Rich's lesson module checklist

Last updated 03/12/2019

- □ 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

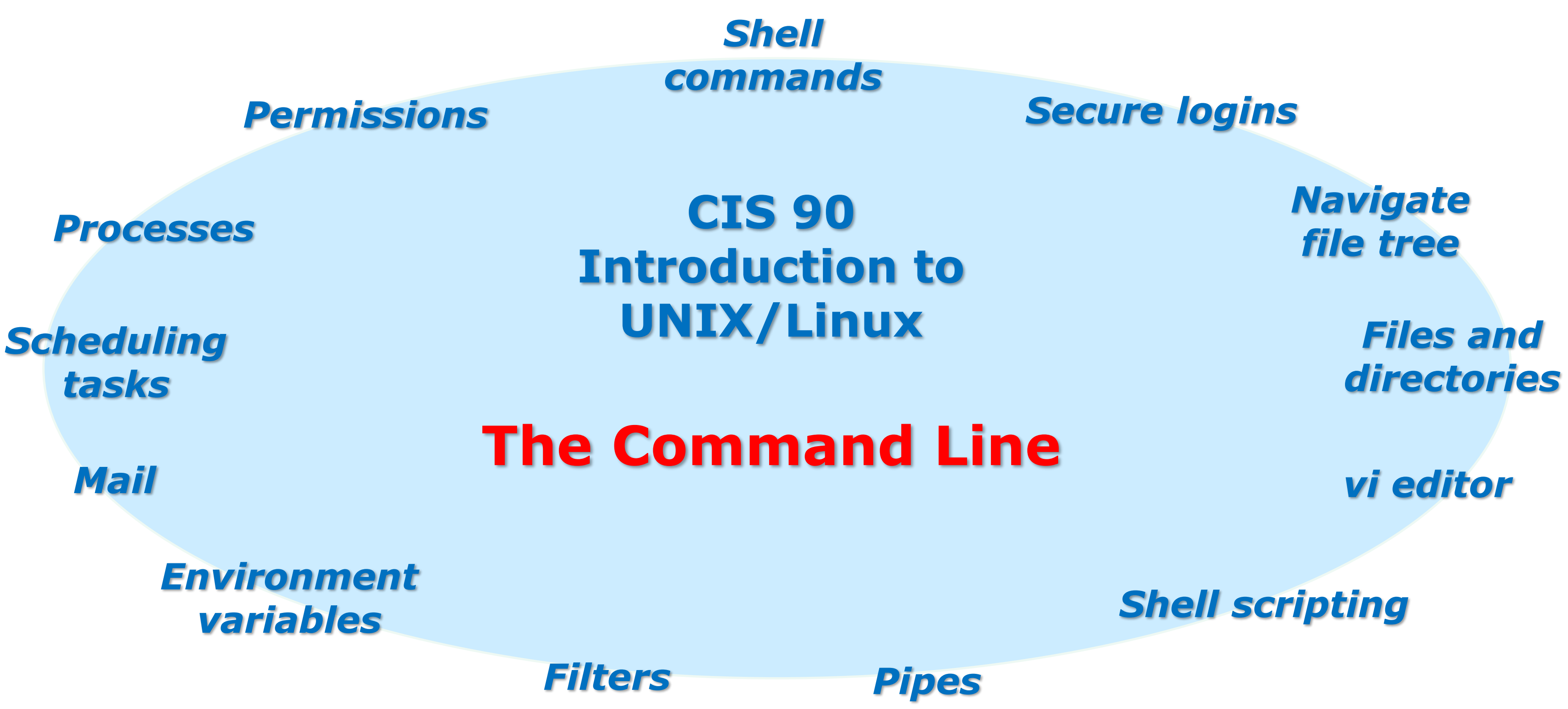
- □ Schedule lock of turnin directory and submit
  scripts/schedule-submit-locks
- □ Lab 6 updated and tested
  - □ Put fresh uhistory (640) in /home/rsimms/uhistory
  - □ Lab 6 future fixes
    - □ One step requires making no changes!
    - □ Assign points for each task completed to improve rubric &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



Shell commands

Permissions

Secure logins

Processes

CIS 90 Introduction to UNIX/Linux

Navigate file tree

Scheduling tasks

Files and directories

The Command Line

Mail

vi editor

Environment variables

Shell scripting

Filters

Pipes

Student Learner Outcomes

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

Introductions and Credits

Jim Griffin

- Created this Linux course
- Created Opus and the CIS VLab
- Jim’s site: https://web.archive.org/web/20140209023942/http://cabrillo.edu/~jgriffin/

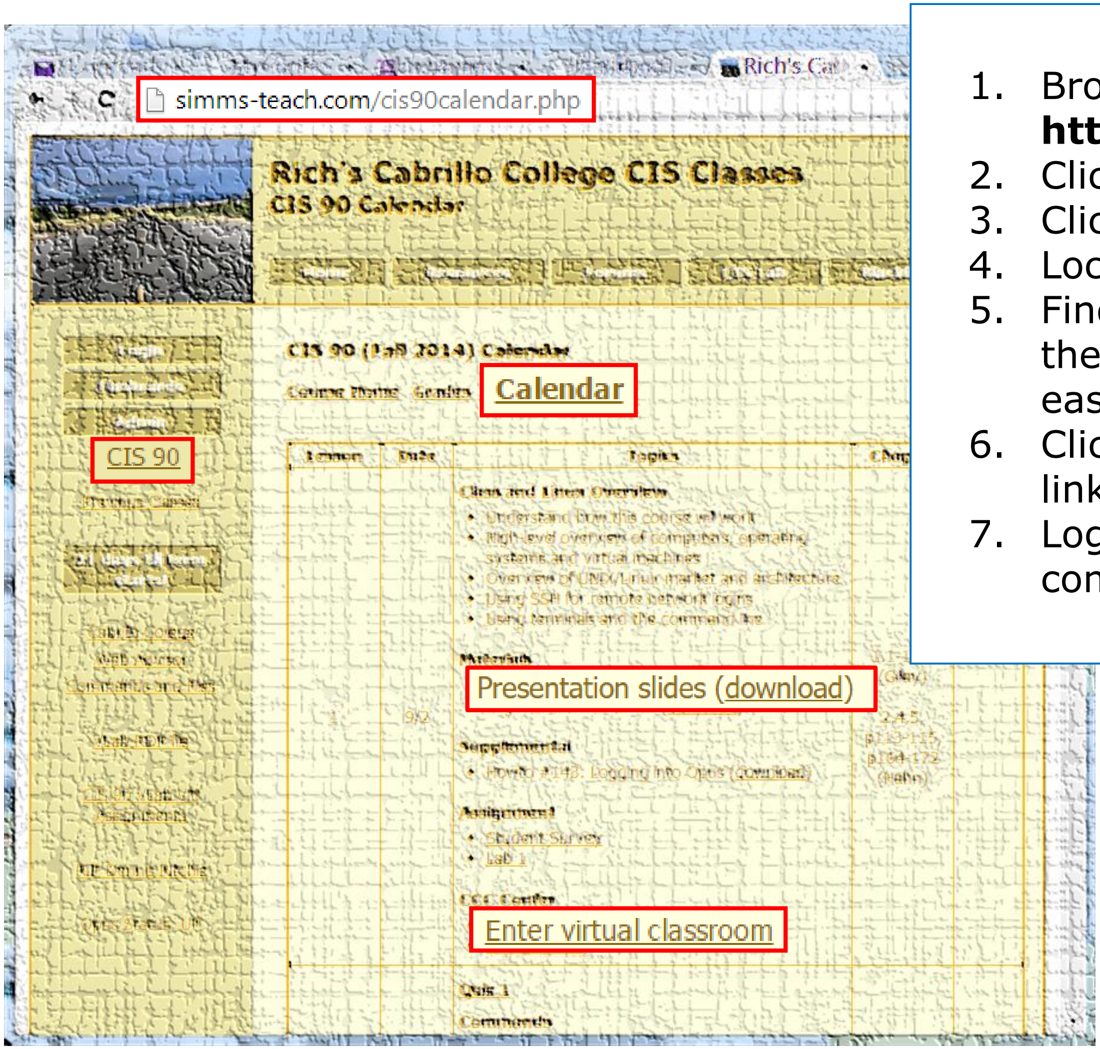
Rich Simms

- 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



simms-teach.com/cis90calendar.php

Rich's Cabrillo College CIS Classes
CIS 90 Calendar

CIS 90 (Fall 2014) Calendar

Course Home Grades Calendar

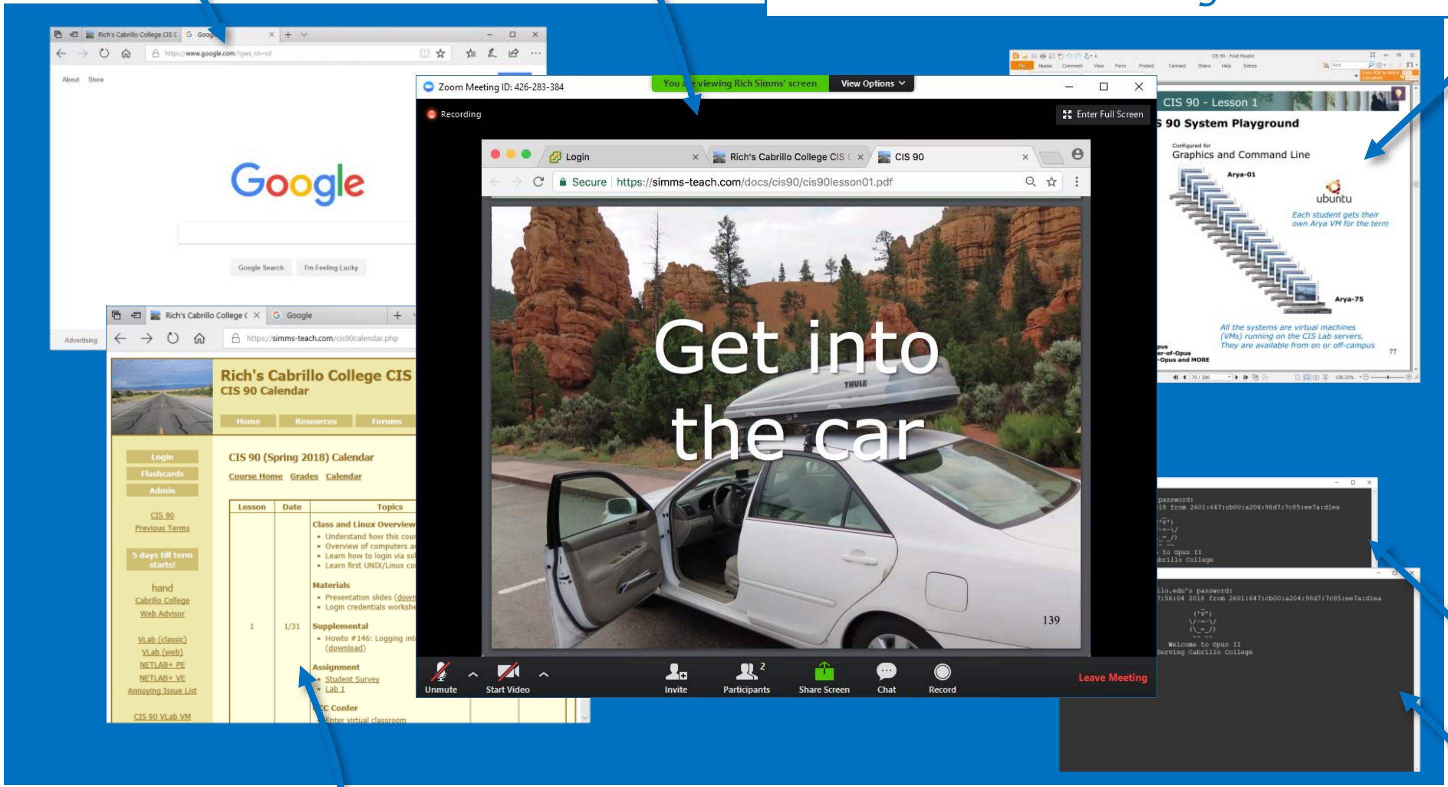
CIS 90

Lesson	Date	Topics	Chap
1	9/2	Class and Linux Overview • Understand how this course will work • High-level overviews of computers, operating systems and virtual machines • Overview of UNIX/Linux market and architecture • Using SSH for remote network logins • Using terminals and the command line Materials Presentation slides (download) Supplemental • Howto #148: Logging into Opus (download) Assignment • Student Survey • Lab 1 CCC Confer Enter virtual classroom Quiz 1 Commands	(Glass) 2,4,5, p113-115, p164-172 (Haho)

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.

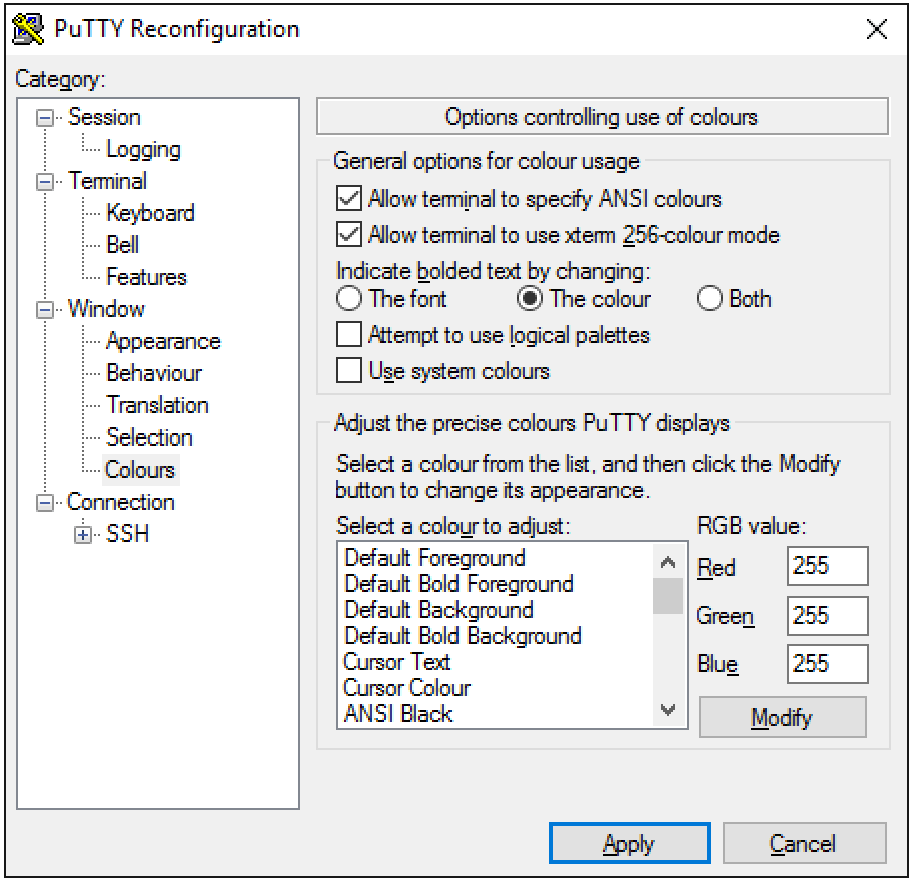
Student checklist - Before class starts

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


Google
Google Search
I'm Feeling Lucky
Zoom Meeting ID: 426-283-384
You are viewing Rich Simms' screen
View Options
Recording
Enter Full Screen
Login
Rich's Cabrillo College CIS
CIS 90
Secure https://simms-teach.com/docs/cis90/cis90lesson01.pdf
Get into the car
139
Unmute
Start Video
Invite
Participants
Share Screen
Chat
Record
Leave Meeting
Rich's Cabrillo College CIS
CIS 90 Calendar
Home
Resources
Forums
CIS 90 (Spring 2018) Calendar
Course Home Grades Calendar
Lesson
Date
Topics
1
1/31
Class and Linux Overview
Materials
Supplemental
Assignment
CC Confer
CIS 90 - Lesson 1
CIS 90 System Playground
Graphics and Command Line
Arya-01
ubuntu
Each student gets their own Arya VM for the term
Arya-75
All the systems are virtual machines (VMs) running on the CIS Lab servers. They are available from on or off-campus
Welcome to Opus II
Serving Cabrillo College

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

CCC Confer Rich's ConferZoom checklist - Putty Colors



PuTTY Reconfiguration

Category:

- Session
  - Logging
- Terminal
  - Keyboard
  - Bell
  - Features
- Window
  - Appearance
  - Behaviour
  - Translation
  - Selection
  - Colours
- Connection
  - SSH

Options controlling use of colours

General options for colour usage

☑ Allow terminal to specify ANSI colours

☑ Allow terminal to use xterm 256-colour mode

Indicate bolded text by changing:

○ The font ● The colour ○ Both

□ Attempt to use logical palettes

□ Use system colours

Adjust the precise colours PuTTY displays

Select a colour from the list, and then click the Modify button to change its appearance.

Select a colour to adjust:

Default Foreground
Default Bold Foreground
Default Background
Default Bold Background
Cursor Text
Cursor Colour
ANSI Black

RGB value:

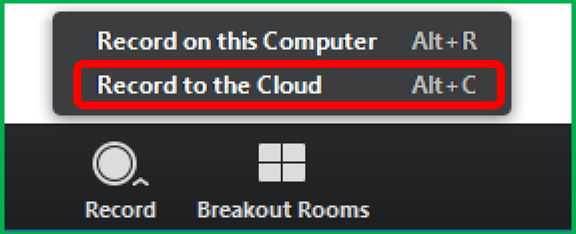
Red 255
Green 255
Blue 255

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

Putty Colors

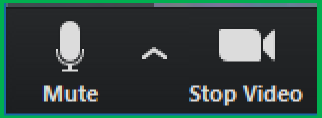
Default Foreground 255 255 255
Default Bold Foreground 255 255 255
Default Background 51 51 51
Default Bold Background 255 2 85
Cursor Text 0 0 0
Cursor Color 0 255 0
ANSI Black 77 77 77
ANSI Black Bold 85 85 85
ANSI Red 187 0 0
ANSI Red Bold 255 85 85
ANSI Green 152 251 152
ANSI Green Bold 85 255 85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

Start



Start Recording

Audio Check



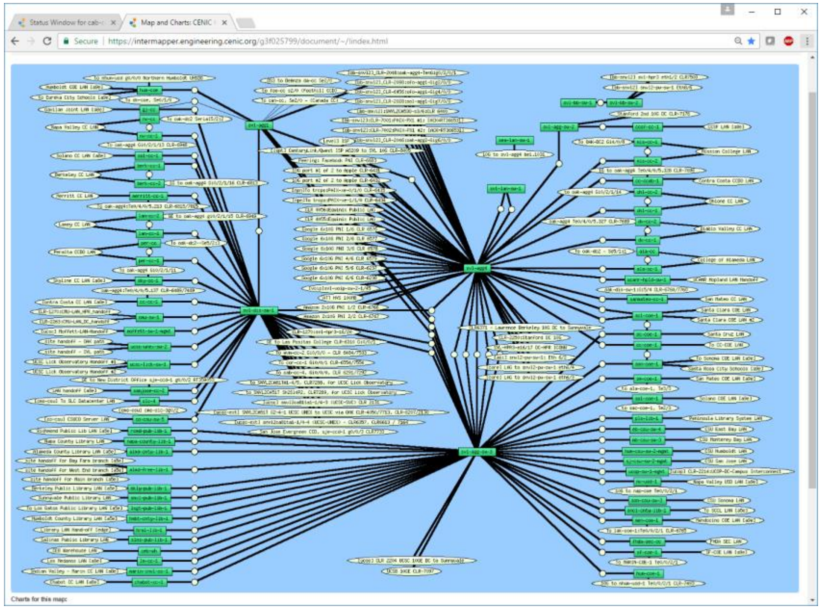
Start Recording

Audio & video Check

Instructor: **Rich Simms**
Dial-in: **669-900-6833 (toll)**
Meeting ID: **426 283 384**

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

Network Check


Status Window for cab-
Map and Charts: CENIC
Secure
https://intermapper.engineering.cenic.org/g3f025799/document/~/!index.html
Charts for this map:

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

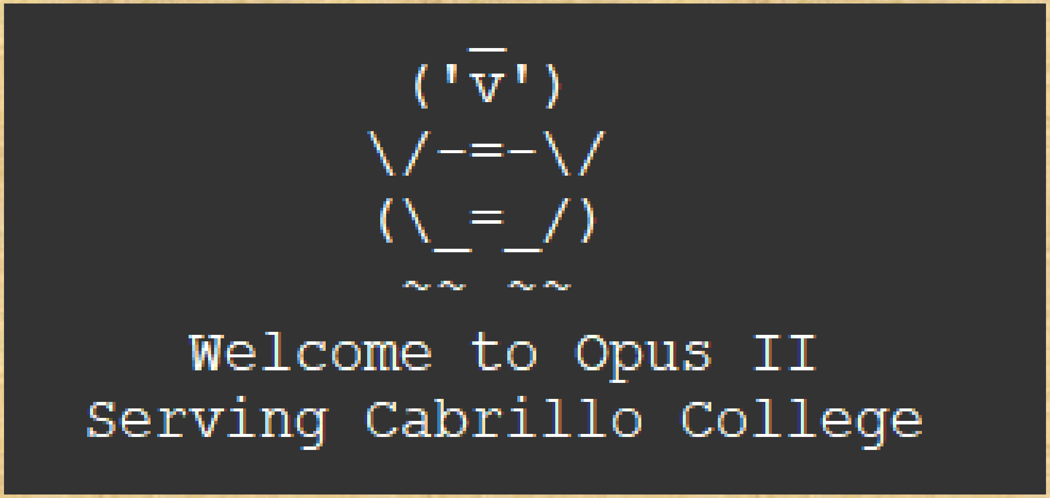
email answers to: `risimms@cabrillo.edu`

(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 review • 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 • Directory permissions • Assignment • Wrap up

Class Activity



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

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

Class Activity

3

2/19

Quiz 7

Electronic Mail

- Guest speaker: Dennis Moss on OTC (On-The-Job) training programs
- Learn how to use the UNIX communication tools write and /bin/mail
- Overview on end-to-end email

Materials

- Presentation slides (download)

Supplemental

- Howto #31?: Accessing VLab (download)

Assignment

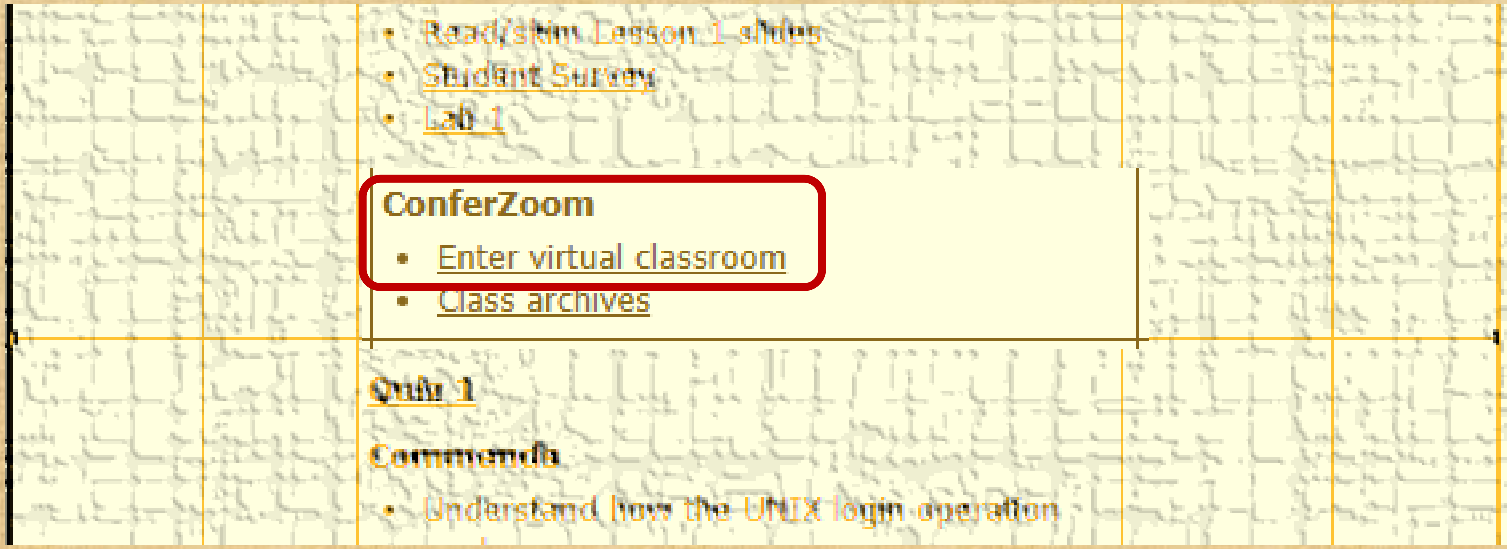
- Read/skim Lesson 3 slides

Lab 2

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

If you haven’t already, download the lesson slides

Class Activity



- Read/skim Lesson 1 slides
- Student Survey
- Lab 1

ConferZoom

- Enter virtual classroom
- Class archives

Quiz 1

Commands

- Understand how the UNIX login operation

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

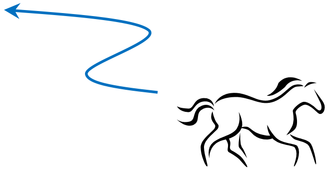
Chinese Proverb	他問一個問題，五分鐘是個傻子，他不問一個問題仍然是一個傻瓜永遠。 *He who asks a question is a fool for five minutes; he who does not ask a question remains a fool forever.*

Test 1
Post Mortem

Test 1 – Results

Missed Q28 = 19
Missed Q16 = 16
Missed Q11 = 16
Missed Q4 = 15
Missed Q25 = 15
Missed Q20 = 13
Missed Q30 = 11
Missed Q27 = 11
Missed Q6 = 10
Missed Q24 = 10
Missed Q13 = 10
Missed Q12 = 10
Missed Q23 = 9
Missed Q3 = 8
Missed Q10 = 6

Missed Q7 = 5
Missed Q26 = 5
Missed Q22 = 4
Missed Q8 = 3
Missed Q29 = 3
Missed Q2 = 3
Missed Q19 = 3
Missed Q17 = 3
Missed Q18 = 2
Missed Q15 = 2
Missed Q14 = 2
Missed Q9 = 1
Missed Q5 = 1
Missed Q21 = 1
Missed Q1 = 0



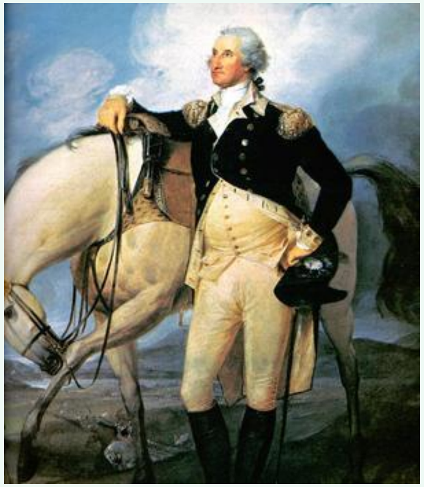
Extra Credit
Missed Q31 = 18
Missed Q33 = 14
Missed Q32 = 11

See test01.graded in your home directory for correct answers

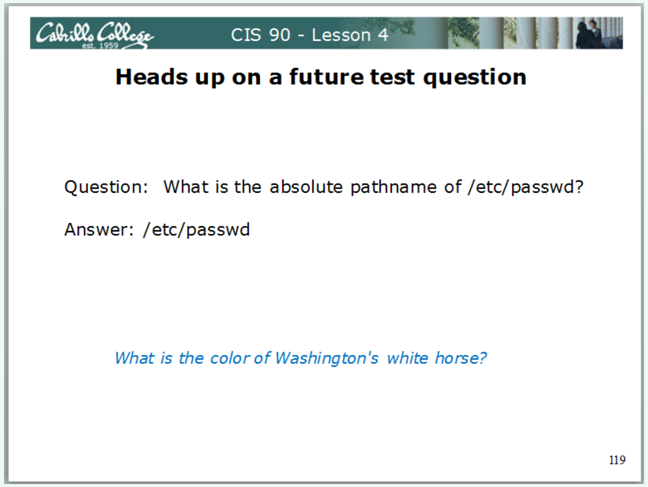
Q17) On sun-hwa-vii, there is a file named *passwd* which resides in the */etc* directory. Cat this file and look at it. Both the file and this question should ring a bell. What is the ABSOLUTE pathname of this file?

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/



CIS 90 - Lesson 4

Heads up on a future test question

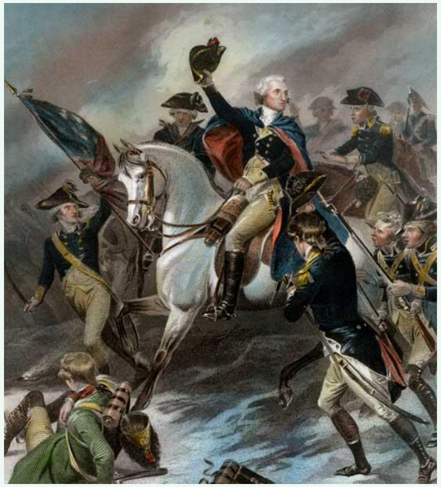
Question: What is the absolute pathname of /etc/passwd?

Answer: /etc/passwd

What is the color of Washington's white horse?

