Lesson Module Checklist

- Slides
- WB

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

- Lab 7 tested
- Lab X1 tested

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

Introductions and Credits

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

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

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

Cabrillo College est. 1959

CIS 90 - Lesson 8

Instructor: **Rich Simms**
Dial-in: **888-450-4821**
Passcode: **761867**

Aaron, Andrew B., Andrew C., Arthur, Brian, Cory

Daniel, David G., Dave L., David P., Debbie, Edtson, Fidel, Humberto, Hunter, Imara

Ismael, Jessica, Joseph, Juliana, Lucie, Marc, Marty, Matt, Michael, Rochelle

Shawn, Tabitha, Taylor, Tyler, Will, Zachary, Zsolt

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

Quiz

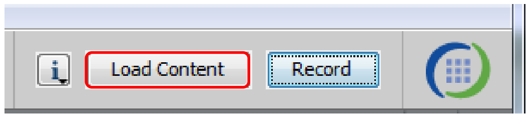
Please answer these questions **in the order** shown:

See electronic white board

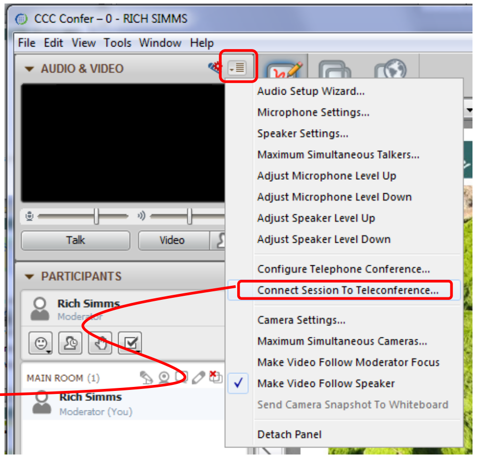
email answers to: `risimms@cabrillo.edu`

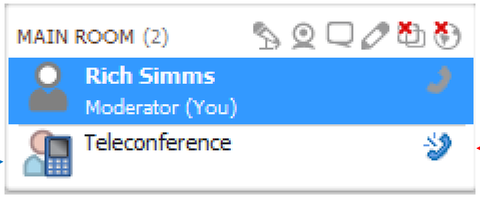
(answers must be emailed within the first few minutes of class for credit)

[ ] Preload White Board with *cis*lesson??*-WB*



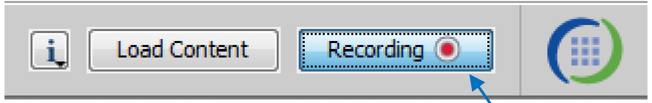
[ ] Connect session to Teleconference


CCC Confer – 0 - RICH SIMMS
File Edit View Tools Window Help
AUDIO & VIDEO
Audio Setup Wizard...
Microphone Settings...
Speaker Settings...
Maximum Simultaneous Talkers...
Adjust Microphone Level Up
Adjust Microphone Level Down
Adjust Speaker Level Up
Adjust Speaker Level Down
Configure Telephone Conference...
Connect Session To Teleconference...
Camera Settings...
Maximum Simultaneous Cameras...
Make Video Follow Moderator Focus
Make Video Follow Speaker
Send Camera Snapshot To Whiteboard
Detach Panel
Talk
Video
PARTICIPANTS
Rich Simms
MAIN ROOM (1)
Rich Simms
Moderator (You)



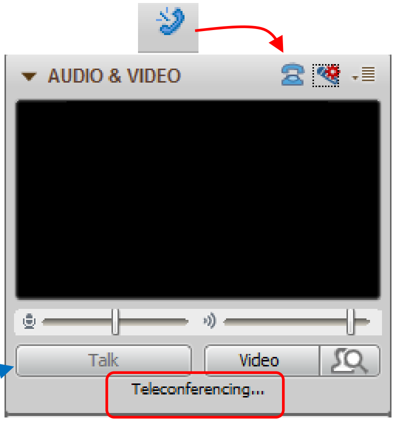
Session now connected to teleconference

[ ] Is recording on?



Red dot means recording

[ ] Use teleconferencing, not mic

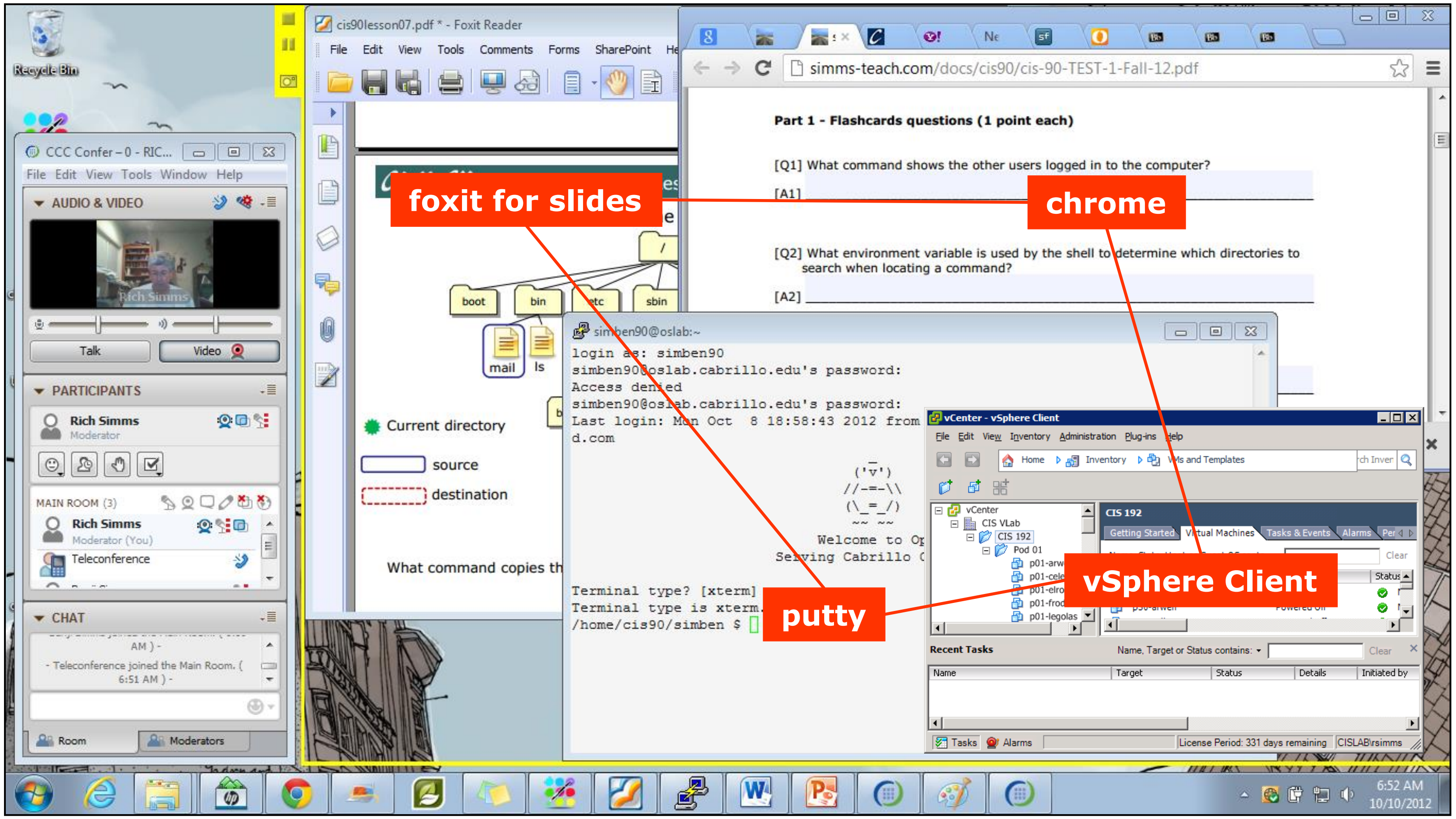


Should be greyed out

CIS 90 - Lesson 8

[ ] Video (webcam) optional

[ ] layout and share apps



- Teleconference joined the Main Room. (6:51 AM) -

Current directory

source

destination

What command copies th

Part 1 - Flashcards questions (1 point each)

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

[A1] ______________________________

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

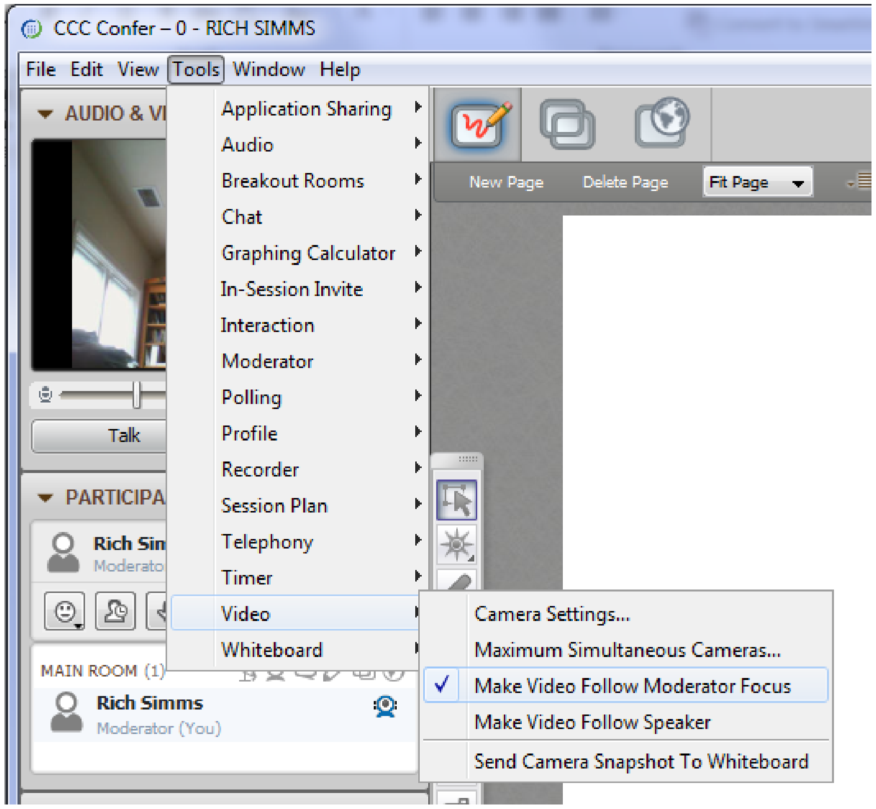
[A2] ______________________________

```
simben90@oslab:~
login as: simben90
simben90@oslab.cabrillo.edu's password:
Access denied
simben90@oslab.cabrillo.edu's password:
Last login: Mon Oct  8 18:58:43 2012 from
d.com

                                   ('v')
                                  //-=-\\
                                  (\_=_/)
                                   ~~ ~~
                                Welcome to Op
                             Serving Cabrillo C

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

[ ] Video (webcam) optional

[ ] Follow moderator

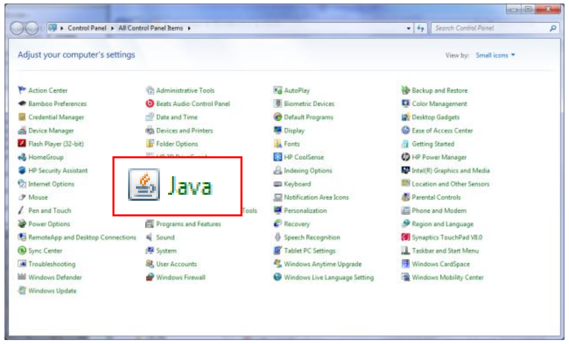
[ ] Double-click on postages stamps



Universal Fix for CCC Confer:

1) Shrink (500 MB) and delete Java cache
2) Uninstall and reinstall latest Java runtime

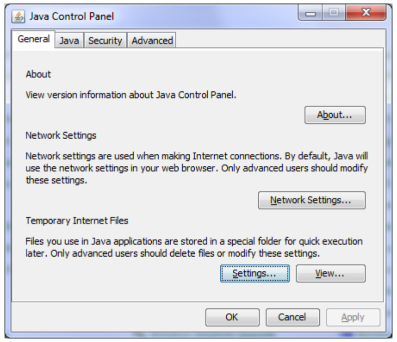
Control Panel (small icons)



Control Panel ▸ All Control Panel Items ▸
Search Control Panel
Adjust your computer's settings
View by: Small icons

Action Center	Administrative Tools	AutoPlay	Backup and Restore
Bamboo Preferences	Beats Audio Control Panel	Biometric Devices	Color Management
Credential Manager	Date and Time	Default Programs	Desktop Gadgets
Device Manager	Devices and Printers	Display	Ease of Access Center
Flash Player (32-bit)	Folder Options	Fonts	Getting Started
HomeGroup		HP CoolSense	HP Power Manager
HP Security Assistant	Java	Indexing Options	Intel(R) Graphics and Media
Internet Options		Keyboard	Location and Other Sensors
Mouse		Notification Area Icons	Parental Controls
Pen and Touch	Tools	Personalization	Phone and Modem
Power Options	Programs and Features	Recovery	Region and Language
RemoteApp and Desktop Connections	Sound	Speech Recognition	Synaptics TouchPad V8.0
Sync Center	System	Tablet PC Settings	Taskbar and Start Menu
Troubleshooting	User Accounts	Windows Anytime Upgrade	Windows CardSpace
Windows Defender	Windows Firewall	Windows Live Language Setting	Windows Mobility Center
Windows Update			

General Tab > Settings...



Java Control Panel
General | Java | Security | Advanced

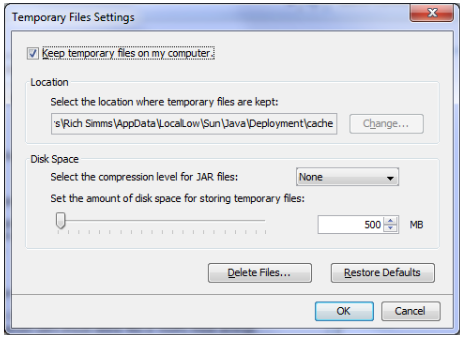
About
View version information about Java Control Panel.
About...

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

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

OK Cancel Apply

500MB cache size



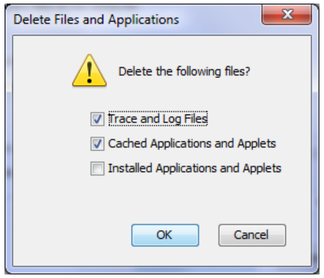
Temporary Files Settings
☑ Keep temporary files on my computer.

Location
Select the location where temporary files are kept:
s\Rich Simms\AppData\LocalLow\Sun\Java\Deployment\cache   Change...

Disk Space
Select the compression level for JAR files: None
Set the amount of disk space for storing temporary files: 500 MB

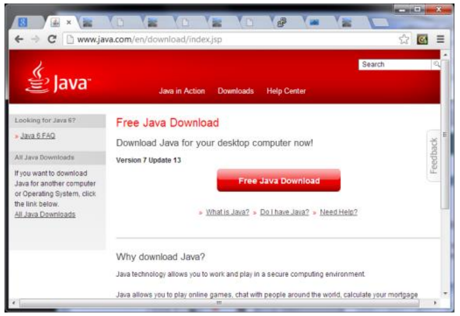
Delete Files... Restore Defaults
OK Cancel

Delete these



Delete Files and Applications
Delete the following files?
☑ Trace and Log Files
☑ Cached Applications and Applets
☐ Installed Applications and Applets
OK Cancel

Google Java download



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Why download Java?
Java technology allows you to work and play in a secure computing environment.
Java allows you to play online games, chat with people around the world, calculate your mortgage

Input/Output Processing

Objectives	Agenda
• Identify the three open file descriptors an executing program is given when started. • Be able to redirect input from files and output to files • Define the terms pipe, filter, and tee • Use pipes and tees to combine multiple commands • Know how to use the following useful UNIX commands: o find o grep o wc o sort o spell	• Quiz • Questions • Warmup • Housekeeping • Review • File descriptors • Pipelines • New commands • Tasks using pipelines

Questions

Questions

Lesson material?

Labs?

Tests?

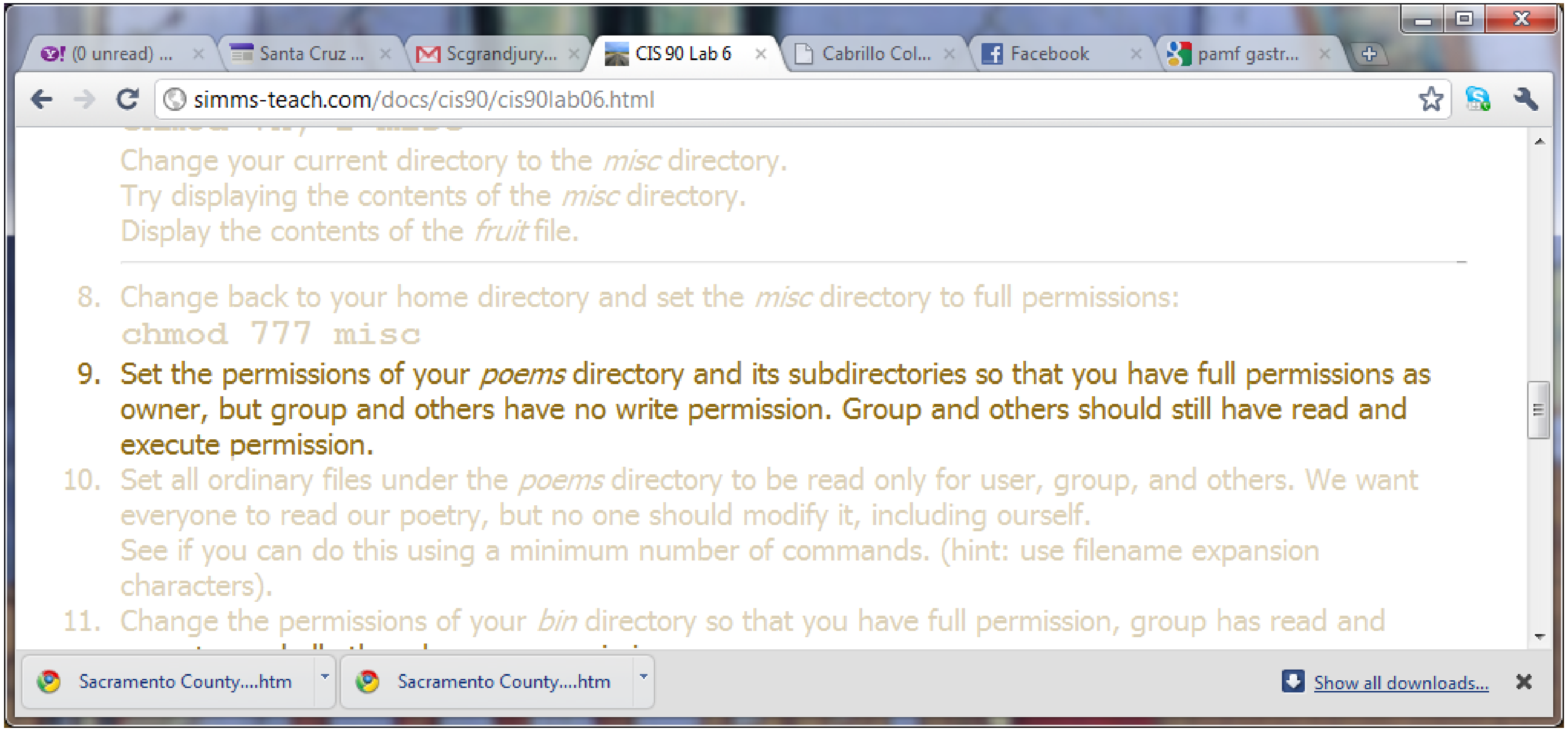
How this course works?

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

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.*

Lab 6 Tips

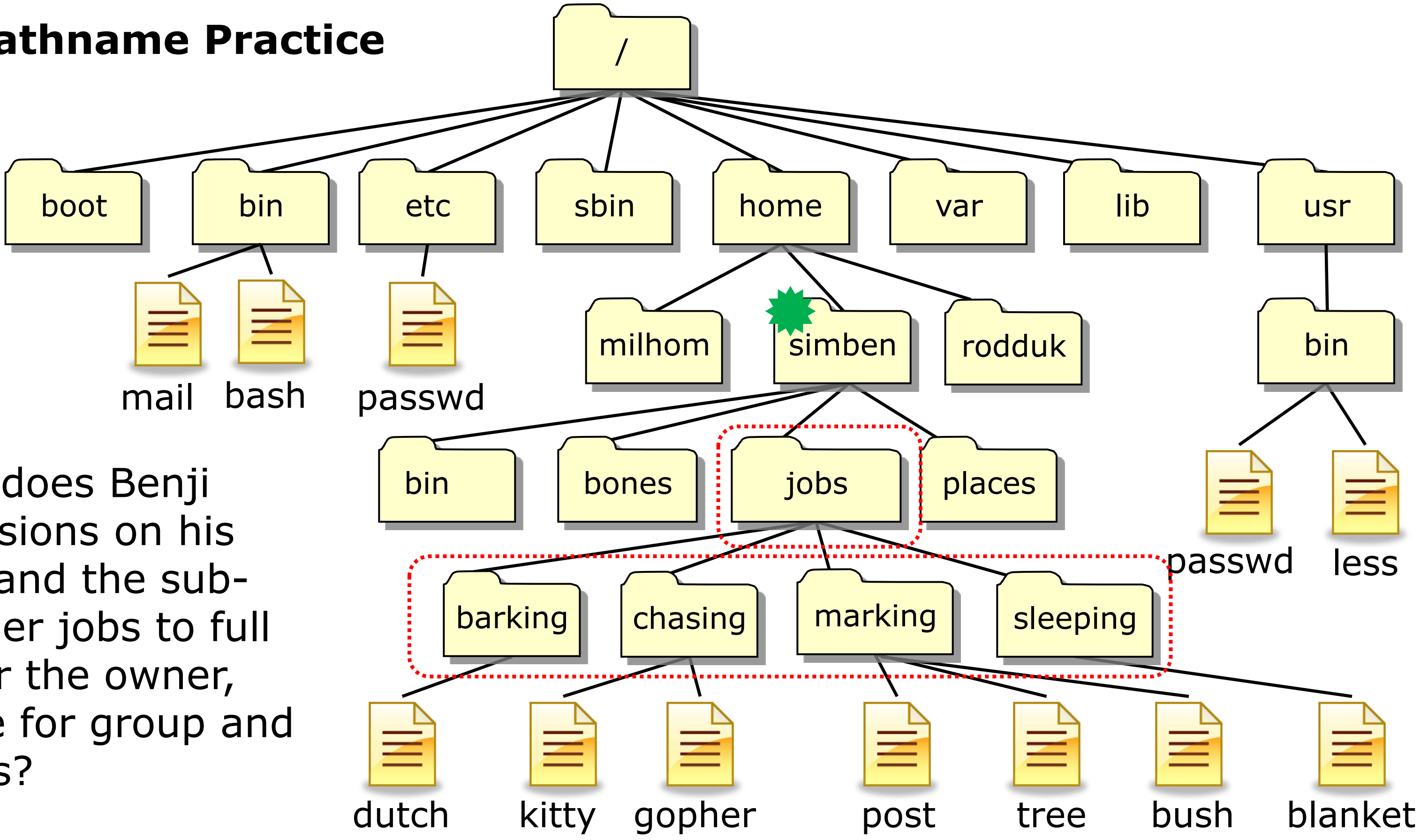
One of the steps in Lab 6



Change your current directory to the *misc* directory.
Try displaying the contents of the *misc* directory.
Display the contents of the *fruit* file.

8. Change back to your home directory and set the *misc* directory to full permissions:
`chmod 777 misc`
9. Set the permissions of your *poems* directory and its subdirectories so that you have full permissions as owner, but group and others have no write permission. Group and others should still have read and execute permission.
10. Set all ordinary files under the *poems* directory to be read only for user, group, and others. We want everyone to read our poetry, but no one should modify it, including ourself.
See if you can do this using a minimum number of commands. (hint: use filename expansion characters).
11. Change the permissions of your *bin* directory so that you have full permission, group has read and

File Tree Pathname Practice

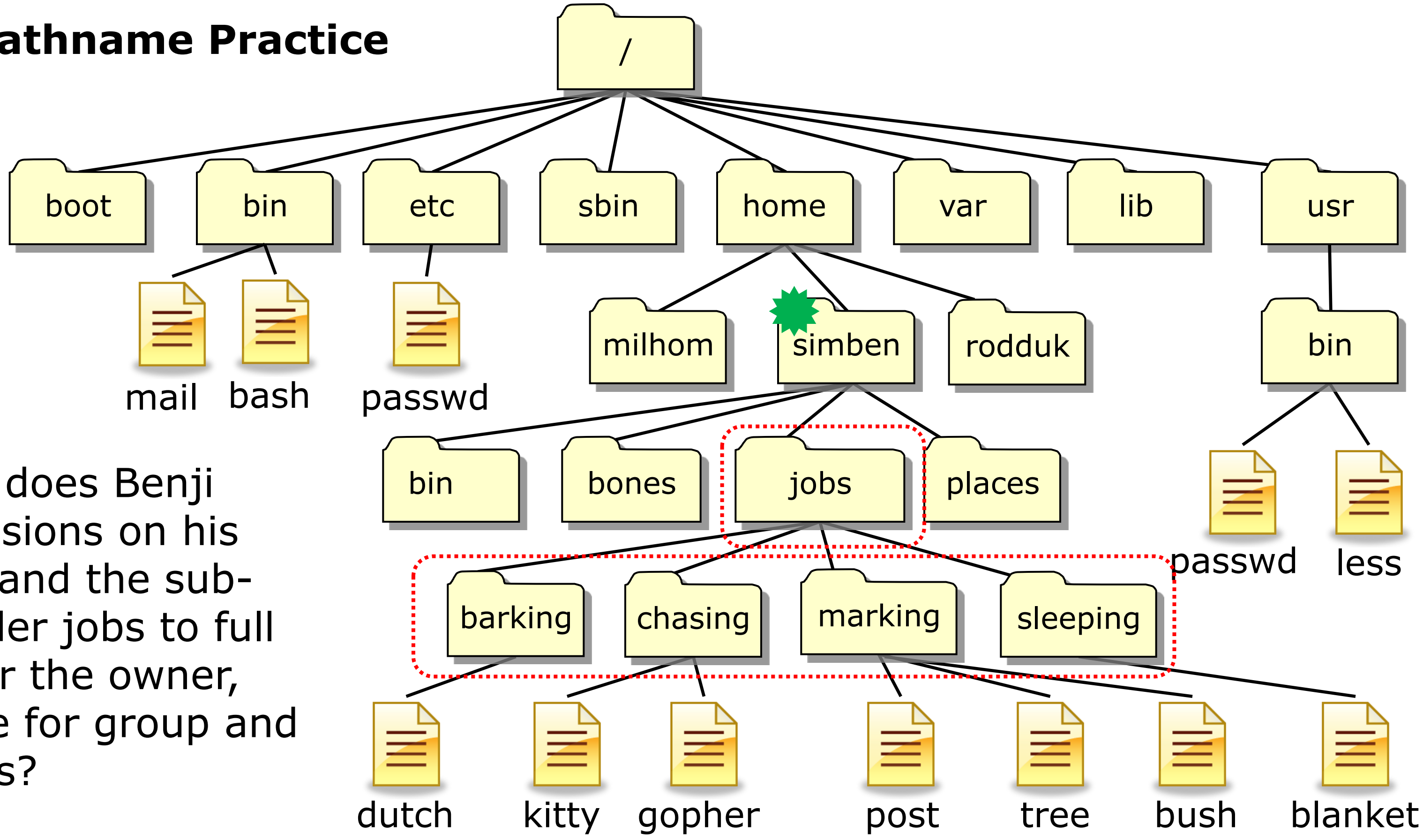


From ✸ how does Benji change permissions on his jobs directory and the sub-directories under jobs to full permissions for the owner, read & execute for group and none for others?

chmod 750 jobs
cd jobs
chmod 750 barking
chmod 750 chasing
chmod 750 marking
chmod 750 sleeping

The "elbow grease" method:
It works and takes 6 commands to complete

File Tree Pathname Practice

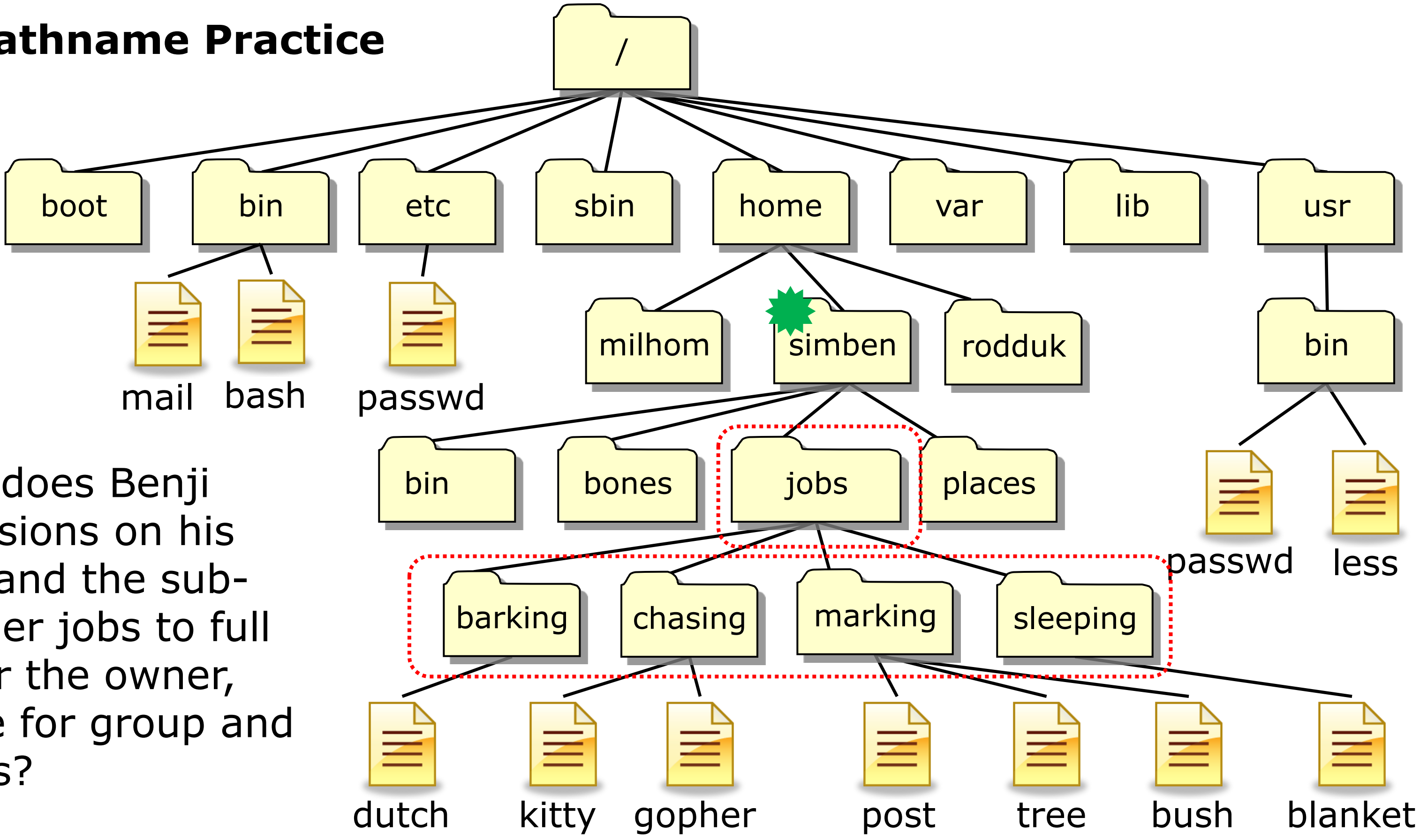


From ✸ how does Benji change permissions on his jobs directory and the sub-directories under jobs to full permissions for the owner, read & execute for group and none for others?

