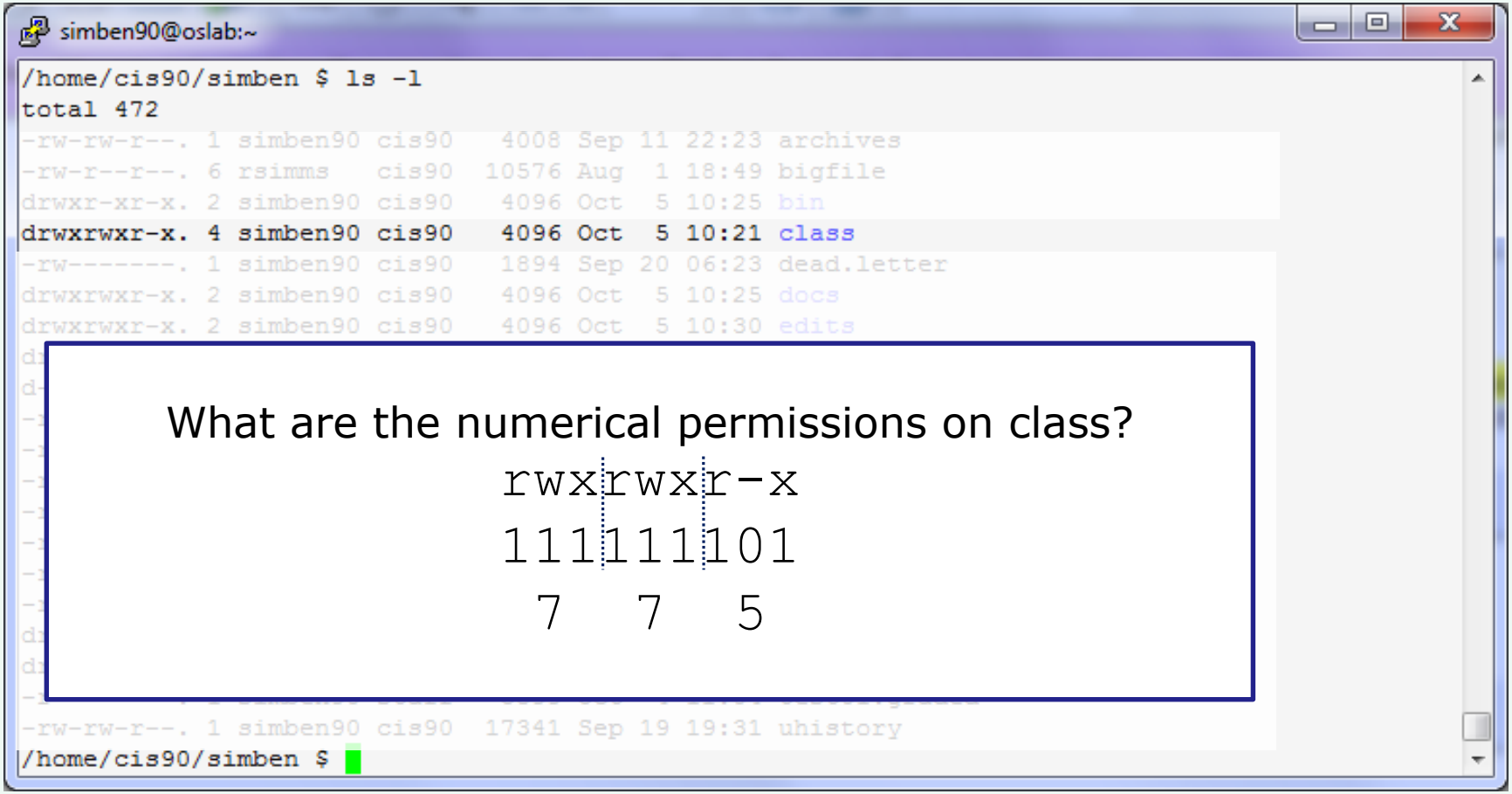
Example 1

Converting mnemonic permissions to numeric



Example 1

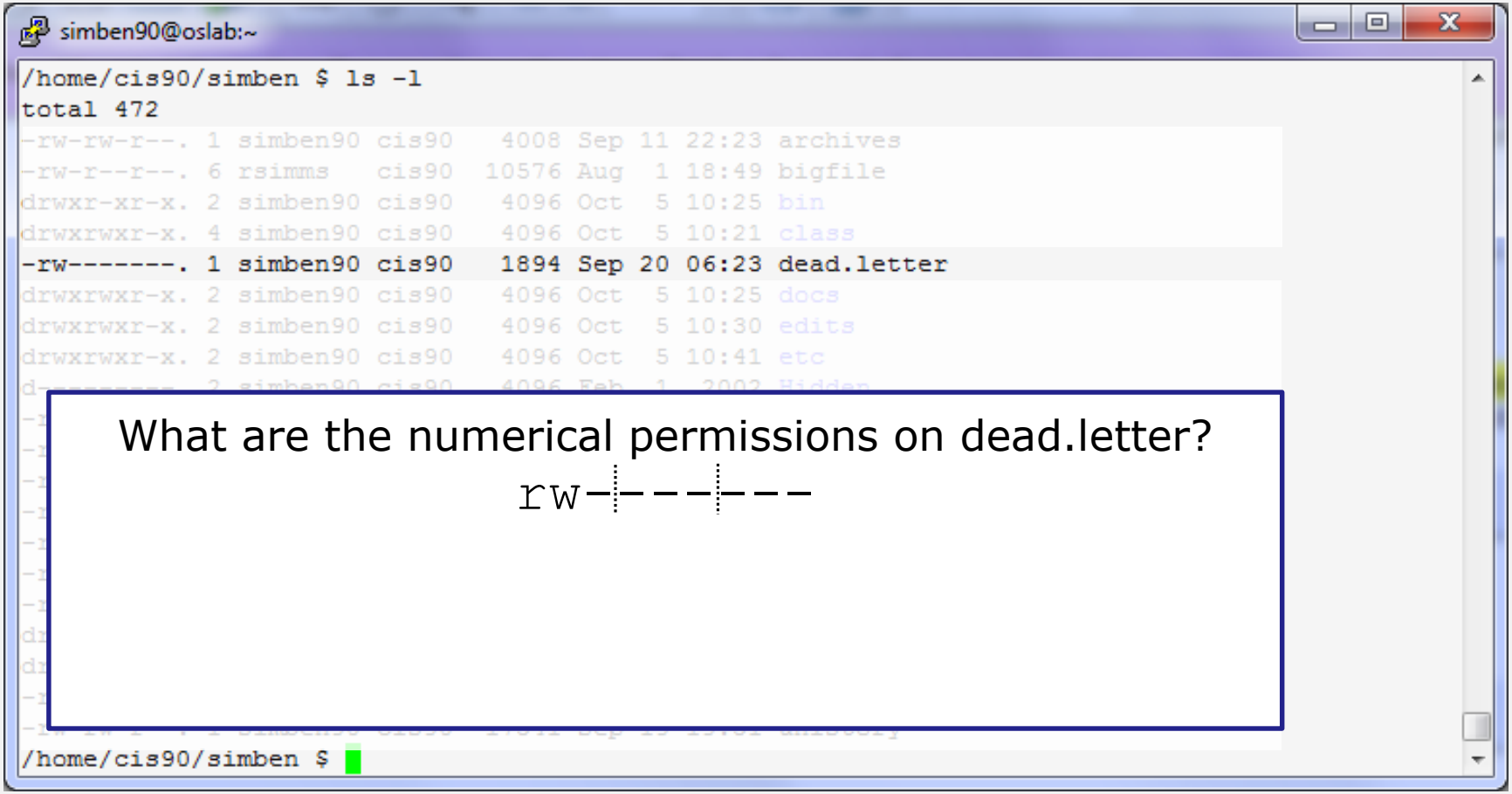
Converting mnemonic permissions to numeric