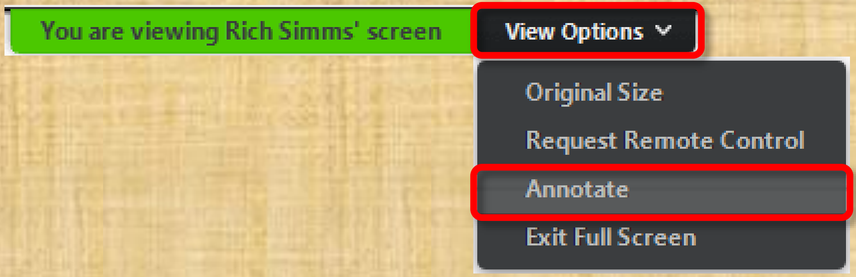
119

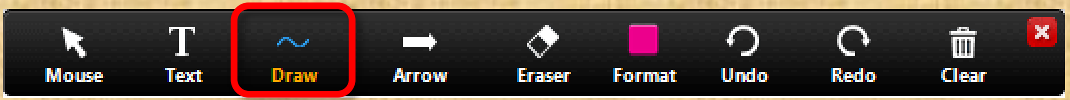
Slide from Lesson 4

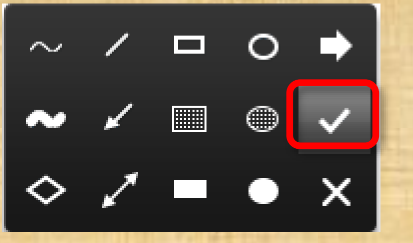


http://www.mountvernon.org/content/revolutionary-war-princeton-white-horse

ConferZoom Annotations







Find the annotation drawing tool for a checkmark.

View Options > Annotate > Draw > "✓"

Would you be interested in an online Sunday afternoon (March 17th) workshop on how to do the Test 1 questions in 30 seconds or less?

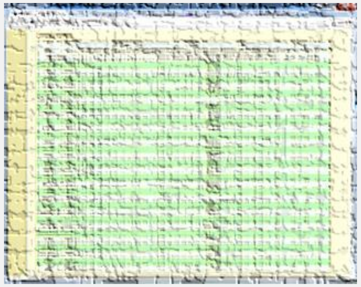
Yes	Maybe	No

Put a checkmark indicating your interest level above

Review your progress in the course

Check the website Grades page

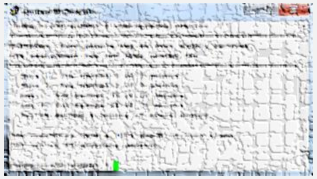
http://simms-teach.com/cis90grades.php



Or check on Opus-II

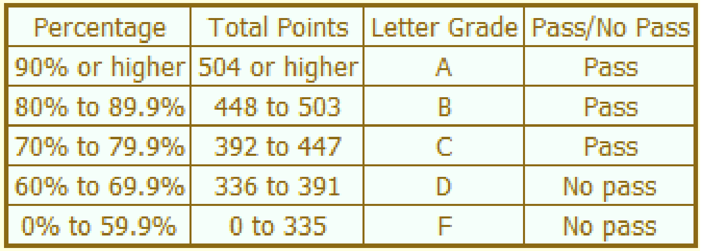
checkgrades *codename*

(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:

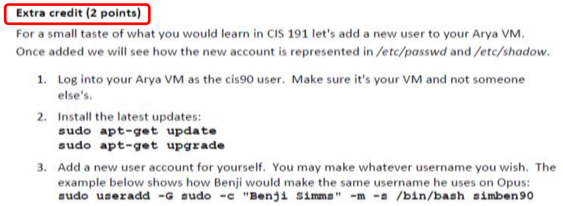
4 quizzes:	12 points
4 labs:	120 points
1 test:	30 points
1 forum quarter:	20 points
Total:	**182 points**

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

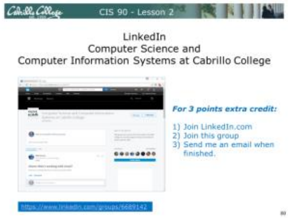


Extra credit (2 points)

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)



CIS 90 - Lesson 2

LinkedIn
Computer Science and
Computer Information Systems at Cabrillo College

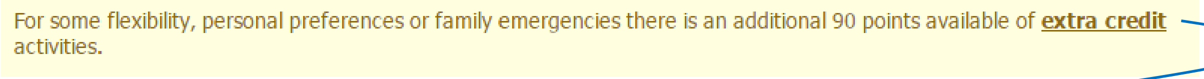
For 3 points extra credit:

1) Join LinkedIn.com
2) Join this group
3) Send me an email when finished.

https://www.linkedin.com/groups/6689142

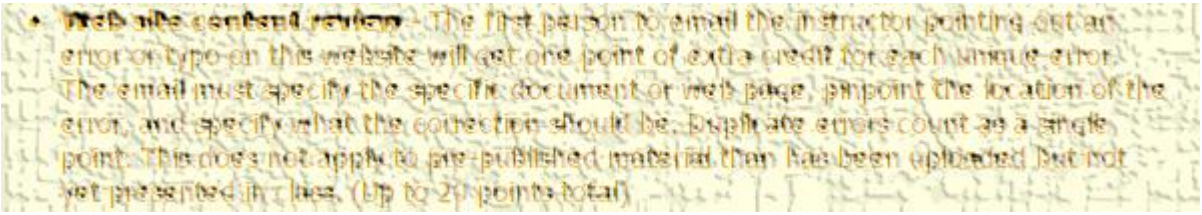
On the website

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



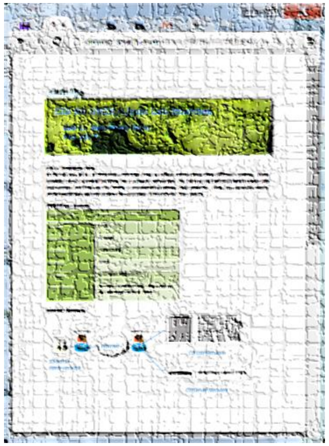
For some flexibility, personal preferences or family emergencies there is an additional 90 points available of **extra credit** activities.

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



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

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.

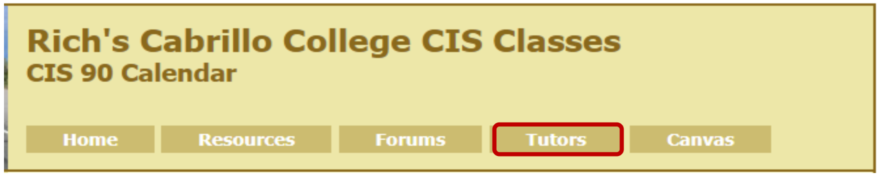
Getting Help When Stuck on an Assignment

- 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 tutor/assistant at the CTC (room 1403) or CIS Lab (STEM Center).
- 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 3:30-6:00 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!

Help Available!

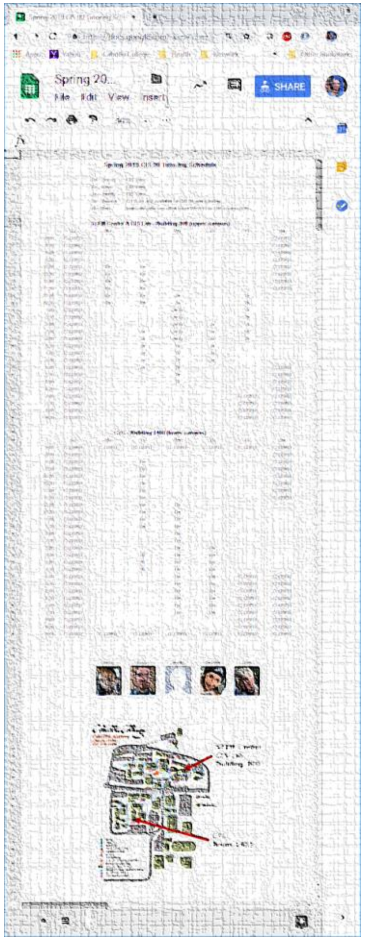
In the CTC and CIS Lab



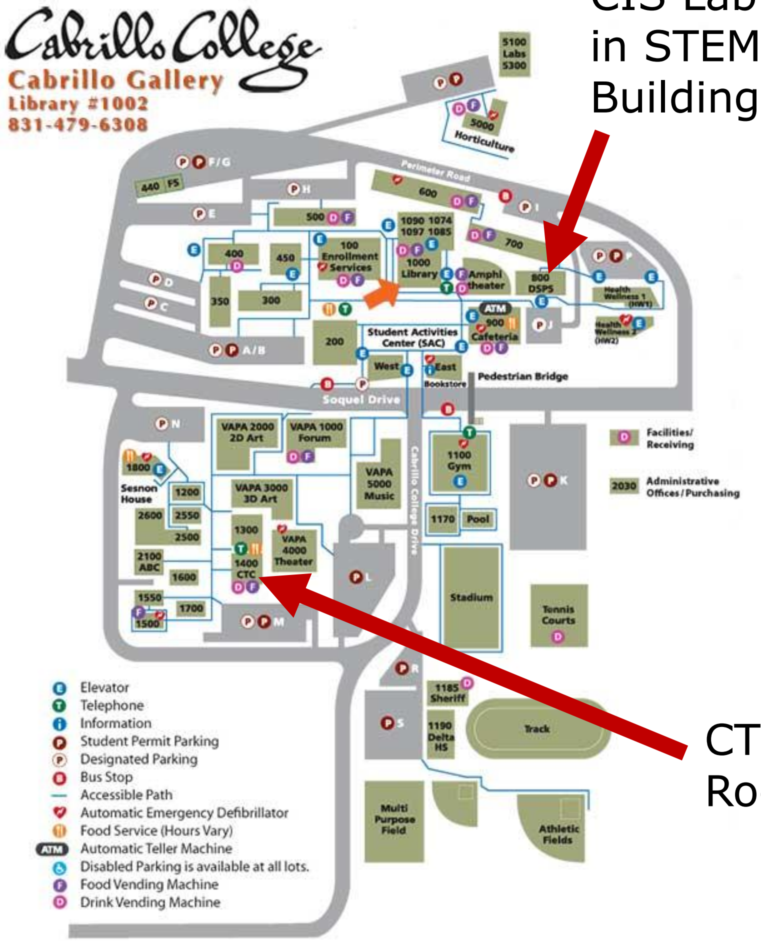
Rich's Cabrillo College CIS Classes

CIS 90 Calendar

To see tutor schedule, click the Tutors link on the the website.



CIS Lab
in STEM Center
Building 800

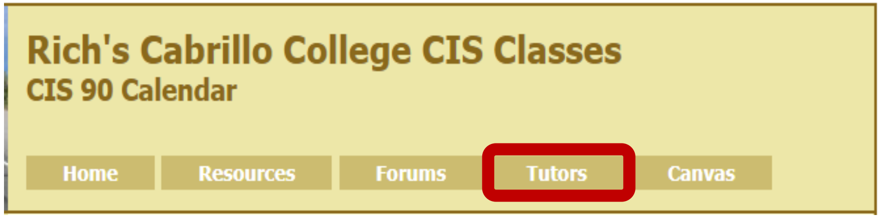


Instructors, tutors and equipment are available for CIS students to work on assignments.

CTC
Room 1403

Help Available!

In the CTC and CIS Lab



Rich's Cabrillo College CIS Classes

CIS 90 Calendar

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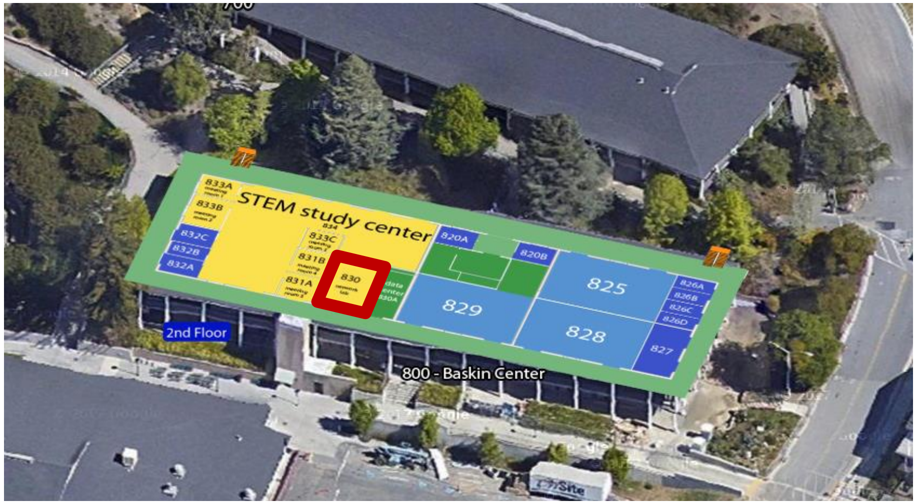
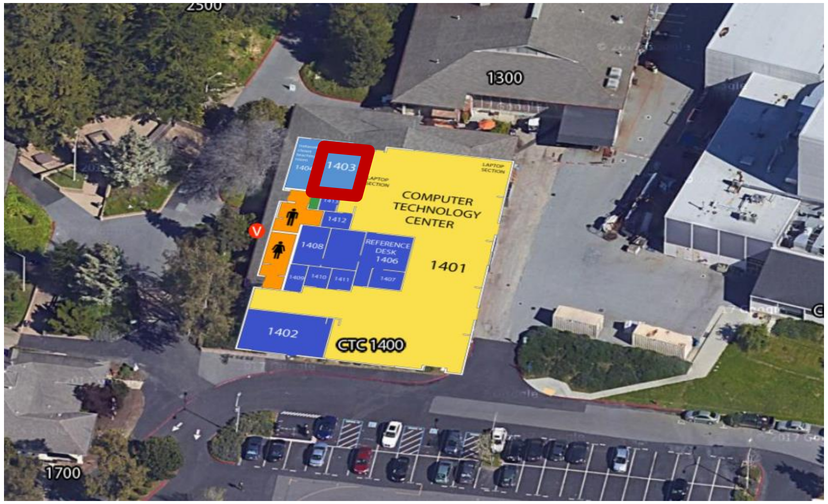


The CIS Lab is in the STEM center (Building 800)



Room 1403 is in the CTC (Building 1400)

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!

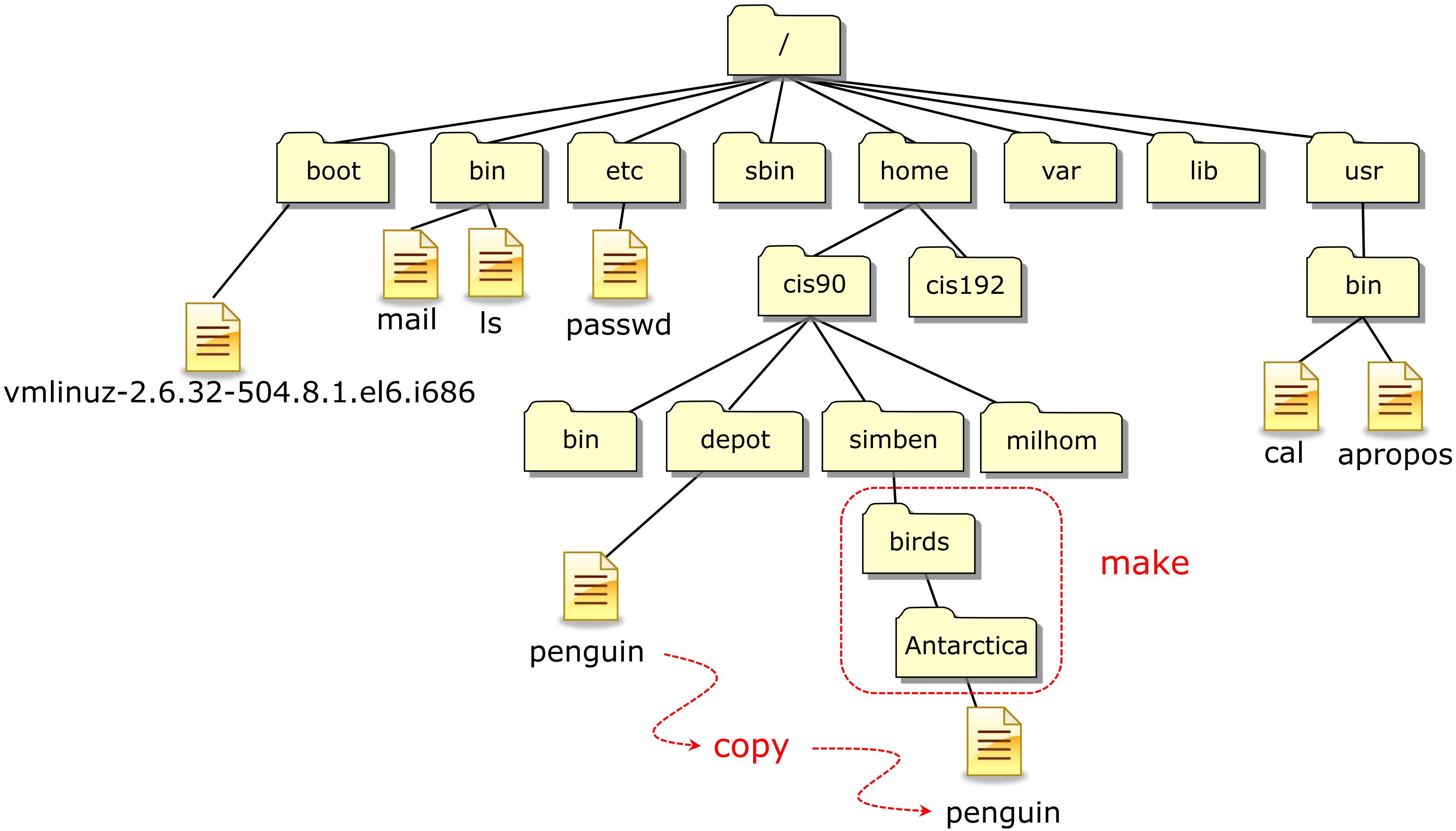
3) Not using . to refer to the current working directory.

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:

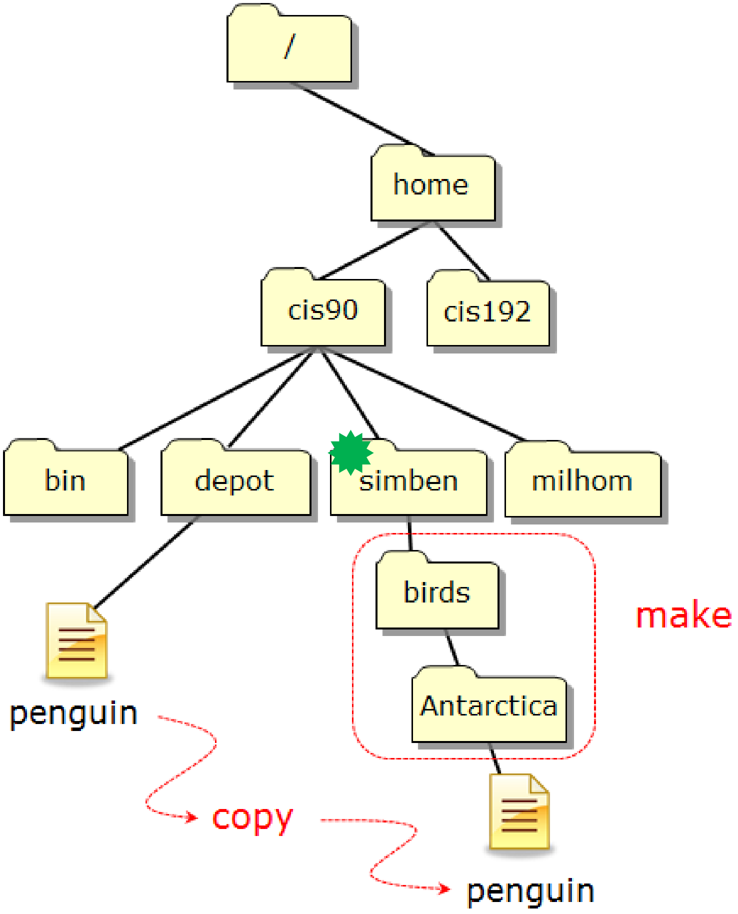
```
cd
mkdir -p birds/Antarctica
```

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

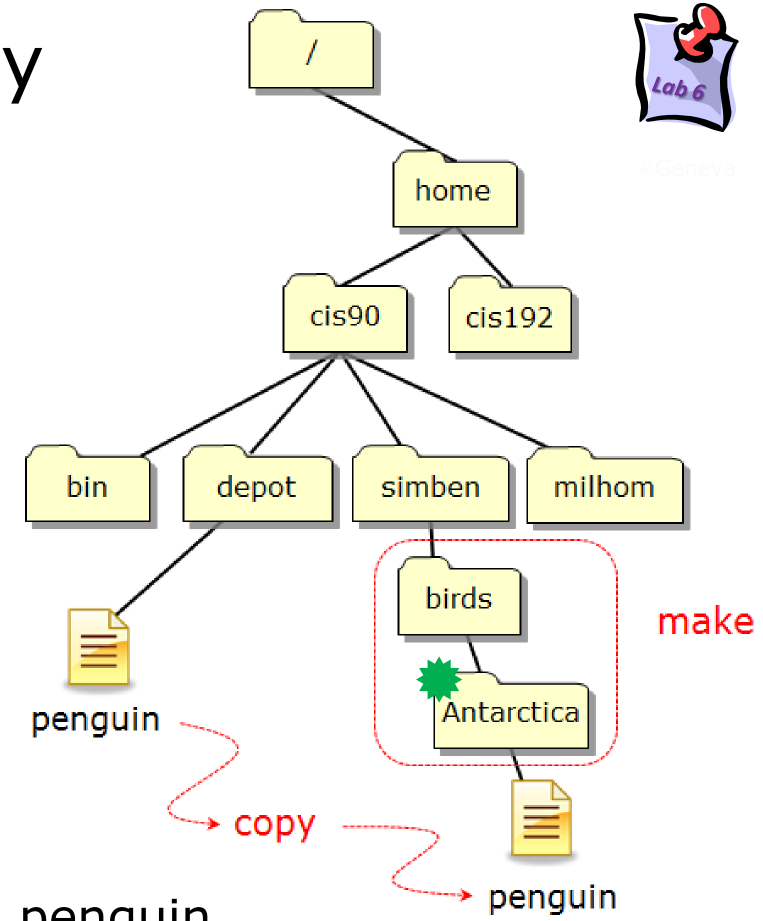
```
cp ../depot/penguin birds/Antarctica/
```

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
```

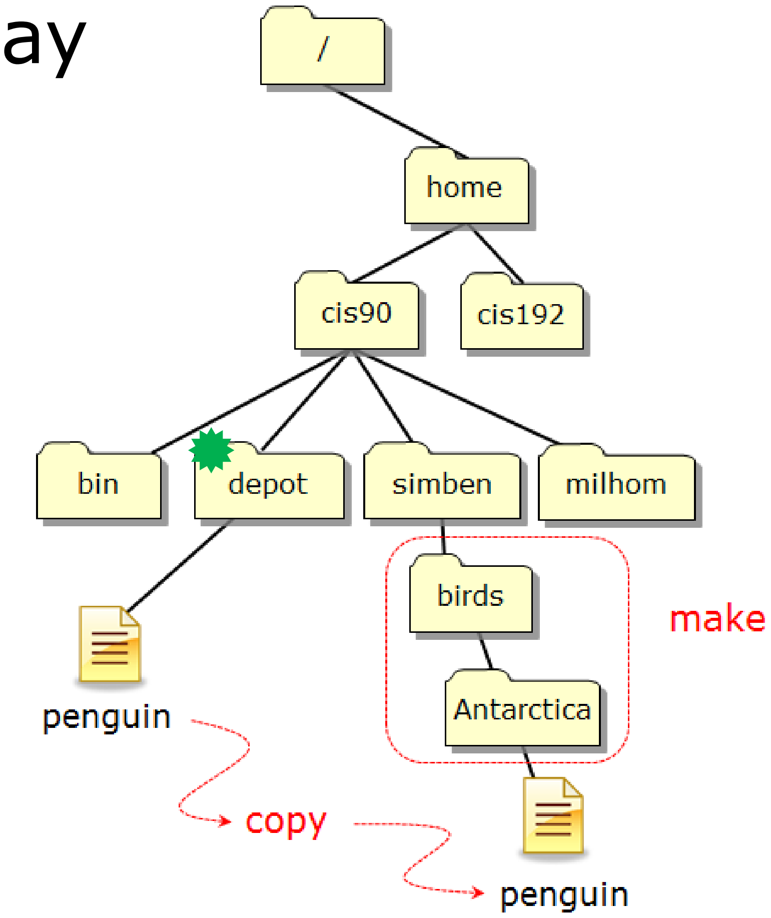
2) From the Antarctica directory copy the penguin file using an absolute pathname and the . "here" directory.