```
chmod 750 jobs
chmod 750 jobs/barking
chmod 750 jobs/chasing
chmod 750 jobs/marking
chmod 750 jobs/sleeping
```

Using relative paths allows us to do the same thing and uses one less command

File Tree Pathname Practice

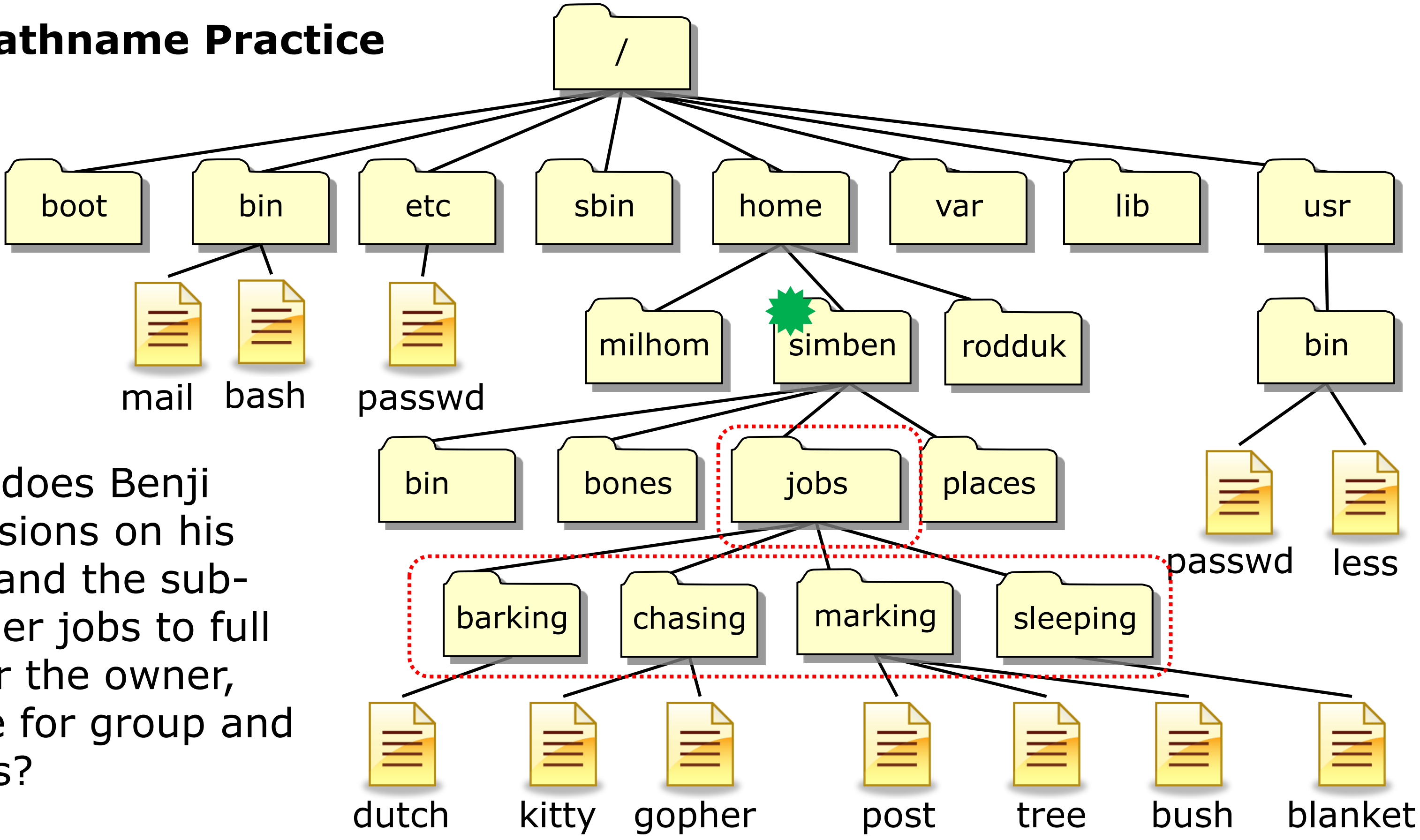


From ✸ how does Benji change permissions on his jobs directory and the sub-directories under jobs to full permissions for the owner, read & execute for group and none for others?

chmod 750 jobs
chmod 750 jobs/*

Using relative paths and a filename expansion metacharacter lets us do the same things with only two commands

File Tree Pathname Practice

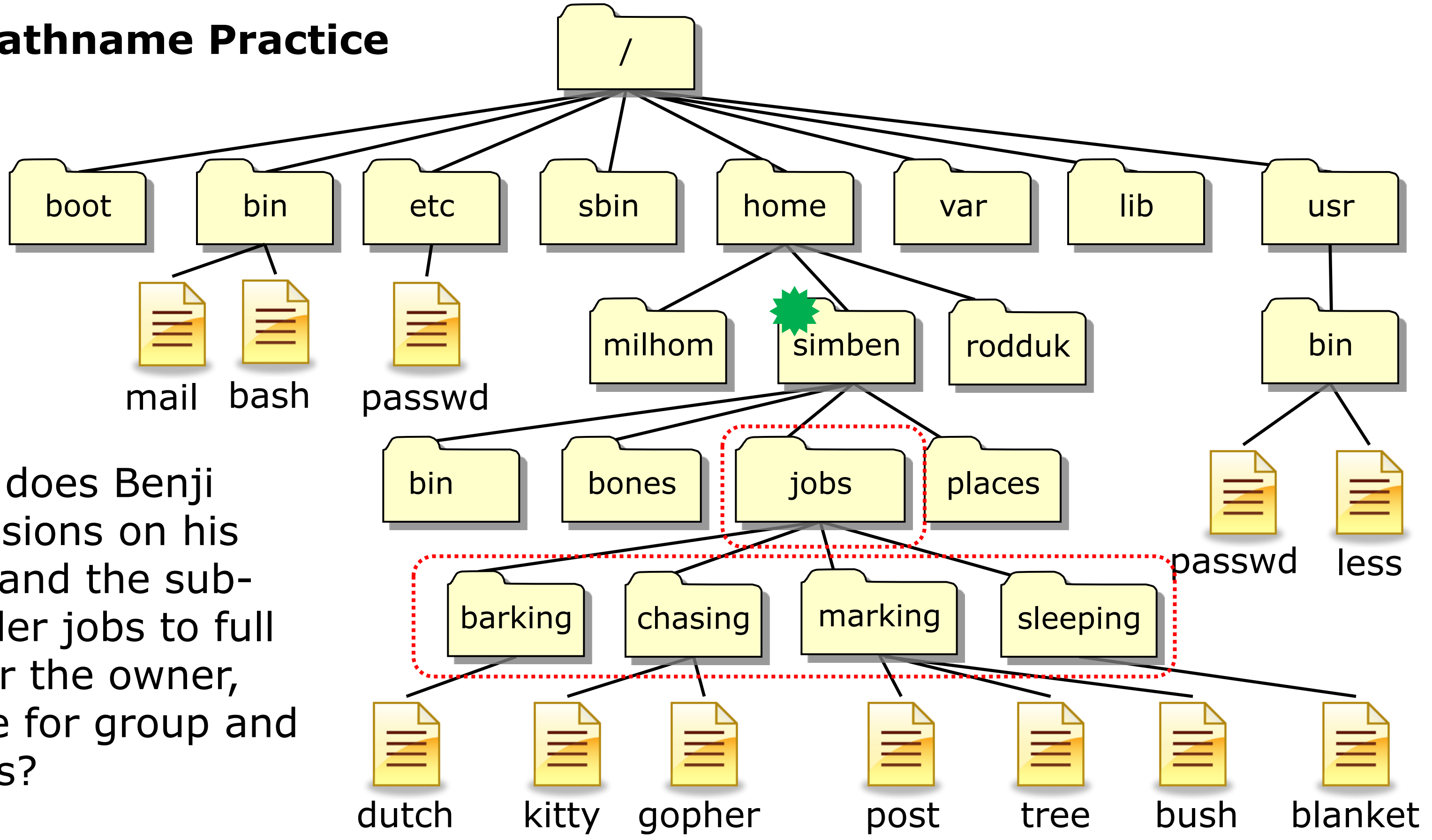


From ✸ how does Benji change permissions on his jobs directory and the sub-directories under jobs to full permissions for the owner, read & execute for group and none for others?

chmod 750 jobs jobs/*

The "Linux guru" method:
Using relative paths, filename expansion metacharacter and multiple arguments lets us do the same thing with one command!

File Tree Pathname Practice



From ✸ how does Benji change permissions on his jobs directory and the sub-directories under jobs to full permissions for the owner, read & execute for group and none for others?

The "elbow grease" method:

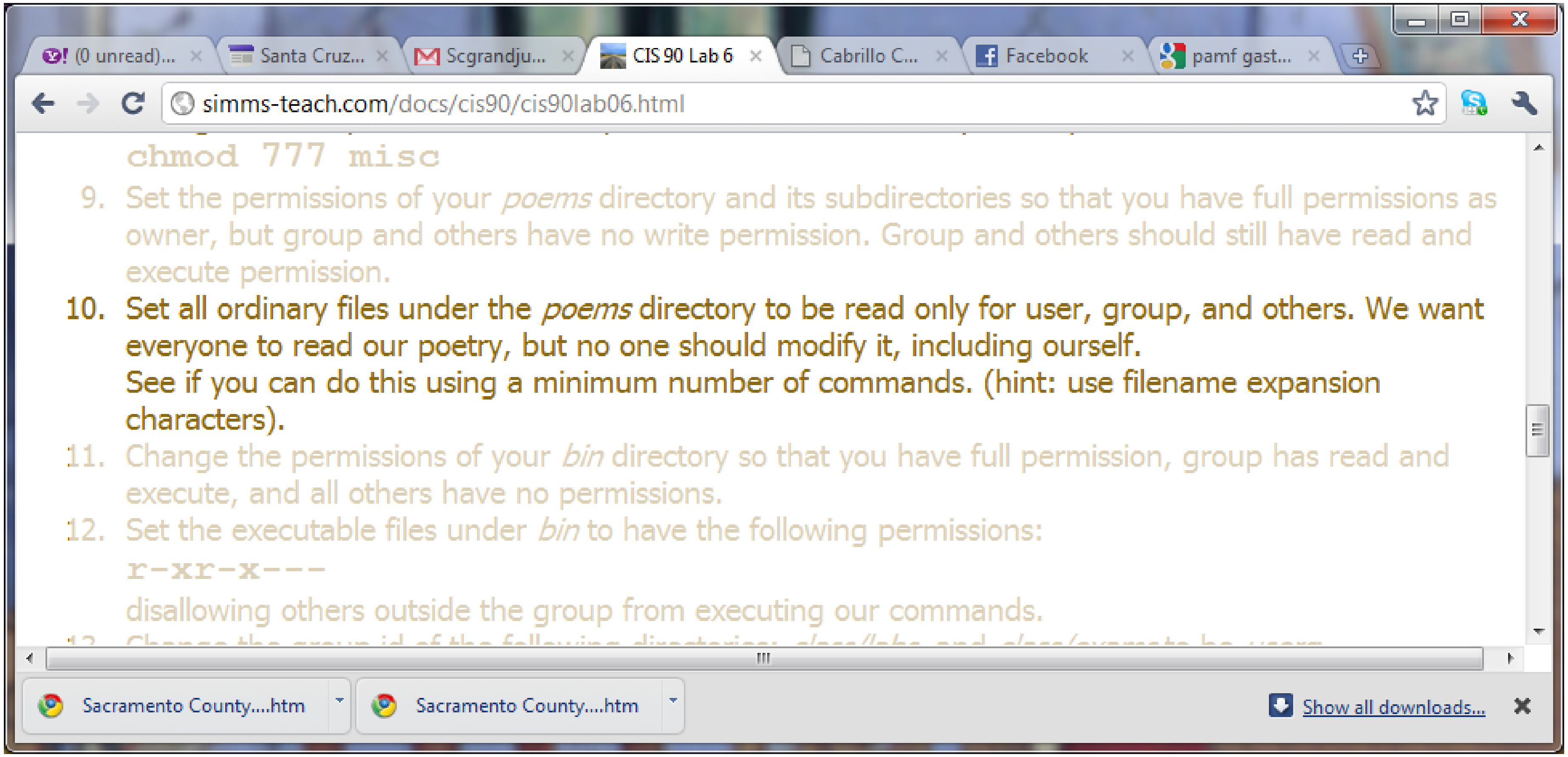
chmod 750 jobs
cd jobs
chmod 750 barking
chmod 750 chasing
chmod 750 marking
chmod 750 sleeping

Both ways work, the choice is yours!

The "Linux guru" method:

chmod 750 jobs jobs/*

Another step in Lab 6



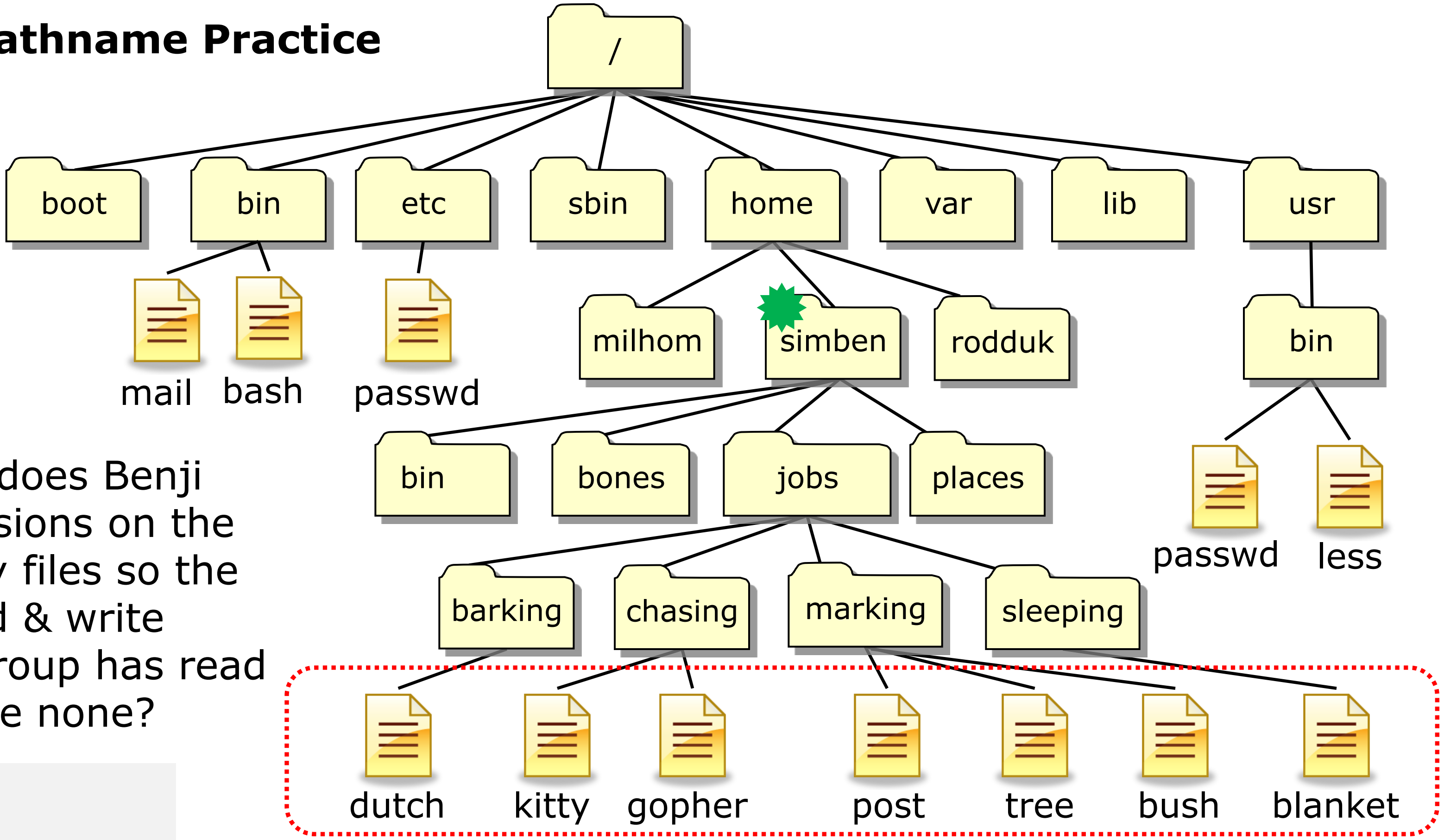
```
chmod 777 misc
```

9. Set the permissions of your *poems* directory and its subdirectories so that you have full permissions as owner, but group and others have no write permission. Group and others should still have read and execute permission.
10. Set all ordinary files under the *poems* directory to be read only for user, group, and others. We want everyone to read our poetry, but no one should modify it, including ourself.
    See if you can do this using a minimum number of commands. (hint: use filename expansion characters).
11. Change the permissions of your *bin* directory so that you have full permission, group has read and execute, and all others have no permissions.
12. Set the executable files under *bin* to have the following permissions:

    ```
    r-xr-x---
    ```

    disallowing others outside the group from executing our commands.

File Tree Pathname Practice



From ✸ how does Benji change permissions on the circled ordinary files so the owner has read & write permissions, group has read and others have none?