simben90's class (directory) permissions are 775

Example 2

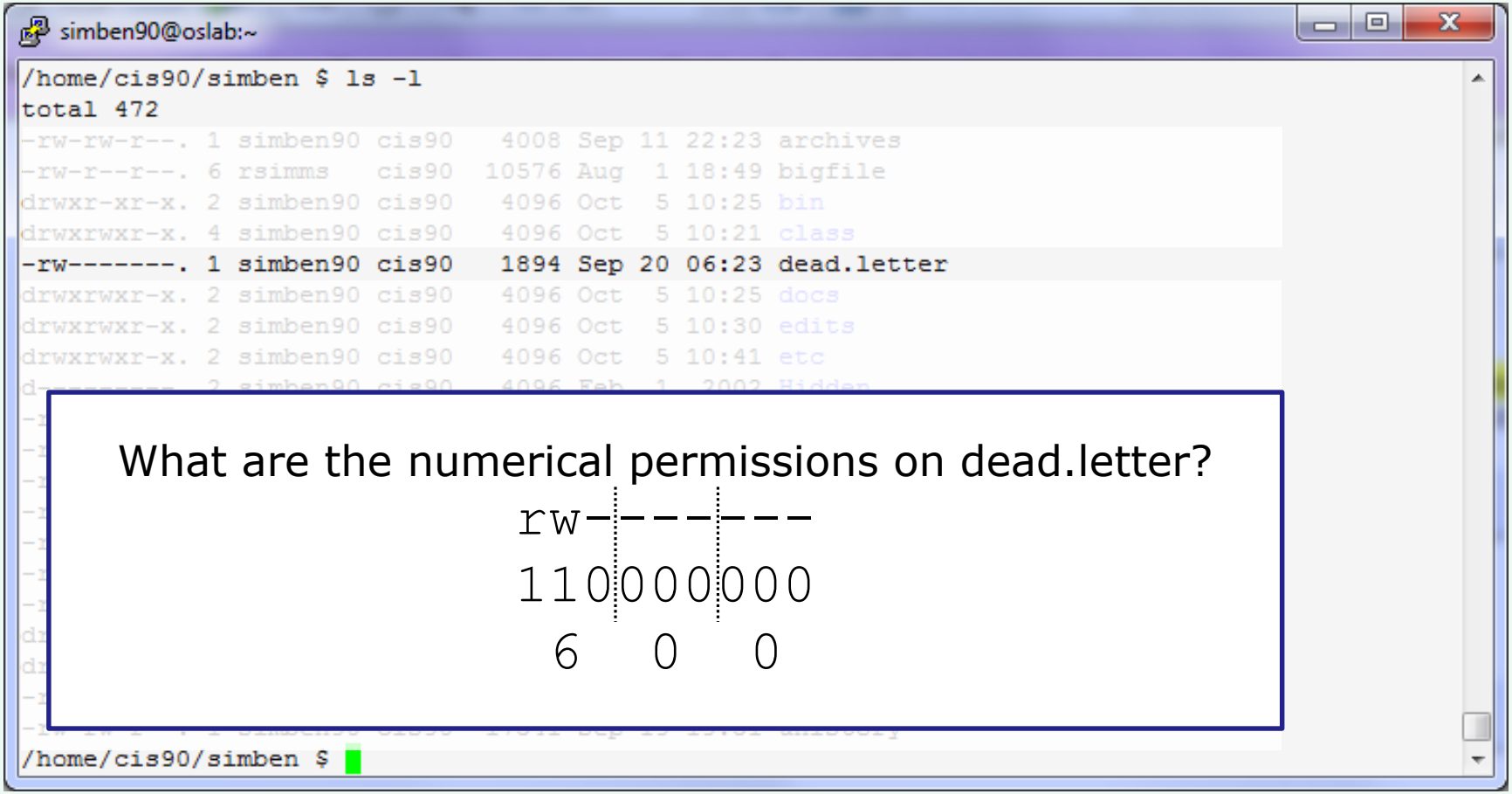
Converting mnemonic permissions to numeric



simben90's dead.letter (regular file)

Example 2

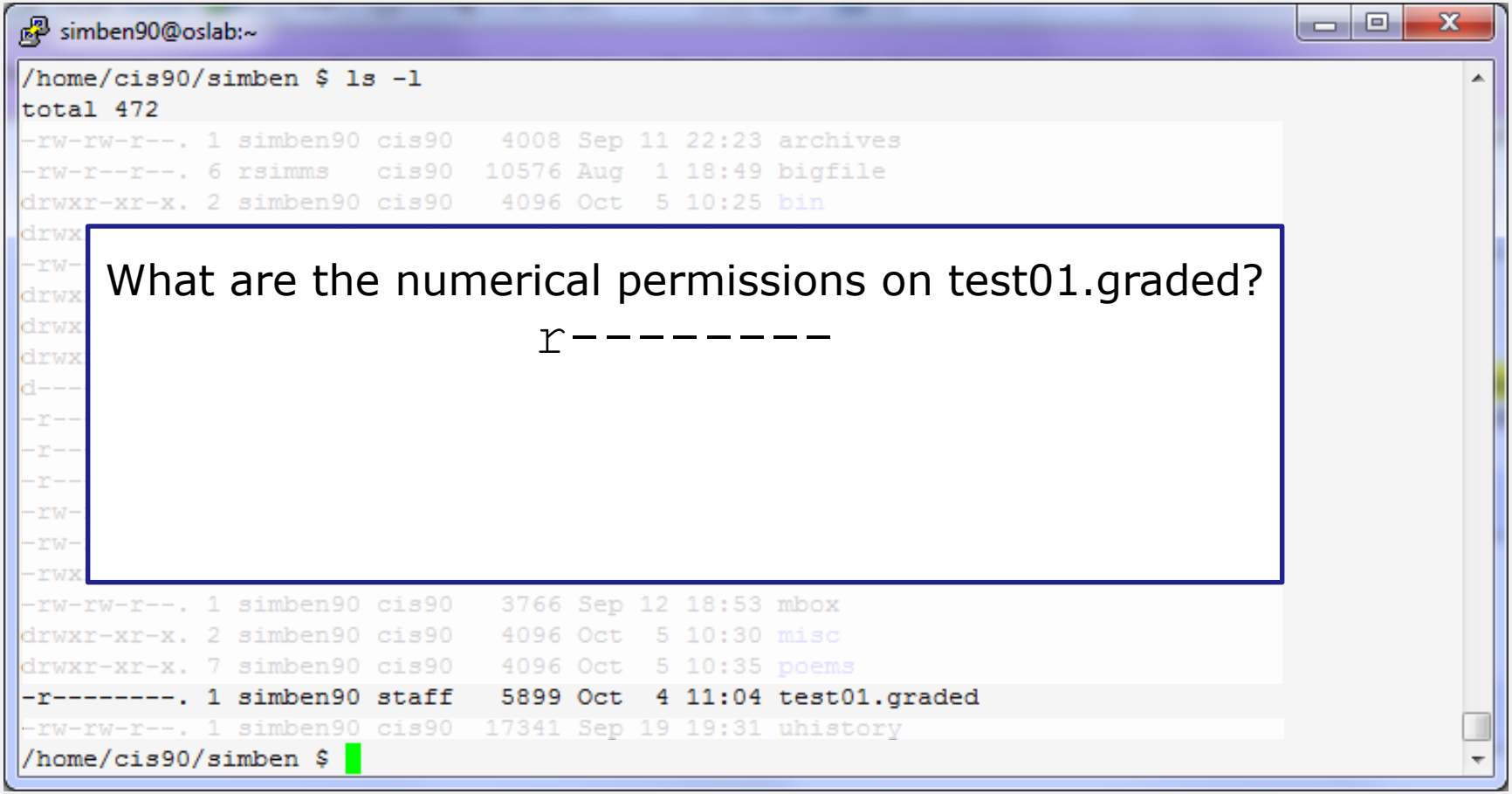
Converting mnemonic permissions to numeric



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

Example 3

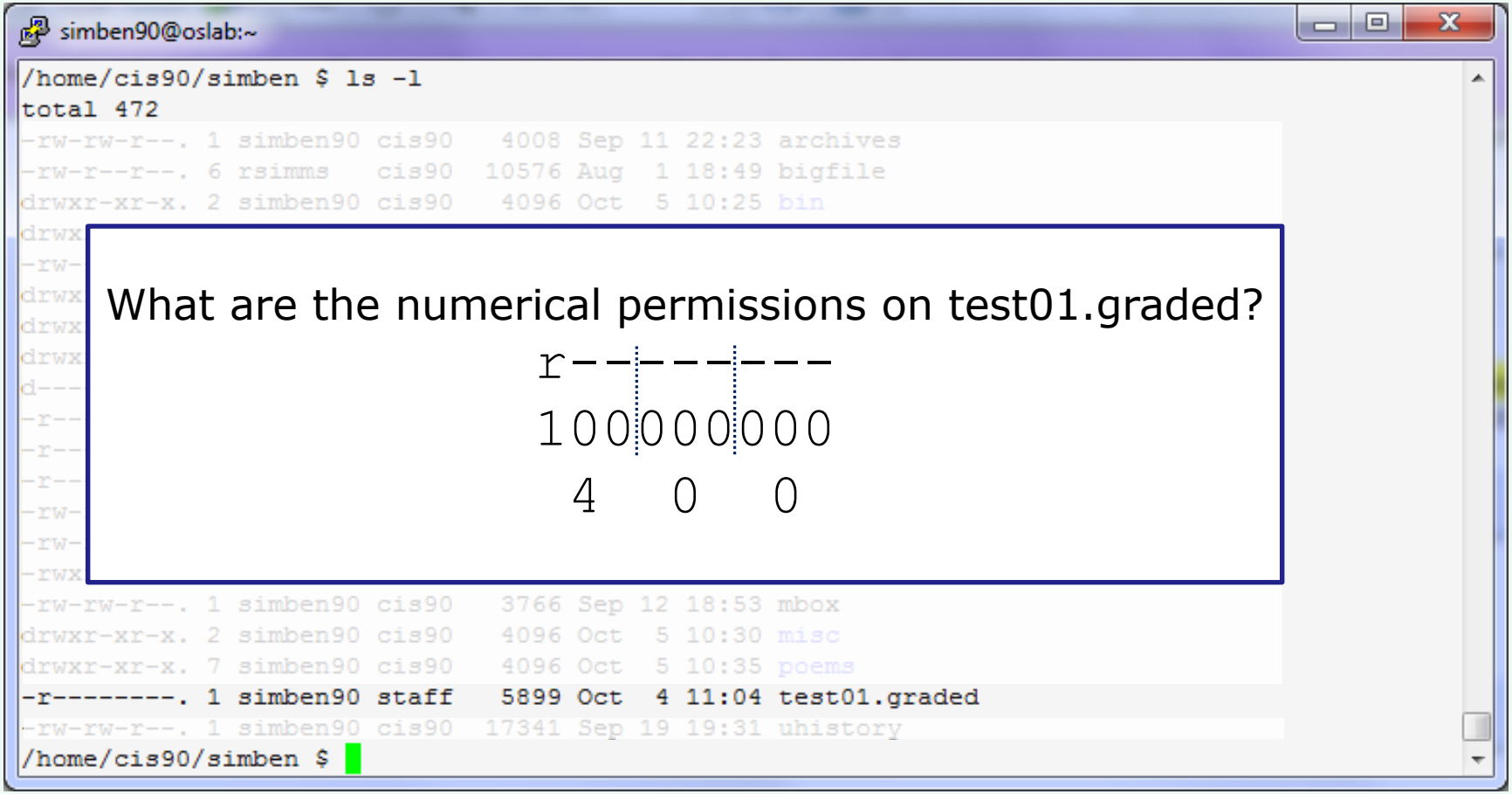
Converting mnemonic permissions to numeric