```
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
```

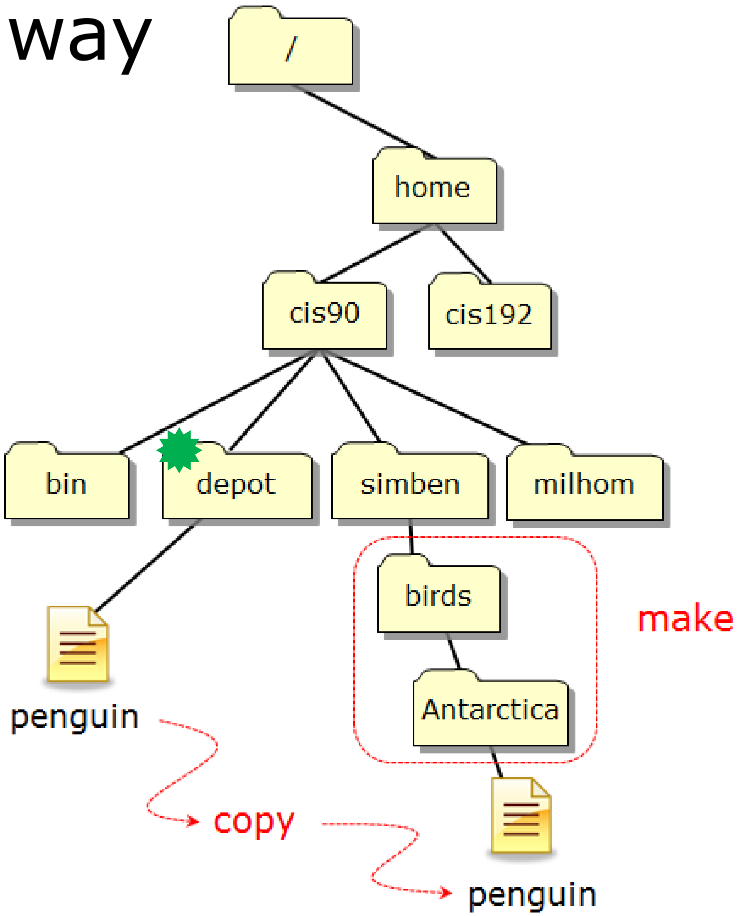
2) Copy the penguin file to the Antarctica directory.

$$\texttt{cp }\underbrace{\texttt{penguin}}_{\text{Relative pathname to the penguin file.}}\ \underbrace{\texttt{../simben/birds/Antarctica/}}_{\text{Relative pathname to the Antarctica directory.}}$$

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.

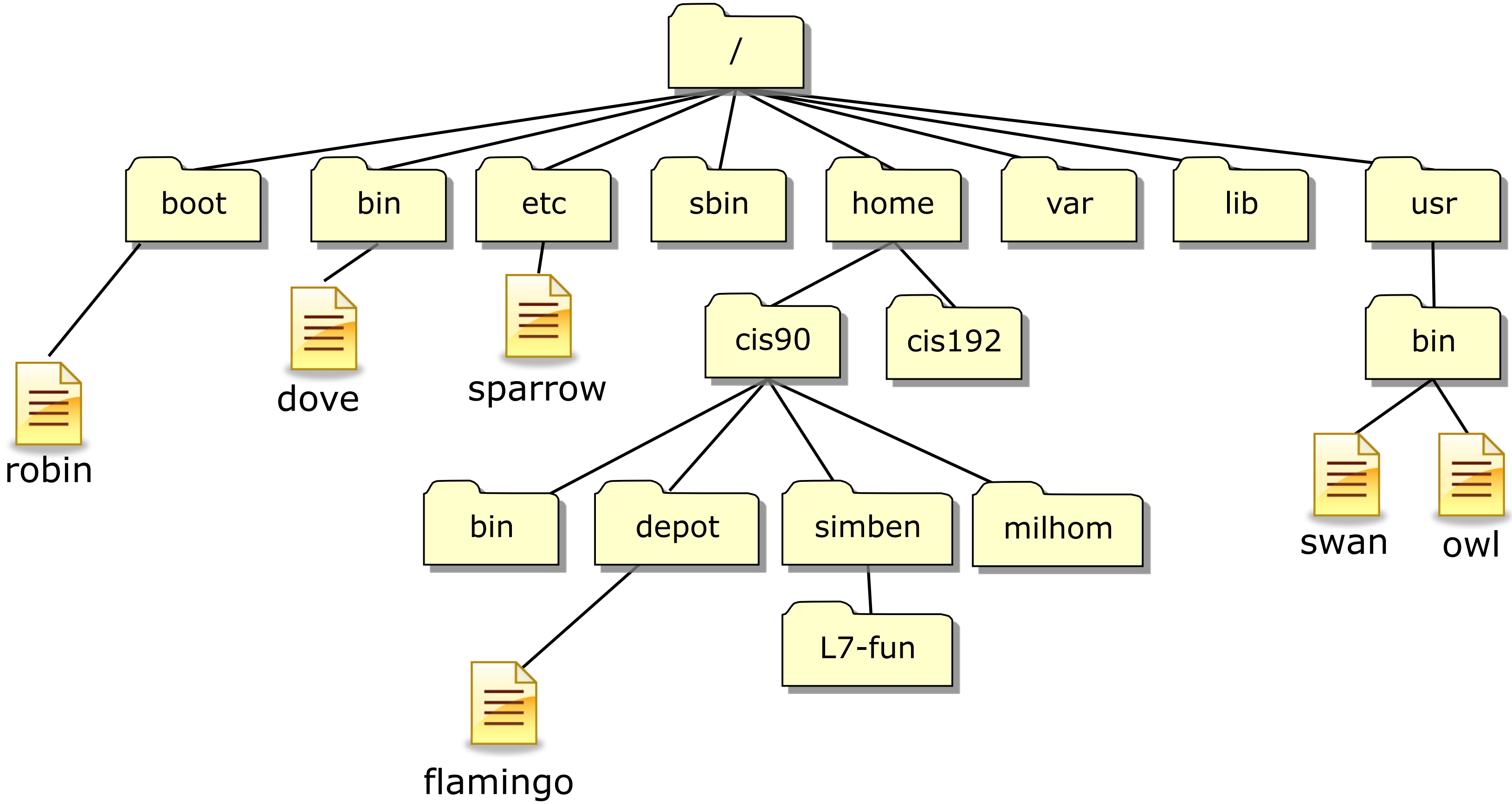
```
cp penguin ~/birds/Antarctica/
```

Relative pathname to the penguin file.

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

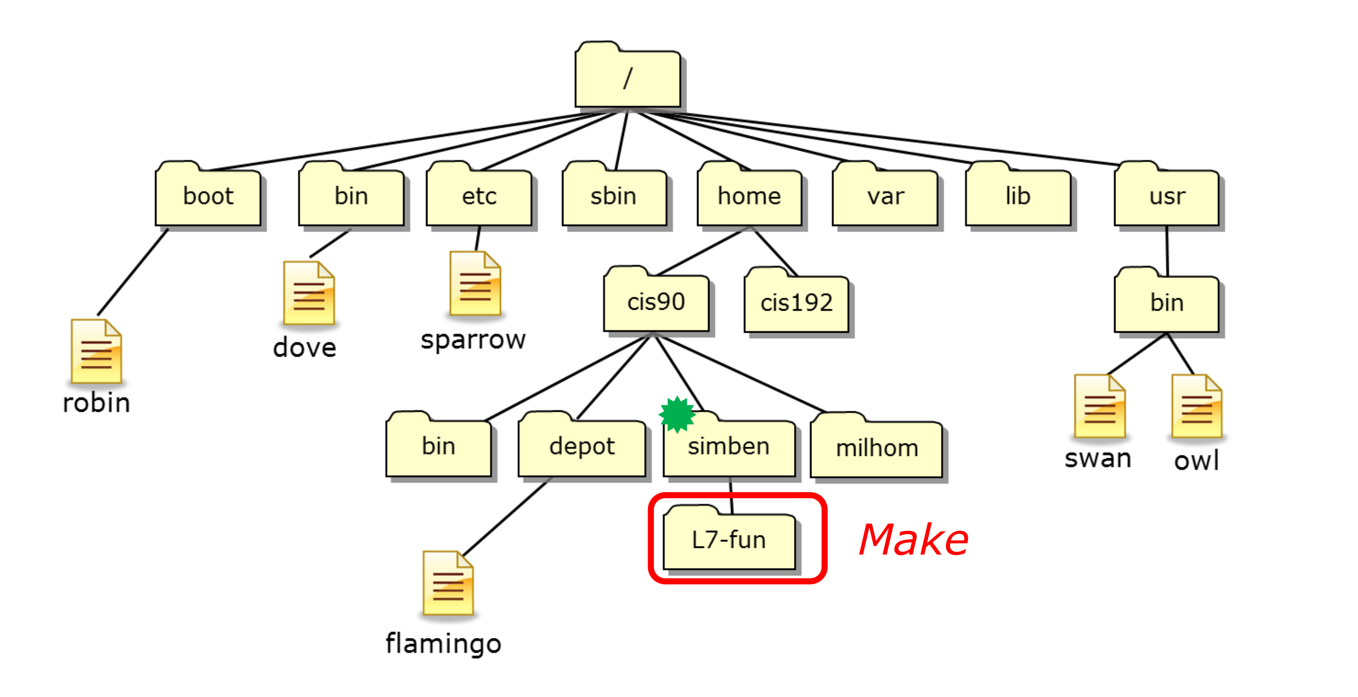
Follow Me

More practice managing files



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

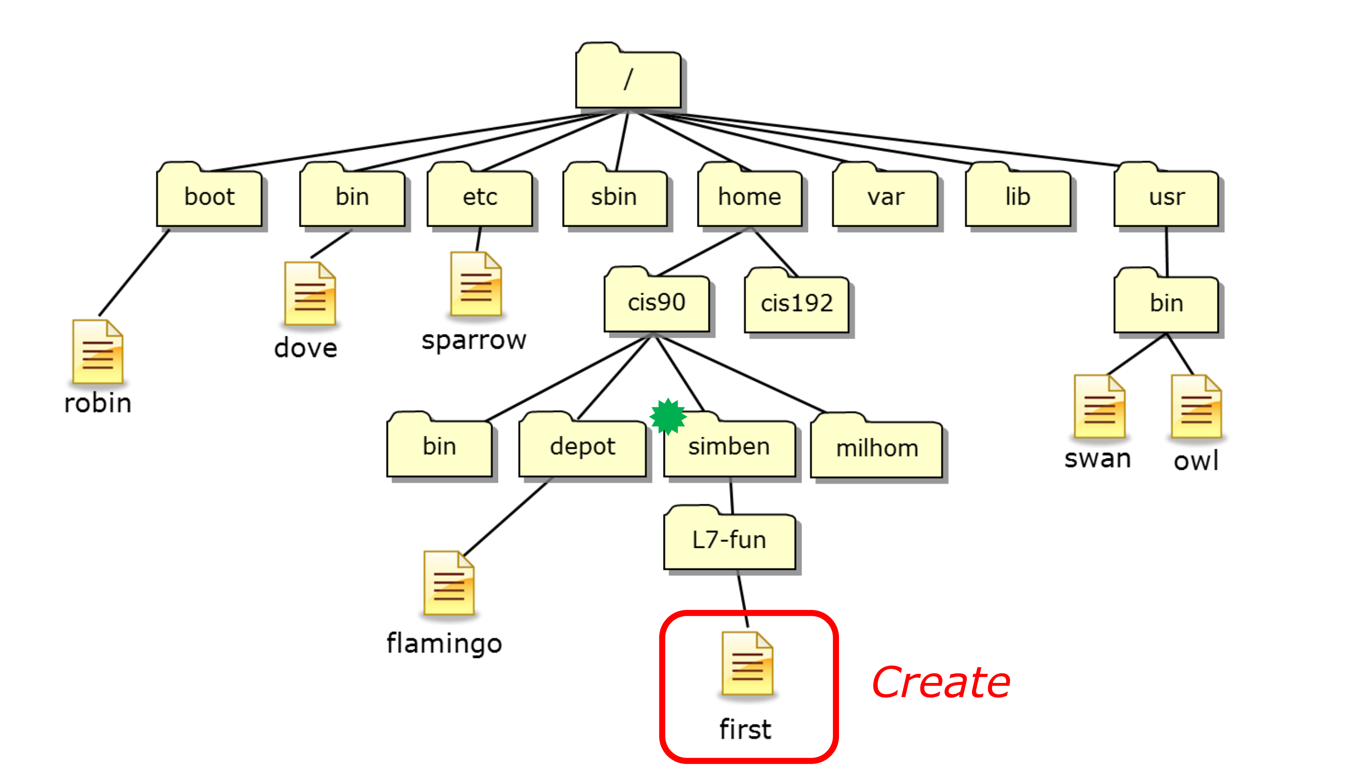
Follow Me



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/
```

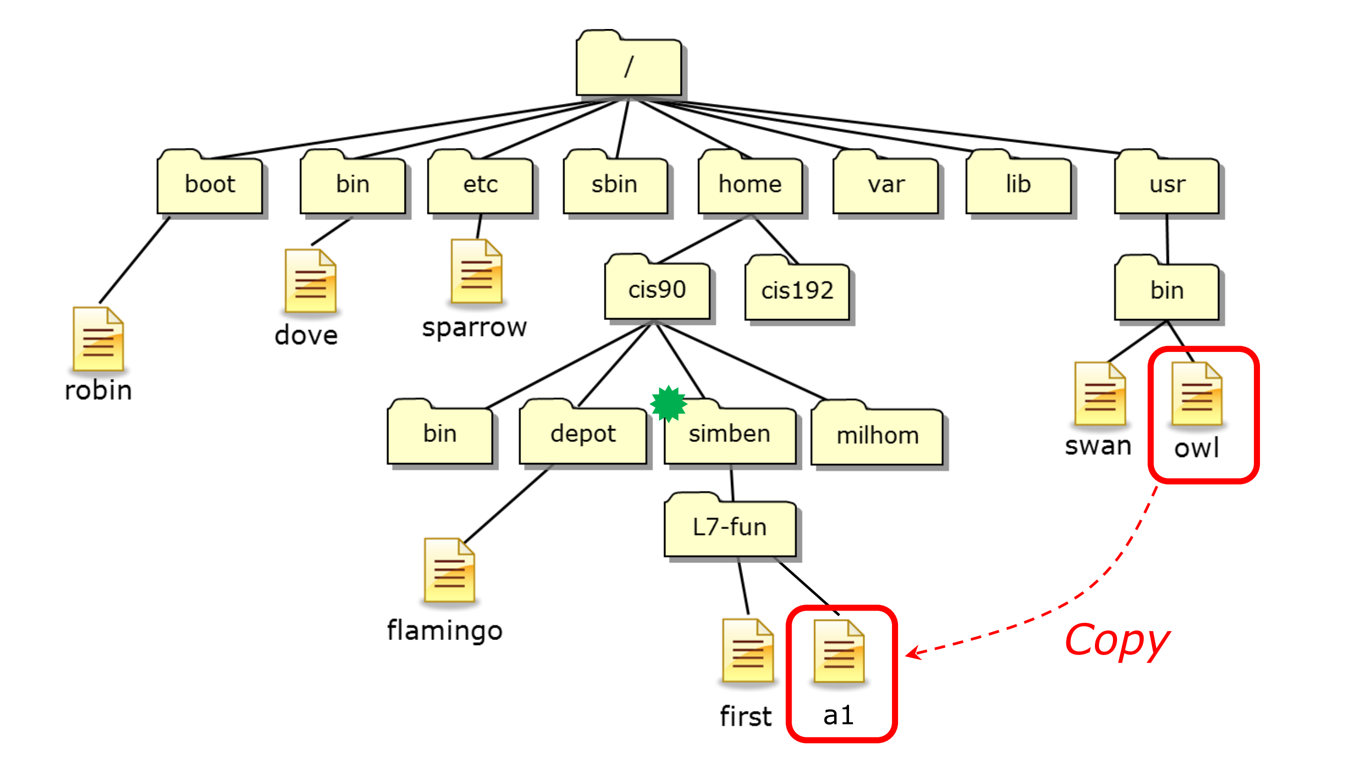
Follow Me



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/
```

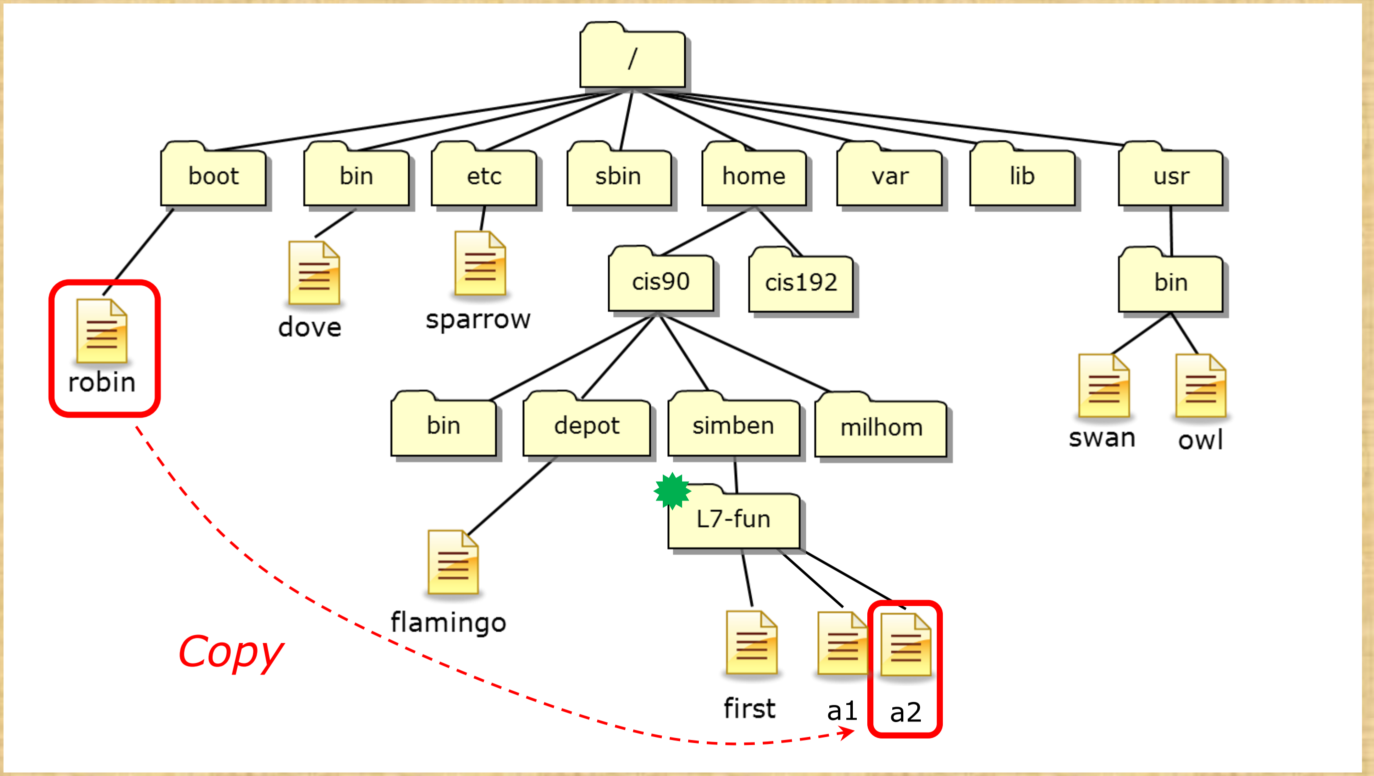
Follow Me



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/
```

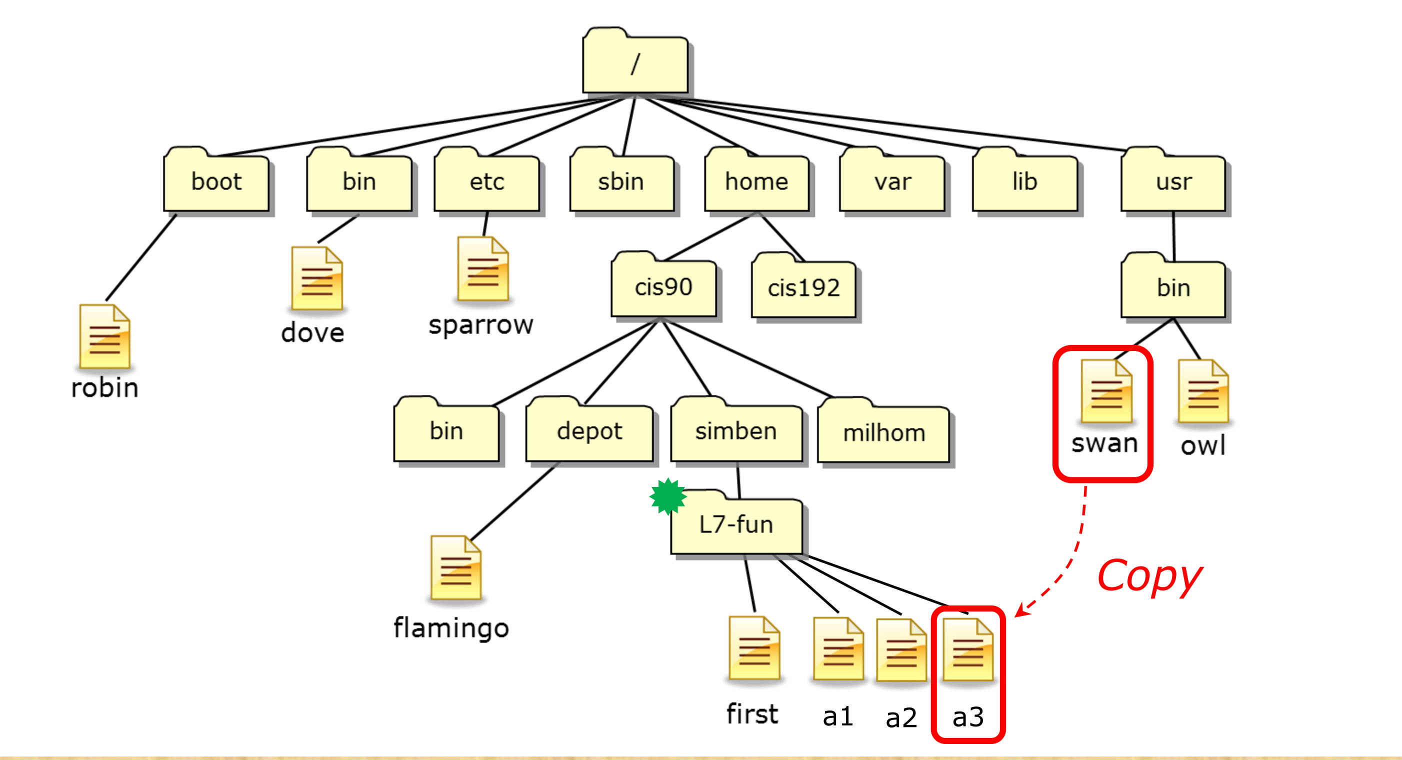
Follow Me



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
```

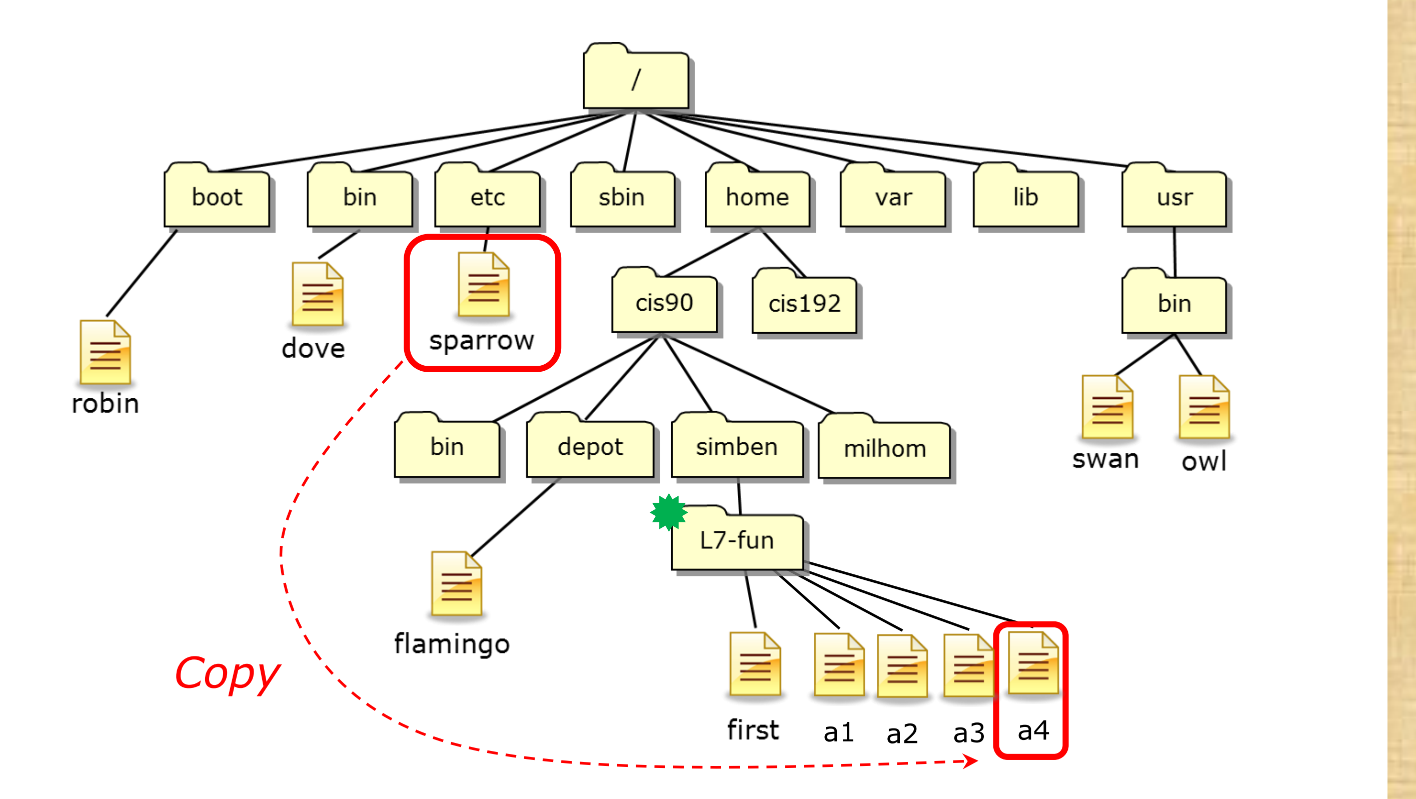
Follow Me



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
```

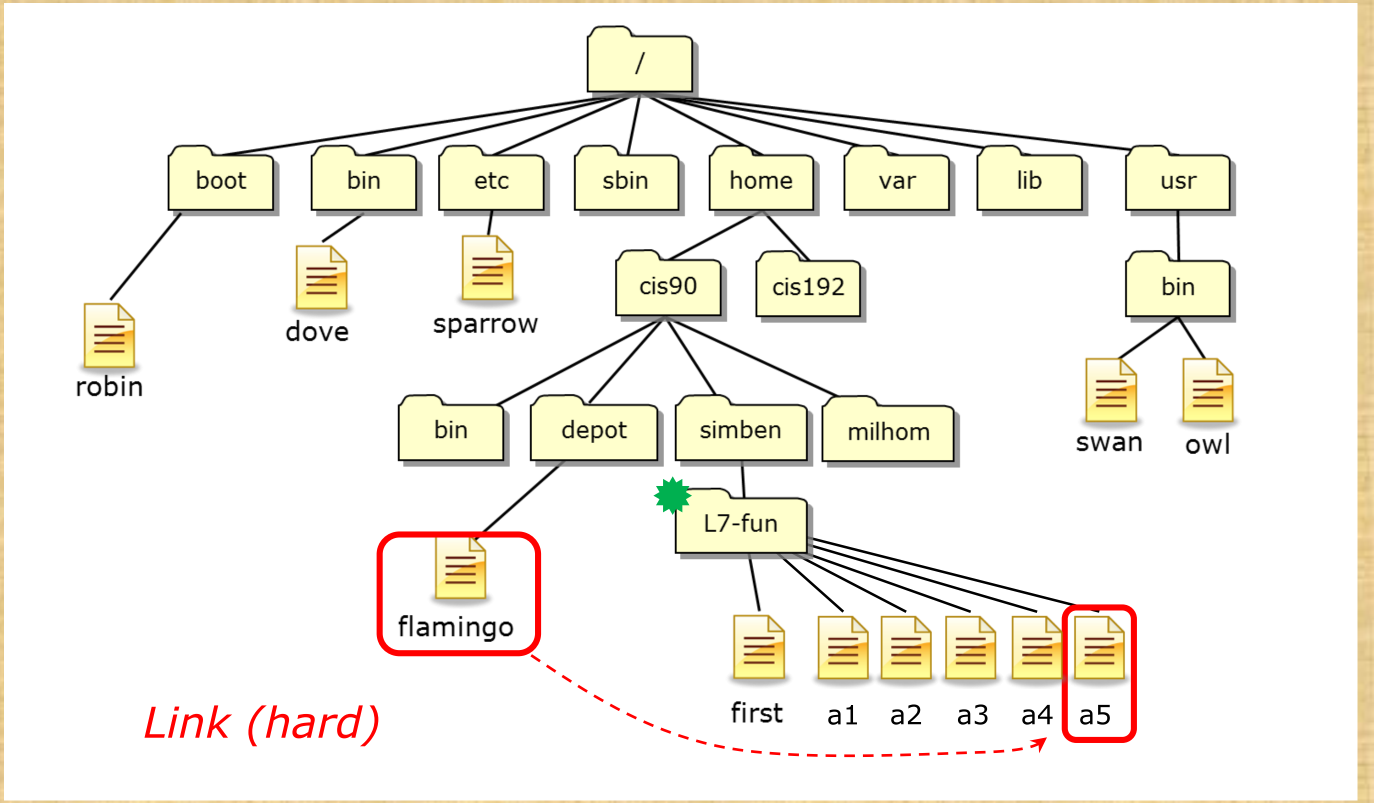
Follow Me



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
```

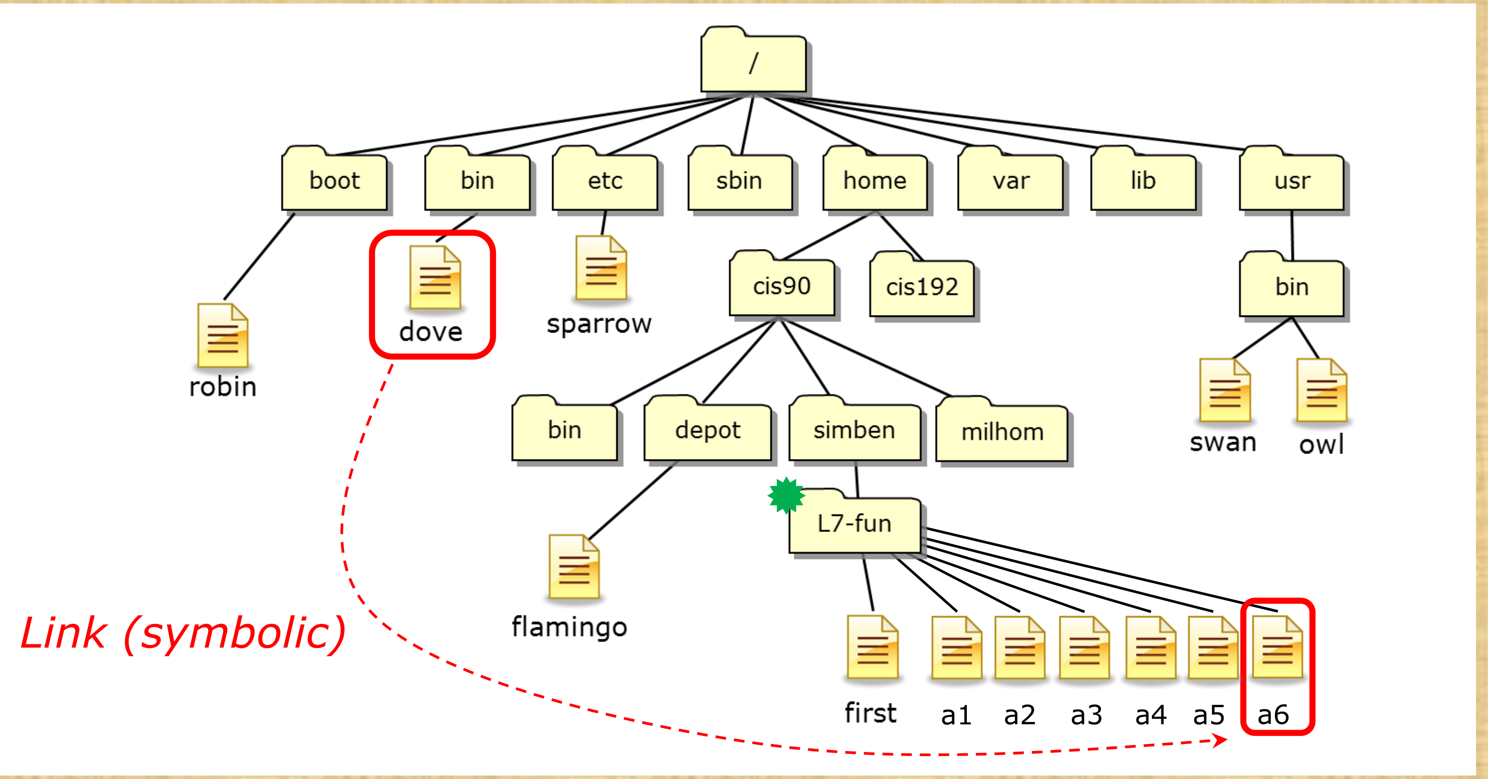
Follow Me



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
```

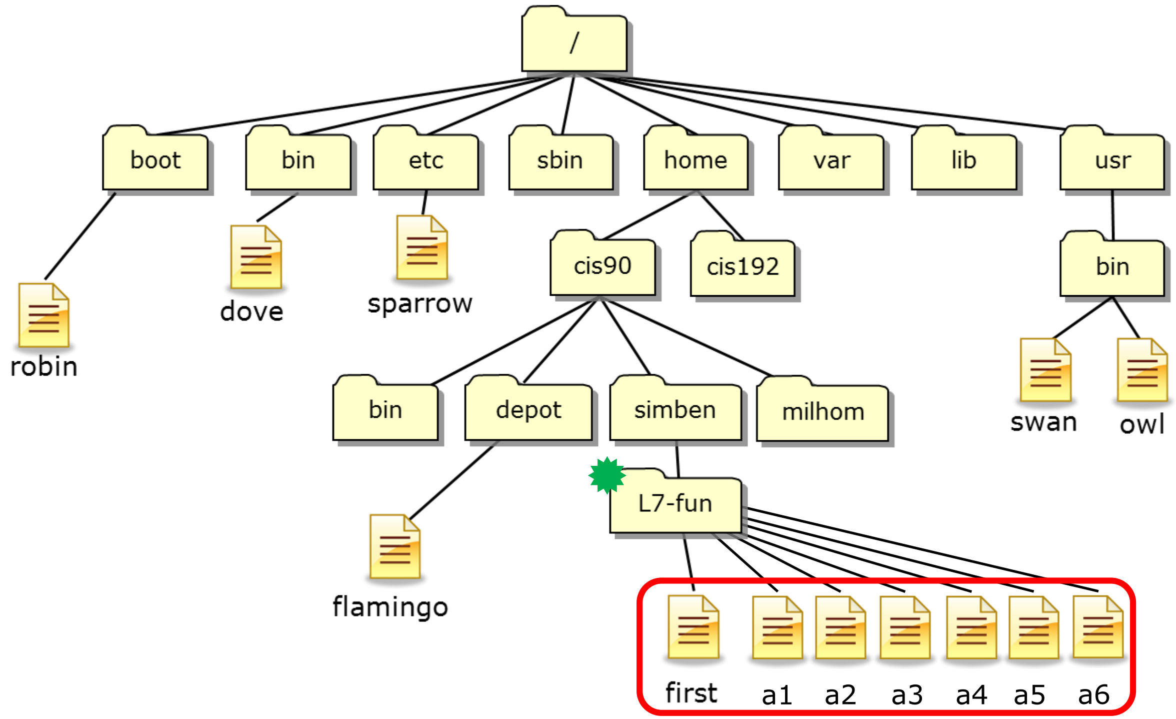
Follow Me



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

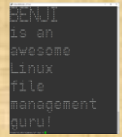


cat

Did you do each step correctly?