```
cd jobs
cd barking
chmod 640 dutch
cd ..
```

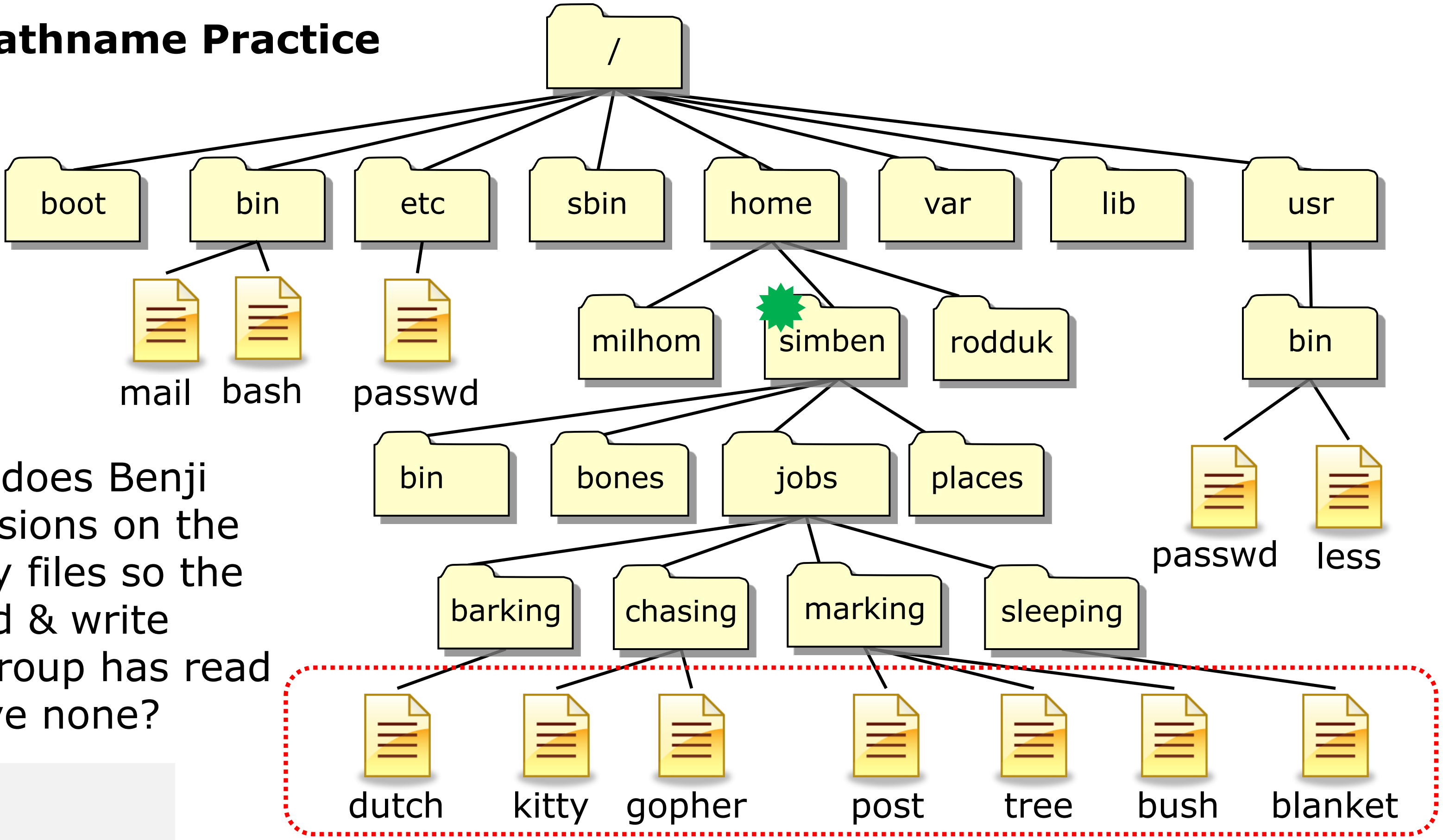
The "elbow grease" method takes 16 commands

```
cd chasing
chmod 640 kitty
chmod 640 gopher
cd ..
```

```
cd marking
chmod 640 post
chmod 640 tree
chmod 640 bush
cd ..
```

```
cd sleeping
chmod 640 blanket
cd
```

File Tree Pathname Practice

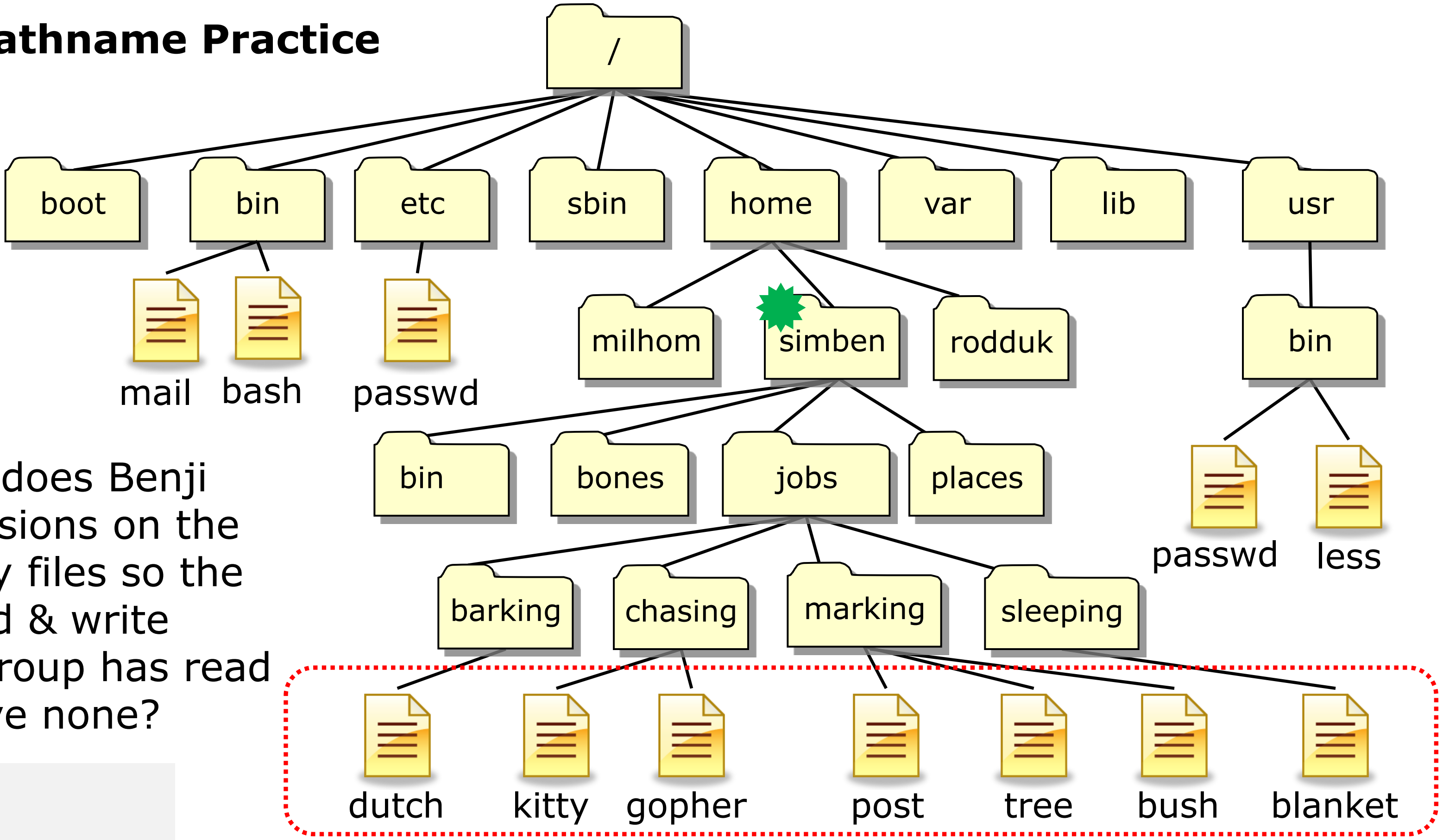


From ✸ how does Benji change permissions on the circled ordinary files so the owner has read & write permissions, group has read and others have none?

```
cd jobs
cd barking
chmod 640 dutch
cd ..
cd chasing
chmod 640 kitty gopher
cd ..
cd marking
chmod 640 post tree bush
cd ..
cd sleeping
chmod 640 blanket
cd
```

Using multiple arguments on chmod: takes 13 commands

File Tree Pathname Practice



From ✸ how does Benji change permissions on the circled ordinary files so the owner has read & write permissions, group has read and others have none?

```
cd jobs
cd barking
chmod 640 *
cd ..
```

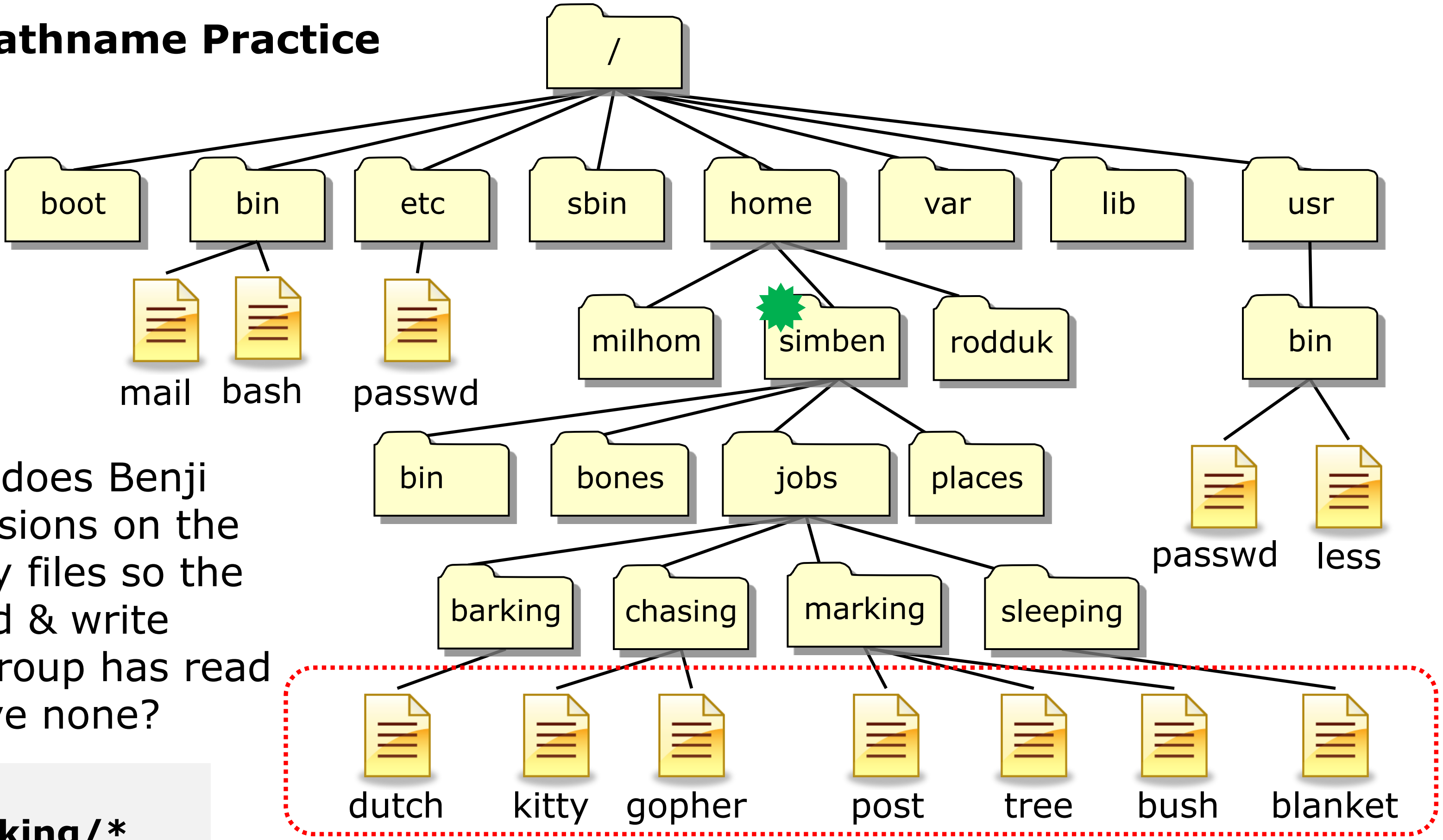
```
cd chasing
chmod 640 *
cd ..
```

```
cd marking
chmod 640 *
cd ..
```

```
cd sleeping
chmod 640 *
cd
```

*Using * (filename expansion metacharacter) takes 13 commands but fewer keystrokes*

File Tree Pathname Practice

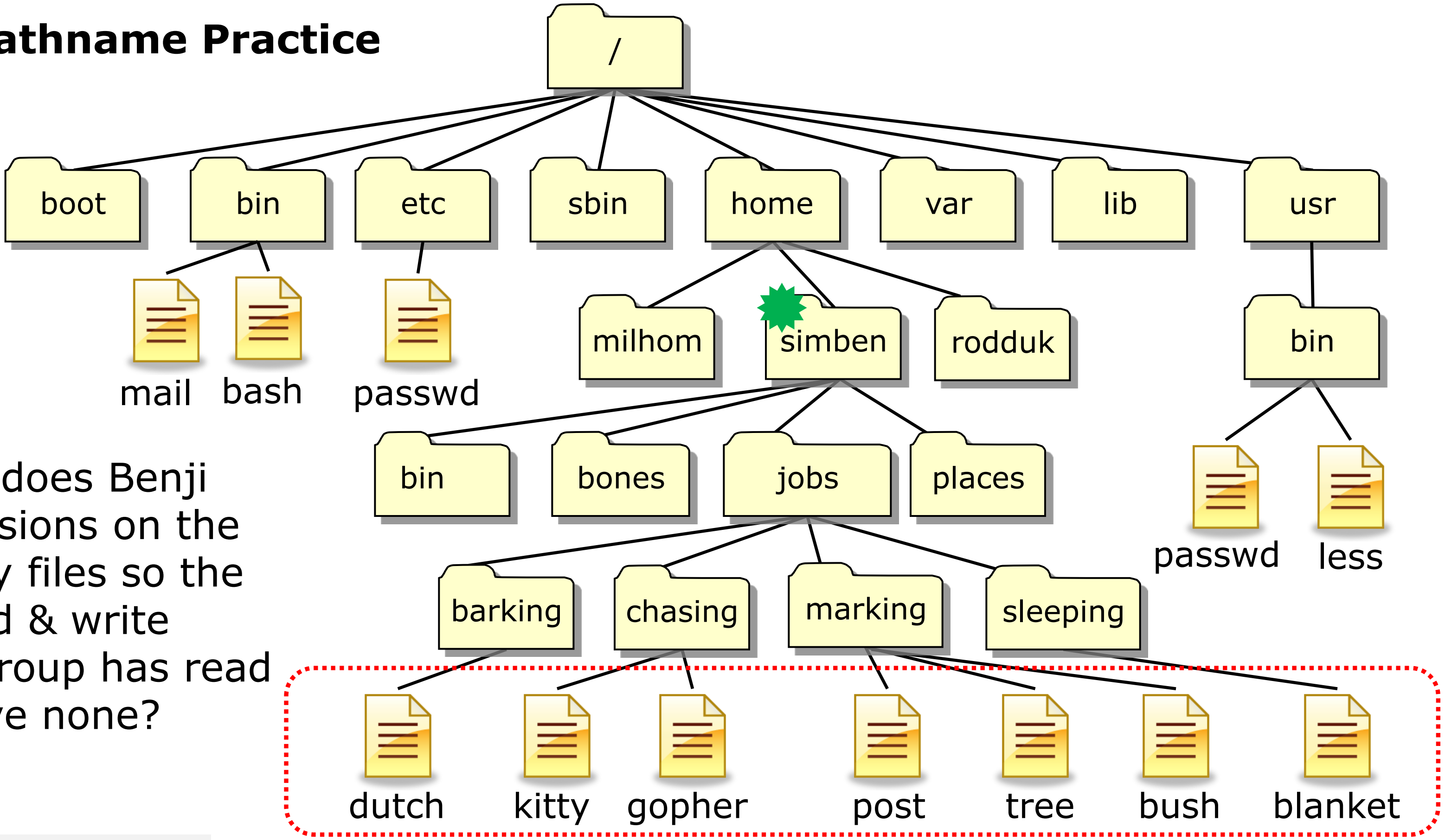


From ✸ how does Benji change permissions on the circled ordinary files so the owner has read & write permissions, group has read and others have none?

```
cd jobs
chmod 640 barking/*
chmod 640 chasing/*
chmod 640 marking/*
chmod 640 sleeping/*
cd ..
```

Using relative paths and filename expansion characters takes 6 commands

File Tree Pathname Practice

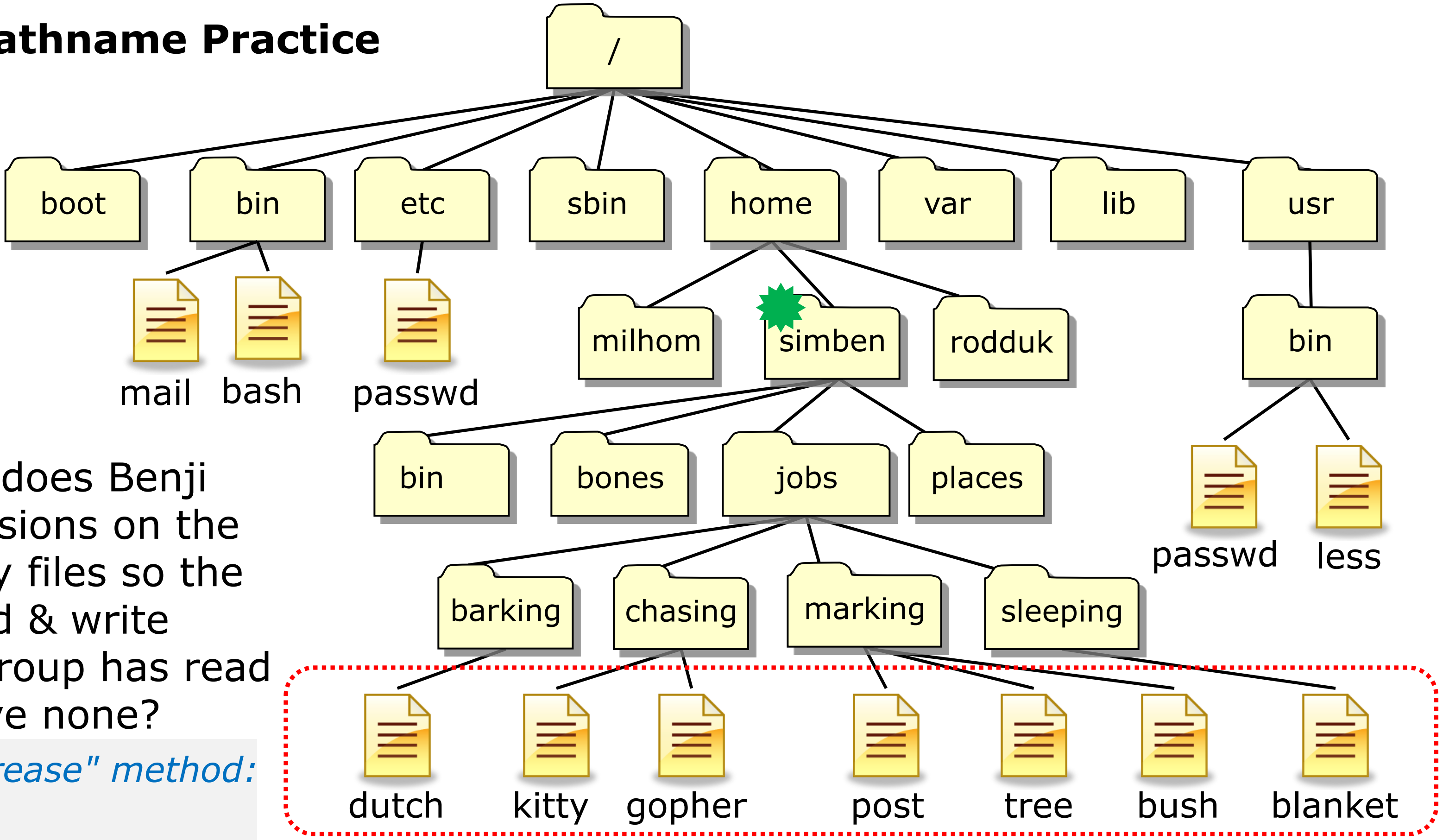


From ✸ how does Benji change permissions on the circled ordinary files so the owner has read & write permissions, group has read and others have none?