simben90's test01.graded (regular file)

Example 3

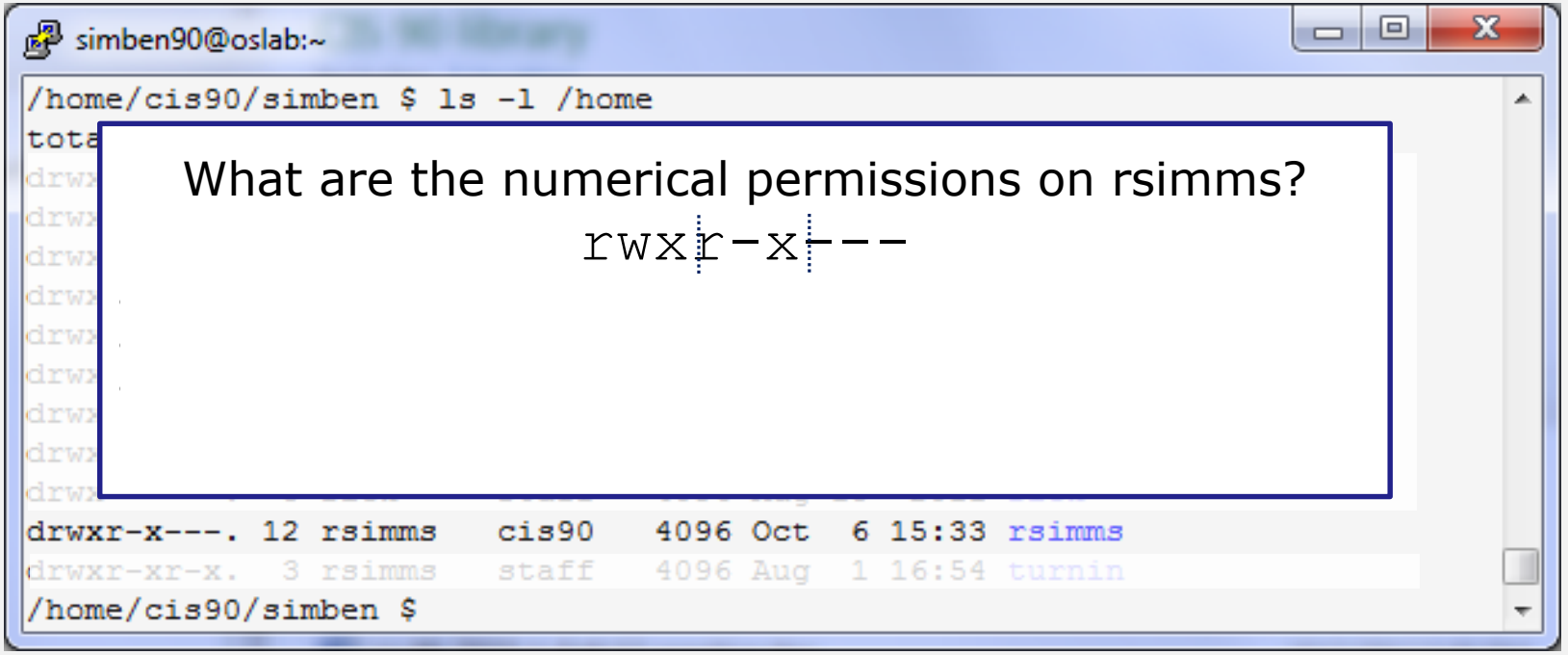
Converting mnemonic permissions to numeric



simben90's test01.graded permissions are 400

Example 4

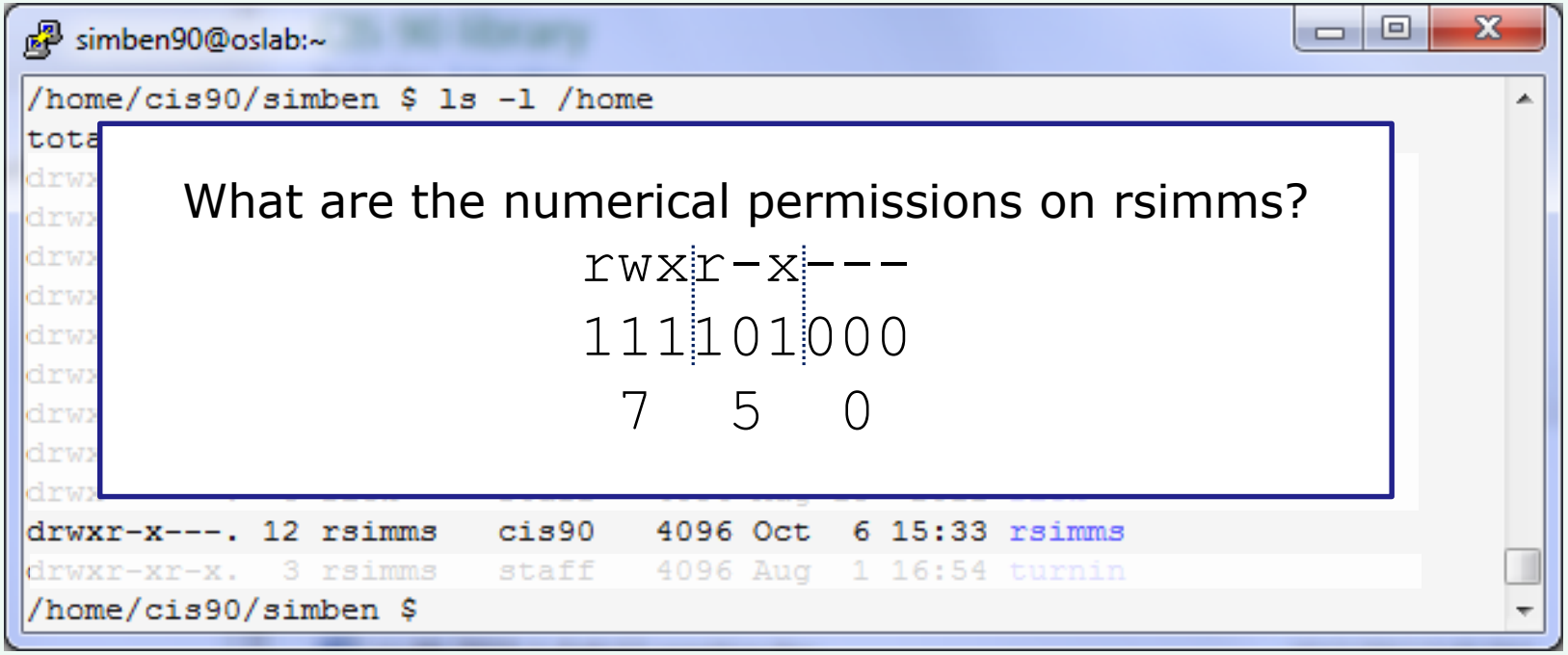
Converting mnemonic permissions to numeric



/home/rsimms (Rich's home directory)