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

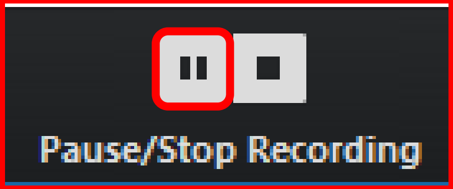
Use the chat window to indicate what happened



```
BENJI
is an
awesome
Linux
file
management
guru!
```

Housekeeping

war is not healthy for children and other living things
ICE COLD
Coffee!
You can sleep when you're dead!
LATTE
TOURIST MAP OF THE WORLD
New Z
We're Proud To Serve



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

Overlap Students

Don't forget to update the Google Docs Log when watching the recording

Resume Recording

Audio Check

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

   - Use the **check5** script to check your work.

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

   - Use **verify** command to verify you submitted your work and see what you sent me to grade.

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

3) Next week five more forum posts are due!

Groups

Groups

Question: Is there a way to group users? For example I'd like to create three groups named marketing, lab and staff. I'd like Chris and Kerin to be members of the marketing group. Janet and Audi to be members of the lab group. I'd like all of them to be members of the staff group:

Marketing	Lab	Staff
Chris	Audi	Audi
Kerin	Janet	Chris
		Janet
		Kerin

Answer: Yes, on Unix all users have a primary group. They can also be members of additional secondary groups. The system administrator creates the groups and makes the membership assignments.

Lesson 7 commands for your toolbox

NEW **groups** shows group membership for a user.

id shows user ID (uid), primary group ID (gid), membership in secondary groups, and SELinux context.

Group Membership

Question: How do I know what groups I belong to?

Answer: Use the **id** or **groups** command.

```
/home/cis90/simben $ id
uid=1201(simben90) gid=1090(cis90) groups=1090(cis90),100(users)
context=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023
```

A groups are represented internally as a numeric GID (Group ID).

On Opus-II the "cis90" group has a GID=1090 and the "users" group has a GID=100.

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

Benji (simben90) belongs to two groups, cis90 and users.
The first group listed, cis90, is Benji's primary group.

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)

users

Group Membership

Question: How do I know what groups the milhom76 user belongs to?

Answer: Use the **id** or **groups** command with the username as the argument.

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

```
/home/cis90/simben $ groups milhom76
milhom76 : cis76 users
```

The milhom76 user belongs to two groups, cis76 and users.
The first group listed, cis76, is Homer's primary group

Group Membership

Every user belongs to one **primary** group and can optionally belong to any number of **secondary** groups.

The **UID** (user ID) and **GID** (group ID) are numbers that are stored internally to represent users and group names.

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

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

Benji's (simben90, UID=1201) primary group is "cis90" (GID=1090).
He belongs to one secondary group, "users" (GID=100), as well.

Note the primary group is always the first group on the list output by the **id** and **groups** commands.

Activity

What is the primary group for the warjes76 user?

(Write your answer in the chat window)

Activity

What secondary groups does the warjes76 user belong to?

(Write your answer in the chat window)

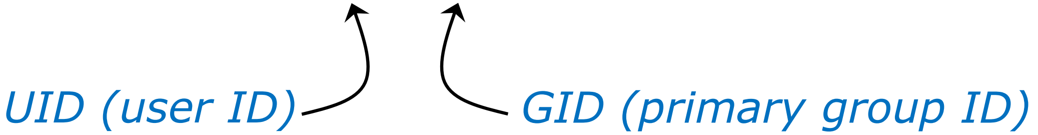
users alumni

Primary group memberships are stored in /etc/passwd

A user's UID (user ID) and GID (primary group ID) are stored in the 3rd and 4th fields of /etc/passwd

Excerpt from **/etc/passwd:**

```
simben90:x:1201:1090:Benji Simms:/home/cis90/simben:/bin/bash
```



UID (user ID)

GID (primary group ID)

E.g. Benji's username is simben90 (UID=1201) and his primary group is cis90 (GID=1090).

Note: secondary group membership is not kept in /etc/passwd

Secondary group memberships are stored in /etc/group

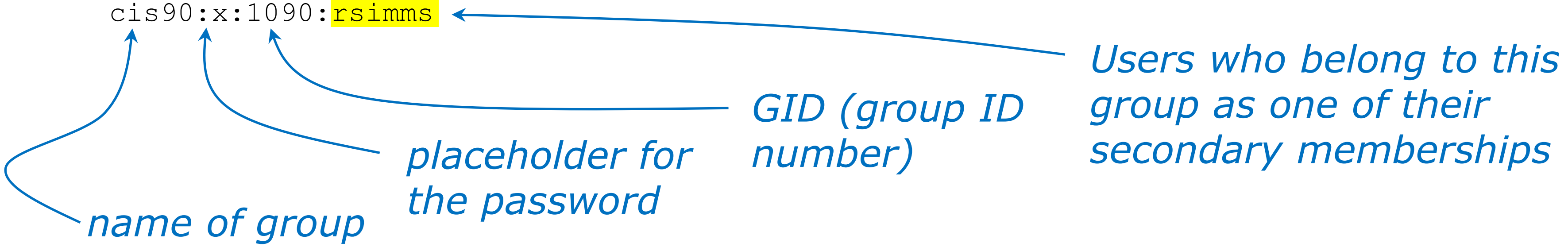
The names and GIDs for all groups are stored in /etc/group

Excerpts from **/etc/group:**

```
audio:x:63:
nobody:x:99:
users:x:100:rsimms,warjes76,simben76,milhom76,rodduk76,watshe76,seasky76,cis90,simben90
,milhom90,rodduk90  < snipped >
stapusr:x:156:
stapsys:x:157:
< snipped >
staff:x:503:rsimms
cis54:x:1054:
cis72:x:1072:
cis75:x:1075:
cis76:x:1076:rsimms
cis77:x:1077:
cis90:x:1090:rsimms
```

E.g. Rich (rsimms) has secondary memberships in the users, staff, cis76 and cis90 groups.

E.g. Benji (simben90) has a secondary membership in the users group.



Users who belong to this group as one of their secondary memberships

GID (group ID number)

placeholder for the password

name of group

Activity

Find your username in /etc/passwd and /etc/group

```
grep $LOGNAME /etc/passwd
grep $LOGNAME /etc/group
```

What are your primary and secondary group GIDs?

(Write your answer in the chat window)

1090 100

When a new file is created

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

```
/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*

File Permissions

R=Read

W=Write

X=Execute

File Permissions

Question: I would like to control access to one of my files so that:

a) I can read it, write (add, modify, empty) it but I can't execute (run) it.

b) Users in the cis90 group can read it but neither write to it nor execute it.

c) All other users on Opus-II have no permissions to access it whatsoever. The can't read, write or execute it.

How can I make this so?

Answer: File Permissions

File Permissions

File permissions are used to control access to files. This includes all types of files: regular files, directories, symbolic links, character devices and block devices.

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

That can be applied to:

- a **user** - the owner of the file.
- a **group** of users.
- and **others** - everyone else besides the user or group.

Use a **long listing** (**ls -l**) on a file to:

- show the **permissions**.
- show the **user** owning the file.
- show the **group** the file belongs to.

The **permissions** on a file, the **user** owning the file, and the **group** the file belongs to are all stored in the file's **inode**.

Activity

Do some long listings of various bin directories:

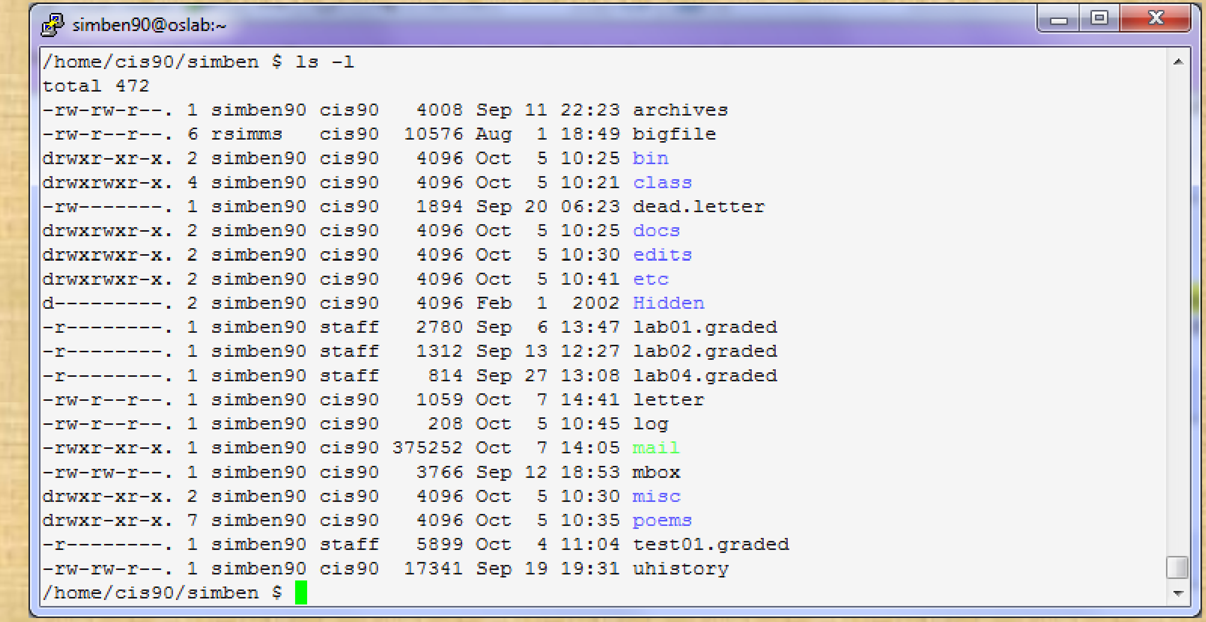
```
cd
ls -ld /bin/ /usr/bin/ /home/cis90/bin/ bin/
ls -l /bin/
ls -l /usr/bin/
ls -l /home/cis90/bin/
ls -l bin/
```

Which bin directory above contains the most files?
Put your answer in the chat window

Activity

Do a long listing of your home directory:

`ls -l`

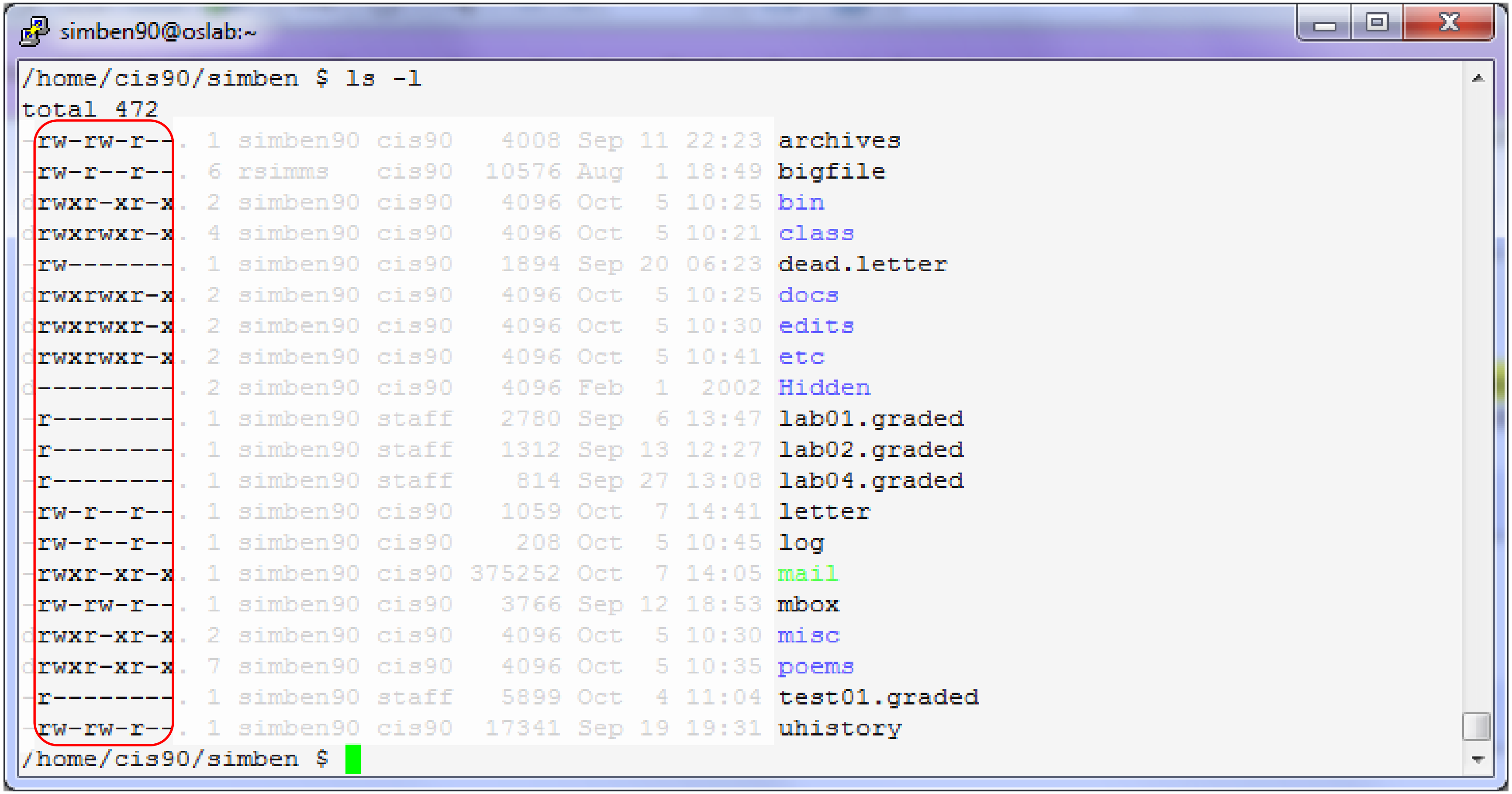


```
/home/cis90/simben $ ls -l
total 472
-rw-rw-r--. 1 simben90 cis90   4008 Sep 11 22:23 archives
-rw-r--r--. 6 rsimms   cis90  10576 Aug  1 18:49 bigfile
drwxr-xr-x. 2 simben90 cis90   4096 Oct  5 10:25 bin
drwxrwxr-x. 4 simben90 cis90   4096 Oct  5 10:21 class
-rw-------. 1 simben90 cis90   1894 Sep 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 $ 
```

Write the name of the last filename in your listing in the chat window

Viewing the nine permission bits

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 $
```

*Columns 2-10 of a long listing show the **permissions** on a file:*
***"r"* = read, *"w"* = write, *"x"* = execute, *"–"* = no permission**

Activity

Use a long listing to show the permission bits on your letter file:

```
ls -l
ls -l letter
```

Write the nine permission bits on your letter file in the chat window

Activity

Use a long listing to show the permission bits on your local bin directory:

`ls -l`

~~`ls -l bin`~~ *try this too to understand why you nee the -d option*

`ls -ld bin`

Write the nine permission bits on your local bin directory in the chat window

Activity

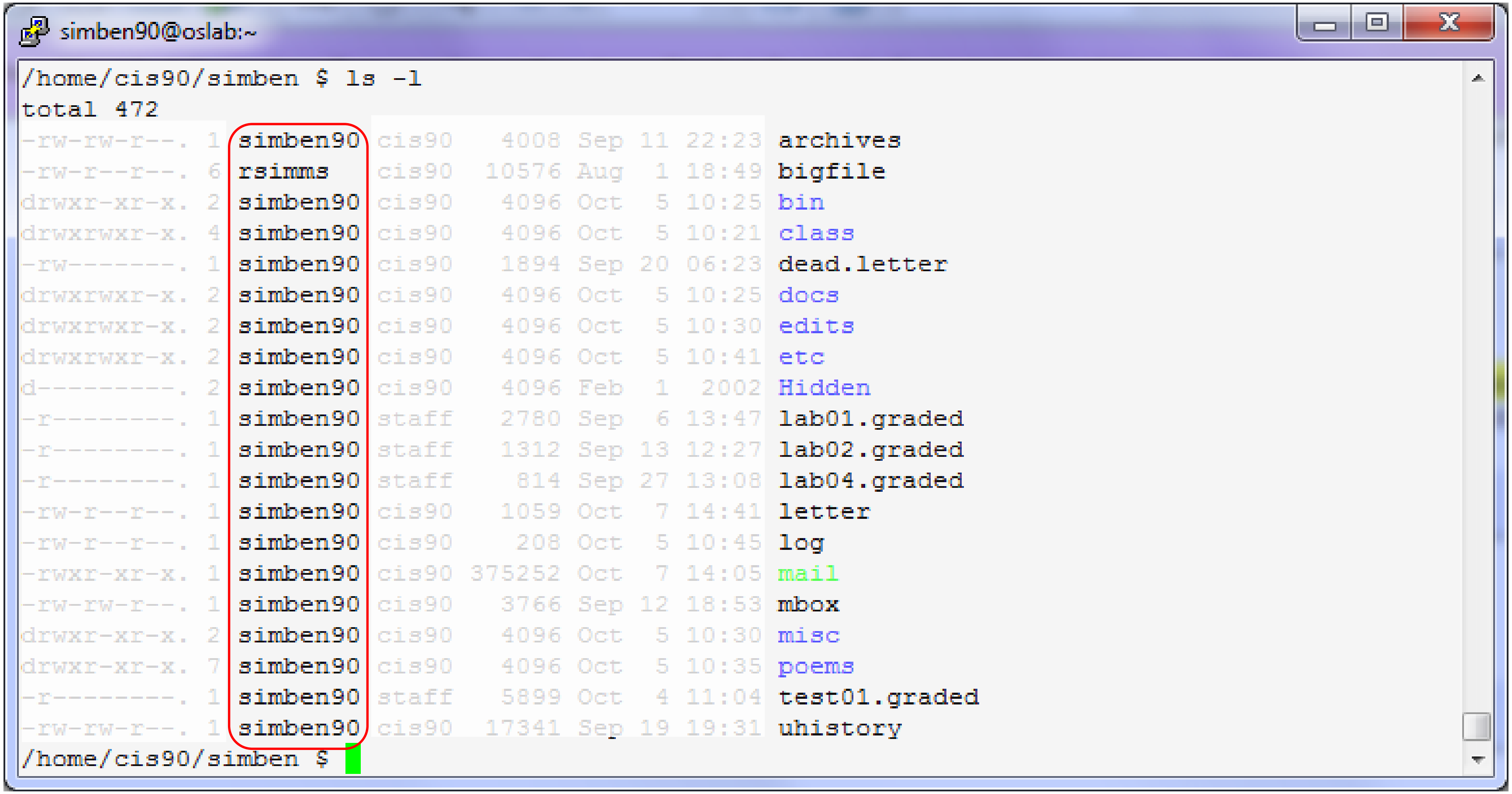
Use a long listing to show the permission bits on the enlightenment file in your bin directory:

```
ls -l bin
ls -l bin/enlightenment
```

Write the nine permission bits on your enlightenment file in the chat window

Identifying the user that owns a file

ls -l



```
/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*

Activity

Use a long listing to show the **user** that owns your letter file:

```
ls -l
ls -l letter
```

Write the name of the user that owns your letter file in the chat window

Activity

Use a long listing to show the **user** that owns your local bin directory:

ls -l
~~**ls -l bin**~~ *try this too to understand why you need the -d option!*
ls -ld bin

Write the name of the user that owns your bin directory in the chat window

Activity

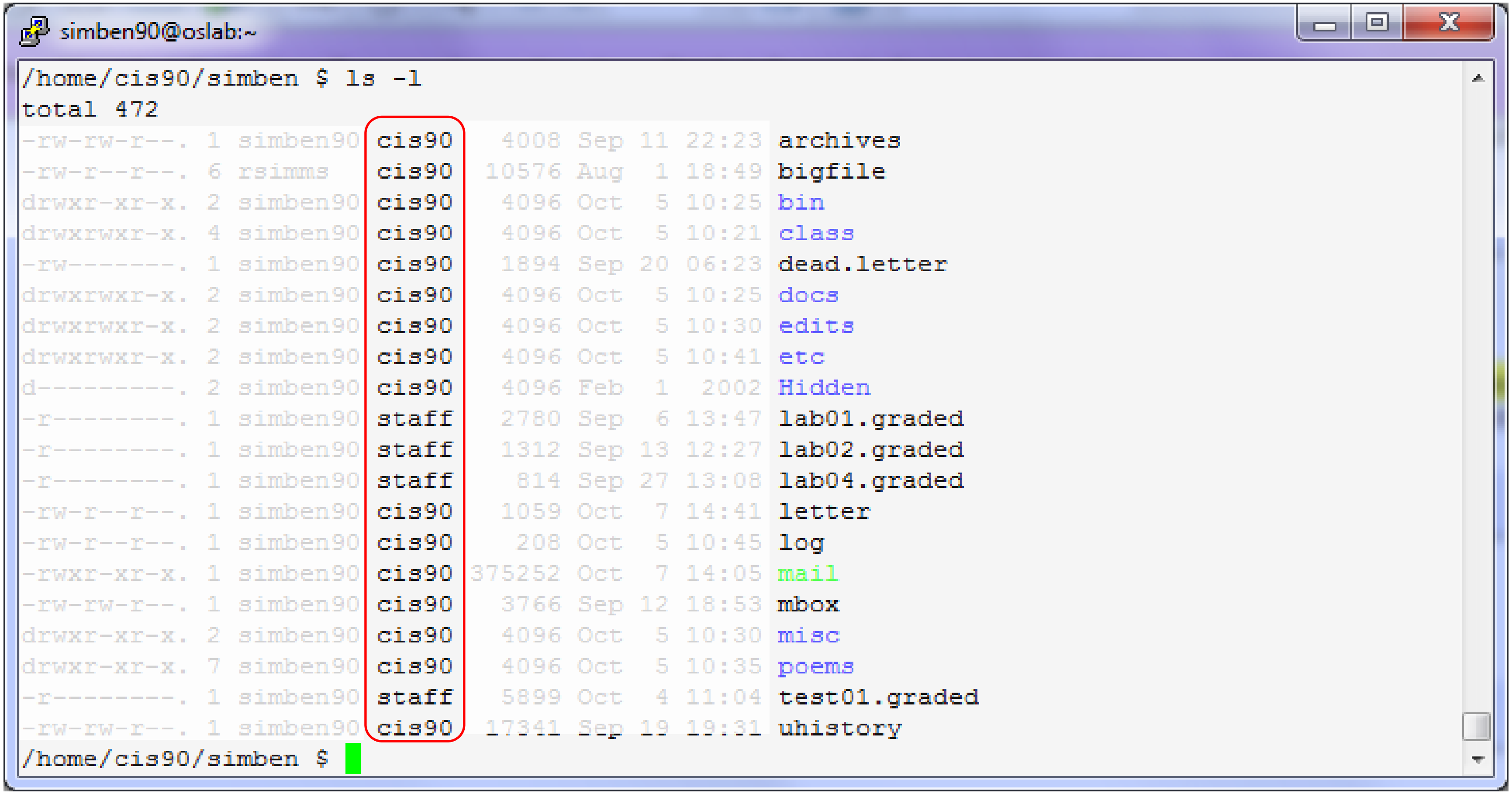
Use a long listing to show the **user** that owns the enlightenment file in your bin directory:

```
ls -l bin
ls -l bin/enlightenment
```

Write the name of the user that owns your enlightenment file in the chat window

Identifying the group a file belongs to

ls -l



```
/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*

Activity

Use a long listing to show the **group** your letter and graded work files belong to:

```
ls -l
ls -l letter *.graded
```

What group does your graded work files belong to ?
Put your answer in the chat window

Activity

Use a long listing to show the **group** your local bin directory belongs to:

`ls -l`
~~`ls -l bin`~~ *try this too to understand why you nee the -d option*
`ls -ld bin`

Write the group your bin directory belongs to in the chat window

Activity

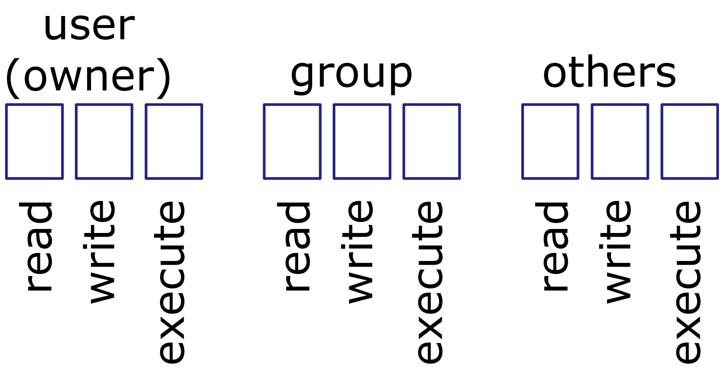
Use a long listing to show the **group** your enlightenment file (which is in your local bin directory) belongs to:

```
ls -l bin
ls -l bin/enlightenment
```

Write the group your enlightenment file belongs to in the chat window

How to interpret the nine permission bits

Three groups of three bits



user (owner)

group

others

read write execute

read write execute

read write execute

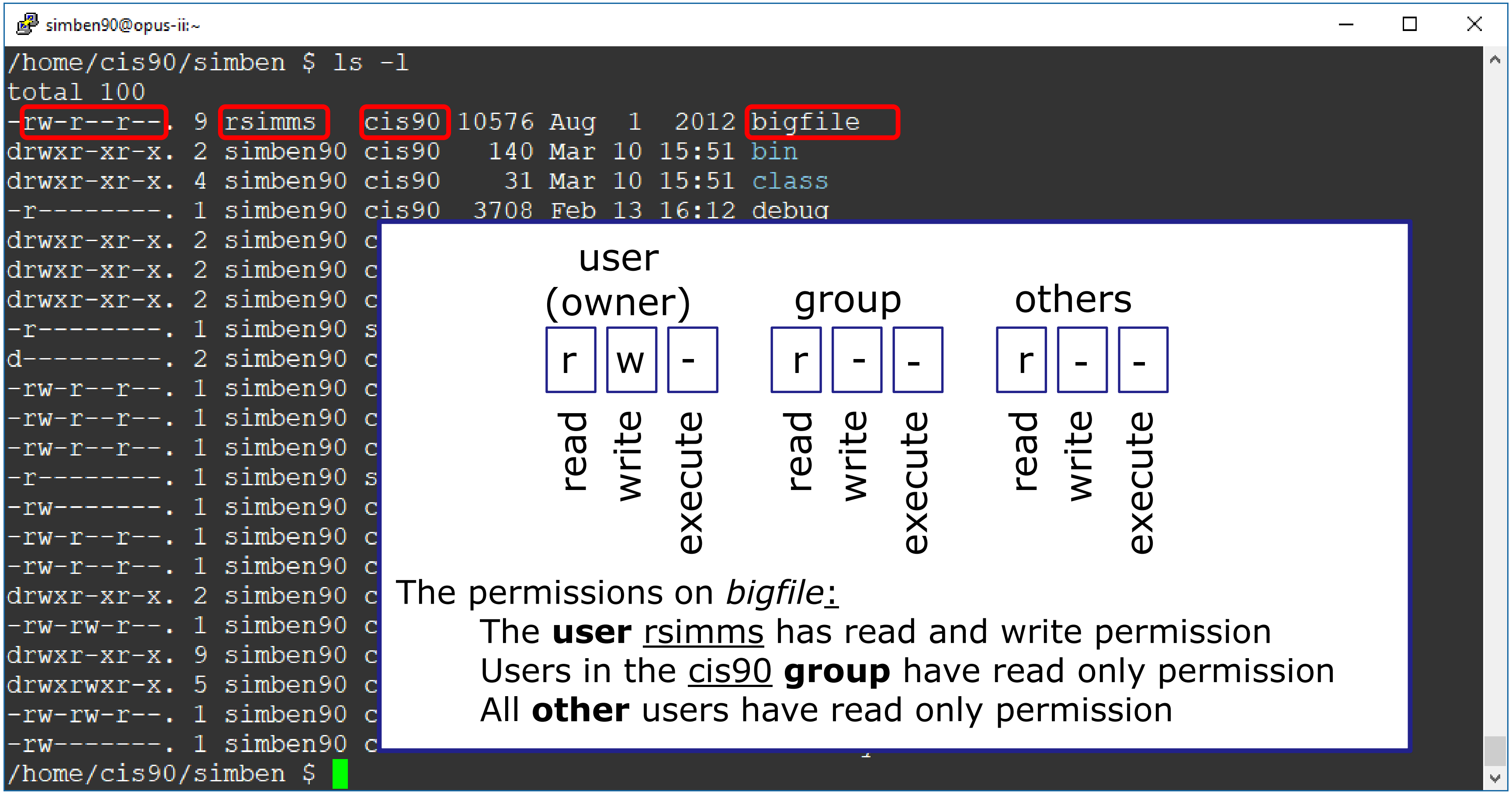
1) The first three permission bits apply to the **user** that owns the file.