```
chmod 640 jobs/*/*
```

The Linux guru method:
Using relative paths, filename expansion characters and combining all arguments on a single command line takes one command

File Tree Pathname Practice



From ✸ how does Benji change permissions on the circled ordinary files so the owner has read & write permissions, group has read and others have none?

The "elbow grease" method:

```
cd jobs
cd barking
chmod 640 dutch
cd ..
cd chasing
chmod 640 kitty
chmod 640 gopher
cd ..
cd marking
chmod 640 post
chmod 640 tree
chmod 640 bush
cd ..
cd sleeping
chmod 640 blanket
cd
```

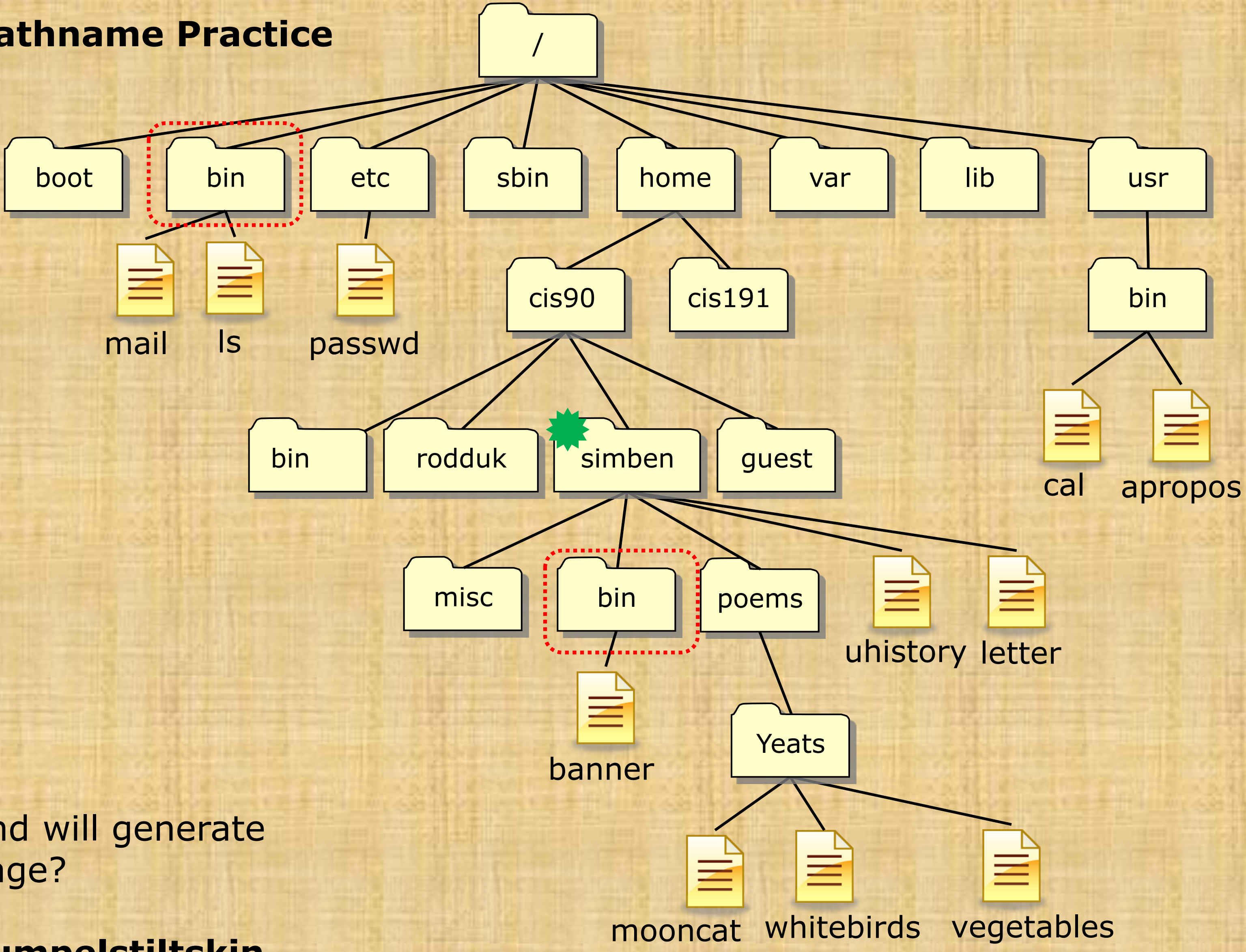
Both ways work, the choice is yours!

The "Linux guru" method:

chmod 640 jobs/*/*

Warmup

File Tree Pathname Practice

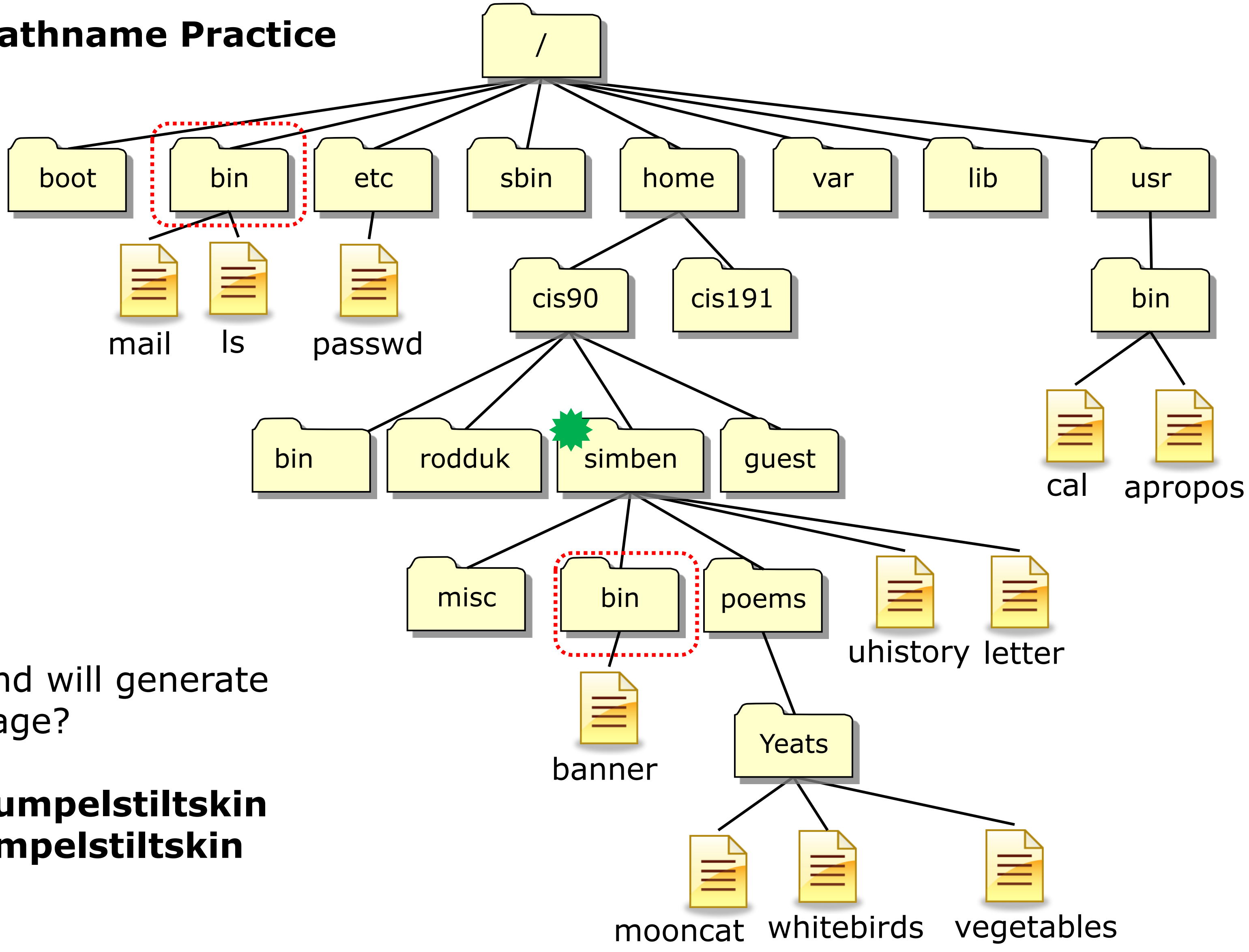


From ✸ how does Benji:

Which command will generate an error message?

touch /bin/rumpelstiltskin
touch bin/rumpelstiltskin

File Tree Pathname Practice



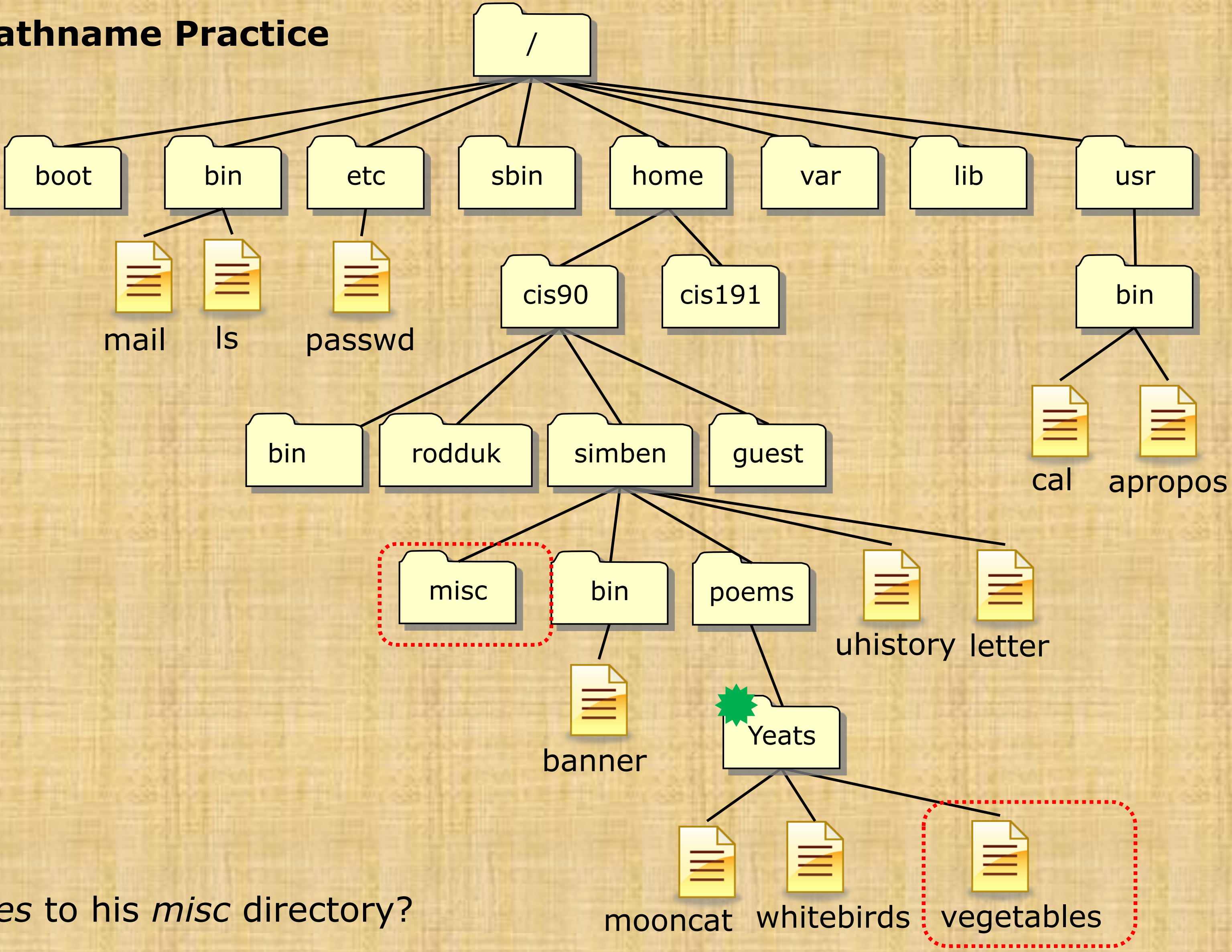
From ✸ how does Benji:

Which command will generate an error message?

touch /bin/rumpelstiltskin
touch bin/rumpelstiltskin

```
/home/cis90/simben $ touch /bin/rumpelstiltskin
touch: cannot touch `/bin/rumpelstiltskin': Permission denied
```

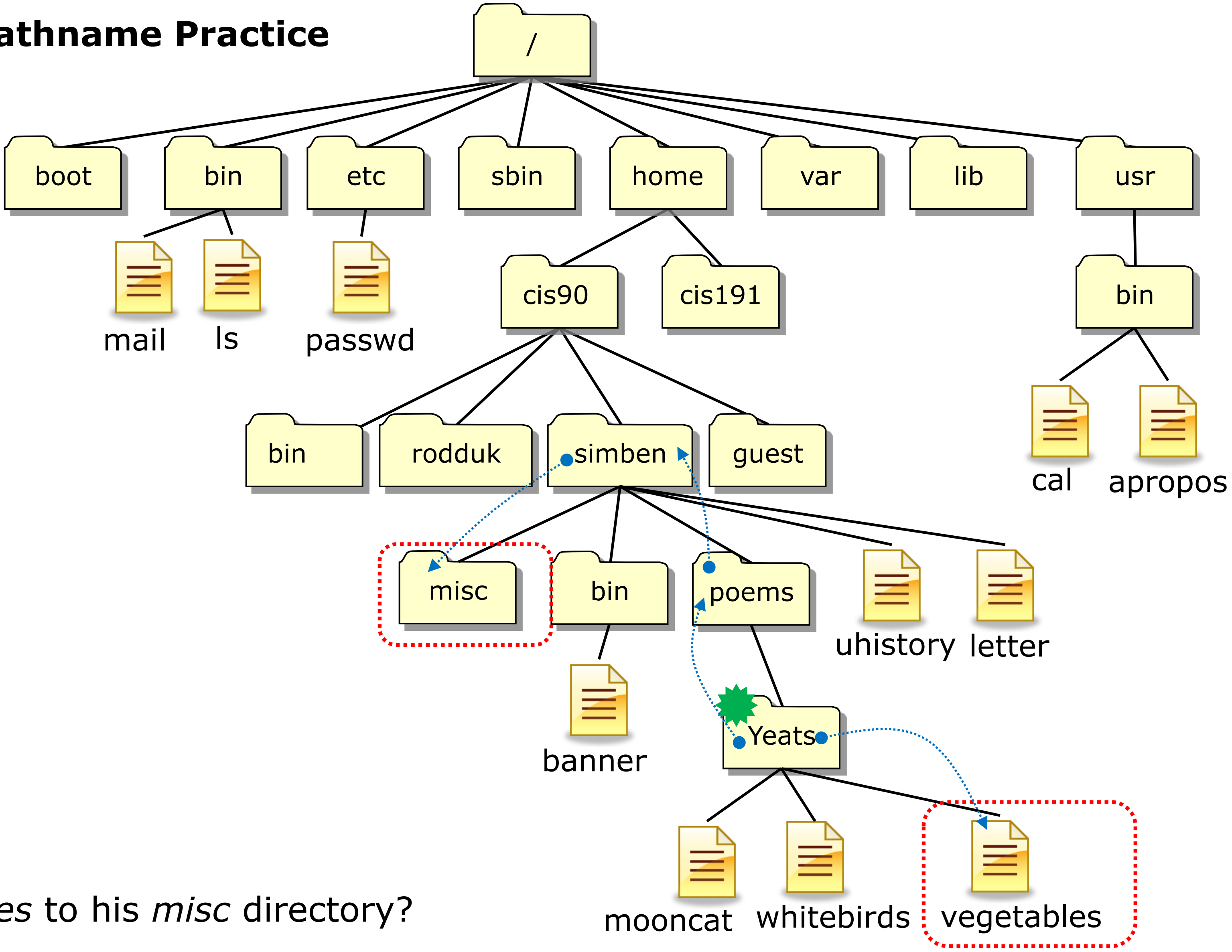
File Tree Pathname Practice



From ✸ how does Benji:

Move *vegetables* to his *misc* directory?

File Tree Pathname Practice



From ✸ how does Benji:

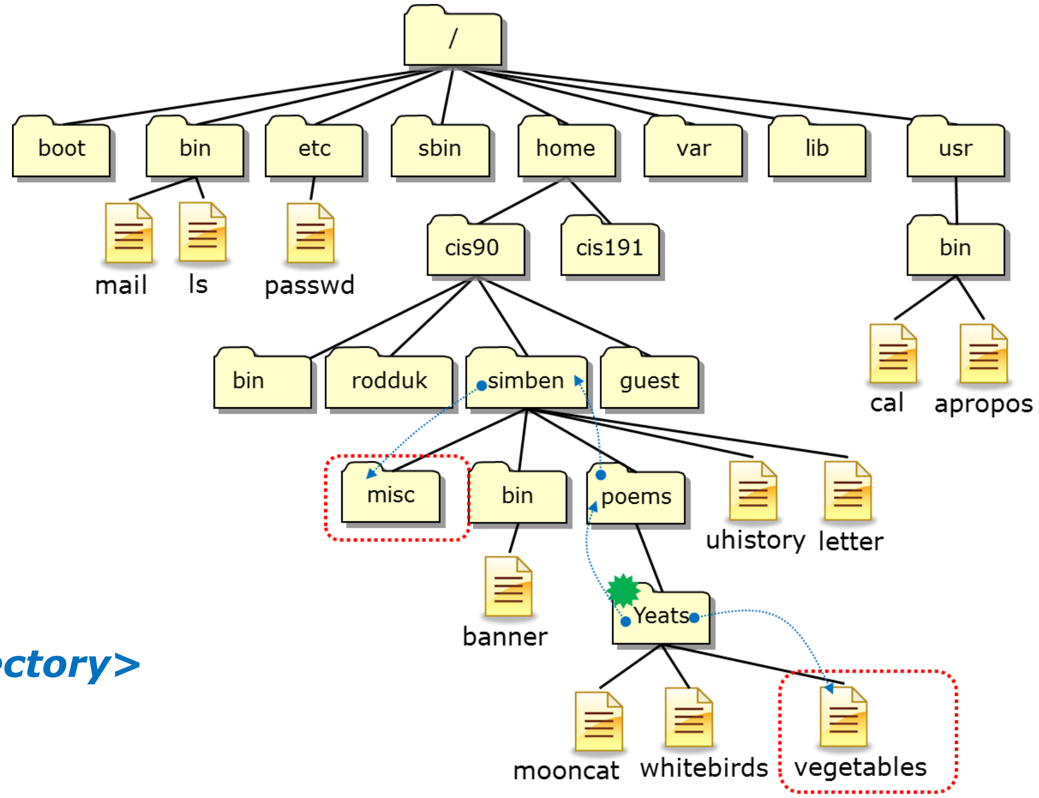
Move *vegetables* to his *misc* directory?

```
/home/cis90/simben/poems/Yeats $ mv vegetables ../../misc/
```

Other answers are also acceptable

From ✸ how does Benji:

Move *vegetables* to his *misc* directory?



mv <path-to-file> <path-to-directory>

mv vegetables ../../misc/

mv vegetables /home/cis90/simben/misc/

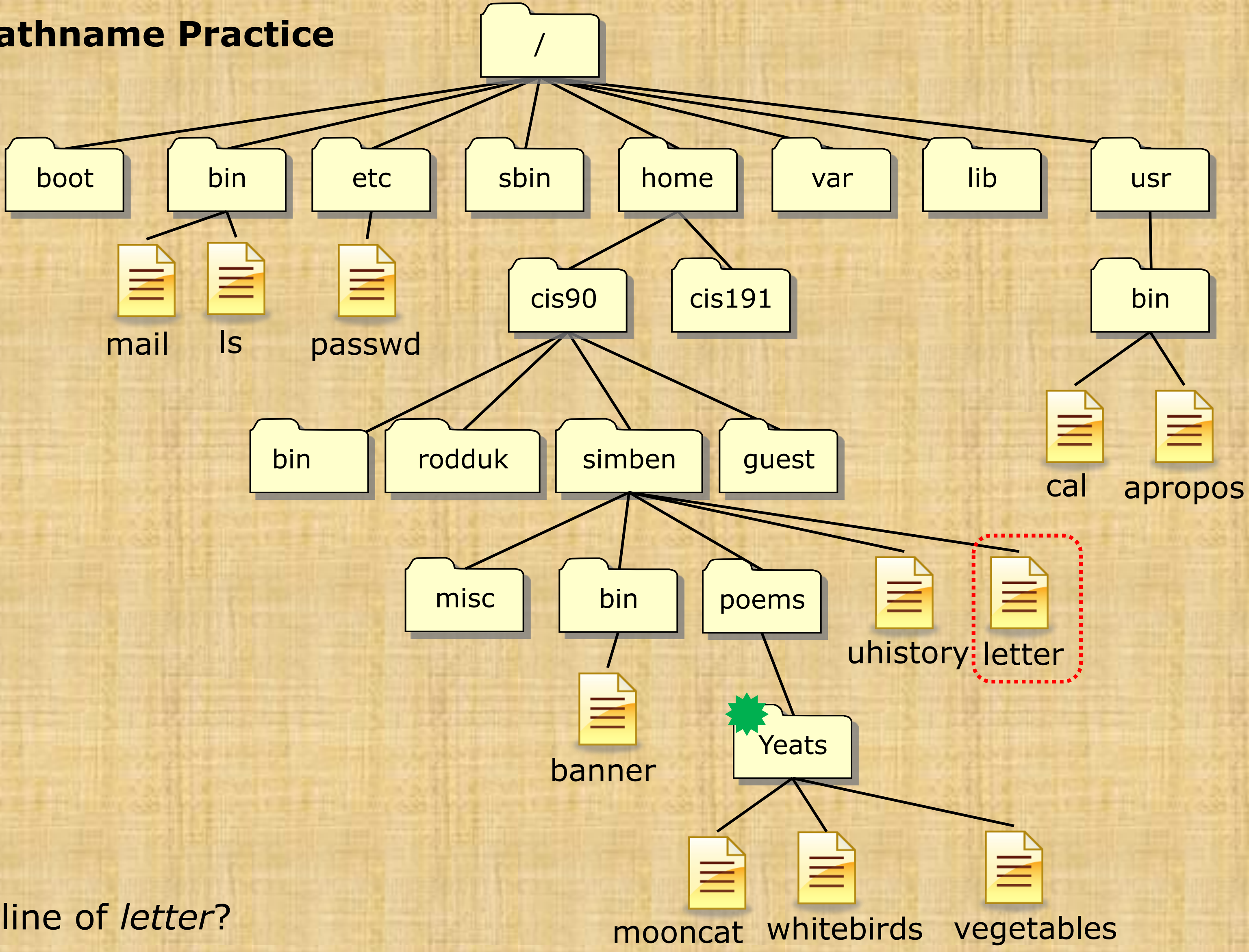
mv /home/cis90/simben/poems/Yeats/vegetables ../../misc/

mv /home/cis90/simben/poems/Yeats/vegetables /home/cis90/simben/misc/

mv vegetables ~/misc/

All these answers are correct

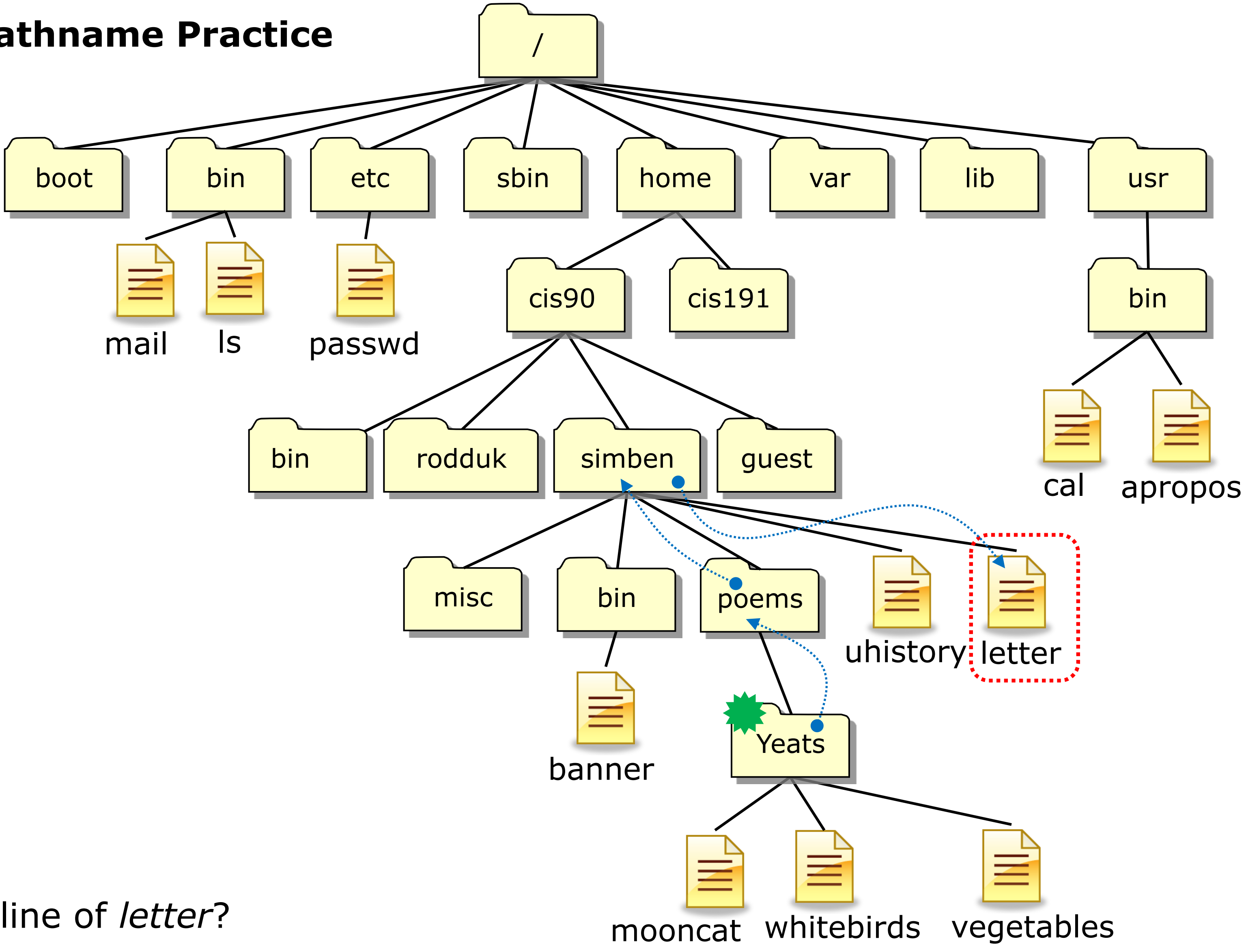
File Tree Pathname Practice



From ✸ how does Benji:

Print the last line of *letter*?

File Tree Pathname Practice

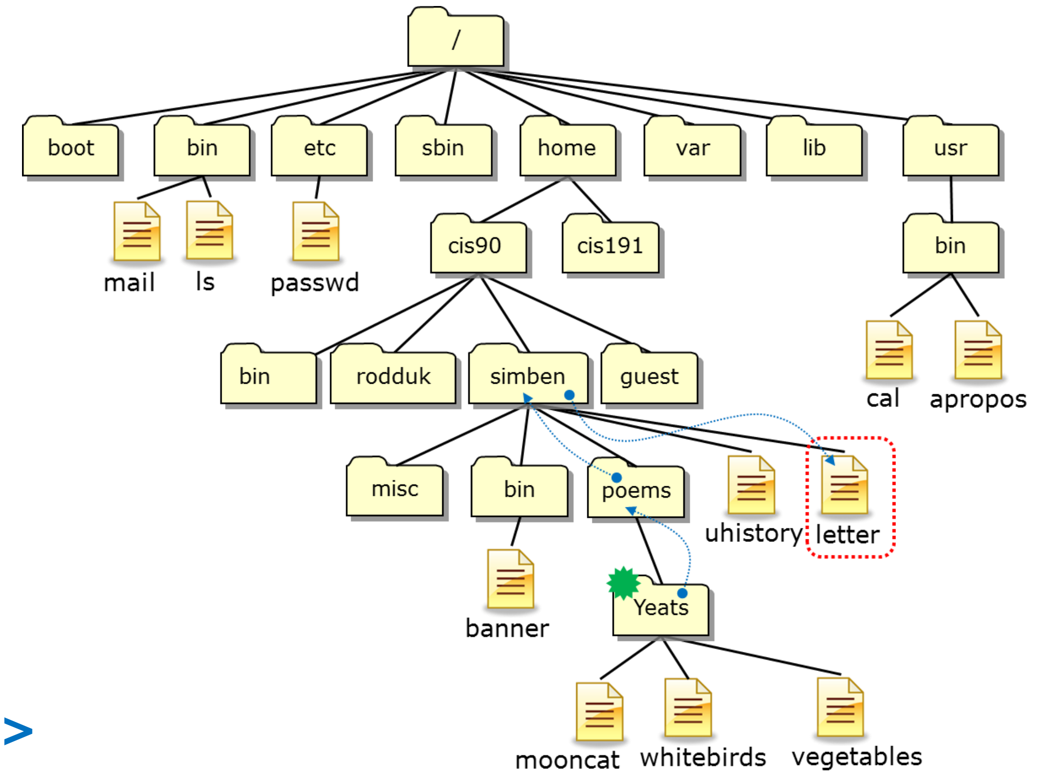


From ✸ how does Benji:

Print the last line of *letter*?