Example 4

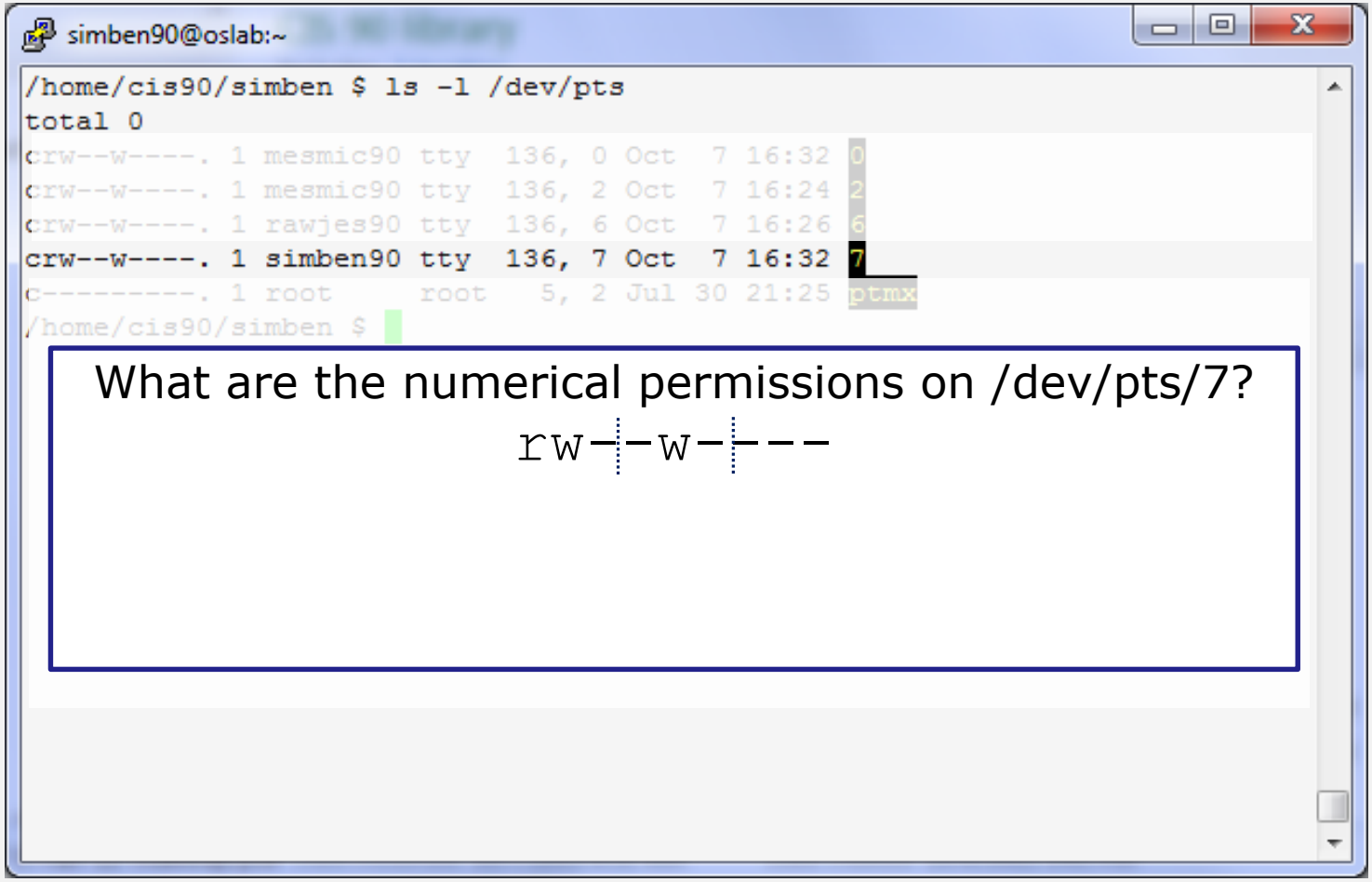
Converting mnemonic permissions to numeric



/home/rsimms permissions are 750

Example 5

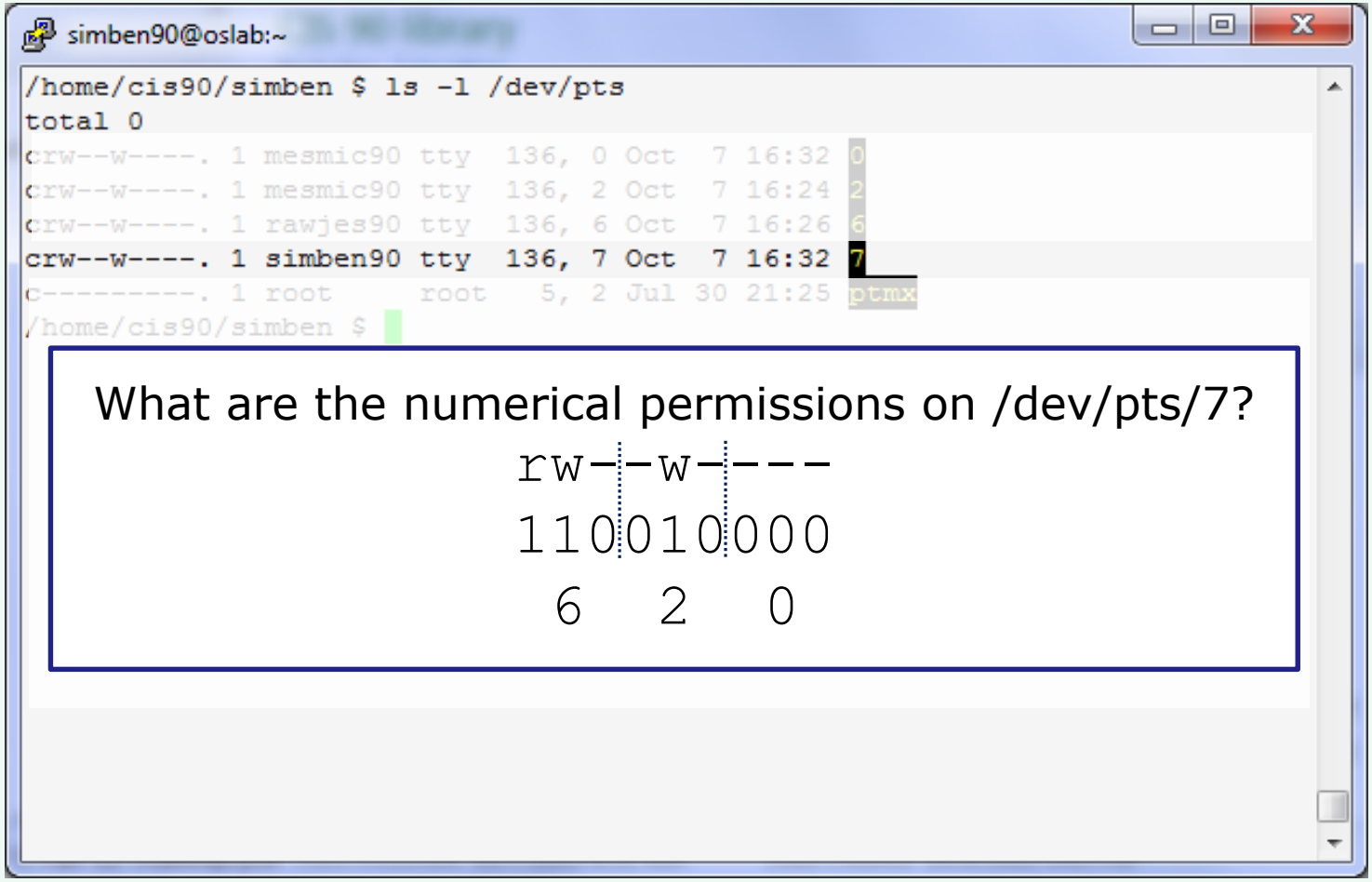
Converting mnemonic permissions to numeric



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

Example 5

Converting mnemonic permissions to numeric



/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
```

Permissions *Owner* *Group*

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

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
```