2) The next three permission bits apply to the users that are members of the specified **group**.

3) The last three permission bits apply all **other** users on the system.

How to interpret the nine permission bits

`ls -l`



```
/home/cis90/simben $ ls -l
total 100
-rw-r--r--. 9 rsimms   cis90 10576 Aug  1  2012 bigfile
drwxr-xr-x. 2 simben90 cis90   140 Mar 10 15:51 bin
drwxr-xr-x. 4 simben90 cis90    31 Mar 10 15:51 class
-r--------. 1 simben90 cis90  3708 Feb 13 16:12 debug
drwxr-xr-x. 2 simben90 c
drwxr-xr-x. 2 simben90 c
drwxr-xr-x. 2 simben90 c
-r--------. 1 simben90 s
d---------. 2 simben90 c
-rw-r--r--. 1 simben90 c
-rw-r--r--. 1 simben90 c
-rw-r--r--. 1 simben90 c
-r--------. 1 simben90 s
-rw-------. 1 simben90 c
-rw-r--r--. 1 simben90 c
-rw-r--r--. 1 simben90 c
drwxr-xr-x. 2 simben90 c
-rw-rw-r--. 1 simben90 c
drwxr-xr-x. 9 simben90 c
drwxrwxr-x. 5 simben90 c
-rw-rw-r--. 1 simben90 c
-rw-------. 1 simben90 c
/home/cis90/simben $
```

The permissions on *bigfile*:

The **user** rsimms has read and write permission

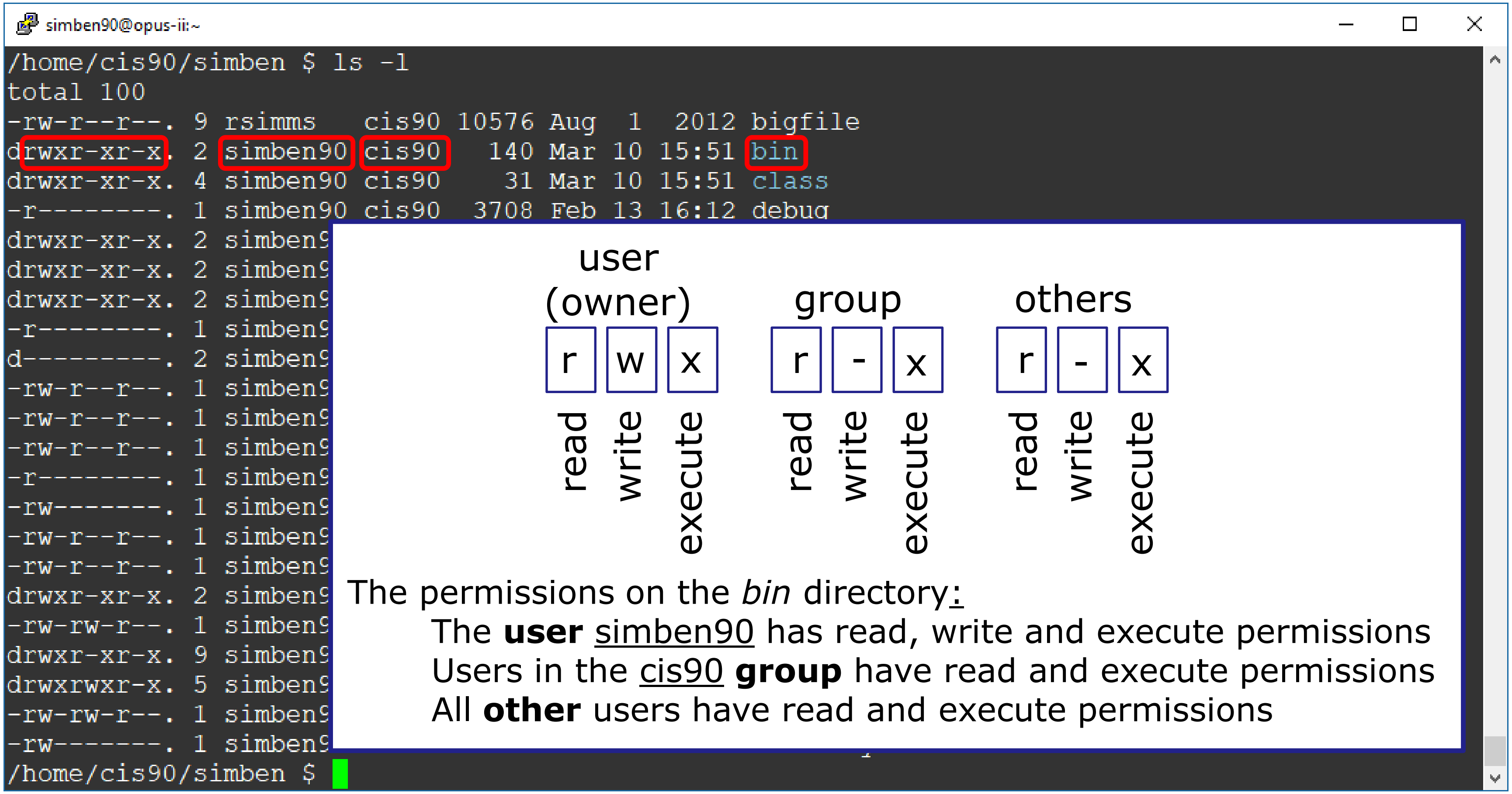
Users in the cis90 **group** have read only permission

All **other** users have read only permission

The regular file named *bigfile* in your home directory (after doing Lab 5).

How to interpret the nine permission bits

ls -l



```
/home/cis90/simben $ ls -l
total 100
-rw-r--r--. 9 rsimms   cis90 10576 Aug  1  2012 bigfile
drwxr-xr-x. 2 simben90 cis90   140 Mar 10 15:51 bin
drwxr-xr-x. 4 simben90 cis90    31 Mar 10 15:51 class
-r--------. 1 simben90 cis90  3708 Feb 13 16:12 debug
drwxr-xr-x. 2 simben9
drwxr-xr-x. 2 simben9
drwxr-xr-x. 2 simben9
-r--------. 1 simben9
d---------. 2 simben9
-rw-r--r--. 1 simben9
-rw-r--r--. 1 simben9
-rw-r--r--. 1 simben9
-r--------. 1 simben9
-rw-------. 1 simben9
-rw-r--r--. 1 simben9
-rw-r--r--. 1 simben9
drwxr-xr-x. 2 simben9
-rw-rw-r--. 1 simben9
drwxr-xr-x. 9 simben9
drwxrwxr-x. 5 simben9
-rw-rw-r--. 1 simben9
-rw-------. 1 simben9
/home/cis90/simben $
```

The permissions on the *bin* directory:

The **user** simben90 has read, write and execute permissions

Users in the cis90 **group** have read and execute permissions

All **other** users have read and execute permissions

The directory named *bin* in your home directory

Activity

Do a long listing of the phpMyAdmin directory in the /etc directory:

```
ls -ld /etc/phpMyAdmin
```

What permissions does the root user have?
Put your answer in the chat window.

Activity

Do a long listing of the phpMyAdmin directory in the /etc directory:

```
ls -ld /etc/phpMyAdmin
```

What permissions do users belonging to the apache group have?
Put your answer in the chat window.

Activity

Do a long listing of the phpMyAdmin directory in the /etc directory:

```
ls -ld /etc/phpMyAdmin
```

What permissions do all other users have?
Put your answer in the chat window.

File Permissions

Supplemental Practice

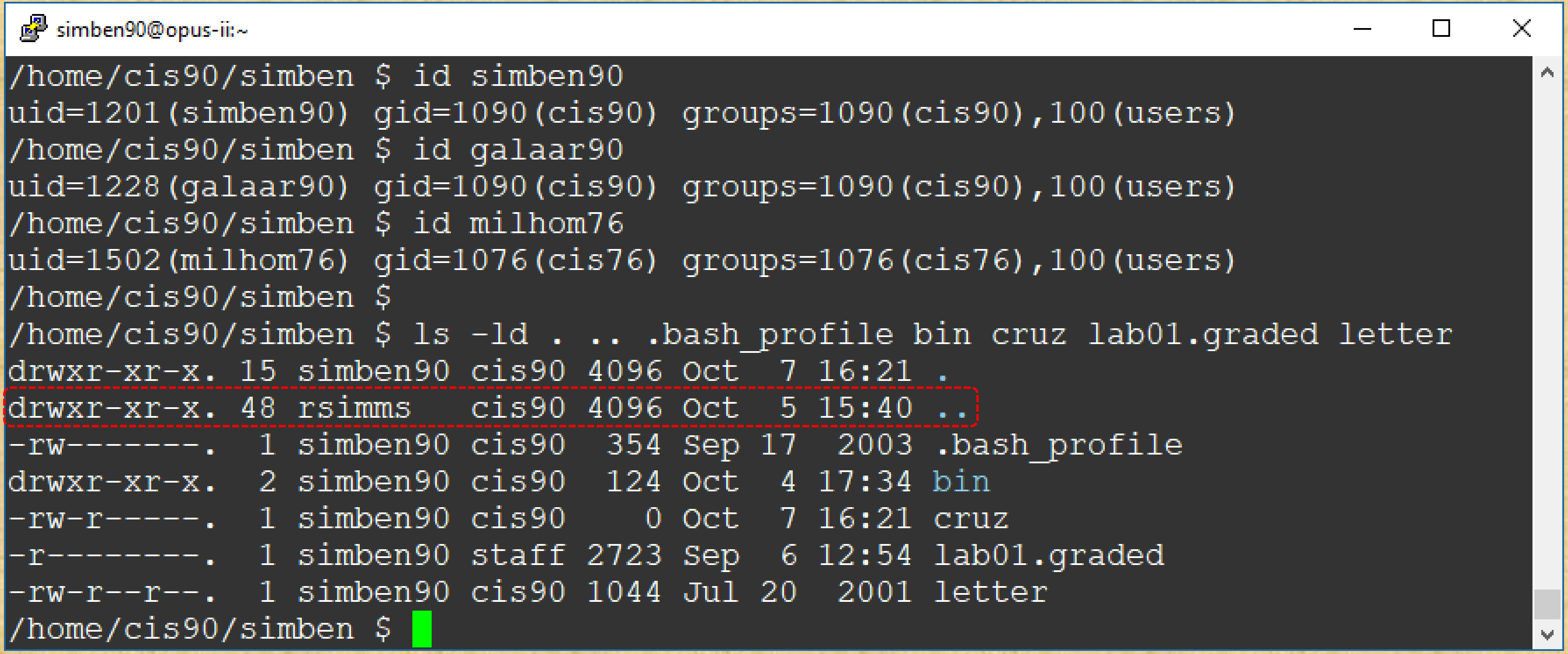
Three users on Opus-II

```
/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



```
/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 $
```

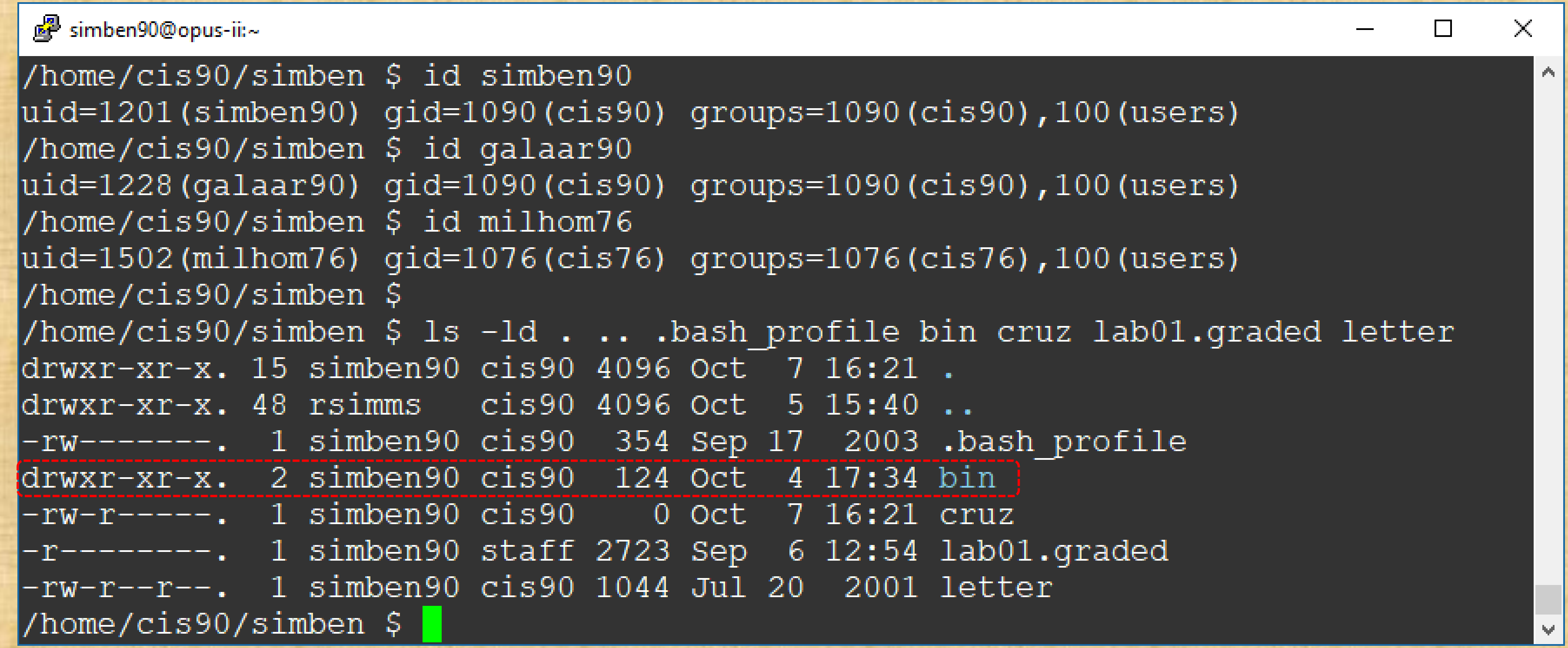
Which user owns the .. directory above?

rsimms

Write your answer in the chat window

Activity

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



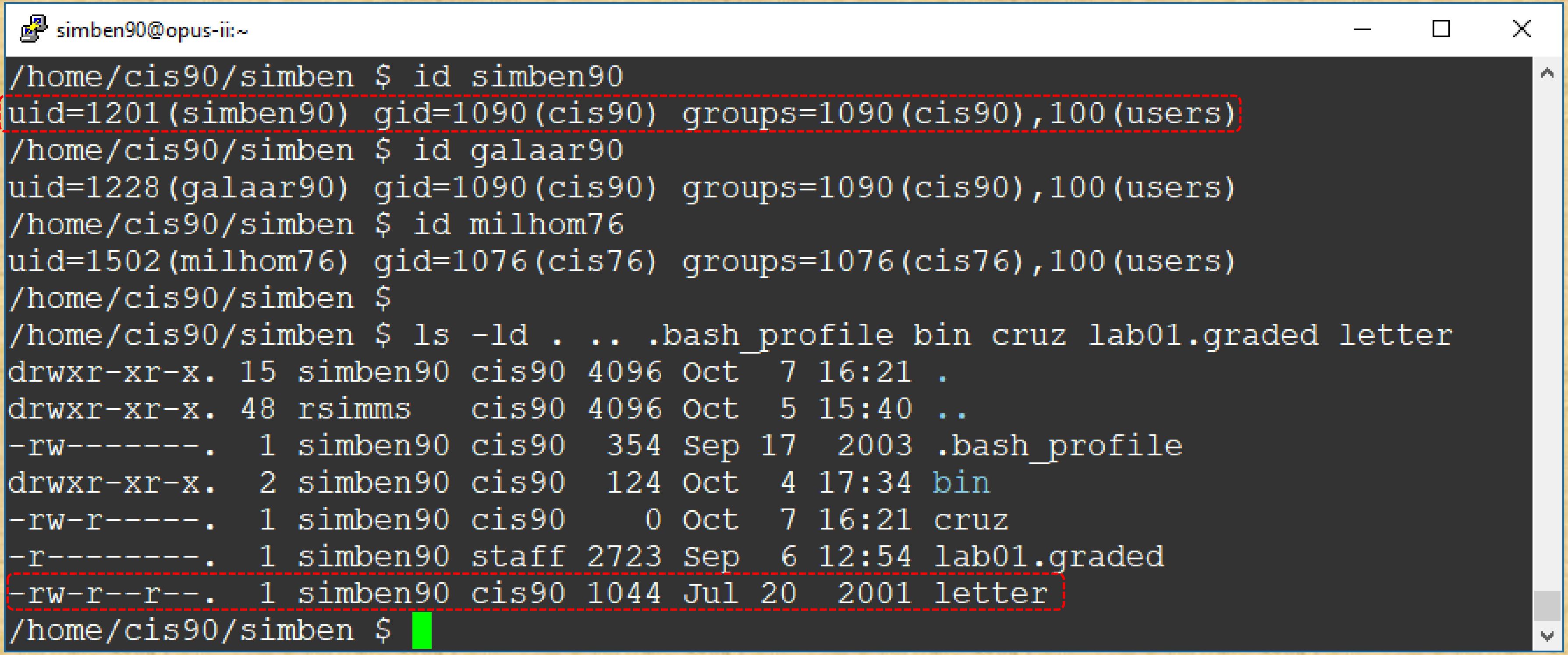
```
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id galaar90
uid=1228(galaar90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id milhom76
uid=1502(milhom76) gid=1076(cis76) groups=1076(cis76),100(users)
/home/cis90/simben $
/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 above 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
```



```
/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 $
```

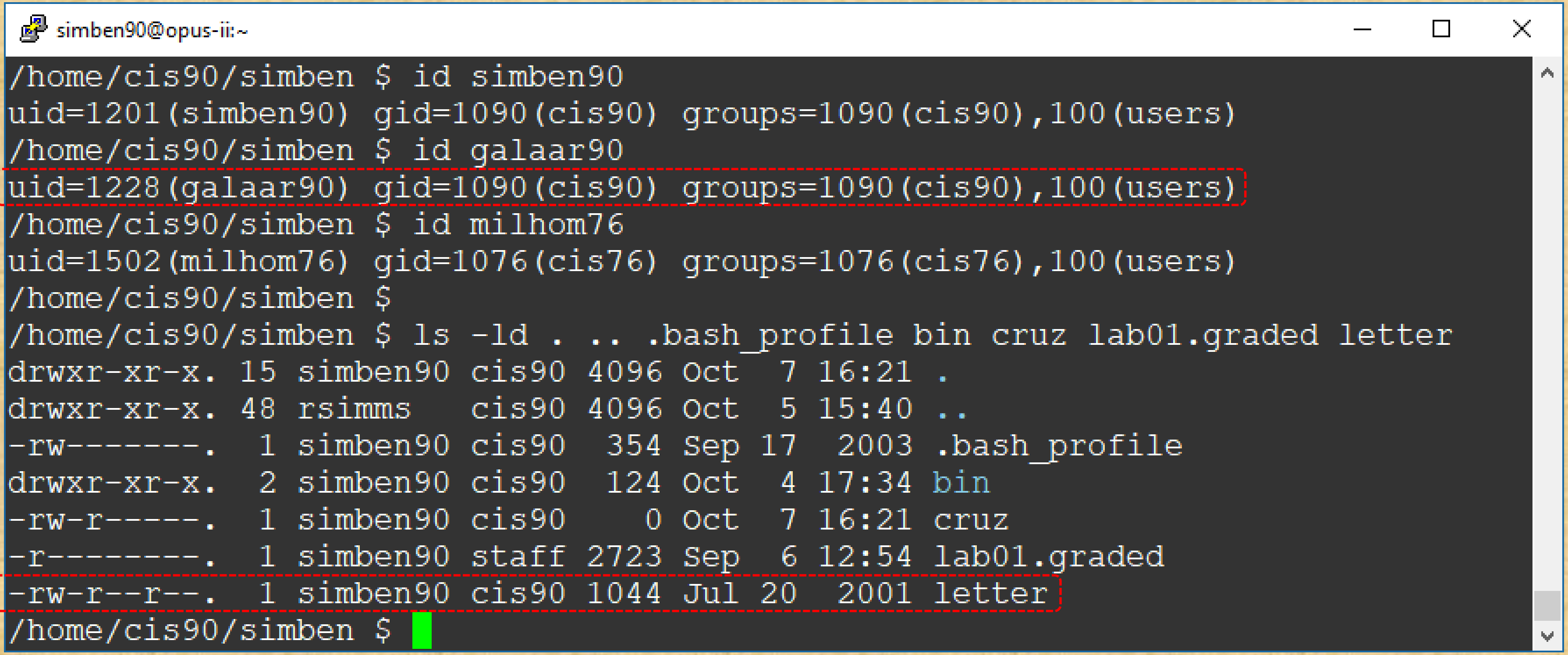
What are the permissions for the user simben90 on the *letter* file?

rw-

Write your answer in the chat window

Activity

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



```
/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 $
```

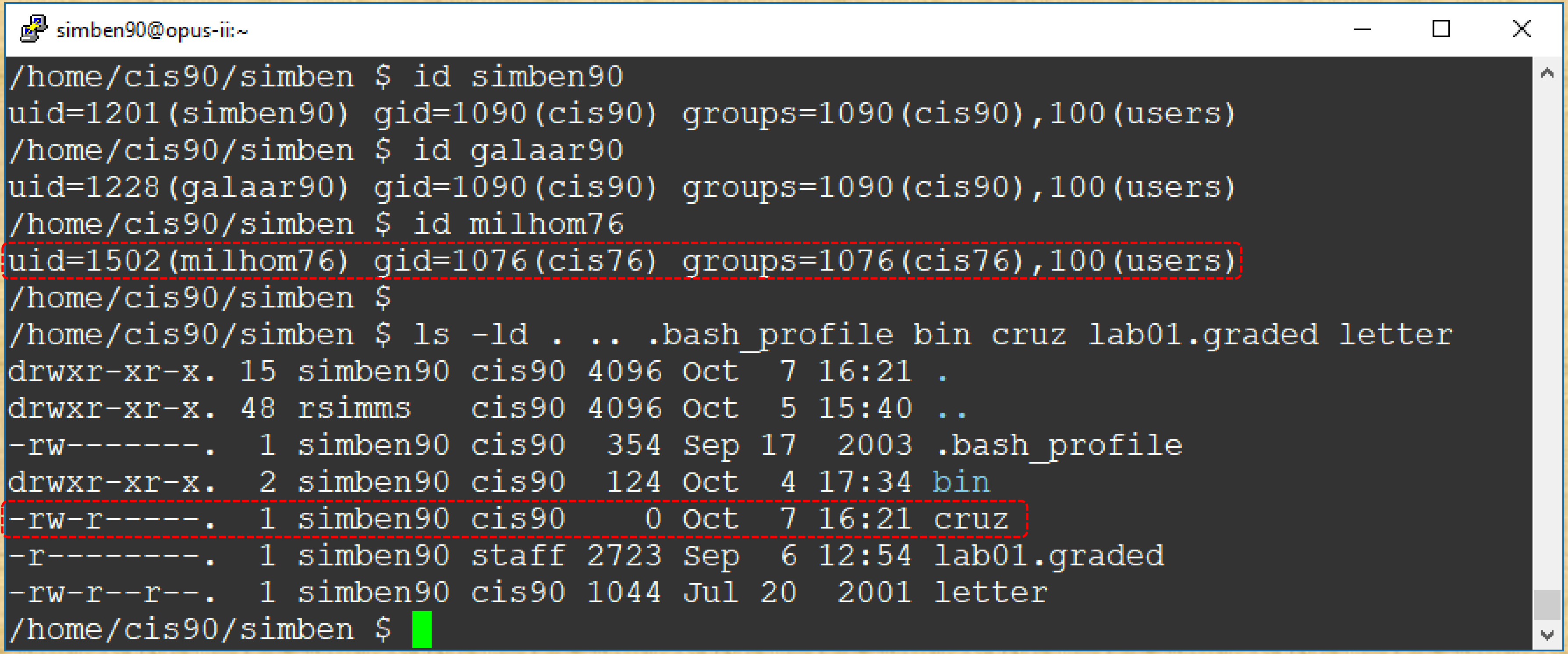
What are the permissions for the user galaar90 on the *letter* file?

r--

Write your answer in the chat window

Activity

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



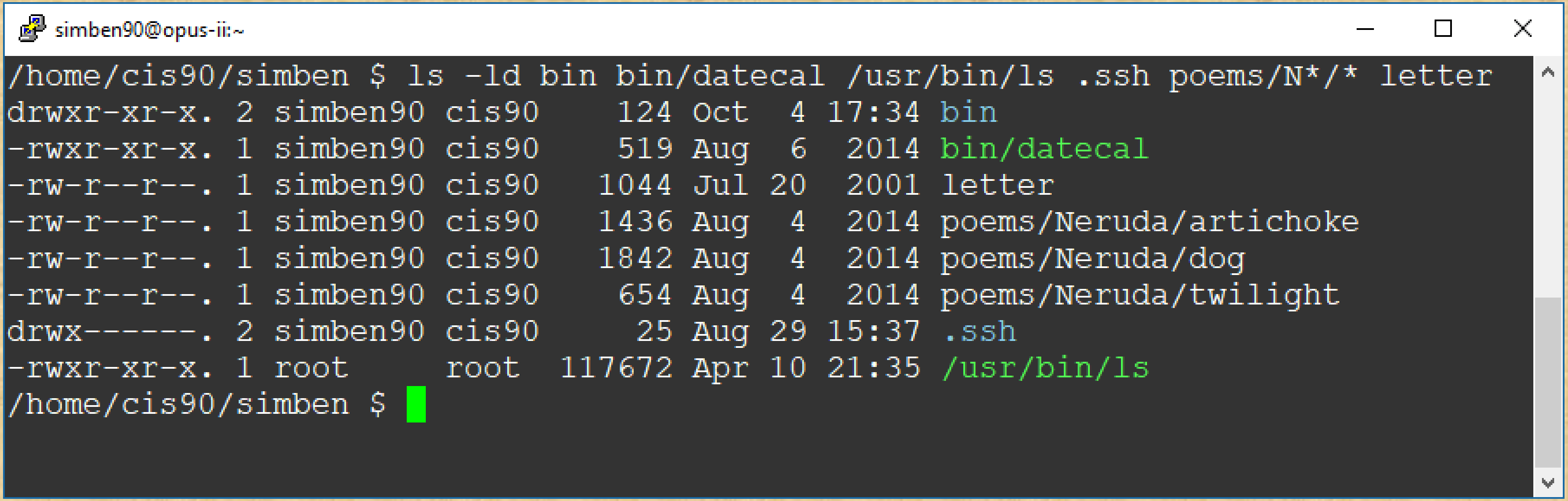
```
/home/cis90/simben $ id simben90
uid=1201(simben90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id galaar90
uid=1228(galaar90) gid=1090(cis90) groups=1090(cis90),100(users)
/home/cis90/simben $ id milhom76
uid=1502(milhom76) gid=1076(cis76) groups=1076(cis76),100(users)
/home/cis90/simben $
/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`



```
/home/cis90/simben $ ls -ld bin bin/datecal /usr/bin/ls .ssh poems/N*/* letter
drwxr-xr-x. 2 simben90 cis90    124 Oct  4 17:34 bin
-rwxr-xr-x. 1 simben90 cis90    519 Aug  6  2014 bin/datecal
-rw-r--r--. 1 simben90 cis90   1044 Jul 20  2001 letter
-rw-r--r--. 1 simben90 cis90   1436 Aug  4  2014 poems/Neruda/artichoke
-rw-r--r--. 1 simben90 cis90   1842 Aug  4  2014 poems/Neruda/dog
-rw-r--r--. 1 simben90 cis90    654 Aug  4  2014 poems/Neruda/twilight
drwx------. 2 simben90 cis90     25 Aug 29 15:37 .ssh
-rwxr-xr-x. 1 root     root  117672 Apr 10 21:35 /usr/bin/ls
/home/cis90/simben $ 
```

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

Permissions R=Read

Read Permission

Read permission is necessary …

to read the data contents of a file.

The following example commands would require the user to have read permission on the file named *myfile:*

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

Read Permission

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


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

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

Put your answer in the chat window

Read Permission

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

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

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

Read Permission

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


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

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

Put your answer in the chat window

Read Permission

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

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

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

Permissions
W=Write

Write Permission

Write permission is necessary …

to write the contents of a file.