```
/home/cis90/simben/poems/Yeats $ tail -n1 ../../letter
```

Other answers are also acceptable



From ✸ how does Benji:

Print the last line of *letter*?

tail -n<number> <path-to-file>

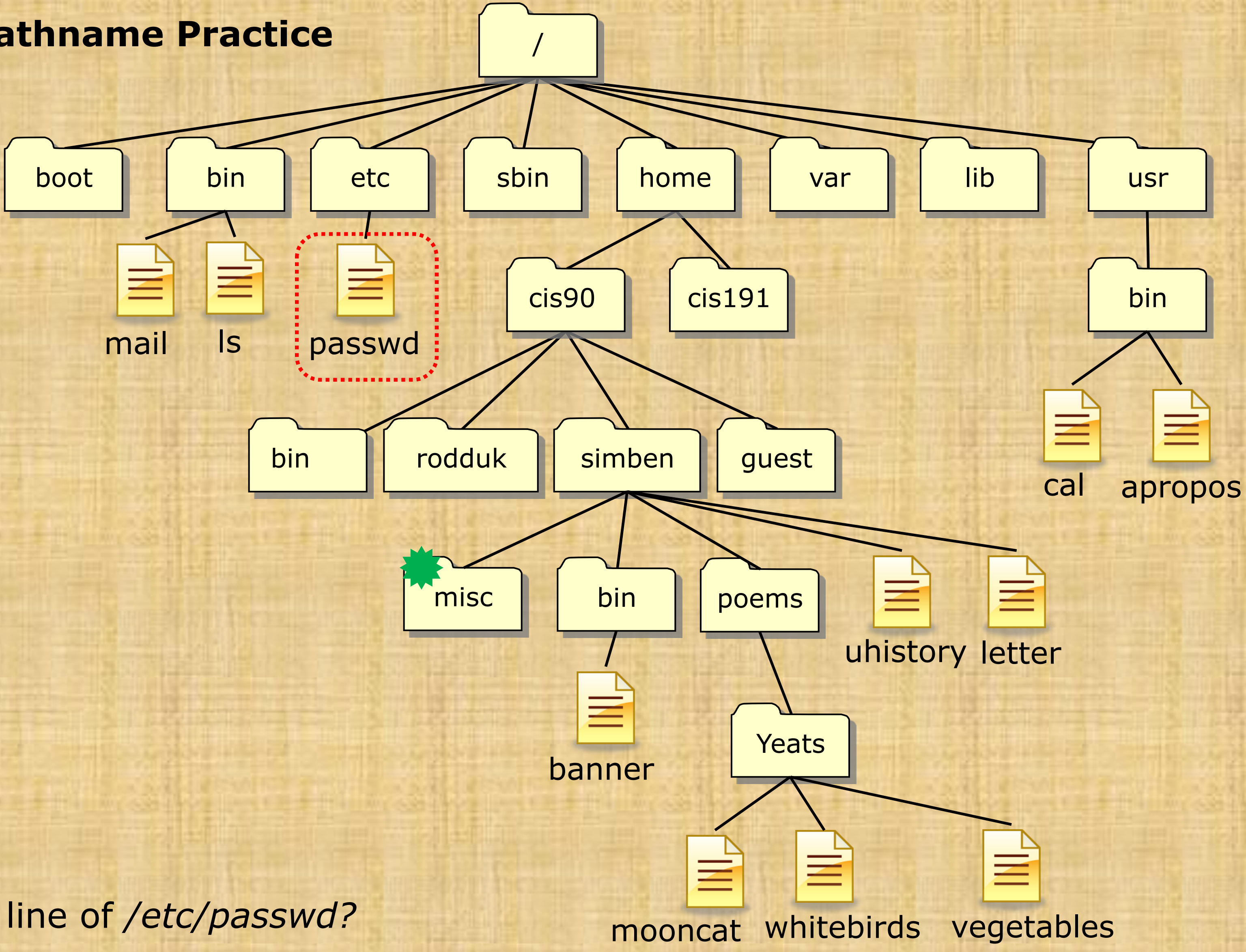
tail -n1 ../../letter

tail -n1 /home/cis90/simben/letter

tail -n1 ~/letter

All these answers are correct

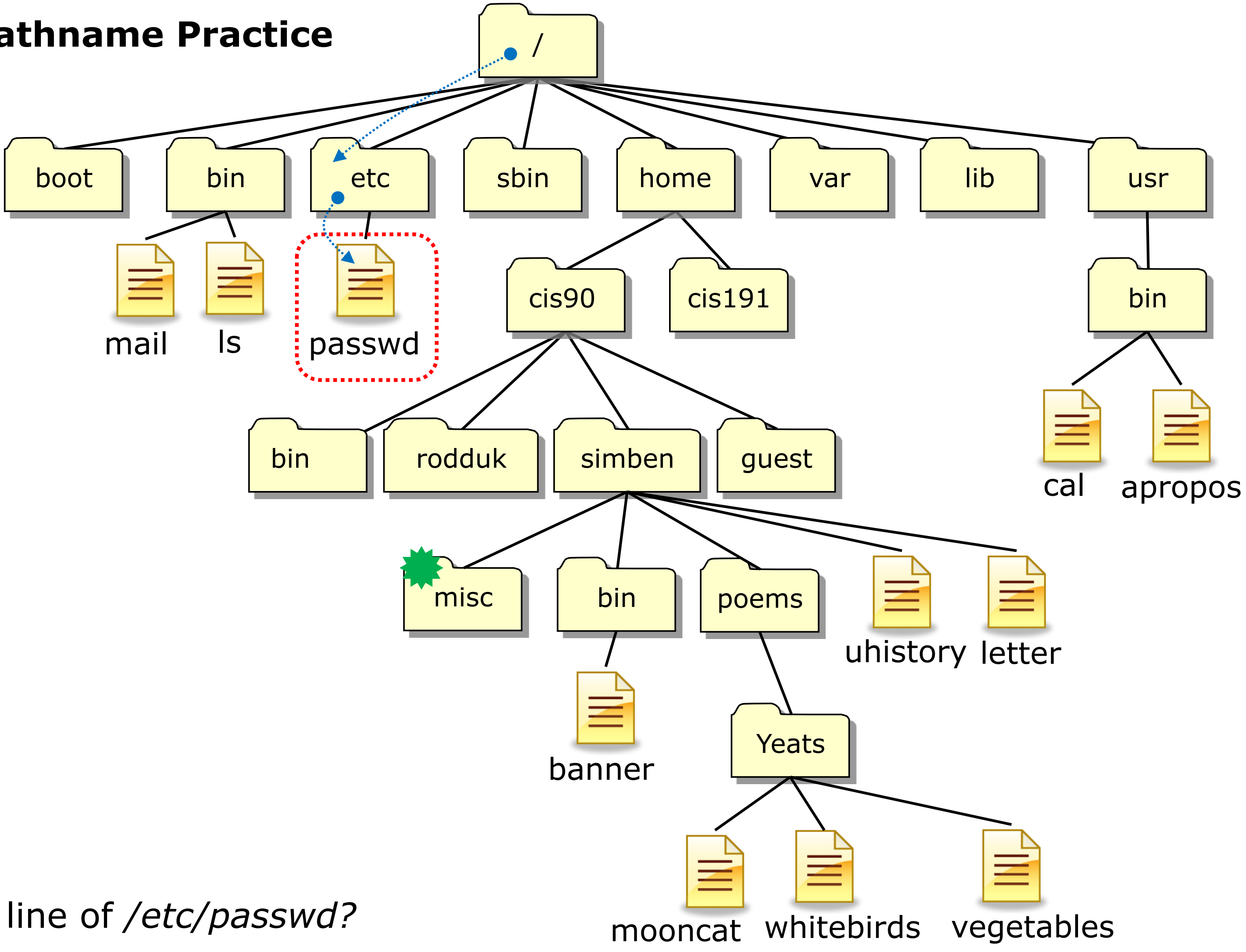
File Tree Pathname Practice



From ✸ how does Benji:

Print the first line of */etc/passwd?*

File Tree Pathname Practice

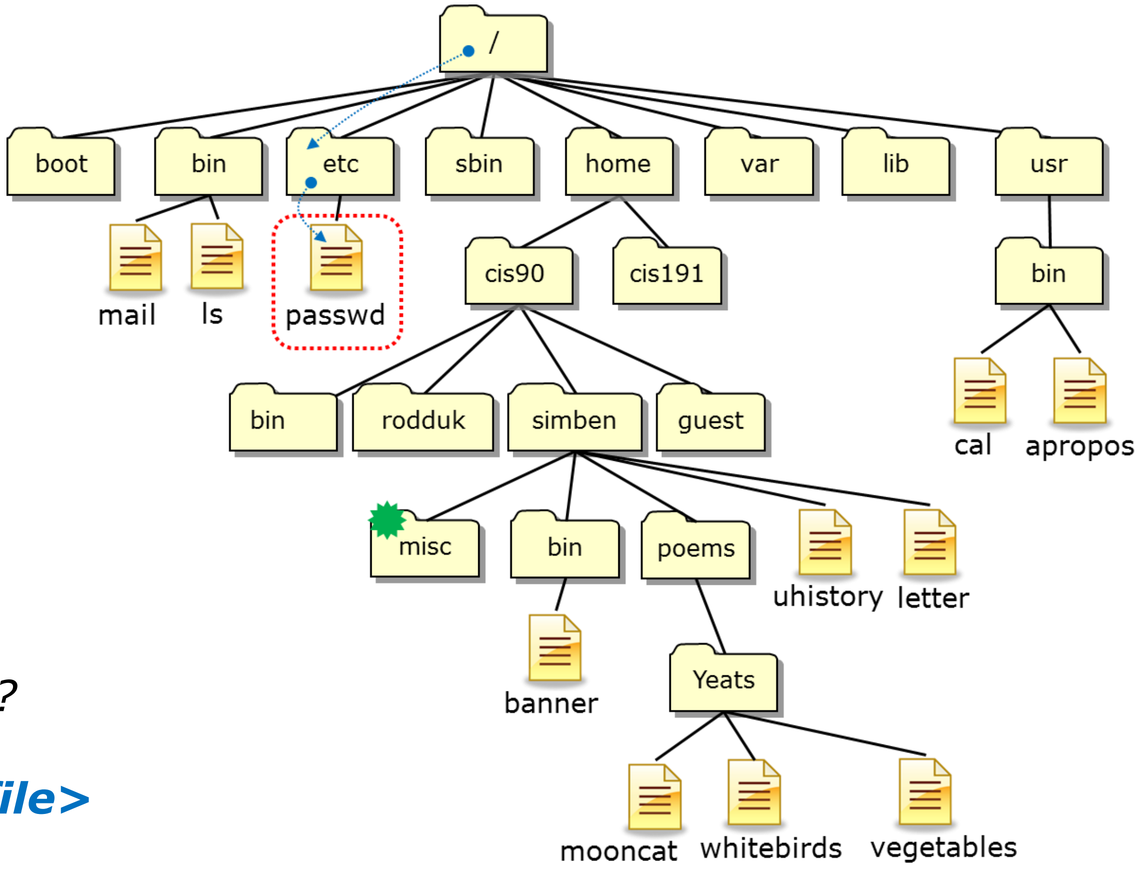


From ✸ how does Benji:

Print the first line of */etc/passwd?*

```
/home/cis90/simben/misc $ head -n1 /etc/passwd
```

Other answers are also acceptable



From ✸ how does Benji:

Print the first line of */etc/passwd?*

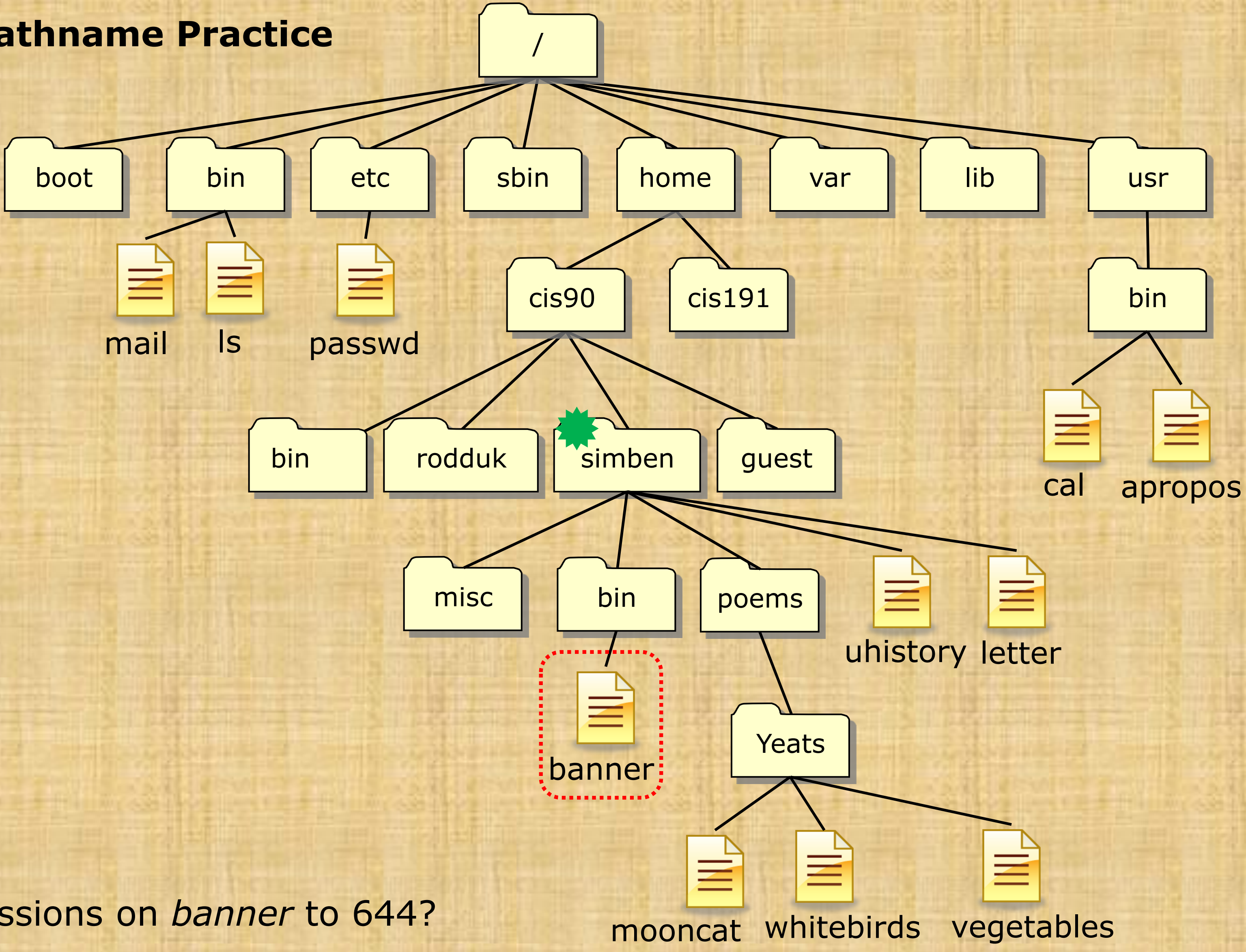
head -*n<number>* *<path-to-file>*

head -n1 /etc/passwd

head -n1 ../../../../etc/passwd

Both these answers are correct

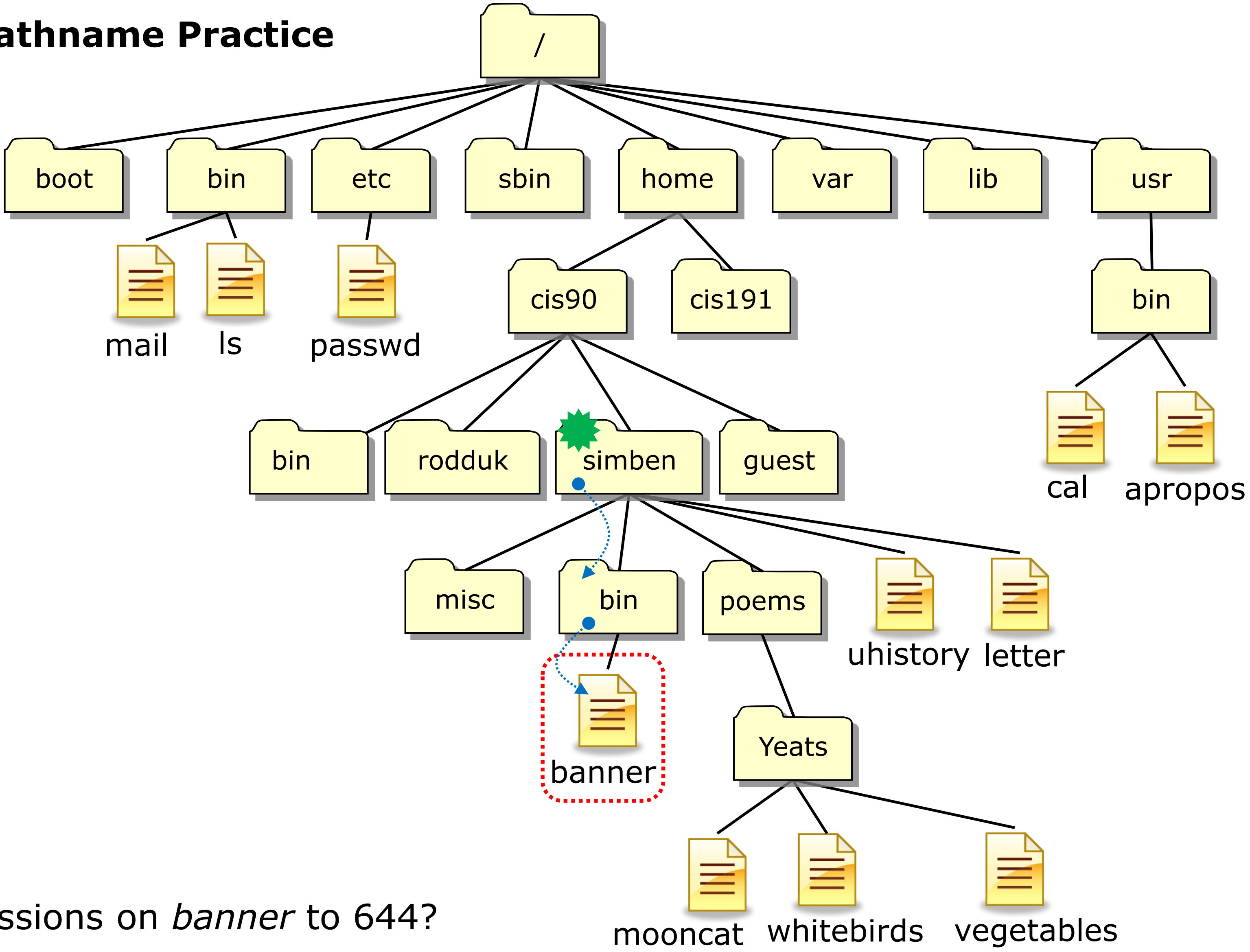
File Tree Pathname Practice



From ✸ how does Benji:

Change permissions on *banner* to 644?

File Tree Pathname Practice

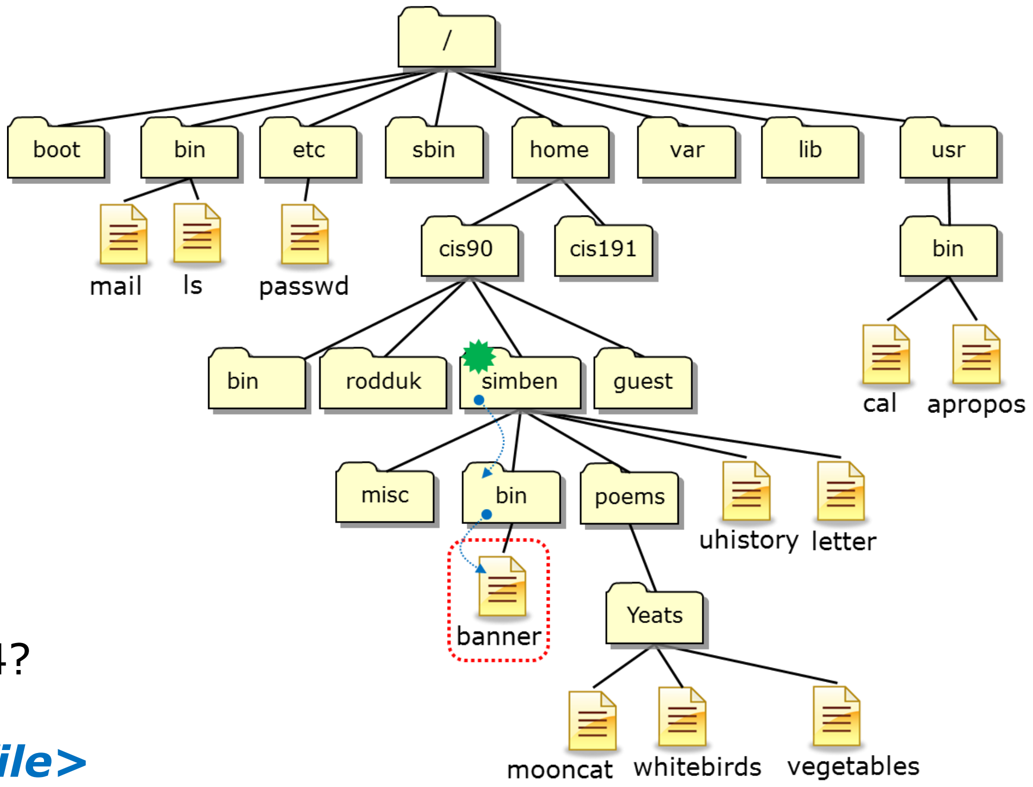


From ✸ how does Benji:

Change permissions on *banner* to 644?