Permissions *Owner* *Group*

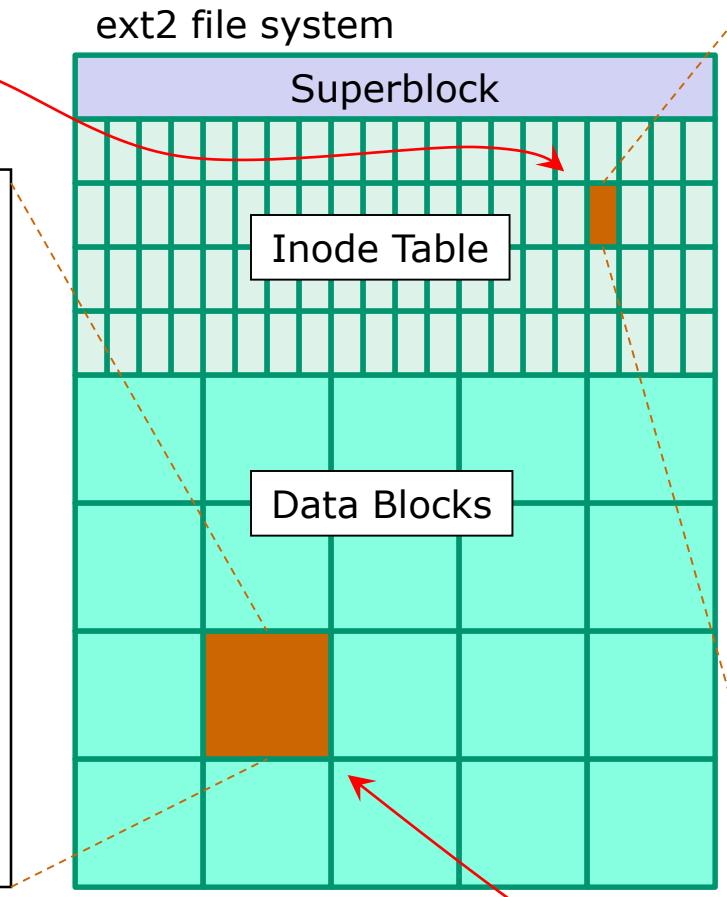
The owner of letter is simben90 and the group is cis90

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

The filename is kept in the directory

bigfile 12687
bin 12067
letter 10574

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



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

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

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
```

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 $
```

numeric form

110100100

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

owner has read and write

group has only read

others have only read

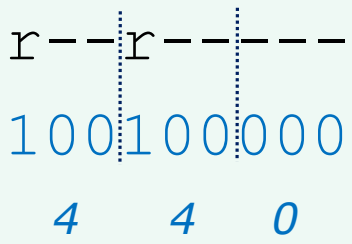
More Practice

File Permissions

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

File Permissions

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



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
111101101
rwxr-xr-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--`?

```
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?

```
110 100 100
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/httpd/conf/httpd.conf?

File Permissions

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

Answer: yes

```
/home/cis90/simben $ ls -l /etc/httpd/conf/httpd.conf
-rw-r--r--. 1 root root 12233 Oct  6 13:56 /etc/httpd/conf/httpd.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

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

Make a test file and try to change the owner

*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)

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

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

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

remove execute from all

add execute to others and group

remove read, write, execute from groups and others

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

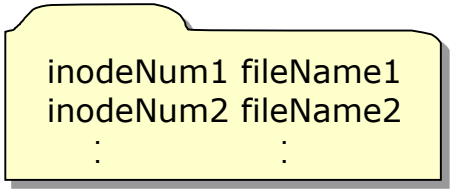
```
/home/cis90/milhom $ chmod 777 myfile
/home/cis90/milhom $ ls -l myfile
-rwxrwxrwx. 1 milhom90 cis90 0 Oct  9 10:23 myfile

/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



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:

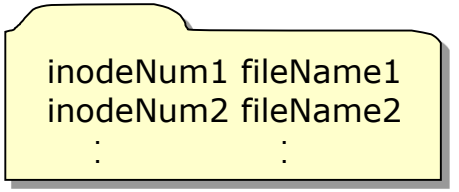
```
/home/cis90/simmsben/Directory3 $ echo Blah Blah Blah > myfile
/home/cis90/simmsben/Directory3 $ cat myfile
Blah Blah Blah
/home/cis90/simmsben/Directory3 $ chmod u-r myfile
/home/cis90/simmsben/Directory3 $ ls -l myfile
--w-r--r-- 1 simmsben cis90 15 Oct 13 08:50 myfile
/home/cis90/simmsben/Directory3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



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 :

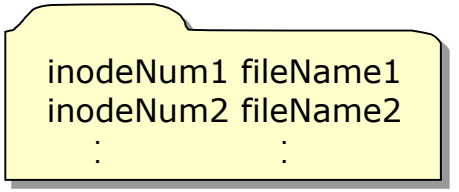
```
/home/cis90/simmsben/Directory3 $ echo Blah Blah Blah > myfile
/home/cis90/simmsben/Directory3 $ chmod 444 myfile
/home/cis90/simmsben/Directory3 $ ls -l myfile
-r--r--r-- 1 simmsben cis90 15 Oct 13 09:02 myfile
/home/cis90/simmsben/Directory3 $ echo Blah Blah Blah > myfile
-bash: myfile: Permission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

write permission removed

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

File Permissions

Commands that use file permissions



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

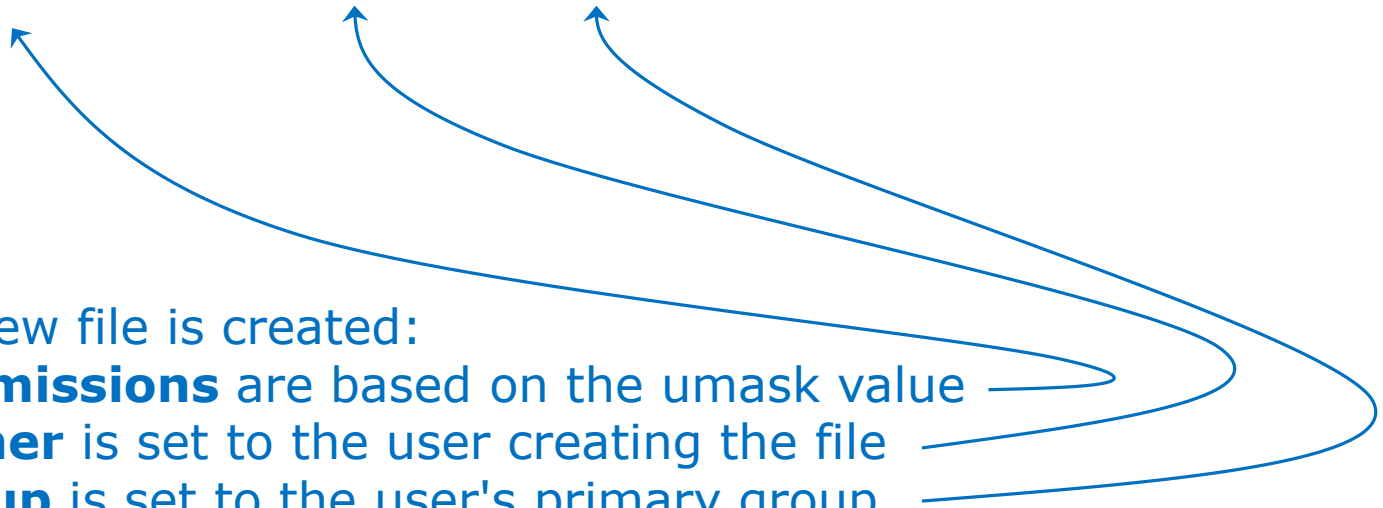
Why umask?

Allows users and system administrators to disable specific permissions on new files and directories when they are created.

*Unlike **chmod**, it does **NOT** change the permissions on existing files or directories.*

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

How is umask used?

To determine permissions on a new file or directory, the umask value is applied to the initial permissions.

1) The new file or directory is created:

- New files are initially created with **666**
- New directories are initially created with **777**
- For file copies, the copy is initially created with **the same permissions as the source file**

2) Then the permissions specified by the umask value are **stripped** from the new file or directory.

Create New File Example

Task: We want to prevent "other" users having read, write or execute permissions on any new files or directories we create.

Solution: Set the umask value to 007

```
/home/cis90/simben $ umask 007

/home/cis90/simben $ touch exampleFile
/home/cis90/simben $ ls -l exampleFile
-rw-rw----. 1 simben90 cis90 0 Mar 13 16:37 exampleFile
```

```
The new file was initially created as 666: rw-rw-rw-
The umask bits to strip off are 007:       ------■■■
The final permissions for the new file:    rw-rw----
```

Create New Directory Example

Task: We want to prevent "other" users having read, write or execute permissions on any new files or directories we create.

Solution: Set the umask value to 007

```
/home/cis90/simben $ umask 007

/home/cis90/simben $ mkdir exampleDir
/home/cis90/simben $ ls -ld exampleDir/
drwxrwx---. 2 simben90 cis90 6 Mar 13 16:38 exampleDir/
```

```
The new directory was initially created as 777:  rwxrwxrwx
The umask bits to strip off are 007:             ------■■■
The resulting permissions for the new directory: rwxrwx---
```

Copy File Example

Task: We want to prevent "group" and "other" users ever having write permissions on any new files or directories we create.