The following example commands would require the user to have 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?

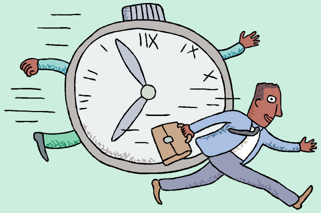
Put your answer in the chat window

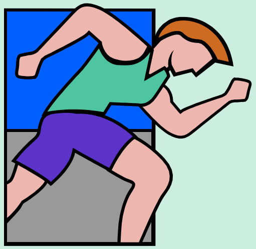
Write Permission

```
/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)

For a user to run the following commands/scripts:

```
hostname
scavenge
submit
```

The user would need to have read and execute permissions on:

```
/bin/hostname
/usr/local/bin/scavenge
/home/cis90/bin/submit
```

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------. 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.

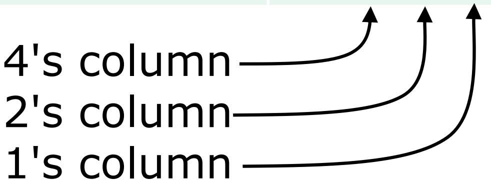
Specifying Numeric Permissions

File Permissions

Binary and Decimal

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

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



4's column
2's column
1's column

File Permissions

Example

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

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

= 110 or 4+2+0 = 6

binary *decimal* *decimal*

File Permissions

Another Example

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

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

= 011 or 0+2+1 = 3

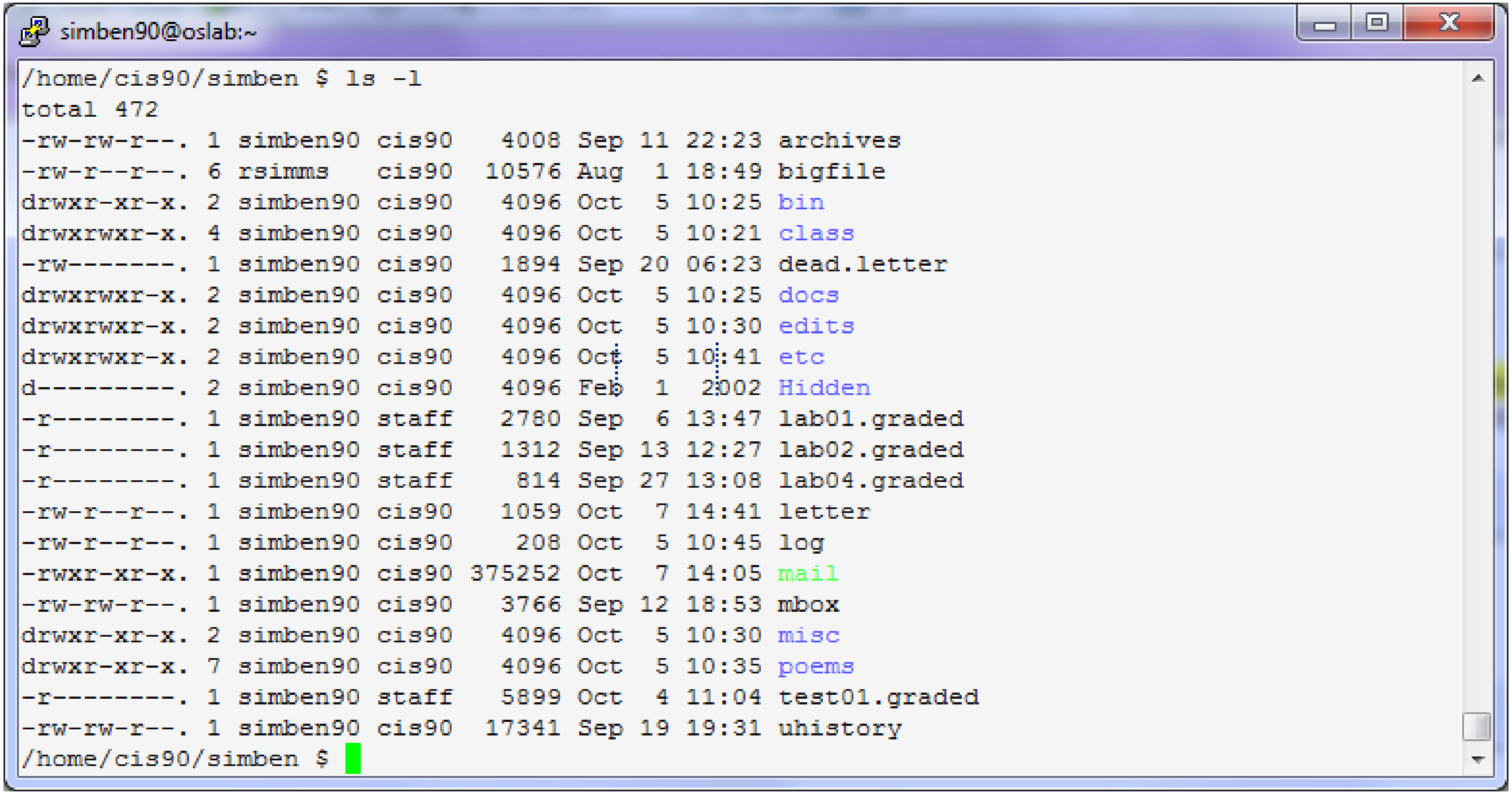
binary *decimal* *decimal*

Practice

converting
mnemonic permissions
to numeric

File Permissions

ls -l

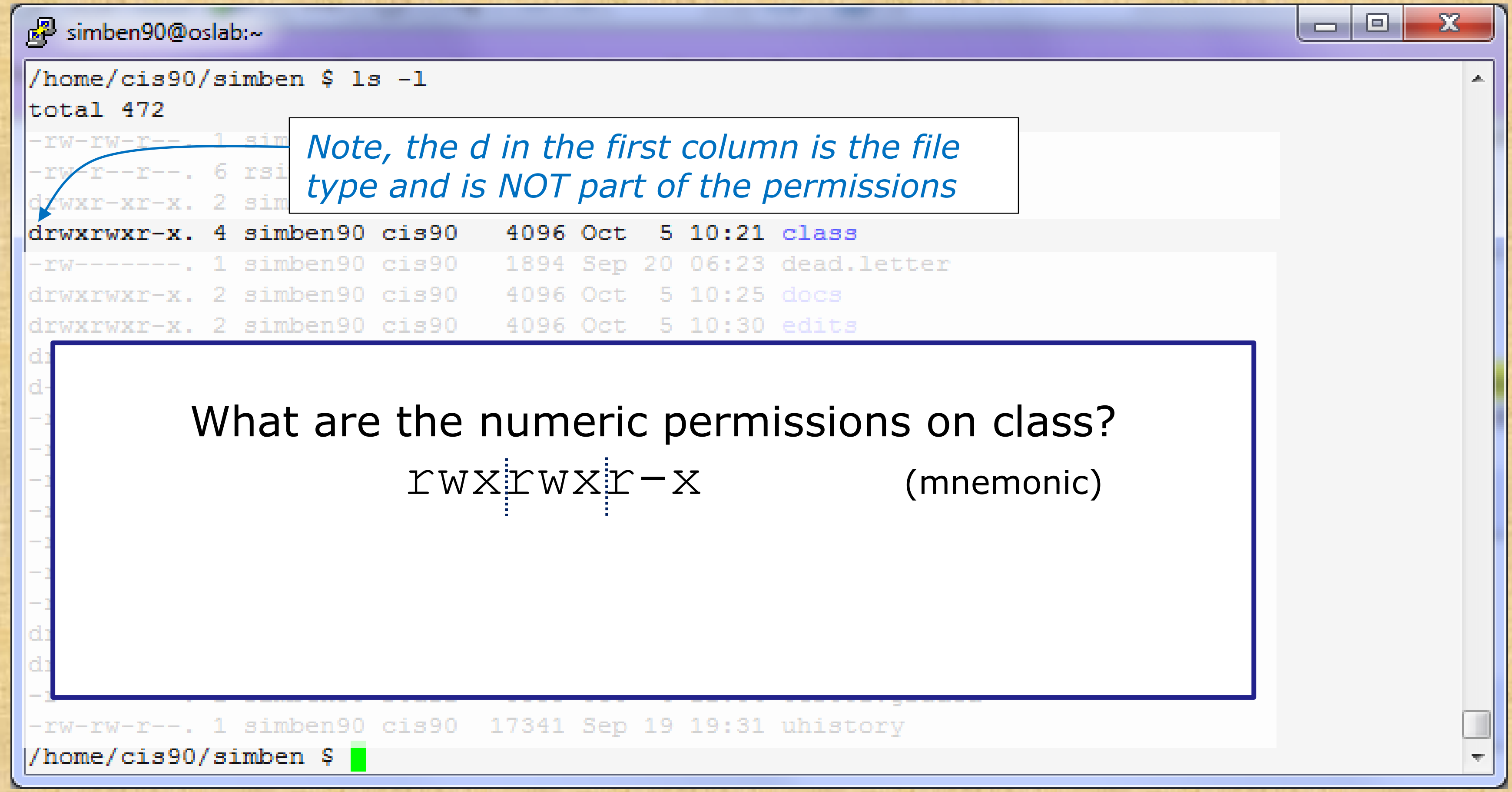


```
/home/cis90/simben $ ls -l
total 472
-rw-rw-r--. 1 simben90 cis90   4008 Sep 11 22:23 archives
-rw-r--r--. 6 rsimms   cis90  10576 Aug  1 18:49 bigfile
drwxr-xr-x. 2 simben90 cis90   4096 Oct  5 10:25 bin
drwxrwxr-x. 4 simben90 cis90   4096 Oct  5 10:21 class
-rw-------. 1 simben90 cis90   1894 Sep 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



```
/home/cis90/simben $ ls -l
total 472
-rw-rw-r--. 1 sim
-rw-r--r--. 6 rsi
drwxr-xr-x. 2 sim
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
dr
d-
-r
-r
-r
-r
-r
-r
dr
dr
-r
-rw-rw-r--. 1 simben90 cis90   17341 Sep 19 19:31 uhistory
/home/cis90/simben $
```

Note, the d in the first column is the file type and is NOT part of the permissions

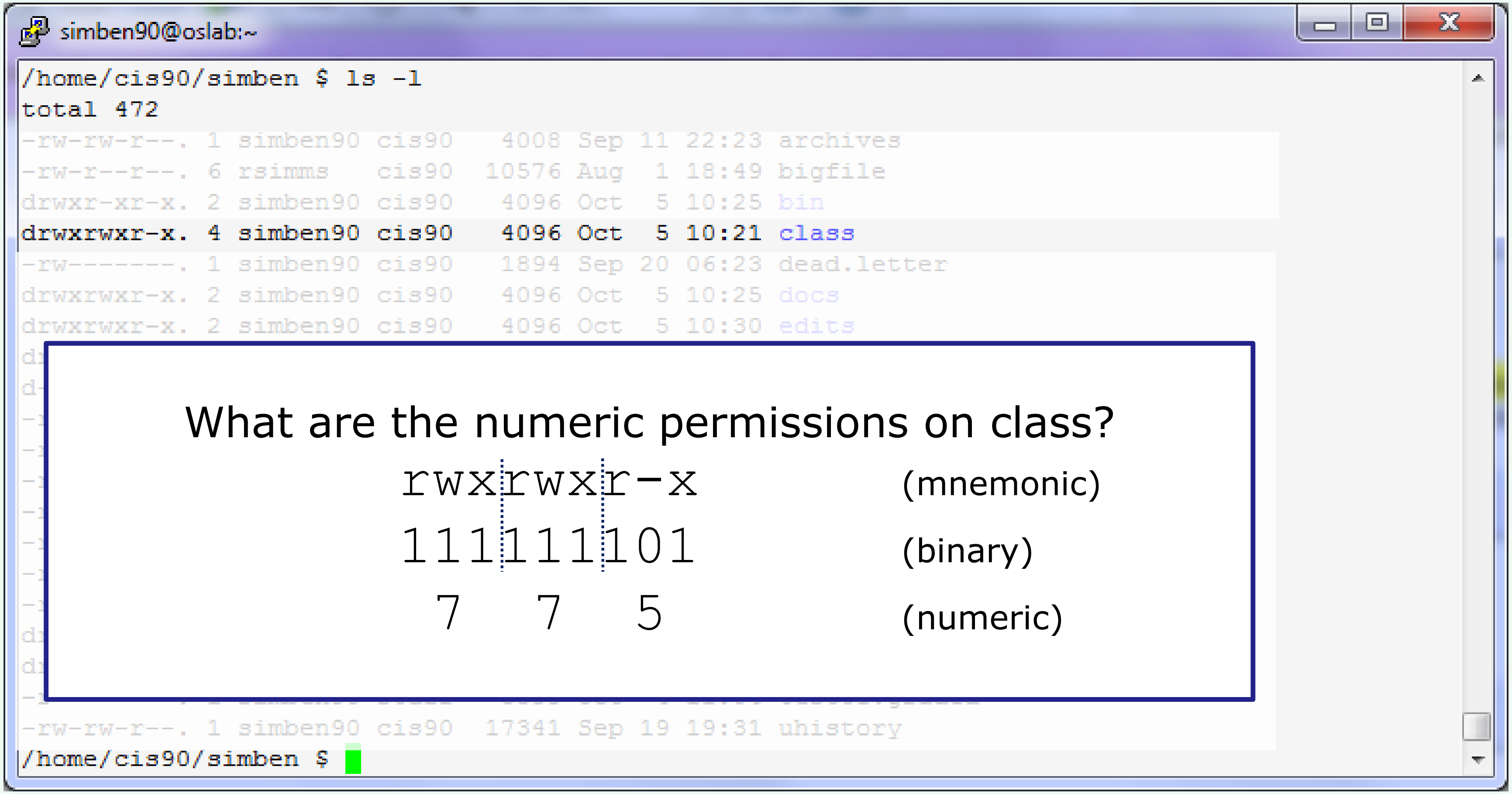
What are the numeric permissions on class?

rwx rwx r-x (mnemonic)

Put your answer in the chat window

Example 1

Converting mnemonic permissions to numeric



```
/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
-rw-rw-r--. 1 simben90 cis90  17341 Sep 19 19:31 uhistory
/home/cis90/simben $
```

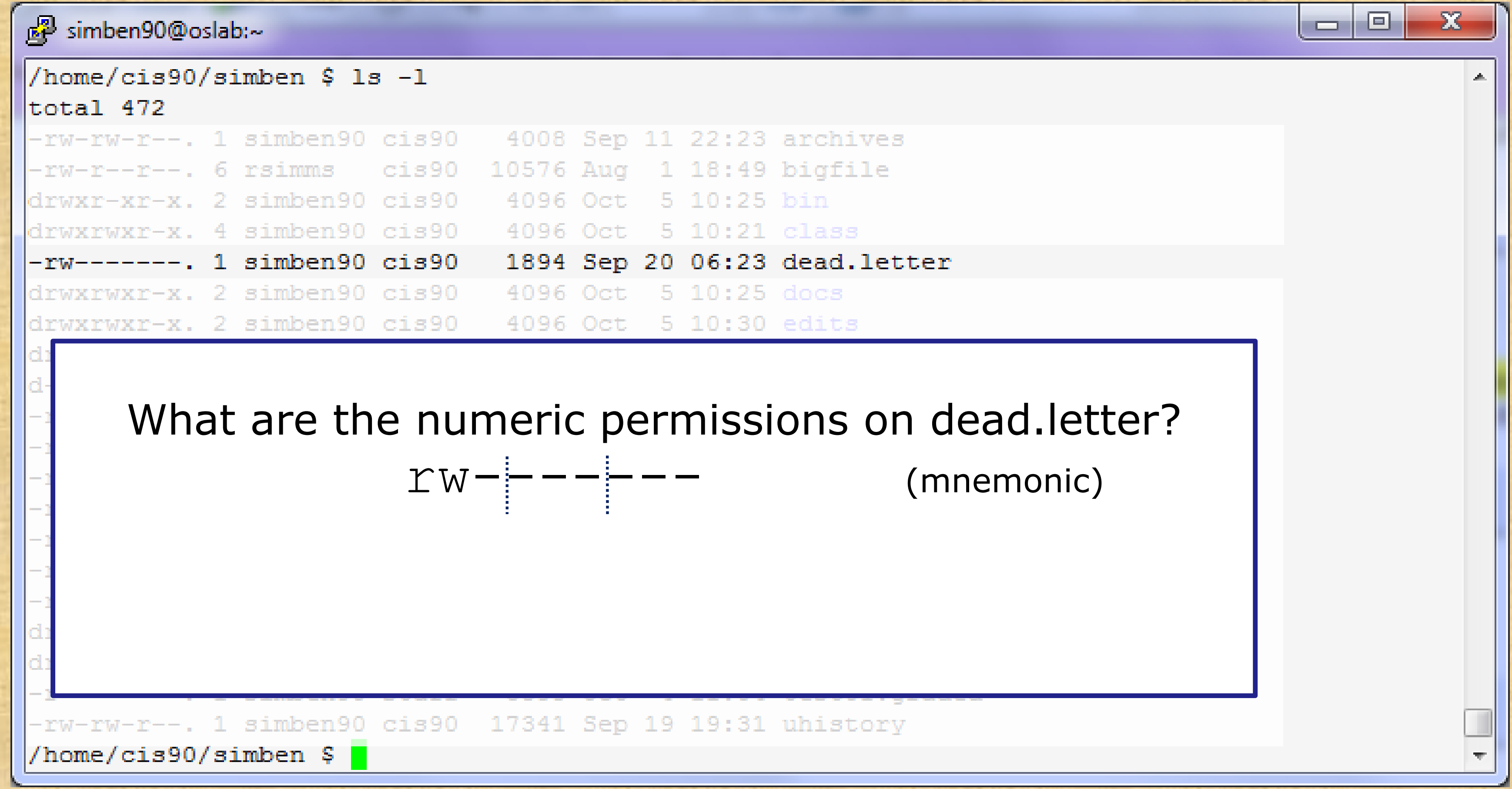
What are the numeric permissions on class?

```
rwx rwx r-x     (mnemonic)
111 111 101     (binary)
 7   7   5      (numeric)
```

class directory permissions are 775

Example 2

Converting mnemonic permissions to numeric



simben90@oslab:~

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

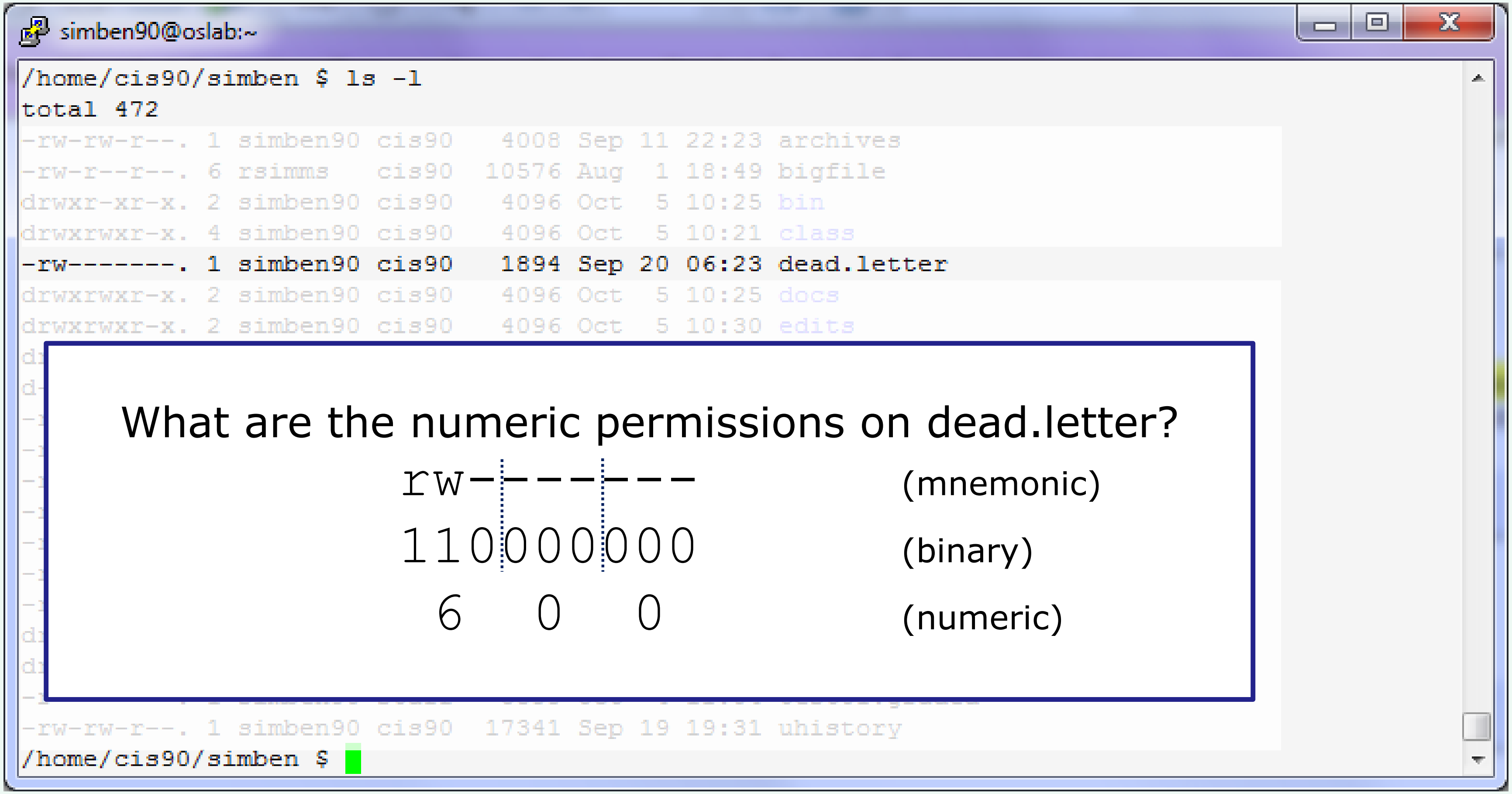
What are the numeric permissions on dead.letter?

rw- --- --- (mnemonic)

Put your answer in the chat window

Example 2

Converting mnemonic permissions to numeric



```
/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
-rw-rw-r--. 1 simben90 cis90  17341 Sep 19 19:31 uhistory
/home/cis90/simben $
```

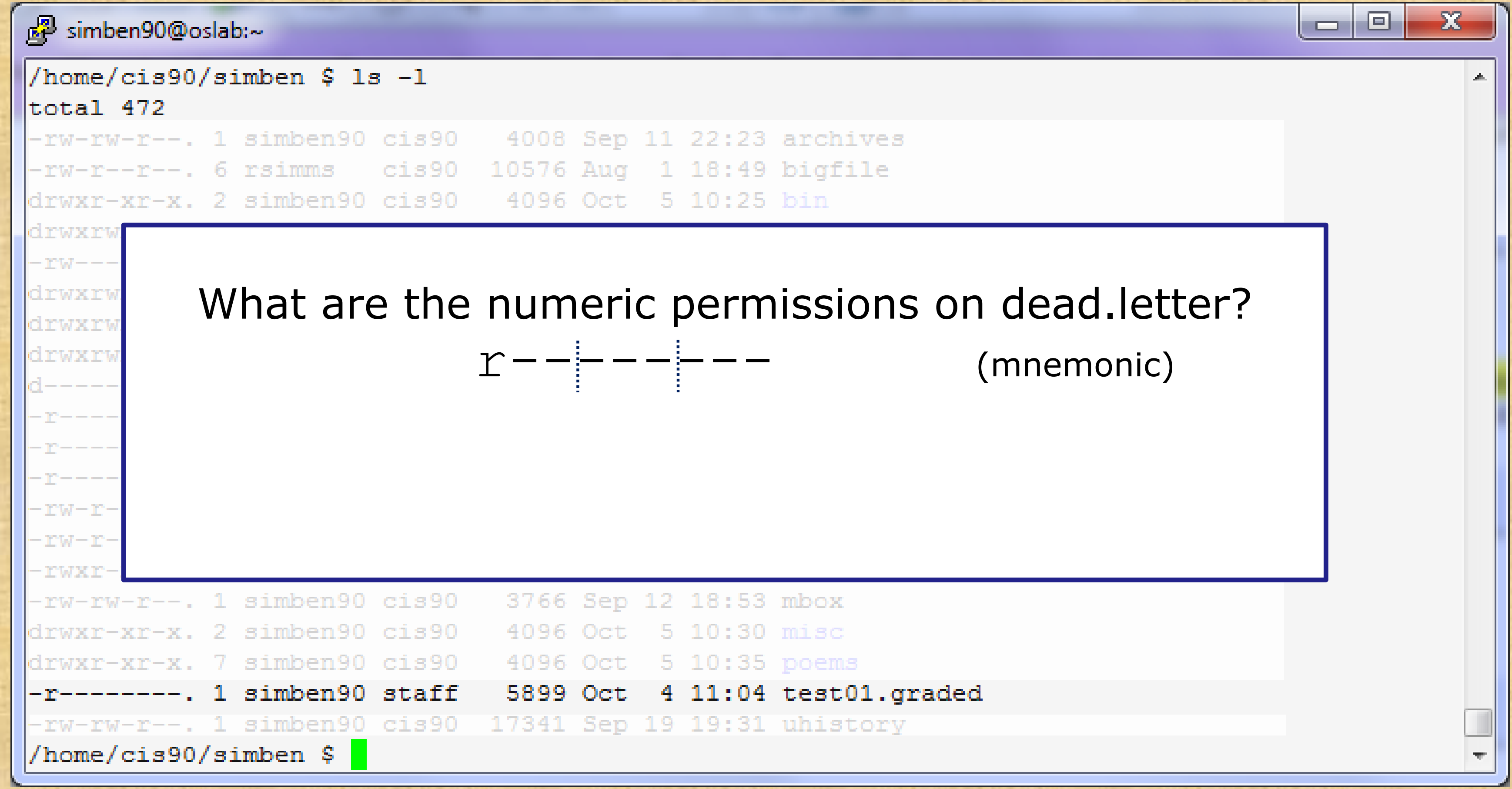
What are the numeric permissions on dead.letter?

rw- --- ---	(mnemonic)
110 000 000	(binary)
6 0 0	(numeric)

dead.letter file permissions are 600

Example 3

Converting mnemonic permissions to numeric



```
/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
drwxrw
-rw---
drwxrw
drwxrw
drwxrw
d-----
-r----
-r----
-r----
-rw-r-
-rw-r-
-rwxr-
-rw-rw-r--. 1 simben90 cis90   3766 Sep 12 18:53 mbox
drwxr-xr-x. 2 simben90 cis90   4096 Oct  5 10:30 misc
drwxr-xr-x. 7 simben90 cis90   4096 Oct  5 10:35 poems
-r--------. 1 simben90 staff   5899 Oct  4 11:04 test01.graded
-rw-rw-r--. 1 simben90 cis90  17341 Sep 19 19:31 uhistory
/home/cis90/simben $
```

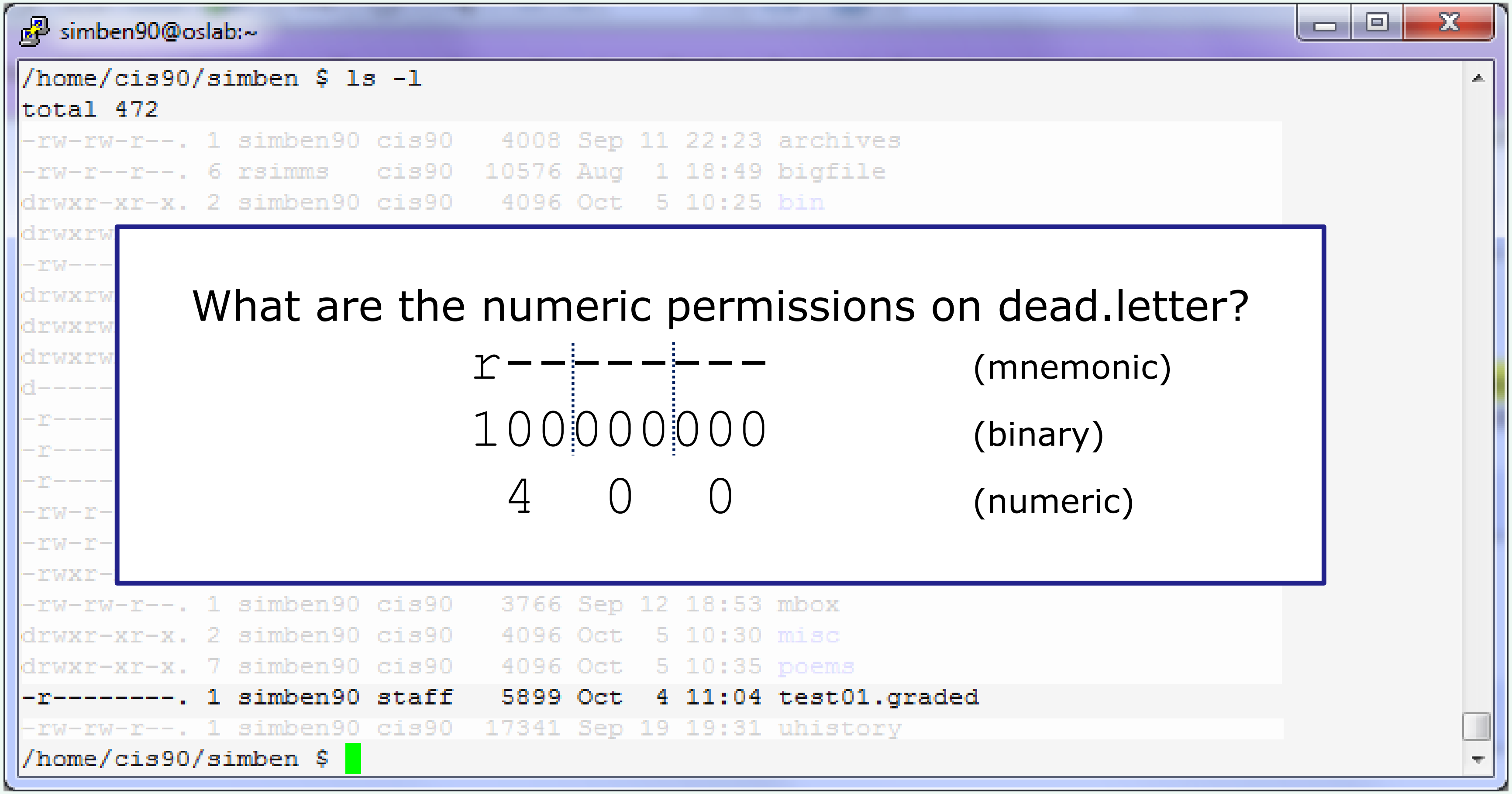
What are the numeric permissions on dead.letter?