```
/home/cis90/simben $ chmod 644  bin/banner
```

Other answers are also acceptable



From ✸ how does Benji:

Change permissions on *banner* to 644?

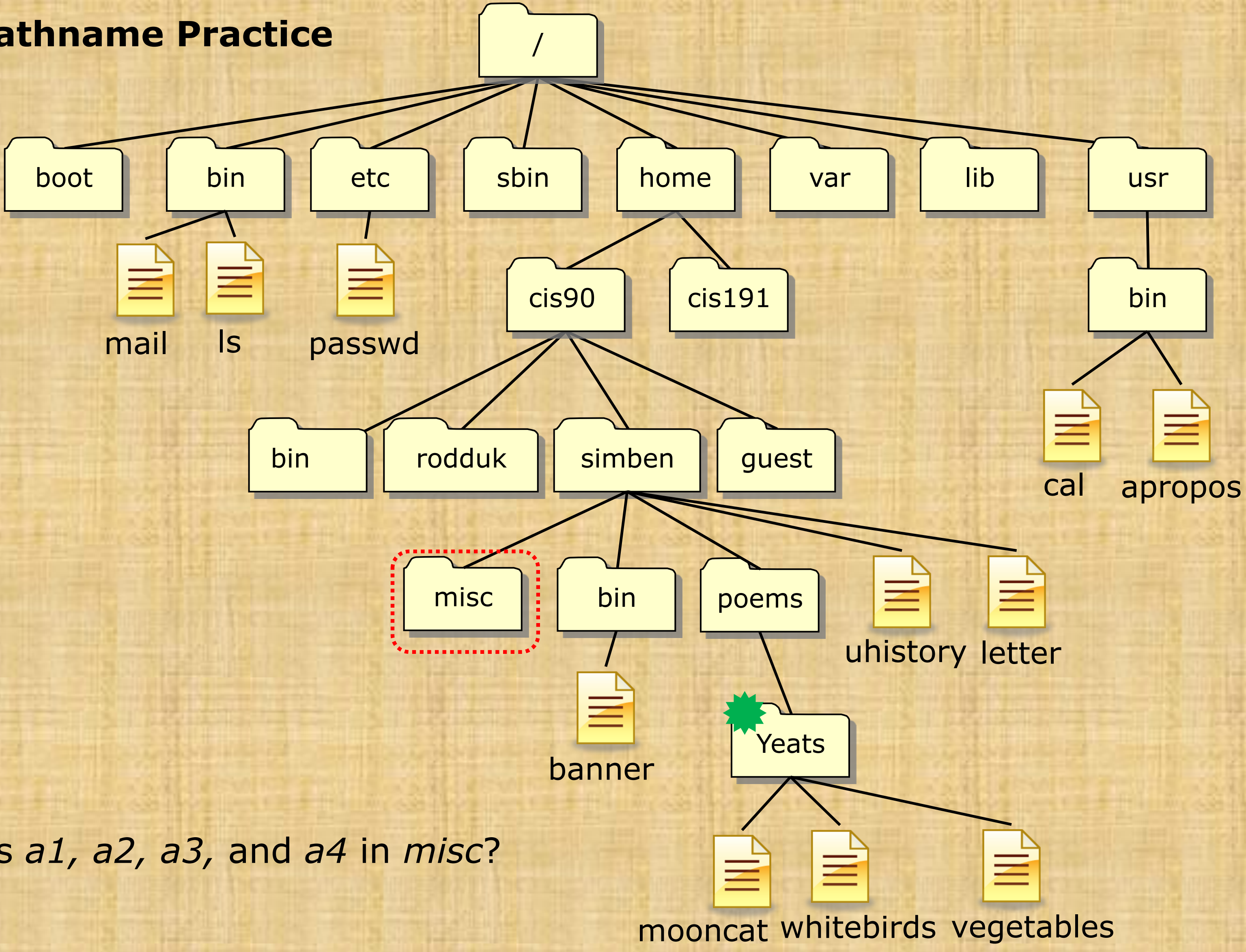
chmod <permissions> <path-to-file>

chmod 644 bin/banner

chmod 644 /home/cis90/simben/bin/banner

Both these answers are correct

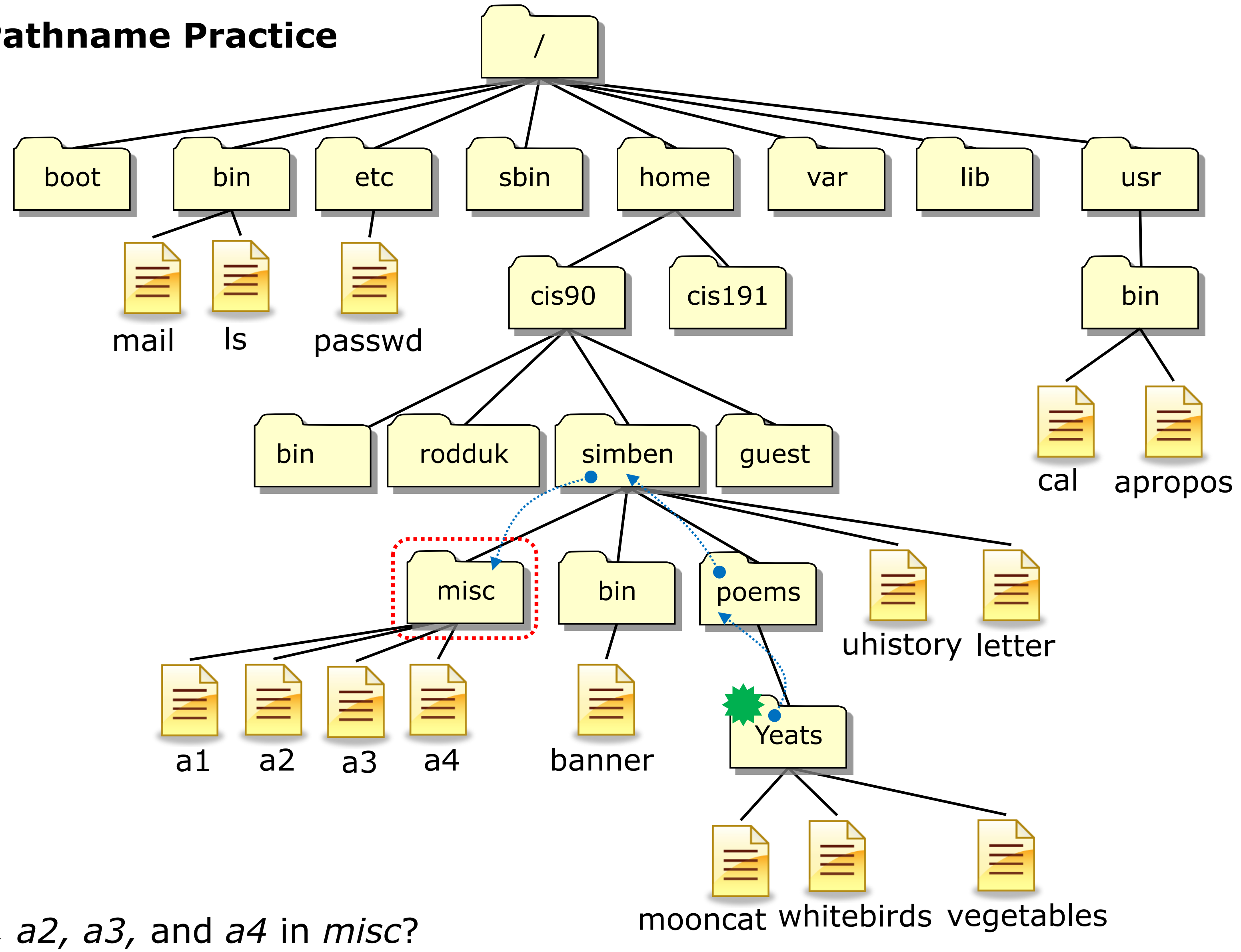
File Tree Pathname Practice



From ✸ how does Benji:

Create new files *a1, a2, a3,* and *a4* in *misc*?

File Tree Pathname Practice

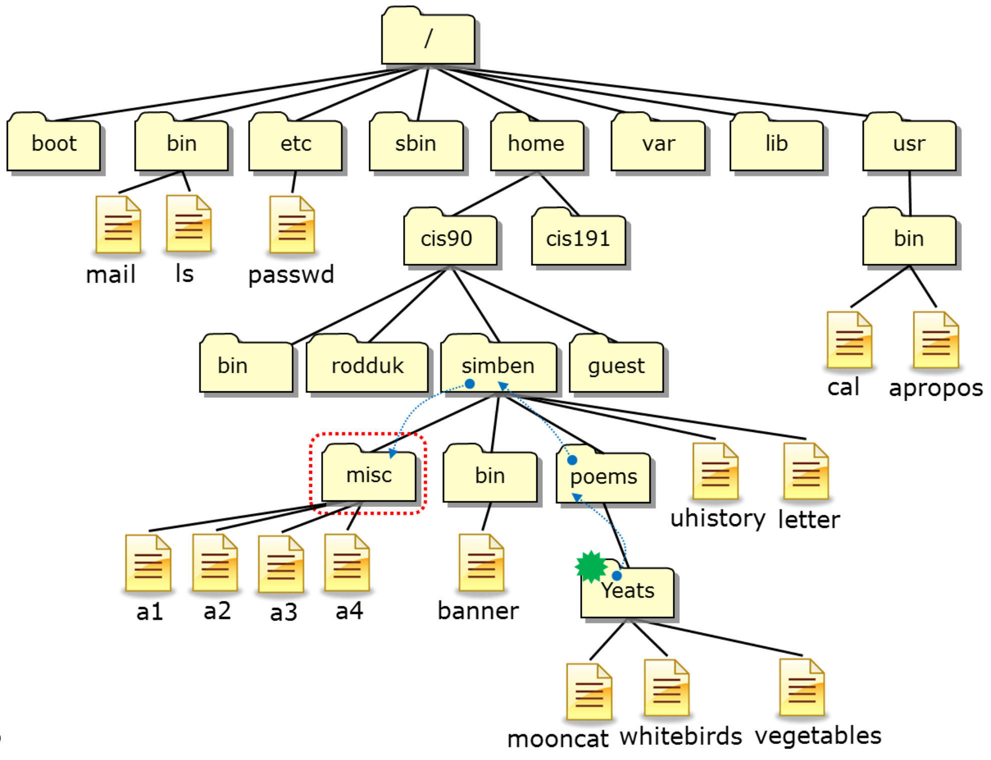


From ✸ how does Benji:

Create files *a1, a2, a3,* and *a4* in *misc*?

```
/home/cis90/simben/poems/Yeats $ touch ../../misc/a1 ../../misc/a2 ../../misc/a3 ../../misc/a4
```

Other answers are also acceptable



From ✸ how does Benji:

Create files *a1, a2, a3,* and *a4* in *misc*?

touch <path-to-file> <path-to-file> <path-to-file> <path-to-file>

touch ../../misc/a1 ../../misc/a2 ../../misc/a3 ../../misc/a4

touch ~/misc/a1 ~/misc/a2 ~/misc/a3 ~/misc/a4

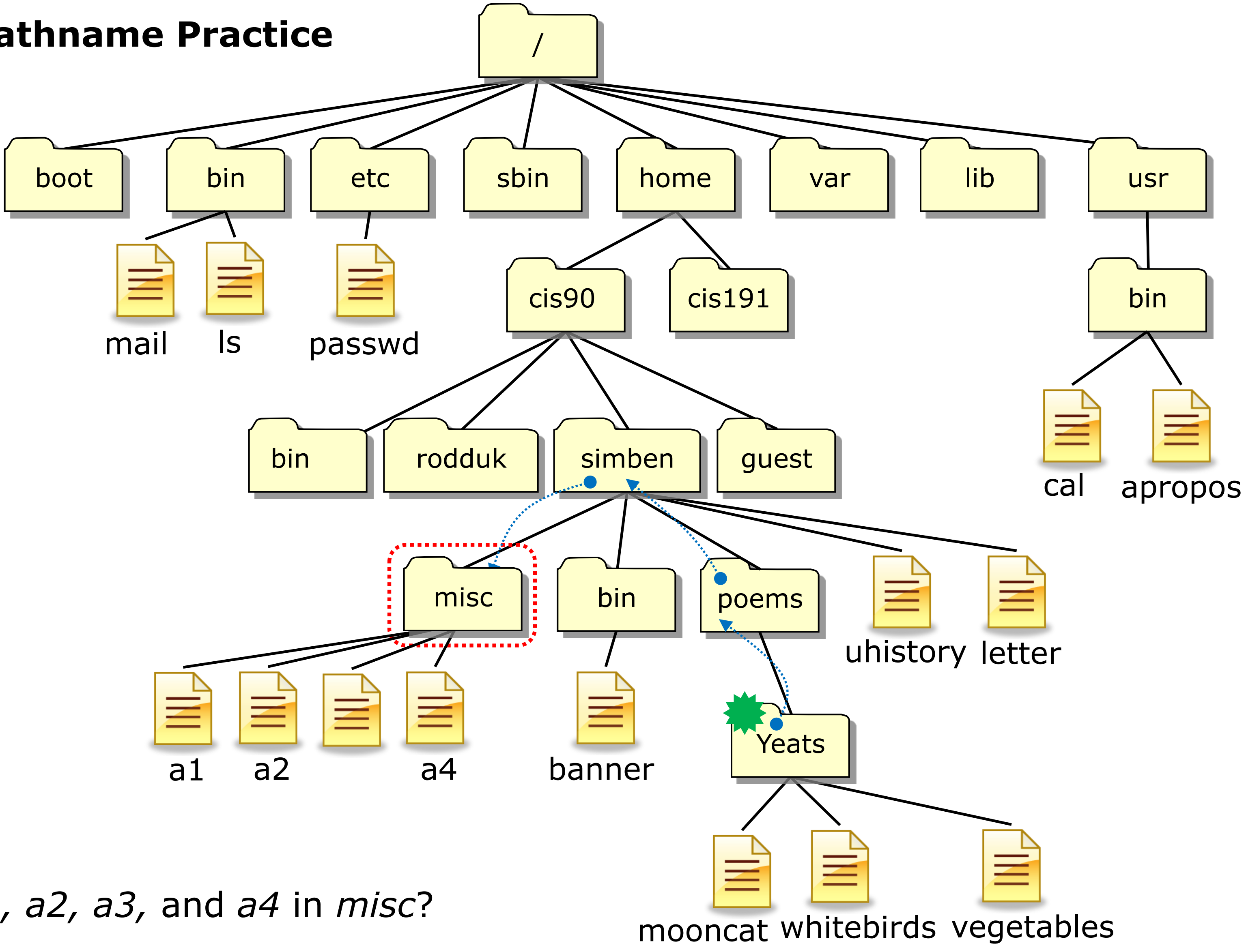
touch /home/cis90/simben/misc/a1 /home/cis90/simben/misc/a2 /home/cis90/simben/misc/a3 /home/cis90/simben/misc/a4 *(all on one line)*

All these answers are correct

FYI
only

For the aspiring gurus there is an even better way to do the last operation!

File Tree Pathname Practice



FYI only

From ✸ how does Benji:

Create files *a1, a2, a3,* and *a4* in *misc*?

```
/home/cis90/simben/poems/Yeats $ touch  ~/misc/a{1,2,3,4}
```

Housekeeping

Previous material and assignment

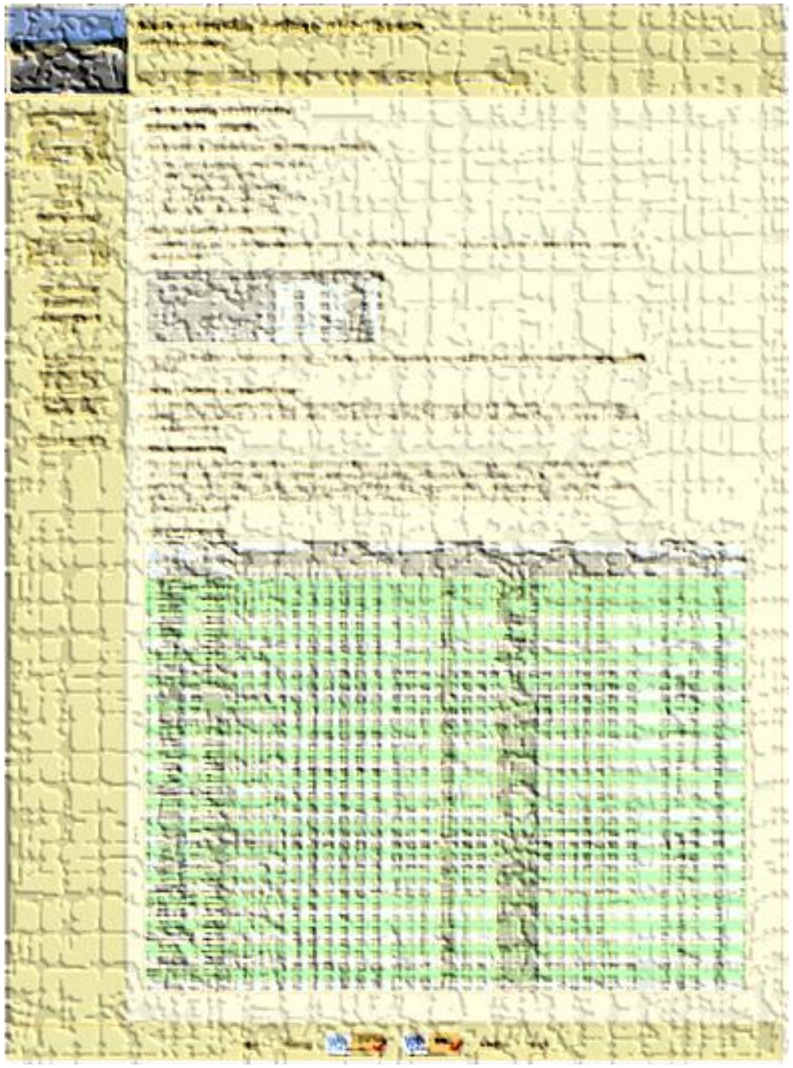
1. Lab 6 due 11:59PM
   - **check6** script available

Don't forget to submit with the submit script!

2. Five more posts due 11:59PM

3. Early preview of Lab X2 is now available. This is recommended for anyone wanting more practice with pathnames.

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



GRADES

- Check your progress on the Grades page
- If you haven't already, send me a student survey to get your LOR secret code name
- Graded labs & tests are placed in your home directories on Opus
- Answers to labs, tests and quizzes are in the */home/cis90/answers* directory on Opus

Current Point Tally

As of 10/22/2013

Points that could have been earned:	
5 quizzes:	15 points
5 labs:	150 points
1 test:	30 points
1 forum quarter:	20 points
Total:	**215 points**

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

adaldrida: 100% (217 of 215 points)
anborn: 0% (0 of 215 points)
aragorn: 99% (213 of 215 points)
arwen: 68% (148 of 215 points)
balrog: 57% (123 of 215 points)
barliman: 1% (4 of 215 points)
beregond: 74% (161 of 215 points)
boromir: 3% (8 of 215 points)
celebrian: 79% (171 of 215 points)
dori: 67% (146 of 215 points)
dwalin: 93% (200 of 215 points)
elrond: 96% (208 of 215 points)
eomer: 81% (175 of 215 points)
faramir: 102% (220 of 215 points)
frodo: 96% (208 of 215 points)
gimli: 96% (207 of 215 points)
goldberry: 107% (231 of 215 points)
huan: 52% (113 of 215 points)
ingold: 100% (216 of 215 points)
ioreth: 74% (160 of 215 points)
legolas: 70% (151 of 215 points)
marhari: 101% (218 of 215 points)
pallando: 104% (225 of 215 points)
pippen: 95% (205 of 215 points)
quickbeam: 47% (102 of 215 points)
samwise: 80% (172 of 215 points)
sauron: 102% (220 of 215 points)
shadowfax: 65% (141 of 215 points)
strider: 86% (186 of 215 points)
theoden: 101% (219 of 215 points)
treebeard: 89% (192 of 215 points)
tulkas: 100% (215 of 215 points)
ulmo: 64% (138 of 215 points)

If you are not happy with your current standing contact the instructor ASAP

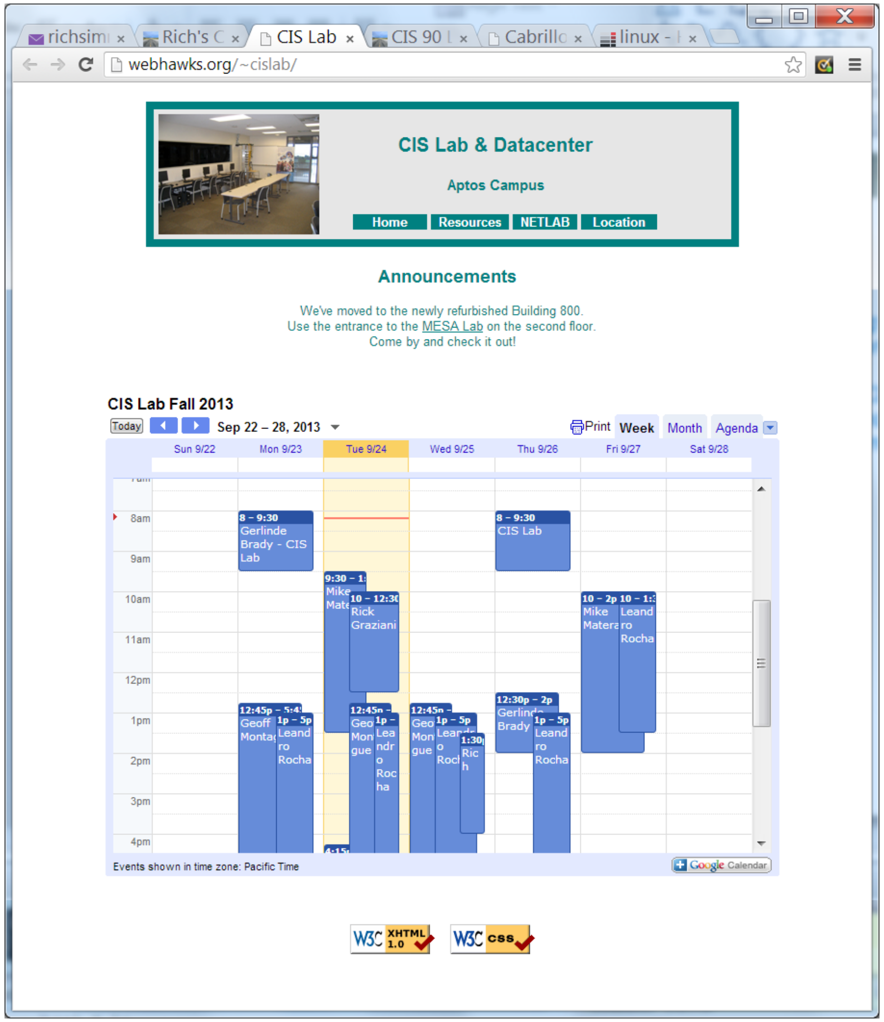
Jesse's checkgrades python script

http://oslab.cabrillo.edu/forum/viewtopic.php?f=31&t=773&p=2966

```
/home/cis90/simben $ checkgrades smeagol

Remember, your points may be zero simply because the
assignment has not been graded yet.

Quiz 1: You earned 3 points out of a possible 3.
Quiz 2: You earned 3 points out of a possible 3.
Quiz 3: You earned 3 points out of a possible 3.
Quiz 4: You earned 3 points out of a possible 3.


Forum Post 1: You earned 20 points out of a possible 20.

Lab 1: You earned 30 points out of a possible 30.
Lab 2: You earned 30 points out of a possible 30.
Lab 3: You earned 30 points out of a possible 30.
Lab 4: You earned 29 points out of a possible 30.


You've earned 15 points of extra credit.