Solution: Set the umask value to 022

```
/home/cis90/simben $ umask 022

/home/cis90/simben $ touch Shrek
/home/cis90/simben $ chmod 777 Shrek
/home/cis90/simben $ ls -l Shrek
-rwxrwxrwx. 1 simben90 cis90 0 Mar 13 16:57 Shrek
/home/cis90/simben $ cp Shrek Shrek2
/home/cis90/simben $ ls -l Shrek2
-rwxr-xr-x. 1 simben90 cis90 0 Mar 13 17:07 Shrek2
```

```
The source file permissions were 777:        rwxrwxrwx
The umask bits to strip off are 022:         ----■--■-
The resulting permissions for the new file:  rwxr-xr-x
```

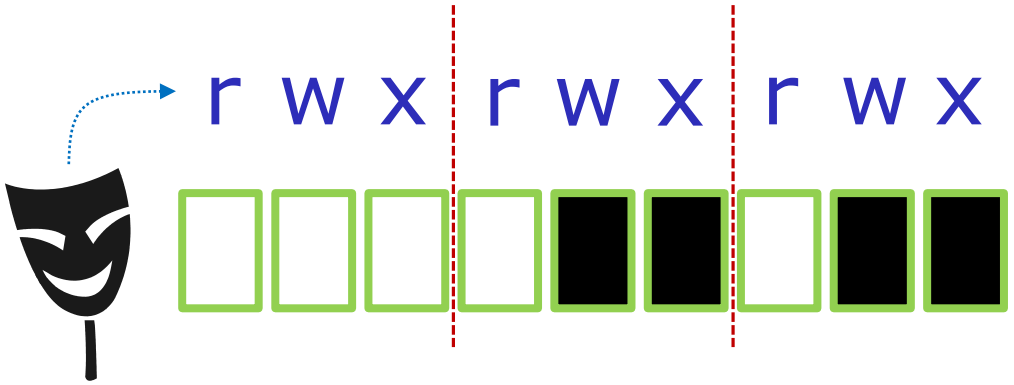
Case 1 – a new directory

With a umask of 033 what permissions would a newly created DIRECTORY have?

Write your answer in the chat window

Case 1 – a new directory

With a umask of 033 what permissions would a newly created DIRECTORY have?



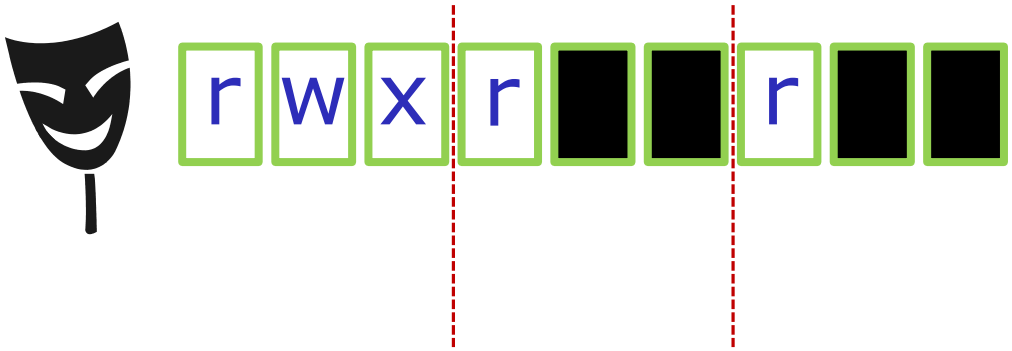
initial permissions = 777 (new directory)

umask setting of 033 specifies these bits: --- -wx -wx

Now slide the mask up and over the starting point permissions

Case 1 – a new directory

With a umask of 033 what permissions would a newly created DIRECTORY have?



resulting permissions = 744 (new directory)

Answer: 744

Prove it to yourself on Opus-II as shown here

```
/home/cis90ol/simmsben $ umask 033
/home/cis90ol/simmsben $ mkdir brandnewdir
/home/cis90ol/simmsben $ ls -ld brandnewdir/
drwxr--r-- 2 simmsben cis90ol 4096 Apr 21 12:46 brandnewdir/
 7  4  4
```

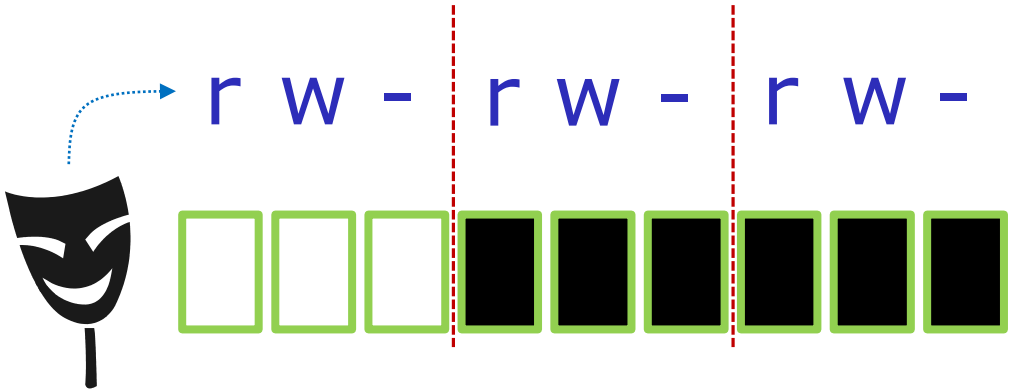
Case 2 – new file

With a umask of 077 what permissions would a newly created FILE have?

Write your answer in the chat window

Case 2 – new file

With a umask of 077 what permissions would a newly created FILE have?



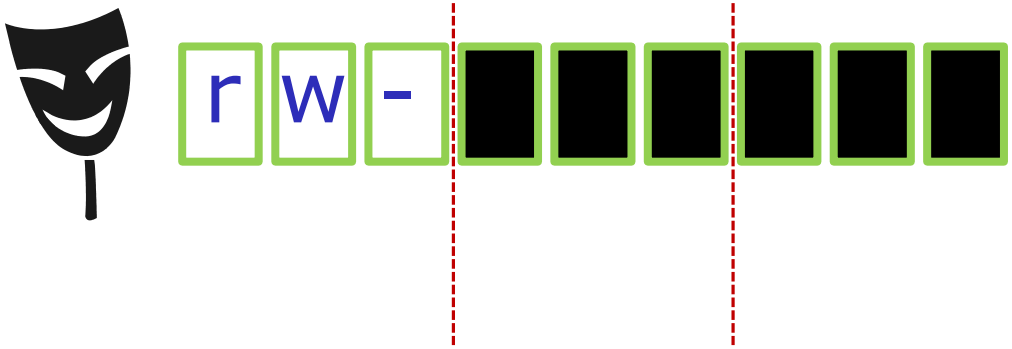
initial permissions = 666 (new file)

umask setting of 077 strips these bits: --- rwx rwx

Now slide the mask up and over the starting point permissions

Case 2 – new file

With a umask of 077 what permissions would a newly created FILE have?



resulting permissions = 600 (new directory)

Answer: 600

Prove it to yourself on Opus-II as shown here

```
/home/cis90ol/simmsben $ umask 077
/home/cis90ol/simmsben $ touch brandnewfile
/home/cis90ol/simmsben $ ls -l brandnewfile
-rw------- 1 simmsben cis90ol 0 Apr 21 12:50 brandnewfile
 6  0  0
```

Case 3 – file copy

If umask=066 and the *cinderella* file permissions are 440
What would the permissions be on *cinderella.bak* after:

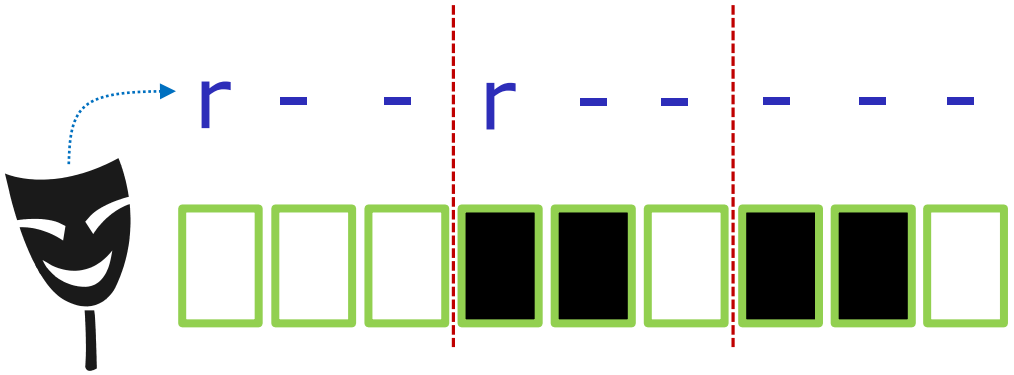
```
cp cinderella cinderella.bak
```

Write your answer in the chat window

Case 3 – file copy

If umask=066 and the *cinderella* file permissions are 440
What would the permissions be on *cinderella.bak* after:

```
cp cinderella cinderella.bak
```



initial permissions = 440
(source file permissions)