`r--|---|---`   (mnemonic)

Put your answer in the chat window

Example 3

Converting mnemonic permissions to numeric



```
/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
drwxrw
-rw---
drwxrw
drwxrw
drwxrw
d-----
-r----
-r----
-r----
-rw-r-
-rw-r-
-rwxr-
-rw-rw-r--. 1 simben90 cis90   3766 Sep 12 18:53 mbox
drwxr-xr-x. 2 simben90 cis90   4096 Oct  5 10:30 misc
drwxr-xr-x. 7 simben90 cis90   4096 Oct  5 10:35 poems
-r--------. 1 simben90 staff   5899 Oct  4 11:04 test01.graded
-rw-rw-r--. 1 simben90 cis90  17341 Sep 19 19:31 uhistory
/home/cis90/simben $
```

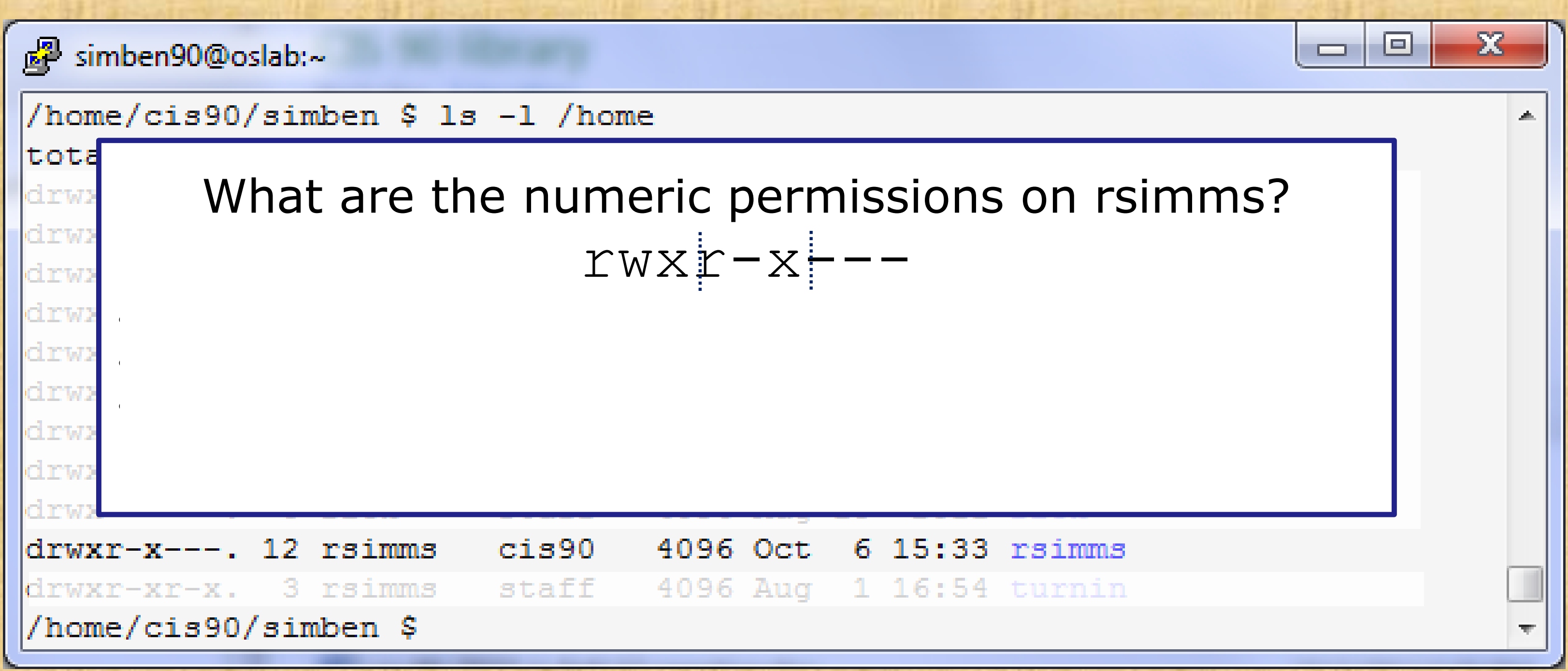
What are the numeric permissions on dead.letter?

```
r--|---|---      (mnemonic)
100|000|000      (binary)
 4    0   0      (numeric)
```

test01.graded permissions are 400

Example 4

Converting mnemonic permissions to numeric



```
/home/cis90/simben $ ls -l /home
tota
drwx
drwx
drwx
drwx
drwx
drwx
drwx
drwx
drwx
drwxr-x---. 12 rsimms    cis90    4096 Oct  6 15:33 rsimms
drwxr-xr-x.  3 rsimms    staff    4096 Aug  1 16:54 turnin
/home/cis90/simben $
```

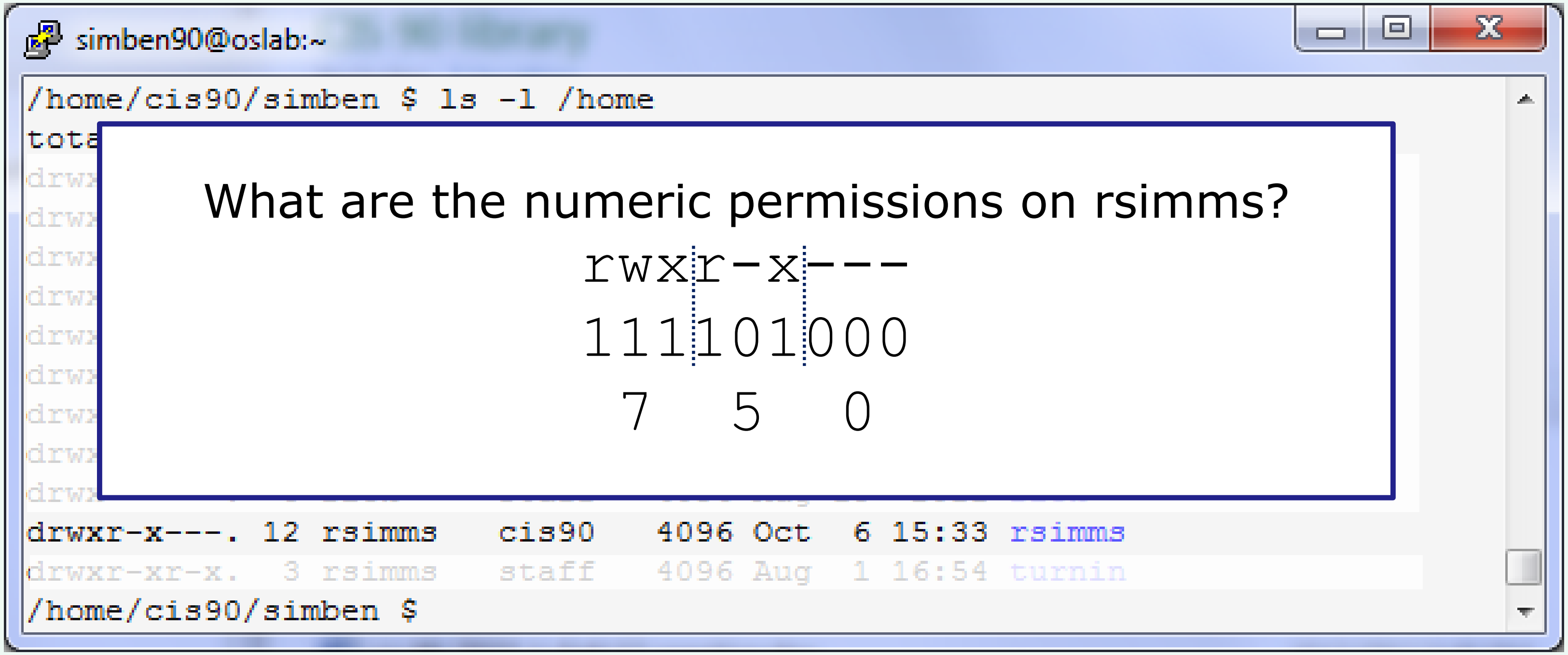
What are the numeric permissions on rsimms?

```
rwx r-x ---
```

Put your answer in the chat window

Example 4

Converting mnemonic permissions to numeric



```
/home/cis90/simben $ ls -l /home
tota
drwx
drwx
drwx
drwx
drwx
drwx
drwx
drwx
drwx
drwxr-x---. 12 rsimms    cis90    4096 Oct  6 15:33 rsimms
drwxr-xr-x.  3 rsimms    staff    4096 Aug  1 16:54 turnin
/home/cis90/simben $
```

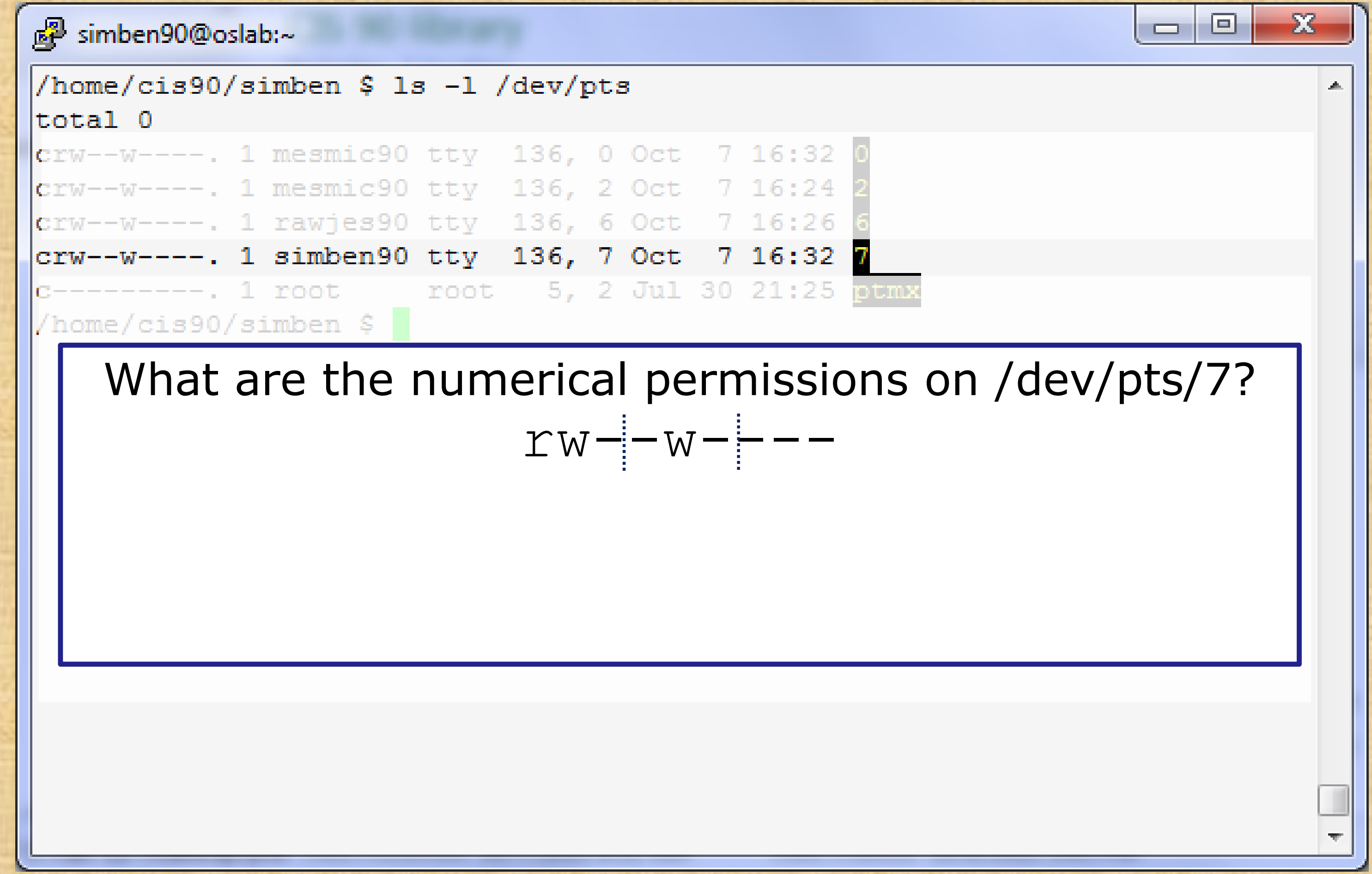
What are the numeric permissions on rsimms?

```
rwx|r-x|---
111|101|000
 7   5   0
```

/home/rsimms permissions are 750

Example 5

Converting mnemonic permissions to numeric



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

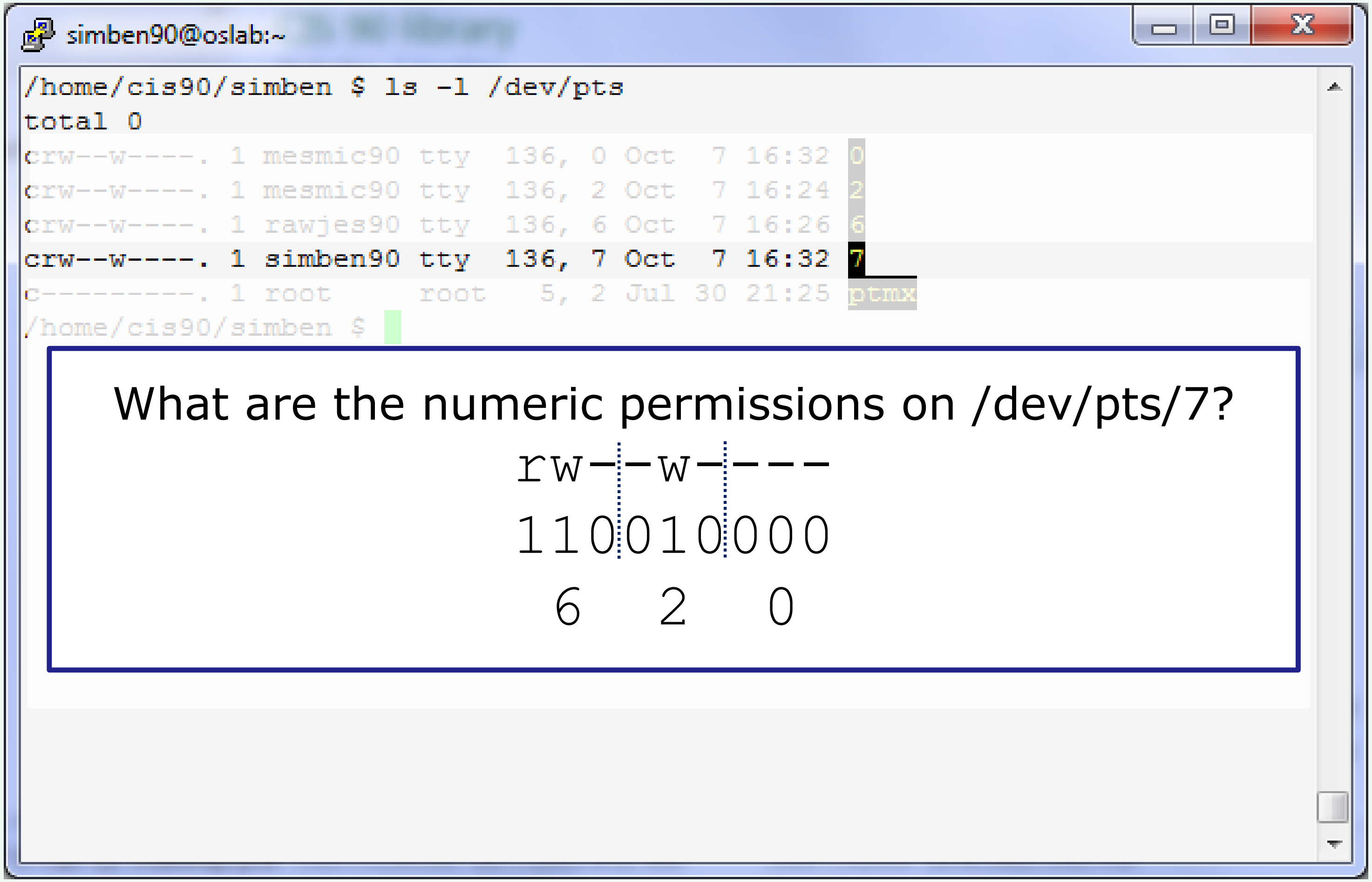
What are the numerical permissions on /dev/pts/7?

rw-|-w-|---

Put your answer in the chat window

Example 5

Converting mnemonic permissions to numeric



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

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

```
rw- -w- ---
110 010 000
 6   2   0
```

/dev/pts/7 permissions are 620

More Practice

supplemental

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

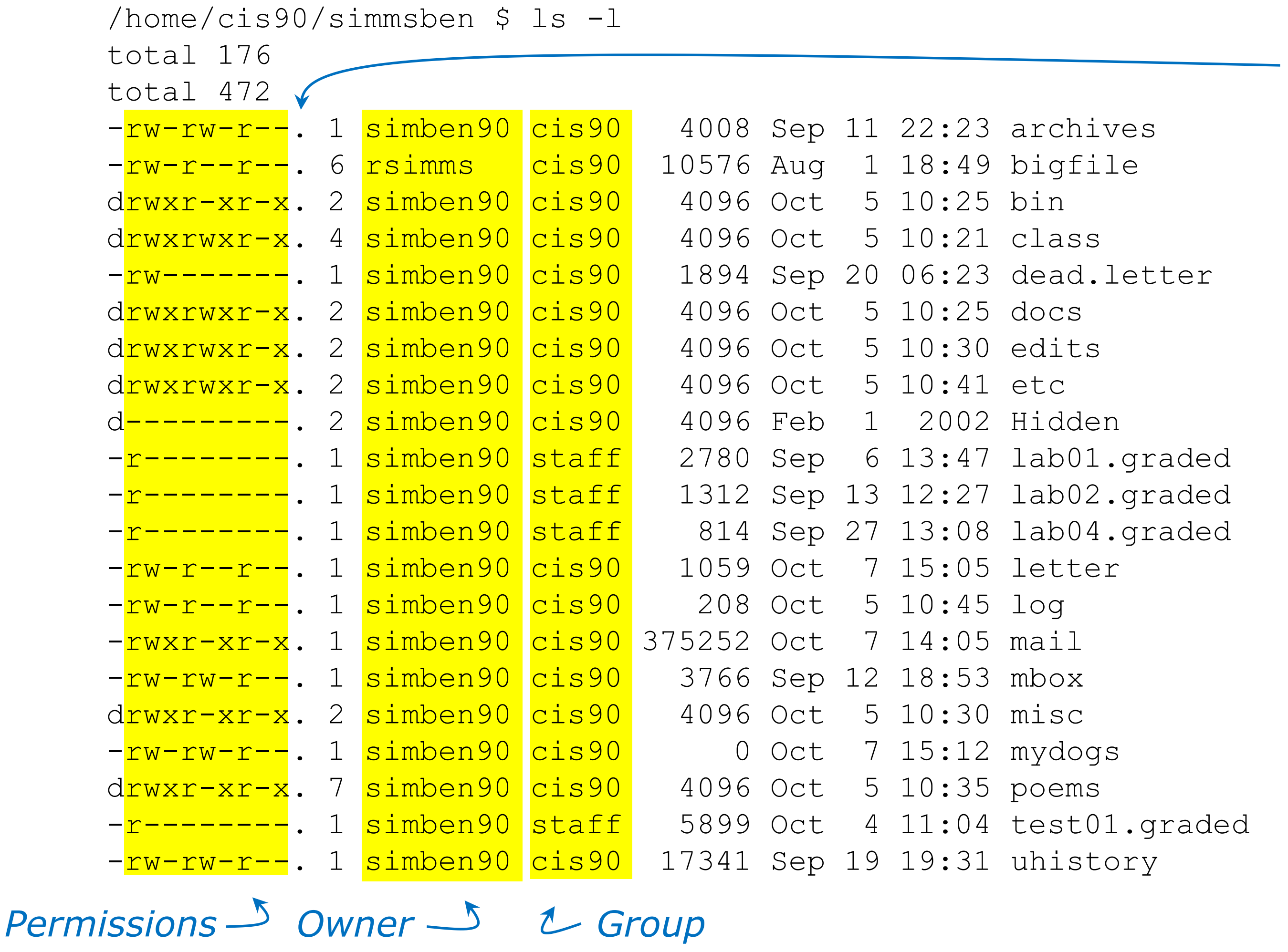
More Lesson 7 commands for your toolbox

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

NEW **stat** – file "status" which displays additional inode information and more

File Permissions

Relevant fields from the inode



```
/home/cis90/simmsben $ ls -l
total 176
total 472
-rw-rw-r--. 1 simben90 cis90   4008 Sep 11 22:23 archives
-rw-r--r--. 6 rsimms   cis90  10576 Aug  1 18:49 bigfile
drwxr-xr-x. 2 simben90 cis90   4096 Oct  5 10:25 bin
drwxrwxr-x. 4 simben90 cis90   4096 Oct  5 10:21 class
-rw-------. 1 simben90 cis90   1894 Sep 20 06:23 dead.letter
drwxrwxr-x. 2 simben90 cis90   4096 Oct  5 10:25 docs
drwxrwxr-x. 2 simben90 cis90   4096 Oct  5 10:30 edits
drwxrwxr-x. 2 simben90 cis90   4096 Oct  5 10:41 etc
d---------. 2 simben90 cis90   4096 Feb  1  2002 Hidden
-r--------. 1 simben90 staff   2780 Sep  6 13:47 lab01.graded
-r--------. 1 simben90 staff   1312 Sep 13 12:27 lab02.graded
-r--------. 1 simben90 staff    814 Sep 27 13:08 lab04.graded
-rw-r--r--. 1 simben90 cis90   1059 Oct  7 15:05 letter
-rw-r--r--. 1 simben90 cis90    208 Oct  5 10:45 log
-rwxr-xr-x. 1 simben90 cis90 375252 Oct  7 14:05 mail
-rw-rw-r--. 1 simben90 cis90   3766 Sep 12 18:53 mbox
drwxr-xr-x. 2 simben90 cis90   4096 Oct  5 10:30 misc
-rw-rw-r--. 1 simben90 cis90      0 Oct  7 15:12 mydogs
drwxr-xr-x. 7 simben90 cis90   4096 Oct  5 10:35 poems
-r--------. 1 simben90 staff   5899 Oct  4 11:04 test01.graded
-rw-rw-r--. 1 simben90 cis90  17341 Sep 19 19:31 uhistory
```

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

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

File Permissions

Relevant fields from the inode

```
/home/cis90/simmsben $ ls -l
total 176
total 472
-rw-rw-r--. 1 simben90 cis90   4008 Sep 11 22:23 archives
-rw-r--r--. 6 rsimms   cis90  10576 Aug  1 18:49 bigfile
drwxr-xr-x. 2 simben90 cis90   4096 Oct  5 10:25 bin
drwxrwxr-x. 4 simben90 cis90   4096 Oct  5 10:21 class
-rw-------. 1 simben90 cis90   1894 Sep 20 06:23 dead.letter
drwxrwxr-x. 2 simben90 cis90   4096 Oct  5 10:25 docs
drwxrwxr-x. 2 simben90 cis90   4096 Oct  5 10:30 edits
drwxrwxr-x. 2 simben90 cis90   4096 Oct  5 10:41 etc
d---------. 2 simben90 cis90   4096 Feb  1  2002 Hidden
-r--------. 1 simben90 staff   2780 Sep  6 13:47 lab01.graded
-r--------. 1 simben90 staff   1312 Sep 13 12:27 lab02.graded
-r--------. 1 simben90 staff    814 Sep 27 13:08 lab04.graded
-rw-r--r--. 1 simben90 cis90   1059 Oct  7 15:05 letter
-rw-r--r--. 1 simben90 cis90    208 Oct  5 10:45 log
-rwxr-xr-x. 1 simben90 cis90 375252 Oct  7 14:05 mail
-rw-rw-r--. 1 simben90 cis90   3766 Sep 12 18:53 mbox
drwxr-xr-x. 2 simben90 cis90   4096 Oct  5 10:30 misc
-rw-rw-r--. 1 simben90 cis90      0 Oct  7 15:12 mydogs
drwxr-xr-x. 7 simben90 cis90   4096 Oct  5 10:35 poems
-r--------. 1 simben90 staff   5899 Oct  4 11:04 test01.graded
-rw-rw-r--. 1 simben90 cis90  17341 Sep 19 19:31 uhistory
```

The owner of letter is simben90 and the group is cis90

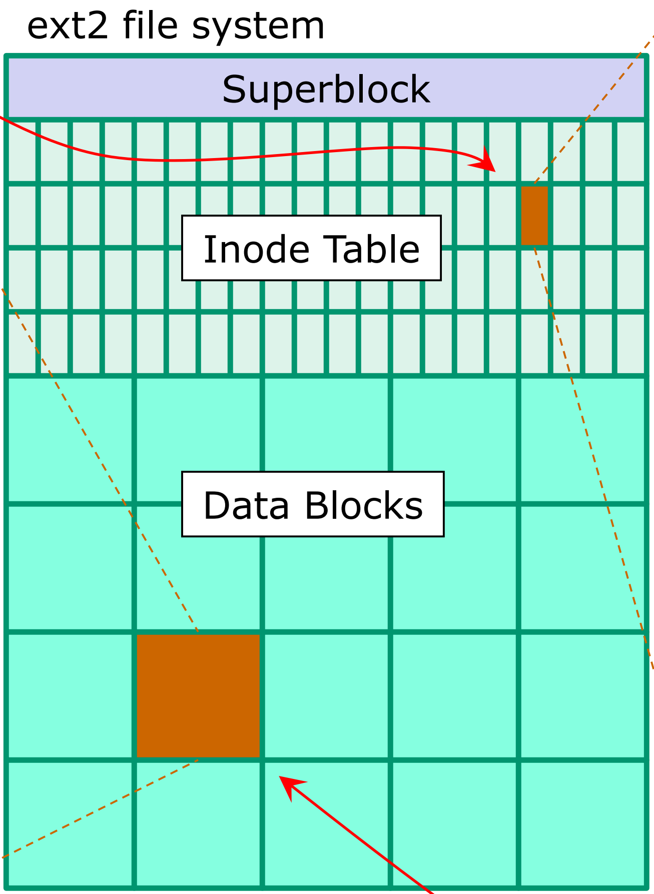
Permissions *Owner* *Group*

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

The filename is kept in the directory

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

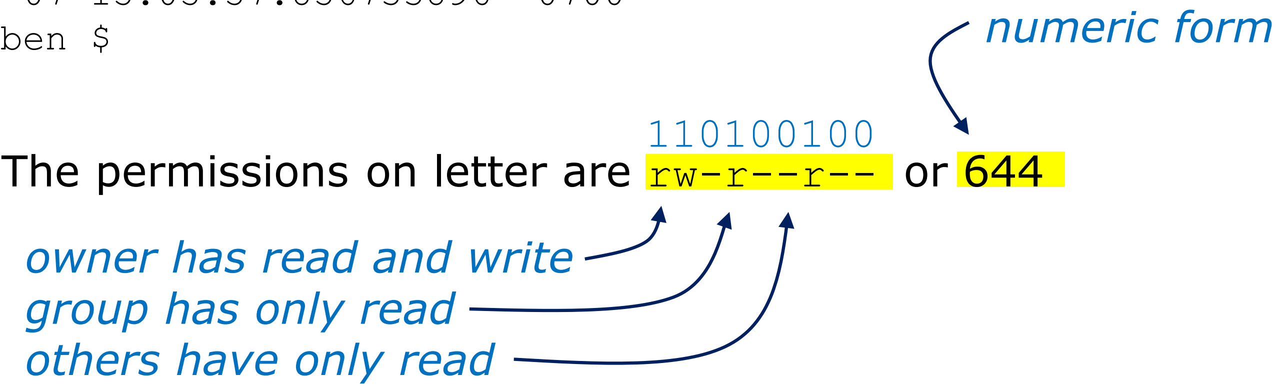
```
/home/cis90/simmsben $ ls -il letter
10574 -rw-r--r--. 1 simben90 cis90  1059 Oct  7 15:05 letter
```

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

supplemental

File Permissions

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

File Permissions

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

```
r-- r-- ---
100 100 000
 4   4   0
```

Answer: 440

Owner has read
Group has read
Others have no permissions

File Permissions

What is the mnemonic form of 755?