You currently have a 109% grade in this class. (166 out of
152 possible points.)
```

Use your LOR code name as an argument on the checkgrades command

Jesse is a CIS 90 Alumnus. He wrote this python script when taking the course. It mines data from the website to check how many of the available points have been earned so far.


webhawks.org/~cislab/

CIS Lab & Datacenter

Aptos Campus

Home | Resources | NETLAB | Location

Announcements

We've moved to the newly refurbished Building 800.
Use the entrance to the MESA Lab on the second floor.
Come by and check it out!

CIS Lab Fall 2013

Sep 22 – 28, 2013

Events shown in time zone: Pacific Time

CIS Lab Schedule
http://webhawks.org/~cislab/

Work on assignments together with other classmates

Get help from instructors and student lab assistants

MESA grants requires logging help sessions with MESA funded student assistants

Permissions Review

File Permissions

Binary

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

r (read) is the 4's column

w (write) is the 2's column

x (execute) is the 1's column

File Permissions

An example long listing

r=read
w=write
x=execute
-=none

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter
```

*The **group***

*The **user***

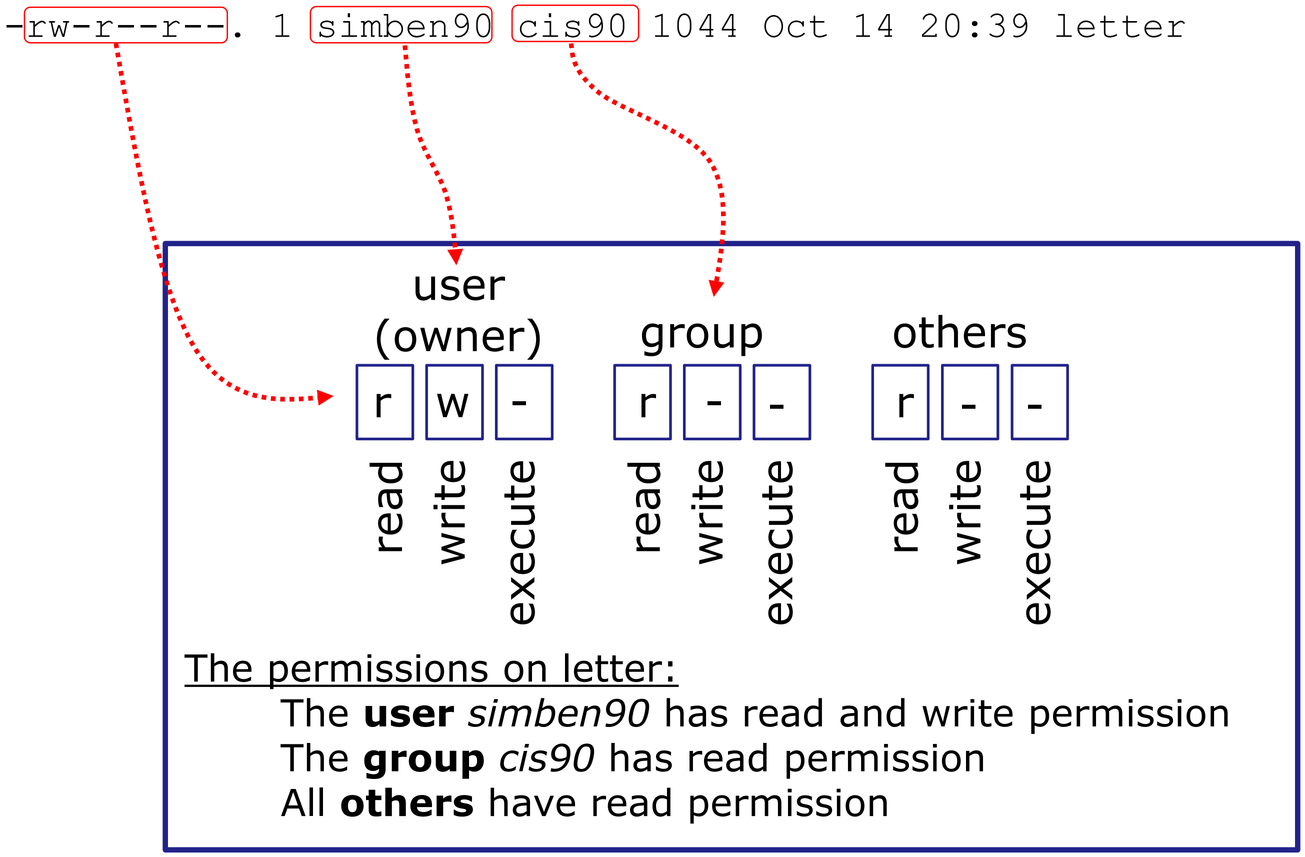
*Permissions that apply to **others***

*Permissions that apply to the **group***

*Permissions that apply to the **user***

File Permissions

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter
```



The permissions on letter:

The **user** *simben90* has read and write permission
The **group** *cis90* has read permission
All **others** have read permission

Use long listings to show permissions

File Permissions

Use long listings to show permissions

r=read
w=write
x=execute
-=none

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter
```

*The **group***

*The **user***

*Permissions that apply to **others***

*Permissions that apply to the **group***

*Permissions that apply to the **user***

Does the simben90 user have execute permission on the letter file?
Type answer in chat window

File Permissions

Use long listings to show permissions

r=read
w=write
x=execute
-=none

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter
```

*The **group***

*The **user***

*Permissions that apply to **others***

*Permissions that apply to the **group***

*Permissions that apply to the **user***

Does the simben90 user have execute permission on the letter file?
No

File Permissions

Use long listings to show permissions

r=read
w=write
x=execute
-=none

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter
```

*The **group***

*The **user***

*Permissions that apply to **others***

*Permissions that apply to the **group***

*Permissions that apply to the **user***

Does the zamhum90 user have write permission on the letter file?
Type answer in chat window

File Permissions

Use long listings to show permissions

r=read
w=write
x=execute
-=none

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter
```

*The **group***

*The **user***

*Permissions that apply to **others***

*Permissions that apply to the **group***

*Permissions that apply to the **user***

Does the zamhum90 user have write permission on the letter file?
No

File Permissions

Use long listings to show permissions

r=read	
w=write	
x=execute	
-=none	

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter
```

*The **group***

*The **user***

*Permissions that apply to **others***

*Permissions that apply to the **group***

*Permissions that apply to the **user***

Does the zamhum90 user have read permission on the letter file?
Type answer in chat window

File Permissions

Use long listings to show permissions

r=read
w=write
x=execute
-=none

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter
```

*The **group***

*The **user***

*Permissions that apply to **others***

*Permissions that apply to the **group***

*Permissions that apply to the **user***

Does the zamhum90 user have read permission on the letter file?

Yes

File Permissions

Use long listings to show permissions

r=read
w=write
x=execute
-=none

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter
```

*The **group***

*The **user***

*Permissions that apply to **others***

*Permissions that apply to the **group***

*Permissions that apply to the **user***

Does the smimat172 user have read permission on the letter file?
Type answer in chat window

File Permissions

Use long listings to show permissions

r=read
w=write
x=execute
-=none

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter
```

*The **group***

*The **user***

*Permissions that apply to **others***

*Permissions that apply to the **group***

*Permissions that apply to the **user***

Does the smimat172 user have read permission on the letter file?
Yes

Tools for managing permissions

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

chgrp - Changes the group of a file. (Only to 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 specific permissions to be removed on future newly created files and directories

Tools for managing permissions

chown

- Changes the ownership of a file. (Only the superuser has this privilege)
- Syntax: **chown <*owner*> <*pathname*>**

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter

/home/cis90/simben $ chown rsimms letter
chown: changing ownership of `letter': Operation not permitted
```

Only root (superuser) can change the ownership of a file

Tools for managing permissions

chgrp

- Changes the group of a file. (Only to groups the owner belongs to)
- Syntax: **chgrp <*group*> <*pathname*>**

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter

/home/cis90/simben $ groups
cis90 users

/home/cis90/simben $ chgrp users letter

/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 users 1044 Oct 14 20:39 letter
```

The owner can change the group to any he/she belongs to

Tools for managing permissions

chmod

- Changes the file mode “permission” bits of a file
- "Numeric" syntax: **chmod <*numeric permission*> <*pathname*>**

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter

/home/cis90/simben $ chmod 750 letter
/home/cis90/simben $ ls -l letter
-rwxr-x---. 1 simben90 cis90 1044 Oct 14 20:39 letter

/home/cis90/simben $ chmod 644 letter
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter
```

*Using **numeric** permissions format*

Tools for managing permissions

chmod

- Changes the file mode “permission” bits of a file.
- "Mnemonic" syntax: **chmod <u|g|o><+|-|=><r|w|x> <pathname(s)>**

  u=user(owner), **g**=group, **o**=other
  r=read, **w**=write, **x**=execute

```
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter

/home/cis90/simben $ chmod u+x,g+w,o-r letter
/home/cis90/simben $ ls -l letter
-rwxrw----. 1 simben90 cis90 1044 Oct 14 20:39 letter

/home/cis90/simben $ chmod u=rw,g=r,o=r letter
/home/cis90/simben $ ls -l letter
-rw-r--r--. 1 simben90 cis90 1044 Oct 14 20:39 letter
```

*Using **mnemonic** permissions format*

Tools for managing permissions

umask – Allows specific permissions to be removed on future newly created files and directories

umask

Why umask?

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.*

umask summary

- Use the **umask** command to specify the permissions you want removed from future new files and directories

- Does not change permissions on existing files

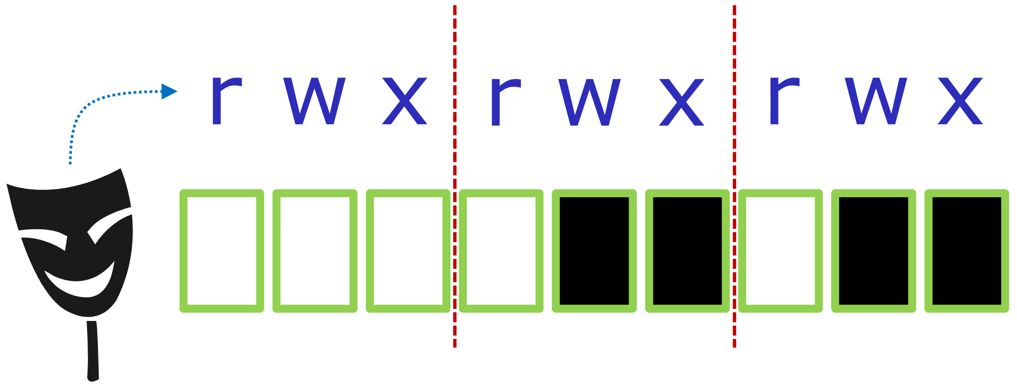
- To determine permissions on a new file or directory apply the umask to the initial permission starting point:
  - For new files, start with ***666***
  - NEW For new directories, start with ***777***
  - For file copies, start with **the permission on the source file** being copied

Case 1 – new directory

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

Case 1 – new directory

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



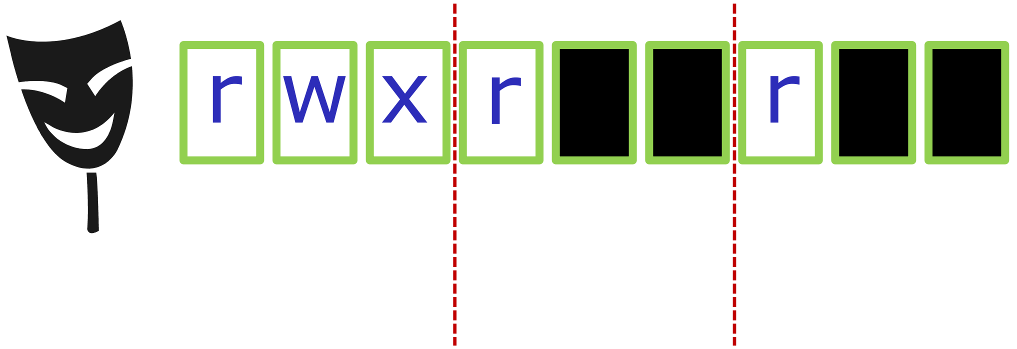
starting point = 777 (new directory)

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

Now slide the mask up and over the starting point permissions

Case 1 – new directory

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



starting point = 777 (new directory)

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

Answer: 744

Prove it to yourself on Opus as shown here

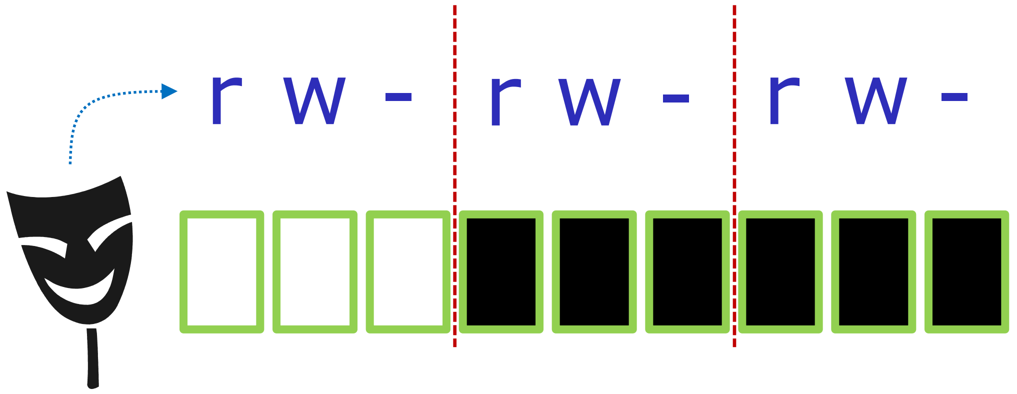
```
/home/cis90ol/simmsben $ umask 033
/home/cis90ol/simmsben $ mkdir brandnewdir
/home/cis90ol/simmsben $ ls -ld brandnewdir/
drwxr--r-- 2 simmsben cis90ol 4096 Apr 21 12:46 brandnewdir/
```

Case 2 – new file

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

Case 2 – new file

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



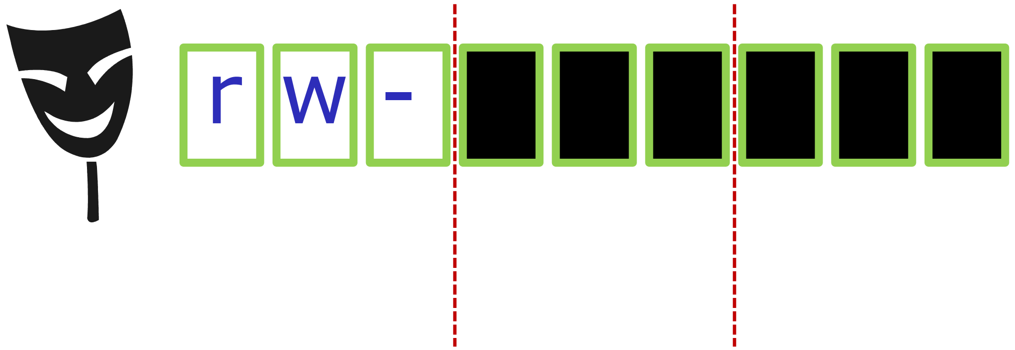
starting point = 666 (new file)

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?



starting point = 666 (new file)

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

Answer: 600

Prove it to yourself on Opus 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
```

Case 3 – file copy

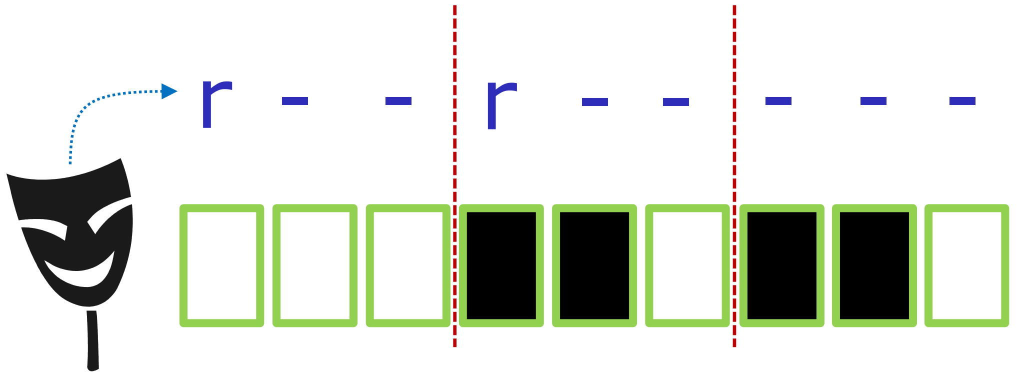
If umask=066 and the *cinderella* file permissions are 440

What would the permissions be on the file *cinderella.bak* after:
cp cinderella cinderella.bak

Case 3 – file copy

If umask=066 and the *cinderella* file permissions are 440

What would the permissions be on the file *cinderella.bak* after:
cp cinderella cinderella.bak



starting point = 440
(source file permissions)

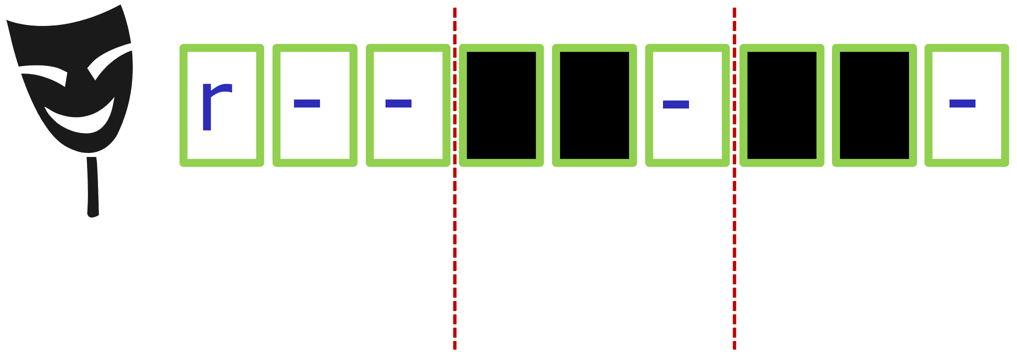
umask setting of 066 strips these bits: --- rw- rw-

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 the file *cinderella.bak* after:
cp cinderella cinderella.bak



starting point = 440
(source file permissions)

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

Answer: 400

Prove it to yourself on Opus 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
```

Permissions

"The rest of the story"

- Special Permissions
- ACLs
- Extended Attributes
- SELinux

FYI only

This module is for your information only. We won't use this in CIS 90 but its good to know they exist. More in CIS 191, 192 and 193

FYI only

Special Permissions

Sticky bit - used on directories, e.g. /tmp, so that only owners can rename or remove files even though other users may have write permission on the directory.

SetUID or SetGID - allows a user to run an program file with the permissions of the file's owner (Set User ID) or the file's group (Set Group ID). Examples include **ping** and **passwd** commands.

FYI only

Special Permissions

Sticky bit - used on directories, e.g. /tmp, so that only owners can rename or remove files even though other users may have write permission on the directory.

green background with black text

```
/home/cis90/simben $ ls -ld /tmp
drwxrwxrwt. 3 root root 4096 Oct 16 16:13 /tmp

/home/cis90/simben $ mkdir tempdir
/home/cis90/simben $ chmod 777 tempdir/
/home/cis90/simben $ ls -ld tempdir/
drwxrwxrwx. 2 simben90 cis90 4096 Oct 16 15:25 tempdir/
```

set sticky bit

```
/home/cis90/simben $ chmod 1777 tempdir
/home/cis90/simben $ ls -ld tempdir/
drwxrwxrwt. 2 simben90 cis90 4096 Oct 16 15:25 tempdir/
```

sticky bit set

green background with black text

FYI only

Special Permissions

SetUID or SetGID - allows a user to run an program file with the permissions of the file's owner (Set User ID) or the file's group (Set Group ID). Examples include **ping** and **passwd** commands.

```
/home/cis90/simben $ ls -l /bin/ping /usr/bin/passwd
-rwsr-xr-x. 1 root root 36892 Jul 18  2011 /bin/ping
-rwsr-xr-x. 1 root root 25980 Feb 22  2012 /usr/bin/passwd
```

red background with gray text

```
/home/cis90/simben $ echo banner Hola > hola; chmod +x hola; ls -l hola
-rwxrwxr-x. 1 simben90 cis90 12 Oct 16 16:45 hola

/home/cis90/simben $ chmod 4775 hola
/home/cis90/simben $ ls -l hola
-rwsrwxr-x. 1 simben90 cis90 12 Oct 16 16:45 hola
/home/cis90/simben $ chmod 2775 hola
/home/cis90/simben $ ls -l hola
-rwxrwsr-x. 1 simben90 cis90 12 Oct 16 16:45 hola
```

FYI only

ACLs (Access Control Lists)

ACLs - offer a finer granularity of control allowing additional permissions to be set for specific users or groups.

FYI only

ACLs (Access Control Lists)

ACLs - offer a finer granularity of control allowing additional permissions to be set for specific users or groups.

```
/home/cis90/simben $ echo yabadabadoo > yogi
/home/cis90/simben $ chmod 400 yogi
/home/cis90/simben $ ls -l yogi
-r--------. 1 simben90 cis90 12 Oct 16 17:02 yogi

/home/cis90/simben $ getfacl yogi
# file: yogi
# owner: simben90
# group: cis90
user::r--
group::---
other::---
```

Create a file and set permissions to 444

*Use **getfacl** to show ACLs*

```
[milhom90@oslab ~]$ cat ../simben/yogi
cat: ../simben/yogi: Permission denied
```

Homer, a member of the cis90 group can't read the file

```
[rodduk90@oslab ~]$ cat ../simben/yogi
cat: ../simben/yogi: Permission denied
```

Duke, a member of the cis90 group can't read the file either

FYI only

ACLs (Access Control Lists)

Let's give special permissions to one user

modify

```
/home/cis90/simben $ setfacl -m u:milhom90:rw yogi
/home/cis90/simben $ ls -l yogi
-r--rw----+ 1 simben90 cis90 12 Oct 16 17:02 yogi
/home/cis90/simben $ getfacl yogi
# file: yogi
# owner: simben90
# group: cis90
user::r--
user:milhom90:rw-
group::---
mask::rw-
other::---
```

Allow milhom90 to have read/write access

```
[milhom90@oslab ~]$ cat ../simben/yogi
yabadabadoo
```

Homer can now read the file

```
[rodduk90@oslab ~]$ cat ../simben/yogi
cat: ../simben/yogi: Permission denied
```

But not Duke

FYI only

ACLs (Access Control Lists)

Let's remove the special permissions to that user

remove all base ACLs

```
/home/cis90/simben $ setfacl -b  yogi
/home/cis90/simben $ ls -l yogi
-r--------. 1 simben90 cis90 12 Oct 16 17:02 yogi
/home/cis90/simben $ getfacl yogi
# file: yogi
# owner: simben90
# group: cis90
user::r--
group::---
other::---
```

Remove all ACLs on yogi file

```
[milhom90@oslab ~]$ cat ../simben/yogi
cat: ../simben/yogi: Permission denied
```

Now Homer can't read it again

```
[rodduk90@oslab ~]$ cat ../simben/yogi
cat: ../simben/yogi: Permission denied
```

Same for Duke

FYI only

Extended File Attributes

Extended Attributes - the root user can set some extended attribute bits to enhance security.

FYI only

Extended File Attributes

Let's use extended file attributes to totally lock down a file against changes, even by its owner!

```
/home/cis90/simben $ echo yabadabadoo > yogi
/home/cis90/simben $ ls -l yogi
-rw-rw-r--. 1 simben90 cis90 12 Oct 16 17:29 yogi
```

Create a sample file to work on

*The root user sets the **immutable bit (i)** so Benji cannot remove his own file*

```
[root@oslab ~]# lsattr /home/cis90/simben/yogi
-------------e- /home/cis90/simben/yogi
[root@oslab ~]# chattr +i /home/cis90/simben/yogi
[root@oslab ~]# lsattr /home/cis90/simben/yogi
----i--------e- /home/cis90/simben/yogi
```

```
/home/cis90/simben $ ls -ld ~
drwxr-xr-x. 17 simben90 cis90 4096 Oct 16 17:29 /home/cis90/simben
/home/cis90/simben $ rm yogi
rm: remove write-protected regular file `yogi'? yes
rm: cannot remove `yogi': Operation not permitted
```

!!

FYI only

Extended File Attributes

Extended Attributes - the root user can set some extended attribute bits to enhance security.

*The root user removes the **immutable bit (i)** so Benji can remove his own file again*

```
[root@oslab ~]# chattr -i /home/cis90/simben/yogi
[root@oslab ~]# lsattr /home/cis90/simben/yogi
-------------e- /home/cis90/simben/yogi
```

```
/home/cis90/simben $ ls -ld ~
drwxr-xr-x. 17 simben90 cis90 4096 Oct 16 17:29 /home/cis90/simben
/home/cis90/simben $ rm yogi
/home/cis90/simben $
```

FYI only

Extended File Attributes

Let's use extended file attributes to allow the file to be appended (but still not emptied or removed)

```
/home/cis90/simben $ ls -l yogi
-rw-rw-r--. 1 simben90 cis90 12 Oct 16 17:41 yogi
```

The root user sets the ***append only bit (a)*** *so Benji can only append to his file*

```
[root@oslab ~]# lsattr /home/cis90/simben/yogi
-------------e- /home/cis90/simben/yogi
[root@oslab ~]# chattr +a /home/cis90/simben/yogi
[root@oslab ~]# lsattr /home/cis90/simben/yogi
-----a-------e- /home/cis90/simben/yogi
```

```
/home/cis90/simben $ rm yogi
rm: cannot remove `yogi': Operation not permitted
/home/cis90/simben $ > yogi
-bash: yogi: Operation not permitted
/home/cis90/simben $ echo yowser >> yogi
/home/cis90/simben $
```

FYI only

SELinux context

SELinux - Security Enhanced Linux. SELinux is a set of kernel modifications that provide Mandatory Access Control (MAC). In MAC-enabled systems there is a strict set of security policies for all operations which users cannot override. The primary original developer of SELinux was the NSA (National Security Agency).