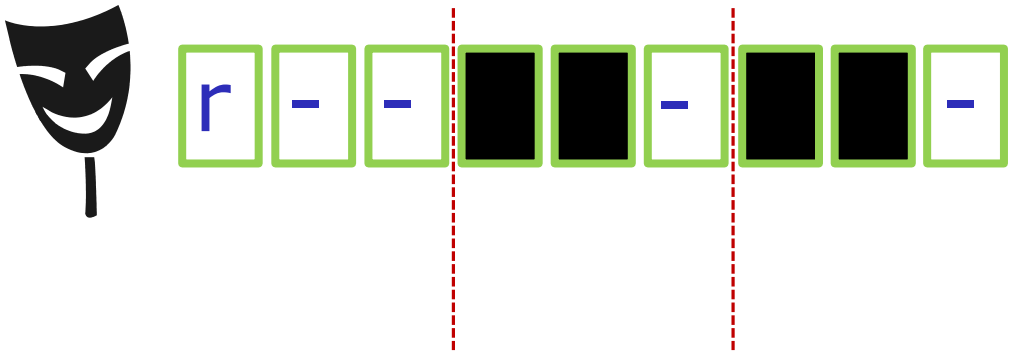
umask setting of 066 strips these bits: --- rw- rw-

Now slide the mask up and over the starting point permissions

Case 3 – file copy

If umask=066 and the *cinderella* file permissions are 440
What would the permissions be on *cinderella.bak* after:

```
cp cinderella cinderella.bak
```



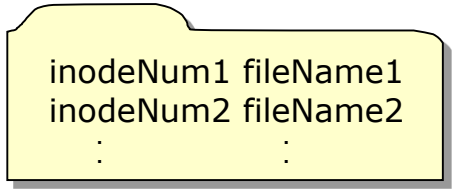
Answer: 400

Prove it to yourself on Opus-II as shown here

```
/home/cis90/simben $ touch cinderella
/home/cis90/simben $ chmod 440 cinderella
/home/cis90/simben $ umask 066
/home/cis90/simben $ cp cinderella cinderella.bak
/home/cis90/simben $ ls -l cinderella.bak
-r--------. 1 simben90 cis90 0 Oct 22 09:17 cinderella.bak
 4  0  0
```

The effect of permissions when removing files

Directory Write Permission



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

```
[simmsben@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

[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

[simmsben@opus Directory3]$ rm myfile
rm: cannot remove `myfile': Permission denied
```

Benji has read and write permission on myfile

Benji (and everyone else) has all permissions.

So why can't Benji remove his own file?

Answer:

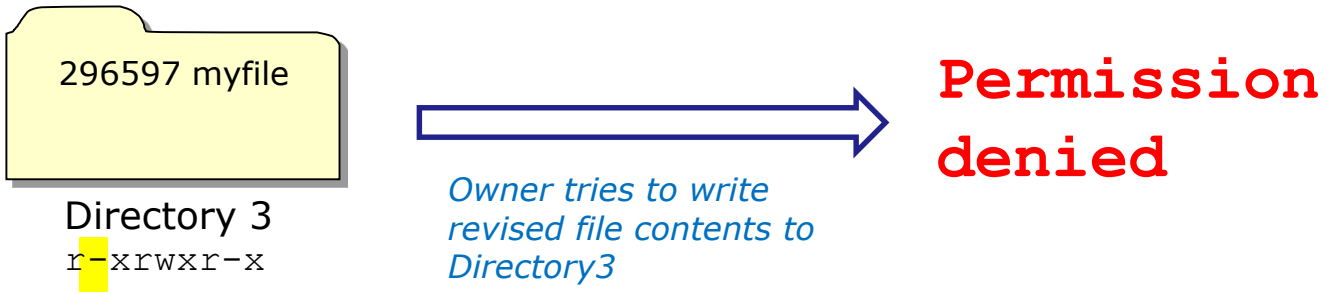
Removing a file requires write permission on the directory containing the file.

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



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

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

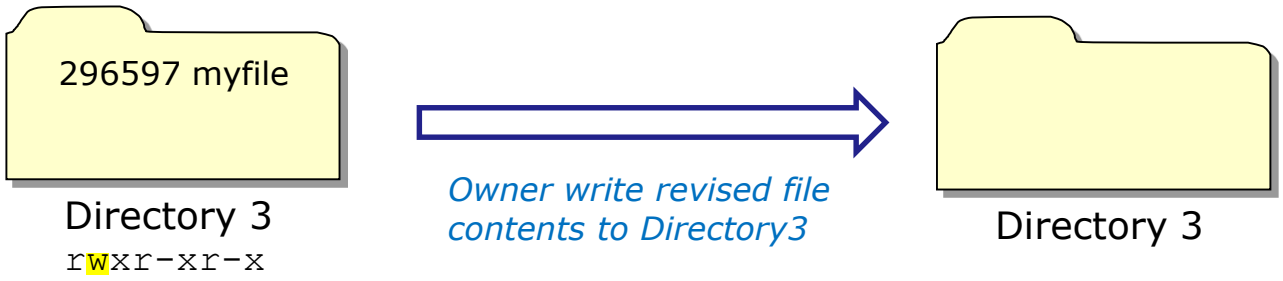
Now Benji has no permissions on this file

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
```

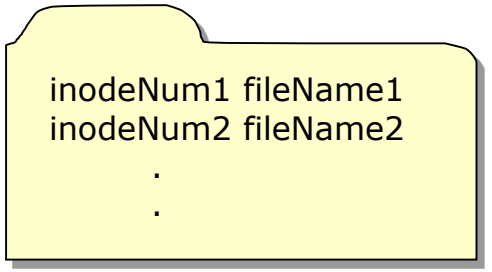
With write permission, Benji can remove any of the files from this directory … even the ones he does not have read & write permission for.



Directory Permissions

Directory Read Permission

rwx



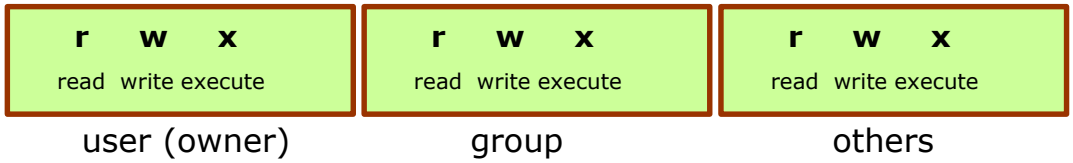
rwx

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

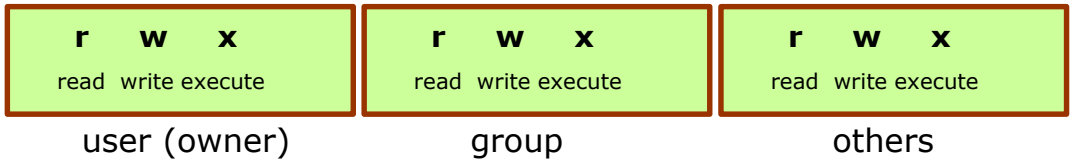


Start with normal directory permissions:

```
/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
```

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

Directory Read Permission



Remove read permission and confirm it's gone

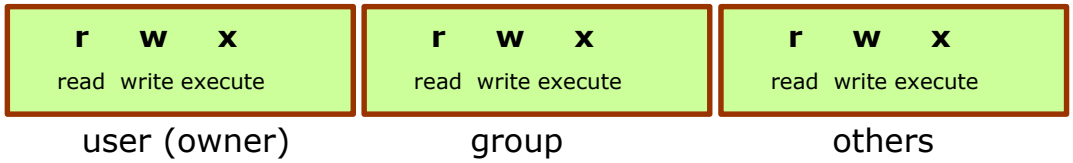
```
/home/cis90/roddyduk $ chmod u-r examples
/home/cis90/roddyduk $ ls -ld examples
d-wxrwxr-x 4 roddyduk cis90 4096 Oct 19 13:59 examples
```

Can we still list the directory contents?

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

NO!

Directory Read Permission

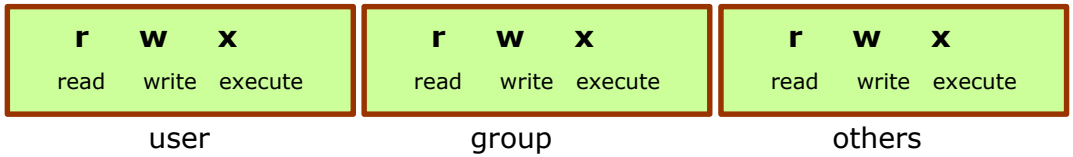


Start with normal directory permissions:

```
/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
```

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

Directory Read Permission



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
```

*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 ...