File Permissions

What is the mnemonic form of 755?

```
 7  5  5
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 `rwx¦rw-¦r--`?

```
111¦110¦100
 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)

chmod – using mnemonic permissions

Syntax:

chmod [u][g][o]+[r][w][x] *pathname(s)*
chmod [u][g][o]-[r][w][x] *pathname(s)*

Examples:

- `chmod +x myscript`
- `chmod g+rw share/*`
- `chmod g-r /home/cis90/test02`

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
```

remove execute from all

```
/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
```

add execute to others and group

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

remove read, write, execute from groups and others

chmod (numerical)

chmod – using numeric permissions

Syntax:

chmod *nnn pathname(s)*

Examples:

- **`chmod 750 check5 check6`**
- **`chmod 644 poems/*/*`**
- **`chmod 000 Hidden`**

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   rw to owner and group, r only to others
/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  All permissions to everyone
/home/cis90/milhom $ ls -l myfile
-rwxrwxrwx. 1 milhom90 cis90 0 Oct  9 10:23 myfile

/home/cis90/milhom $ chmod 640 myfile  rw to owner, r to group, nada to others
/home/cis90/milhom $ ls -l myfile
-rw-r-----. 1 milhom90 cis90 0 Oct  9 10:23 myfile

/home/cis90/milhom $ chmod 000 myfile  No permissions for anyone
/home/cis90/milhom $ ls -l myfile
----------. 1 milhom90 cis90 0 Oct  9 10:23 myfile

/home/cis90/milhom $ chmod 644 myfile  rw to owner, r only to group and others
/home/cis90/milhom $ ls -l myfile
-rw-r--r--. 1 milhom90 cis90 0 Oct  9 10:23 myfile
```

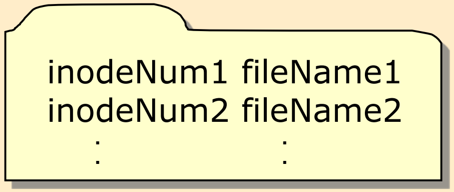
*More examples using the numeric mode of the **chmod** command*

File Permissions in action

supplemental

File Permissions

Commands that use file permissions



inodeNum1 fileName1
inodeNum2 fileName2
: :

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

read permission is required whenever file contents must be accessed

Activity

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:

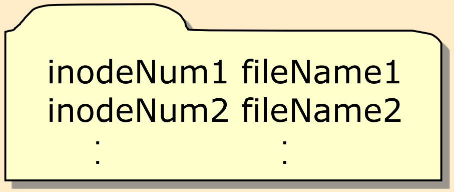
```
/home/cis90/simmsben/Directory3 $ echo Blah Blah Blah > myfile
/home/cis90/simmsben/Directory3 $ cat myfile
Blah Blah Blah
/home/cis90/simmsben/Directory3 $ chmod u-r myfile
/home/cis90/simmsben/Directory3 $ ls -l myfile
--w-r--r-- 1 simmsben cis90 15 Oct 13 08:50 myfile
/home/cis90/simmsben/Directory3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

removes read permission for user owning the file

How can you fix this?
Put your answer in the chat window.

File Permissions

Commands that use file permissions



inodeNum1 fileName1
inodeNum2 fileName2
: :

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

write permission is required whenever file contents are written

Activity

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 :

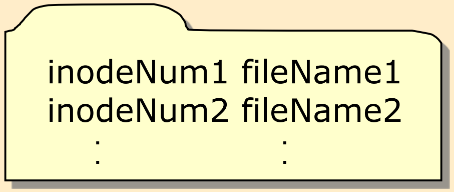
```
    /home/cis90/simmsben/Directory3 $ echo Blah Blah Blah > myfile
    /home/cis90/simmsben/Directory3 $ cat myfile
    Blah Blah Blah
    /home/cis90/simmsben/Directory3 $ chmod 444 myfile
    /home/cis90/simmsben/Directory3 $ ls -l myfile
    -r--r--r-- 1 simmsben cis90 15 Oct 13 09:02 myfile
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

write permission removed

How can you fix this?
Put your answer in the chat window.

File Permissions

Commands that use file permissions



inodeNum1 fileName1
inodeNum2 fileName2
: :

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

execute permission is required to load and run a file

Activity

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:

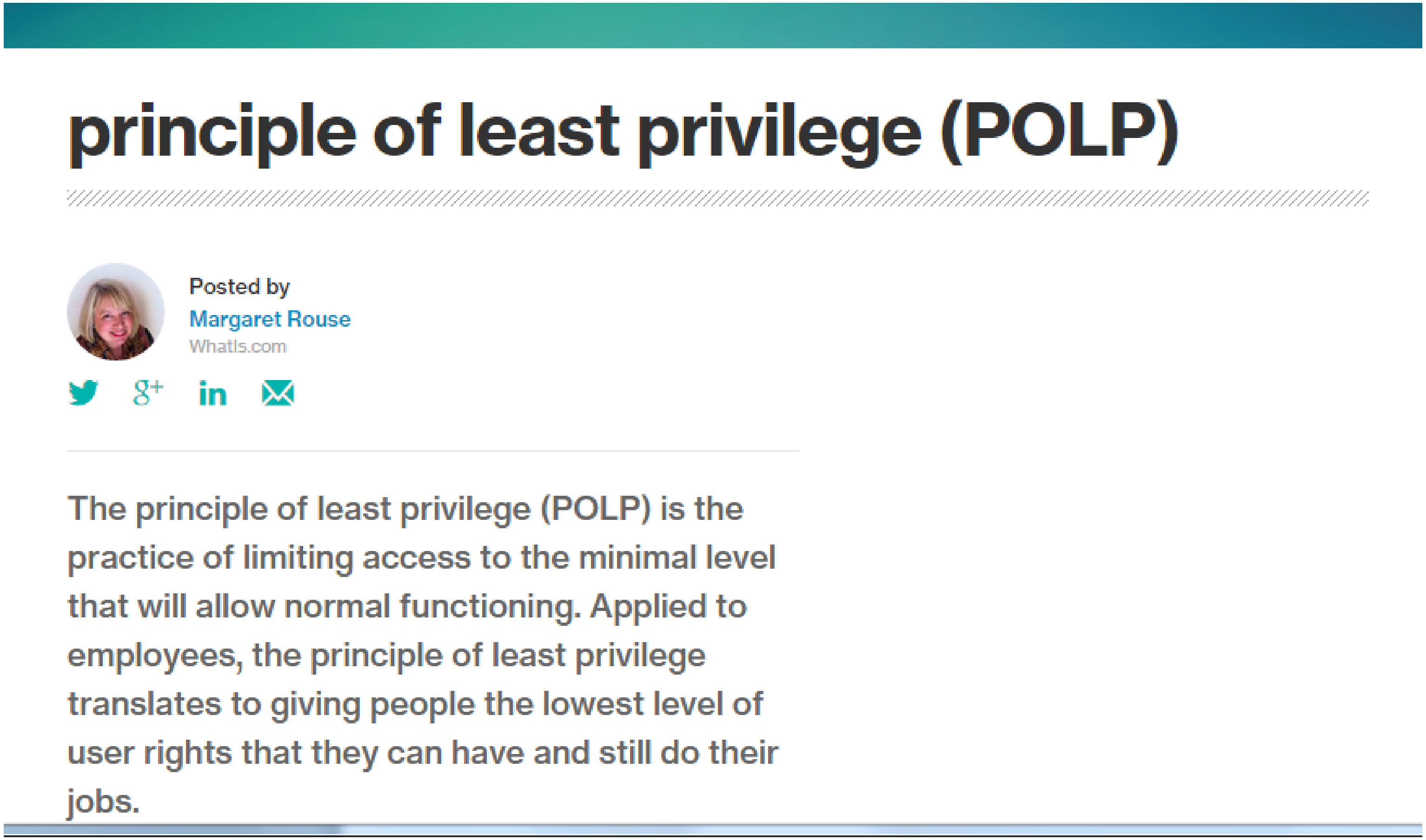
```
/home/cis90/simmsben/Directory3 $ echo 'banner $LOGNAME is cool' > myfile
/home/cis90/simmsben/Directory3 $ cat myfile
banner $LOGNAME is cool
/home/cis90/simmsben/Directory3 $ myfile
-bash: ./myfile: Permission denied
/home/cis90/simmsben/Directory3 $ chmod +x myfile
/home/cis90/simmsben/Directory3 $ 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 enter **myfile**?*
Put your answer in the chat window.

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

What permissions do new files get?

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
```

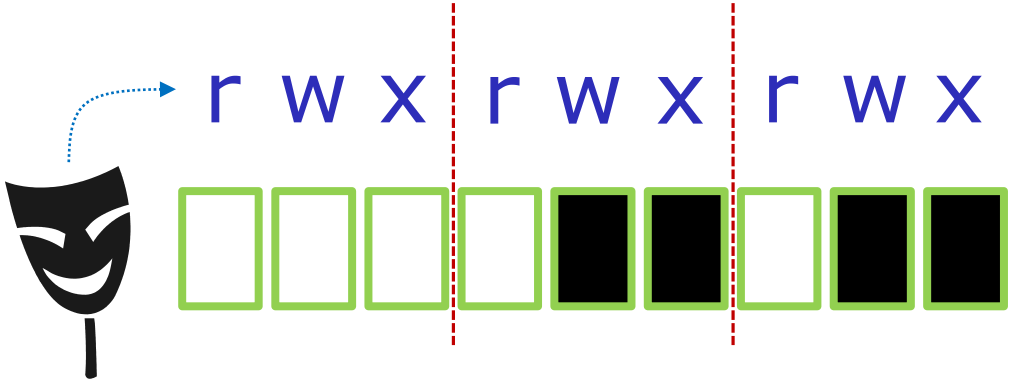
Case 1 – a new directory

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?



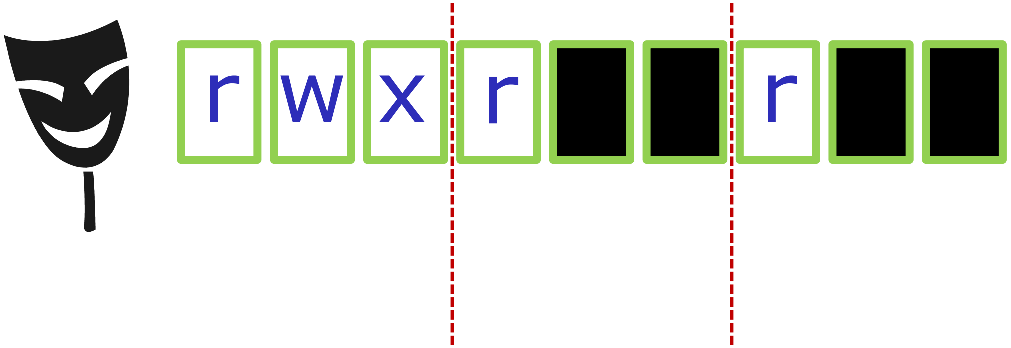
initial permissions = 777 (new directory)

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
```

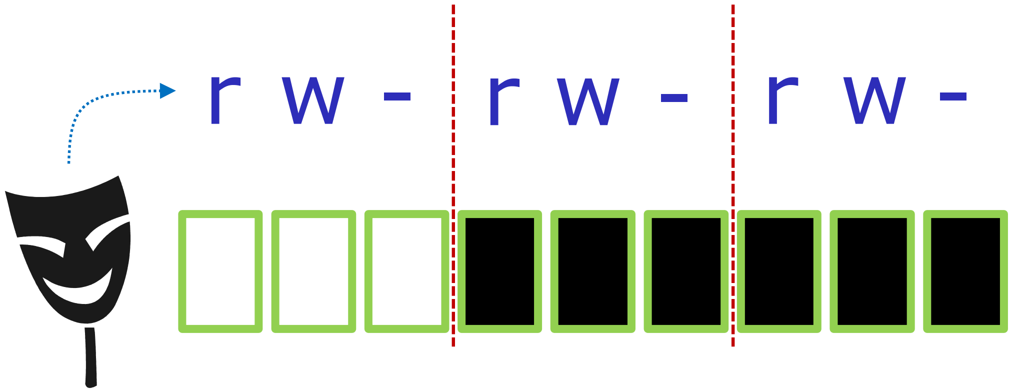
Case 2 – new file

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?



r w - r w - r w -

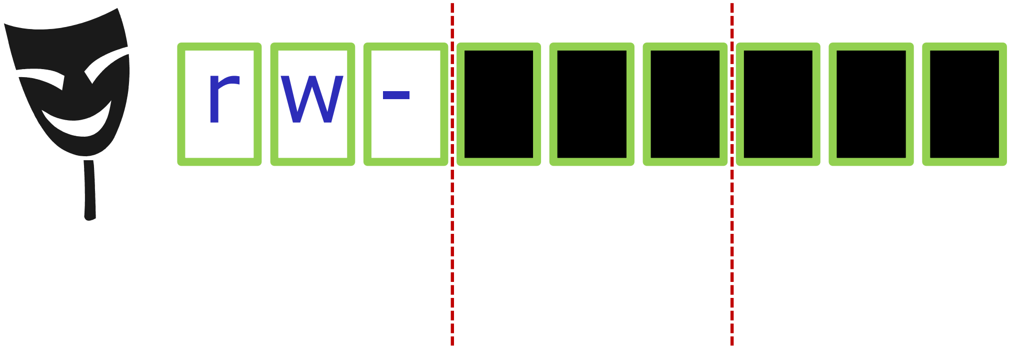
initial permissions = 666 (new file)

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:

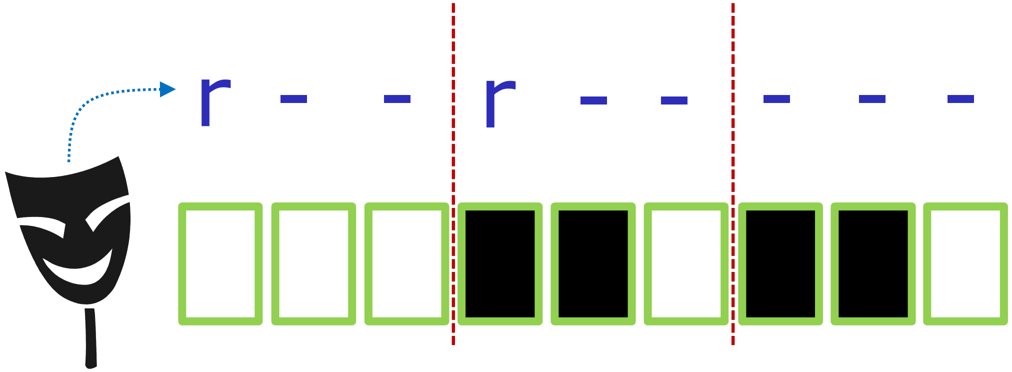
```
cp cinderella cinderella.bak
```

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
```



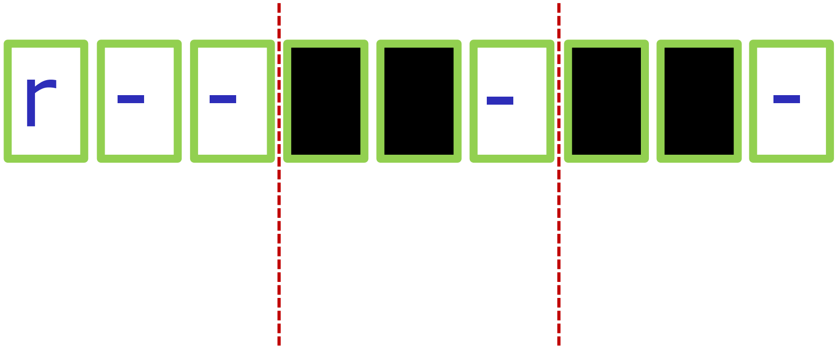
initial permissions = 440
(source file permissions)

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`



r - - ■ ■ - ■ ■ -

resulting permissions = 400
(new directory)

Answer: 400

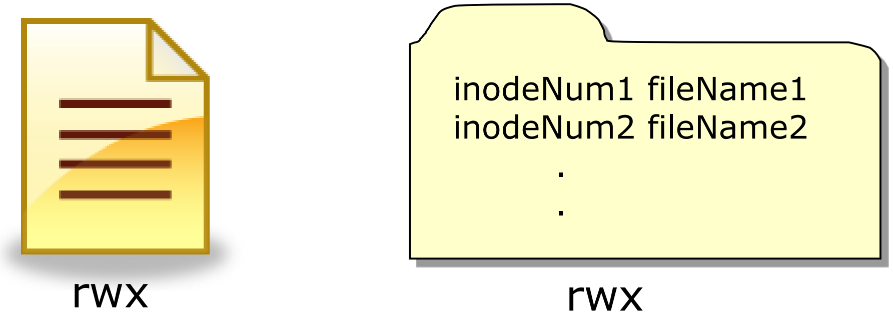
Prove it to yourself on Opus-II as shown here

```
/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
```

Directory Permissions

The effect of READ permission on directories

Directory Read Permission



rwx

inodeNum1 fileName1
inodeNum2 fileName2
.
.

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

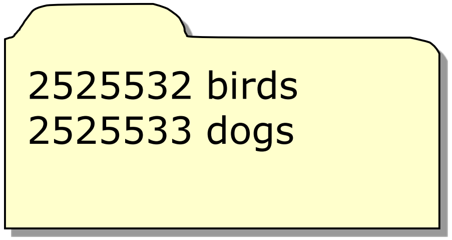
Removing directory READ permission

- 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
```


2525532 birds
2525533 dogs

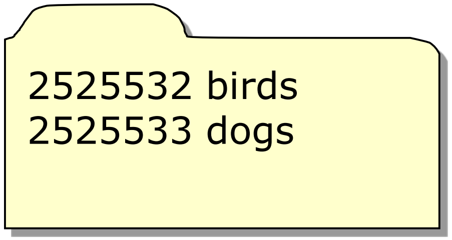
examples

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
```



2525532 birds
2525533 dogs

examples

Can we still list the directory contents?

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

NO!

Directory Read Permission

Start with normal directory permissions:

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

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

2525532 birds
2525533 dogs

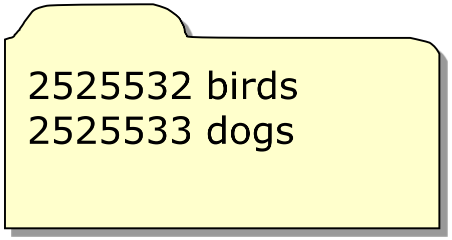
examples

*If read permission is removed from the directory … can we still **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
```



2525532 birds
2525533 dogs

examples

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

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

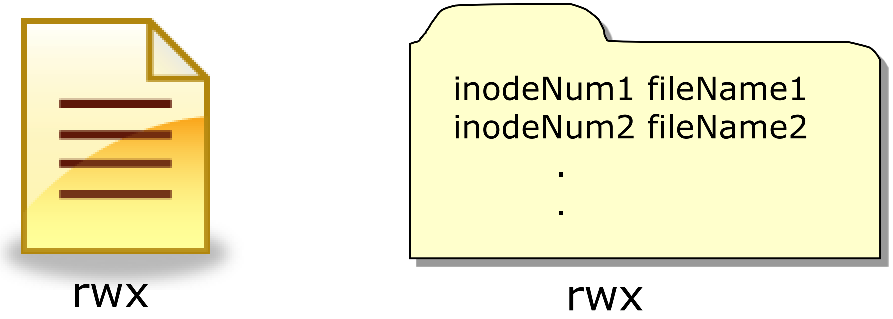
Yes, but ...

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

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

The effect of WRITE permission on directories

Directory Write Permission



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

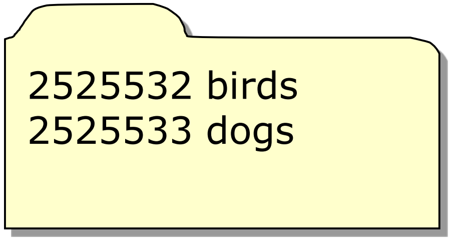
Removing directory WRITE permission

- 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
```



2525532 birds
2525533 dogs

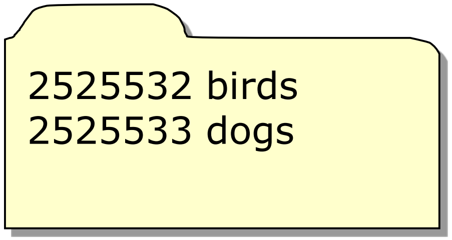
examples

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/
```



2525532 birds
2525533 dogs

examples

Can we remove files from the directory?

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

NO!

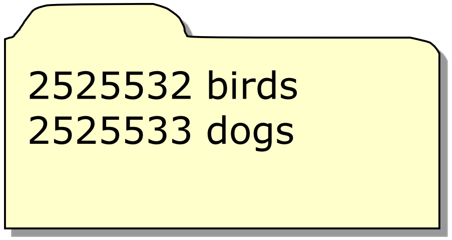
```
/home/cis90/roddyduk $ cd examples/
/home/cis90/roddyduk/examples $ ls
birds  dogs
```

Yet we can still cd into and list directory contents

Directory Write Permission

Start with normal directory permissions:

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

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


2525532 birds
2525533 dogs

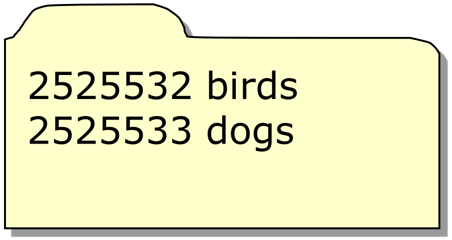
examples

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

Directory Write Permission

Remove write permission and confirm it's gone

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



2525532 birds
2525533 dogs

examples

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

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

NO!

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

Directory Write Permission

Start with normal directory permissions:

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

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

2525532 birds
2525533 dogs

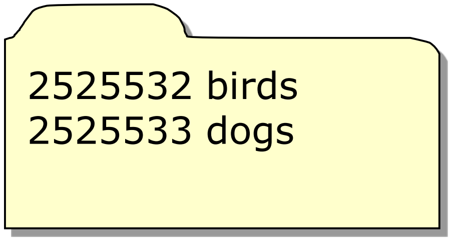
examples

If write permission is removed from the directory … can we 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/
```



2525532 birds
2525533 dogs

examples

Can we move files out of the directory?

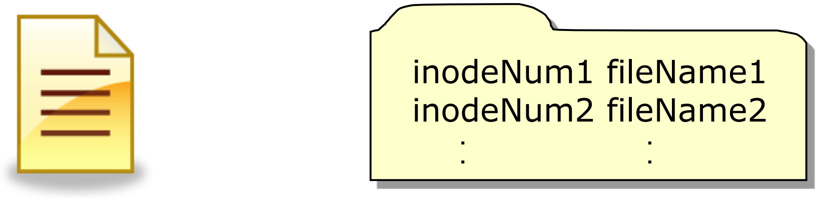
```
/home/cis90/roddyduk $ mv examples/birds .
mv: cannot move `examples/birds' to `./birds': Permission denied
```

NO!

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

Removing files with and without write permission

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 without 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:

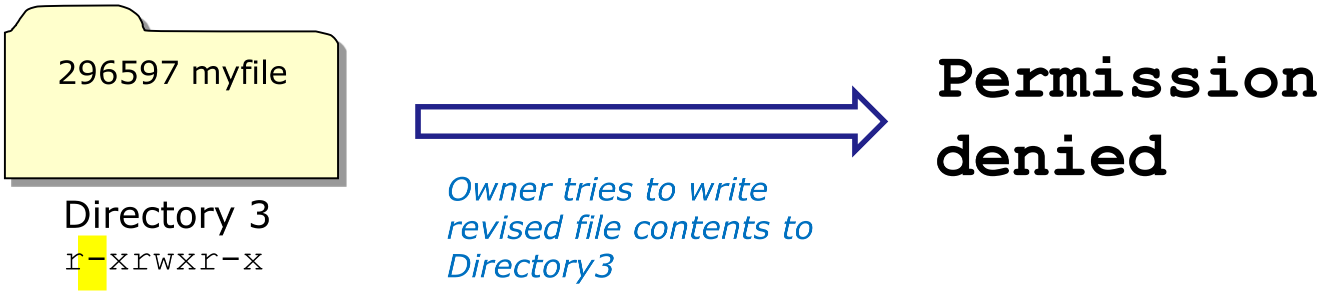
Removing a file requires write permission on the directory containing the file.

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



296597 myfile

Directory 3

r-xrwxr-x

Owner tries to write revised file contents to Directory3

Permission denied

Directory with write permission

example 2

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

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

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

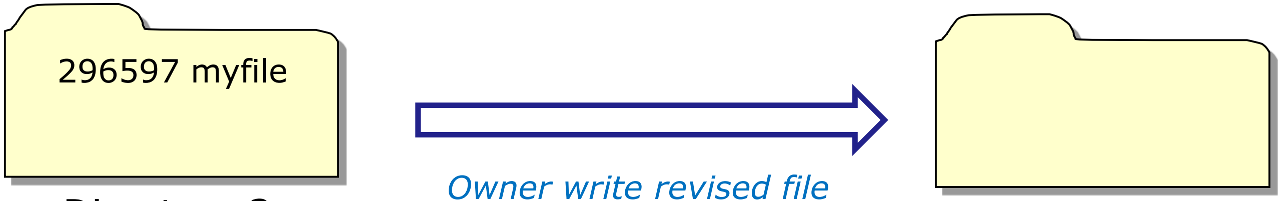
Now Benji has no permissions on this file

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.



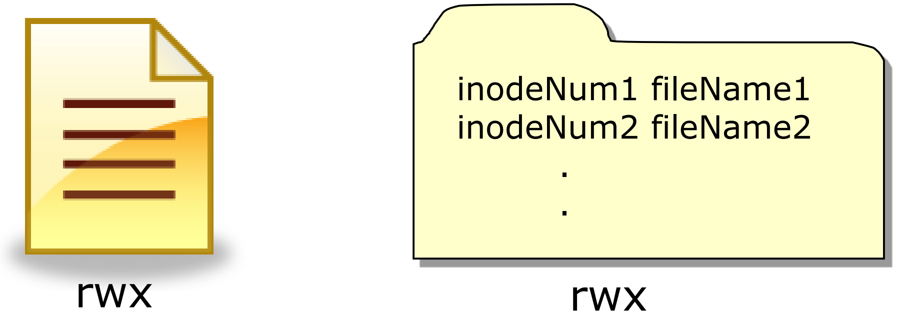
Directory 3
rwxr-xr-x

Owner write revised file contents to Directory3

Directory 3

The effect of EXECUTE permission on directories

Directory Execute Permission



inodeNum1 fileName1
inodeNum2 fileName2
.
.

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

Removing 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
```

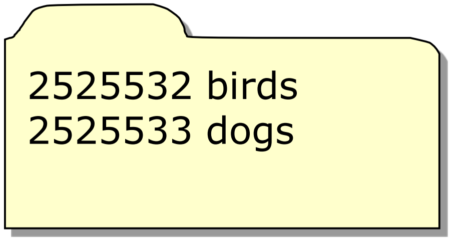
2525532 birds
2525533 dogs
examples

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/
```


2525532 birds
2525533 dogs

examples

Can we change into (cd) the directory?

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

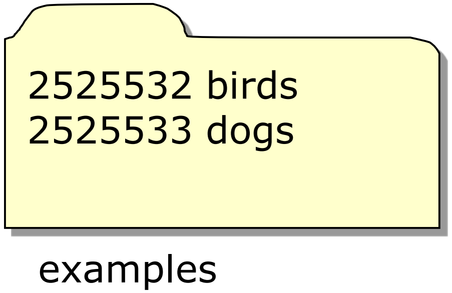
NO!

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

Directory Execute Permission

Start with normal directory permissions:

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

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



2525532 birds
2525533 dogs

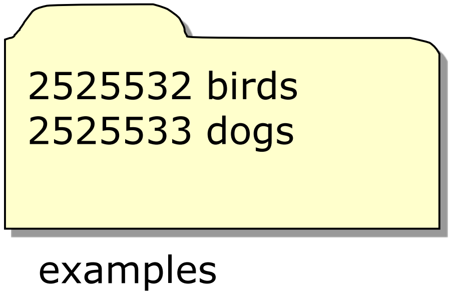
examples

If execute permission is removed from the directory … can we 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/
```


2525532 birds
2525533 dogs

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
```

2525532 birds
2525533 dogs

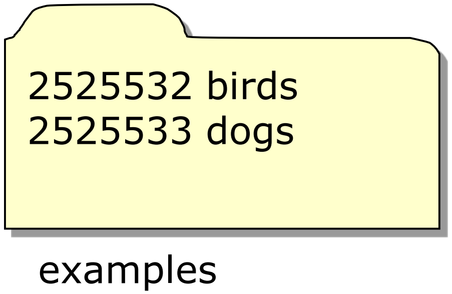
examples

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

Directory Execute Permission

Remove execute permission and confirm it's gone

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



2525532 birds
2525533 dogs

examples

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

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

Incomplete!

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

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

Assignment

CIS 90 Linux Lab Exercise

Lab 6: File Permissions

Spring 2011

Lab 6: File Permissions

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

Forum

Browse to: http://opus.cabrillo.edu/forum/viewforum.php?f=46

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

Procedure

Log on to Opus so that you have a command line shell at your service. Be sure you are in your home directory to start this lab. Using the chgrp, and chmod commands, you will modify the permissions on files and subdirectories in your home directory.

Part I - Making Directories

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

Lab 6

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

Be sure and finish Lab 5 before starting Lab 6!

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

<u>From the /home/cis90 directory</u>

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*
```