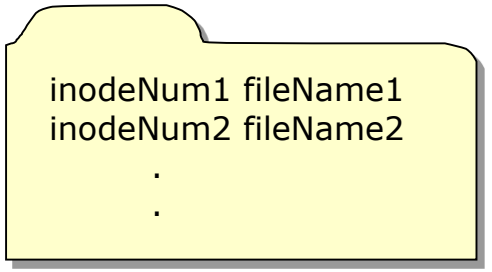
- *we still can't list the contents,*
- *yet we can still access anything in the directory!*

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



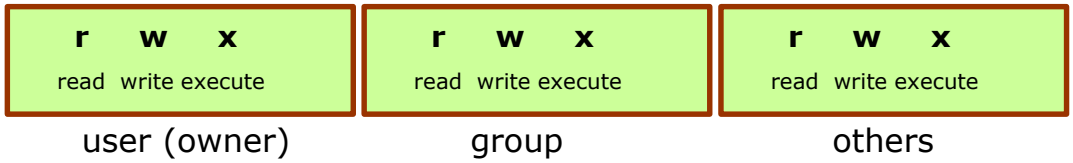
rwx

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

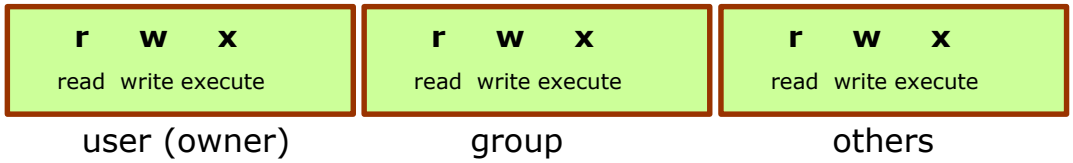


Start with normal directory permissions:

```
/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
```

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

Directory Write Permission



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/
```

Can we remove files from the directory?

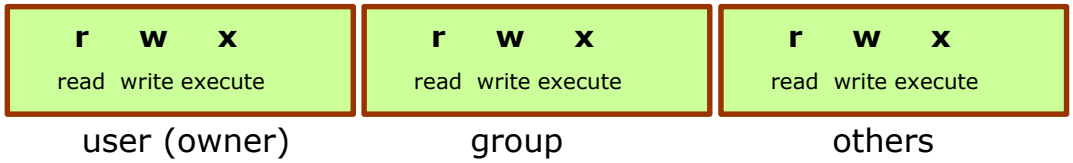
```
/home/cis90/roddyduk/examples $ rmdir dogs
rmdir: dogs: Permission denied
```

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

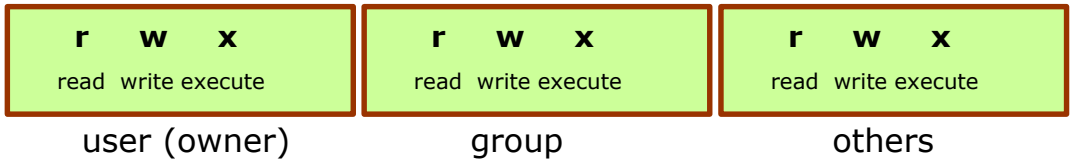


Start with normal directory permissions:

```
/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
```

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

Directory Write Permission



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/
```

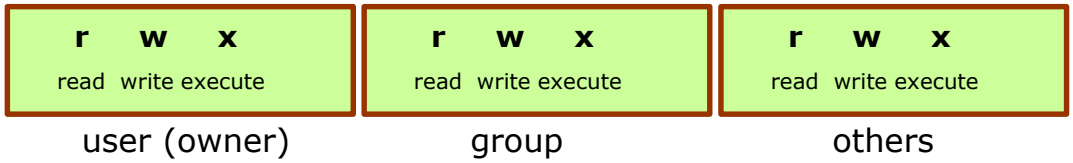
Can we create new files or copy/move files into the directory?

```
/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

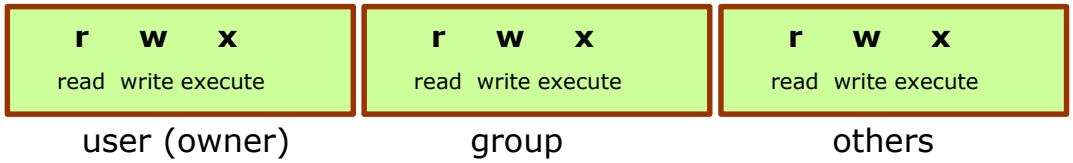


Start with normal directory permissions:

```
/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
```

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

Directory Write Permission



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/
```

Can we move files out of the directory?

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

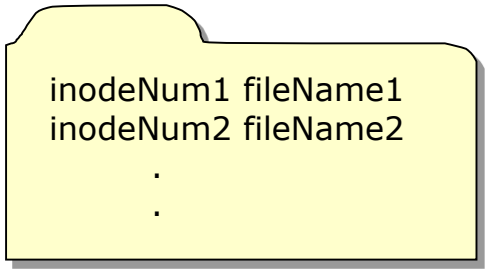
NO!

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



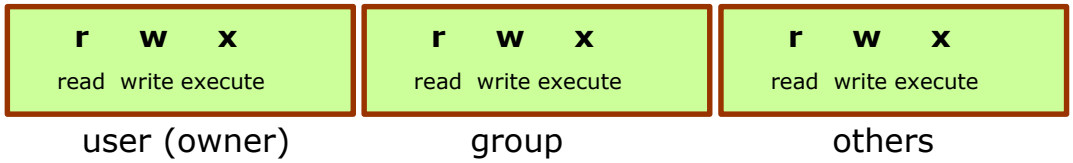
rwx

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

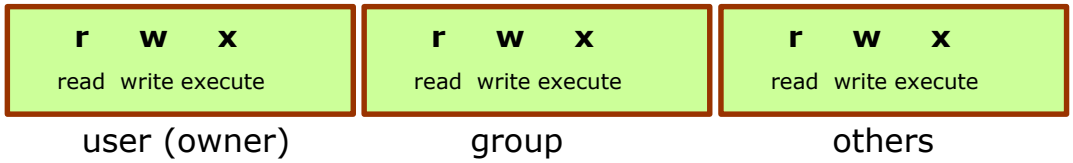


Start with normal directory permissions:

```
/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
```

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

Directory Execute Permission



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/
```

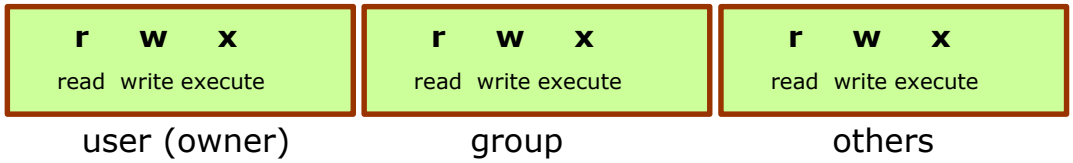
Can we change into (cd) the directory?

```
/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

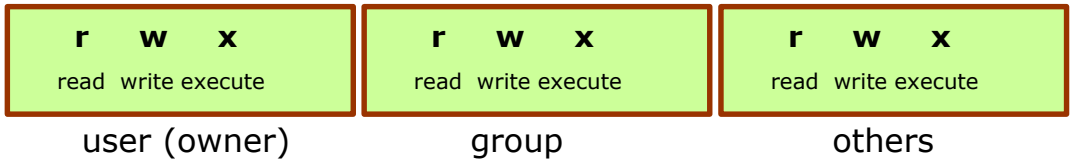


Start with normal directory permissions:

```
/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
```

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

Directory Execute Permission



Remove execute permission and confirm it's gone

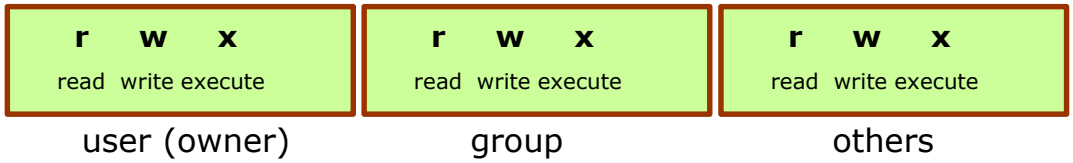
```
/home/cis90/roddyduk $ chmod u-x examples
/home/cis90/roddyduk $ ls -ld examples
drw-rwxr-x 4 roddyduk cis90 4096 Oct 19 13:59 examples/
```

Can list directory contents?

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

Yes

Directory Execute Permission

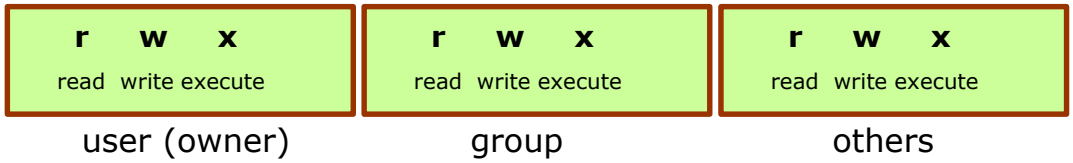


Start with normal directory permissions:

```
/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
```

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

Directory Execute Permission



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/
```

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

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!


Wrap up

New commands:

chgrp	change file's group
chmod	change file permissions
chown	change file owner (superuser only)
groups	show group membership
stat	show all file inode information
umask	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.

Lab 6
Five Posts

Quiz questions for next class:

- 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

cp /boot/grub/stage[12] bin

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*