FYI only

SELinux context

Use the Z option on the ls command to show the SELinux context on a file

```
[root@oslab selinux]# ls -lZ test*
-rw-r--r--. root root unconfined_u:object_r:httpd_sys_content_t:s0 test01.html
-rw-r--r--. root root unconfined_u:object_r:httpd_sys_content_t:s0 test02.html
```

user *role* *type* *level*

FYI only

SELinux context

Create two identical web pages with identical permissions

```
[root@oslab selinux]# cp test01.html test02.html
cp: overwrite `test02.html'? yes

[root@oslab selinux]# ls -lZ test*
-rw-r--r--. root root unconfined_u:object_r:httpd_sys_content_t:s0 test01.html
-rw-r--r--. root root unconfined_u:object_r:httpd_sys_content_t:s0 test02.html
```

Use chcon command to change the SELinux context on one file

```
[root@oslab selinux]# chcon -v -t home_root_t test02.html
changing security context of `test02.html'

[root@oslab selinux]# ls -lZ test*
-rw-r--r--. root root unconfined_u:object_r:httpd_sys_content_t:s0 test01.html
-rw-r--r--. root root unconfined_u:object_r:home_root_t:s0 test02.html
```

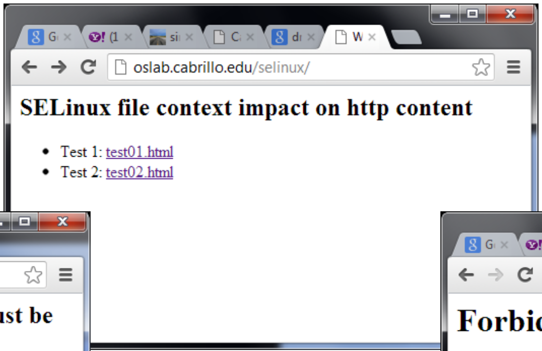
Note, the root user's home files are not appropriate web content

FYI only

SELinux context

SELinux won't let Apache publish a file with an inappropriate context

```
[root@oslab selinux]# ls -lZ test*
-rw-r--r--. root root unconfined_u:object_r:httpd_sys_content_t:s0 test01.html
-rw-r--r--. root root unconfined_u:object_r:home_root_t:s0 test02.html
[root@oslab selinux]#
```

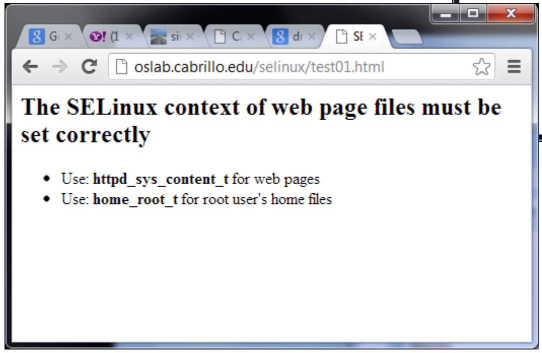


oslab.cabrillo.edu/selinux/

SELinux file context impact on http content

- Test 1: test01.html
- Test 2: test02.html

test01.html



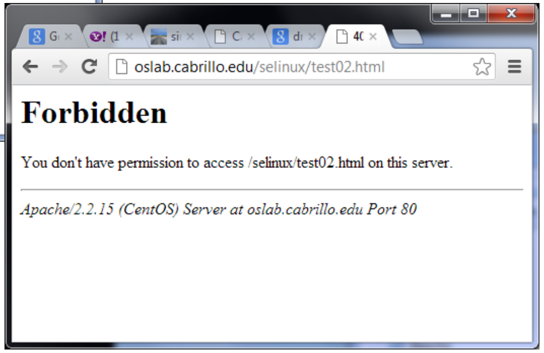
oslab.cabrillo.edu/selinux/test01.html

The SELinux context of web page files must be set correctly

- Use: **httpd_sys_content_t** for web pages
- Use: **home_root_t** for root user's home files

type = httpd_sys_content_t

test02.html



oslab.cabrillo.edu/selinux/test02.html

Forbidden

You don't have permission to access /selinux/test02.html on this server.

Apache/2.2.15 (CentOS) Server at oslab.cabrillo.edu Port 80

type = home_root_t

File Descriptors

Input and Output

File Descriptors

Every process is given three open files upon its execution. These open files are inherited from the shell.

stdin

Standard Input (0)
defaults to the user's terminal keyboard

stdout

Standard Output (1)
defaults to the user's terminal screen

stderr

Standard Error (2)
defaults to the user's terminal screen

Tools for your toolbox

sort - sorts input from a file or stdin and writes output to stdout

Input and Output

File Descriptors

Example program: sort command

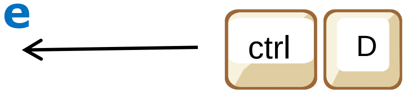
```
/home/cis90/simben $ cat names
duke
benji
homer
lucy
scout
chip
/home/cis90/simben $ sort names
benji
chip
duke
homer
lucy
scout
```

*The sort command will sort the lines in a file and send the sorted lines to **stdout** (defaults to the terminal)*

Input and Output
File Descriptors

Example program: sort command

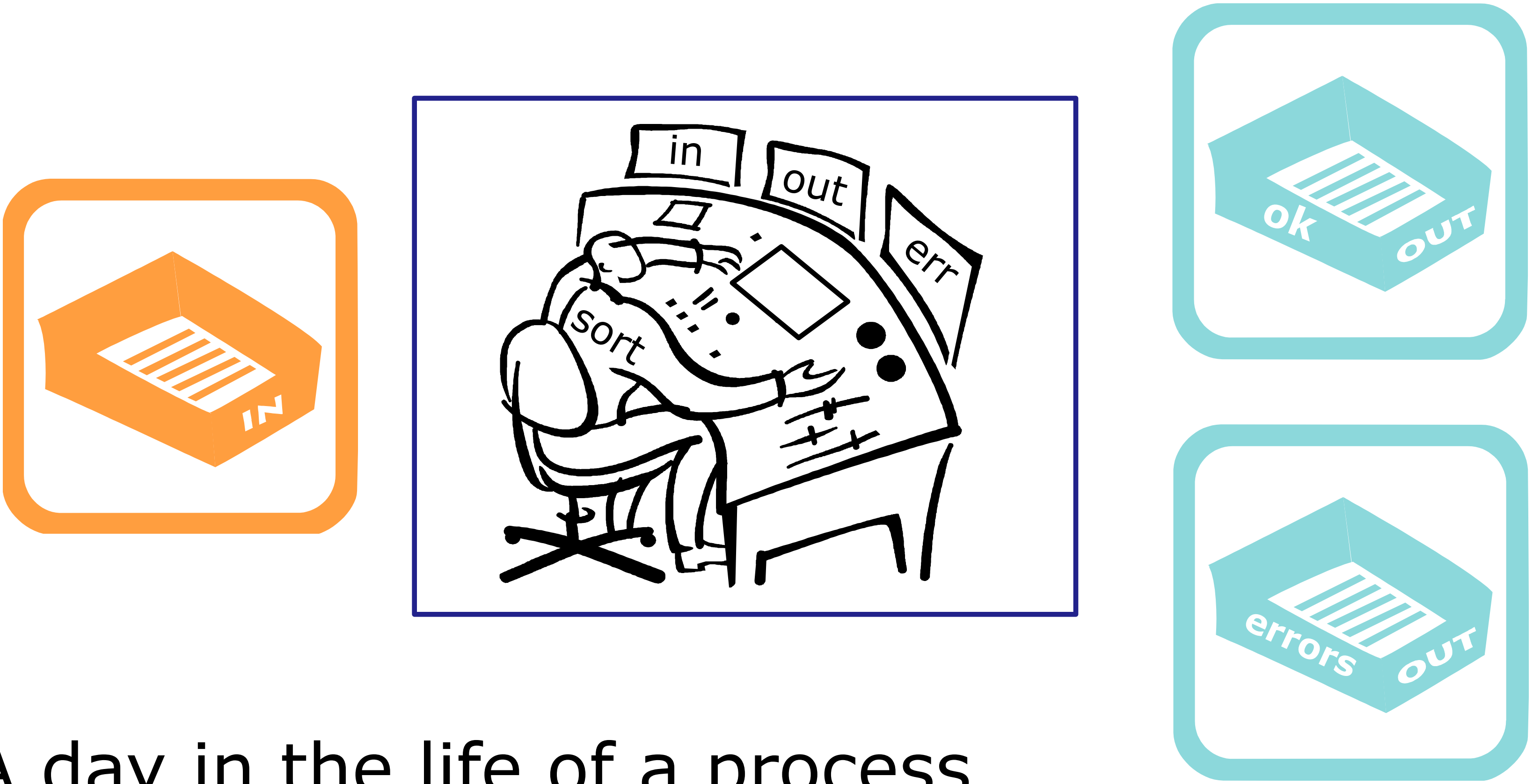
```
/home/cis90/simben $ sort
kayla
sky
bella
benji
charlie
bella
benji
charlie
kayla
sky
```



*If a file name is not specified as an argument on the command line, then the **sort** command will start reading from **stdin** (defaults to the keyboard) until it gets an EOF (End of File).*

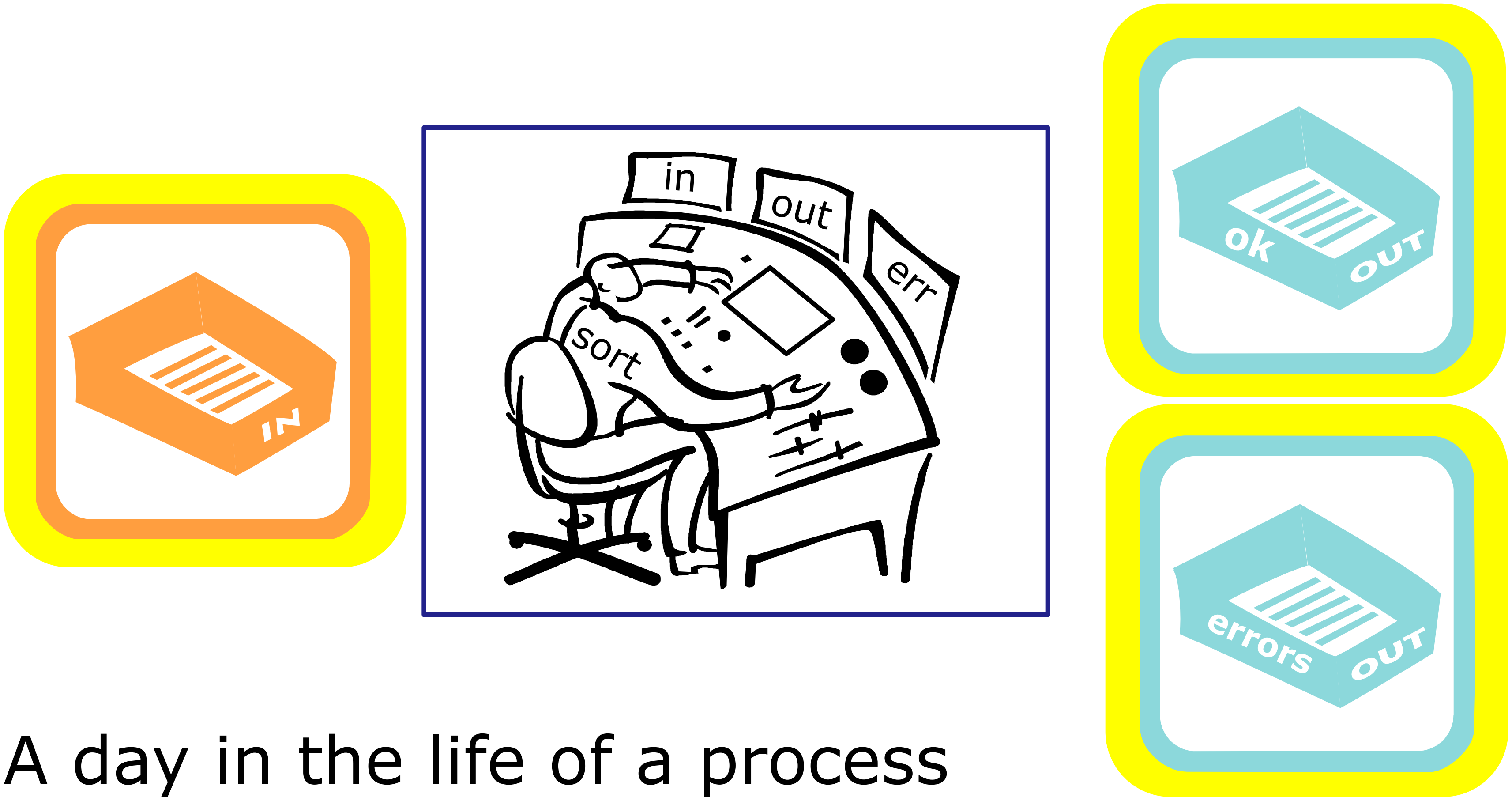
*After getting the EOF, the lines are sorted and sent to **stdout** (defaults to the terminal)*

Lets visualize the sort program being loaded into memory and running as a process by the kernel



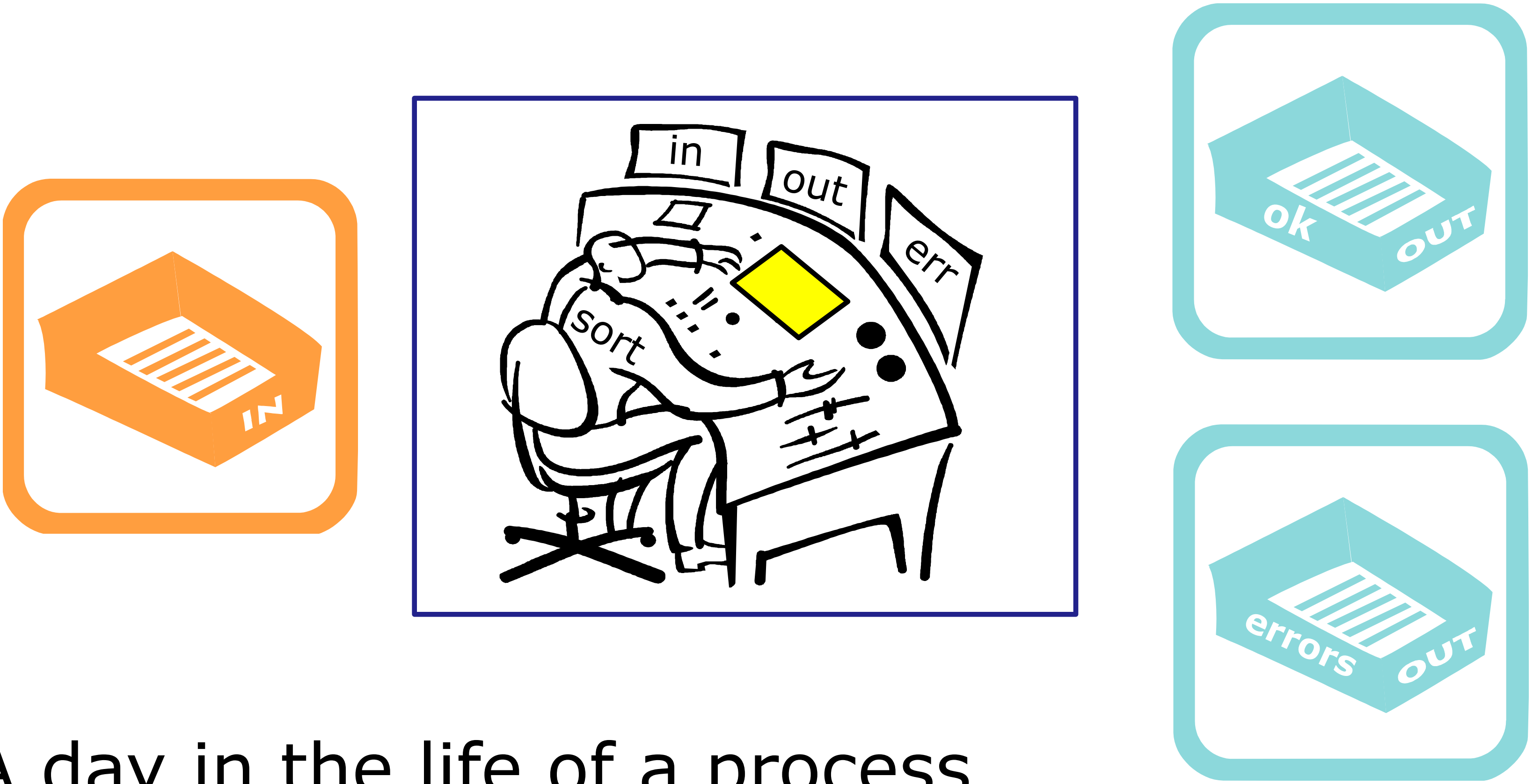
A day in the life of a process

There is one in tray and two out trays



A day in the life of a process

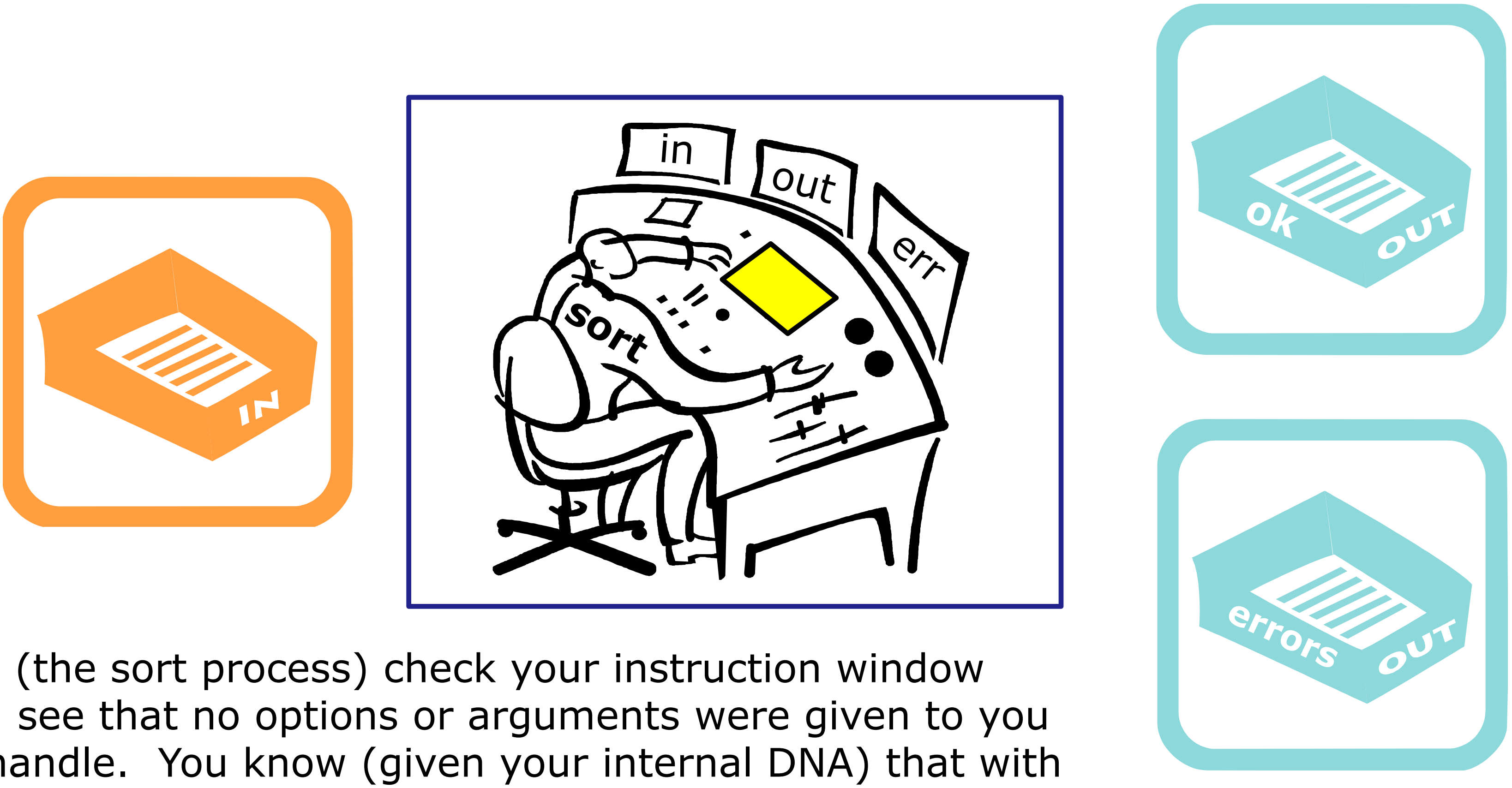
There is also a place where the process can check to see if there were any options or arguments specified on the command line



A day in the life of a process

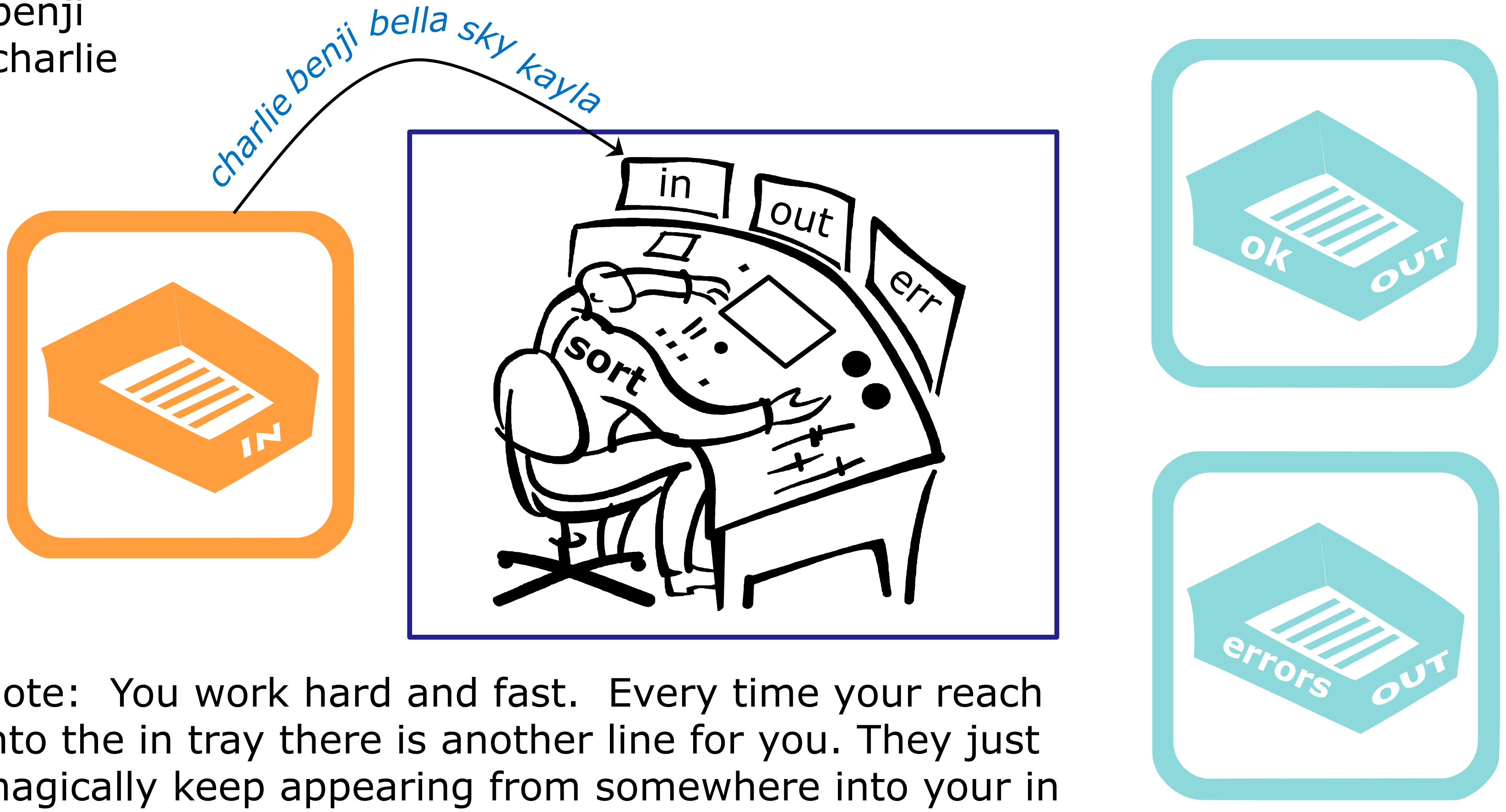
sort process example no args

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



You (the sort process) check your instruction window and see that no options or arguments were given to you to handle. You know (given your internal DNA) that with no arguments you must looks for lines to sort in your in tray, so you reach in to grab the first line to sort.

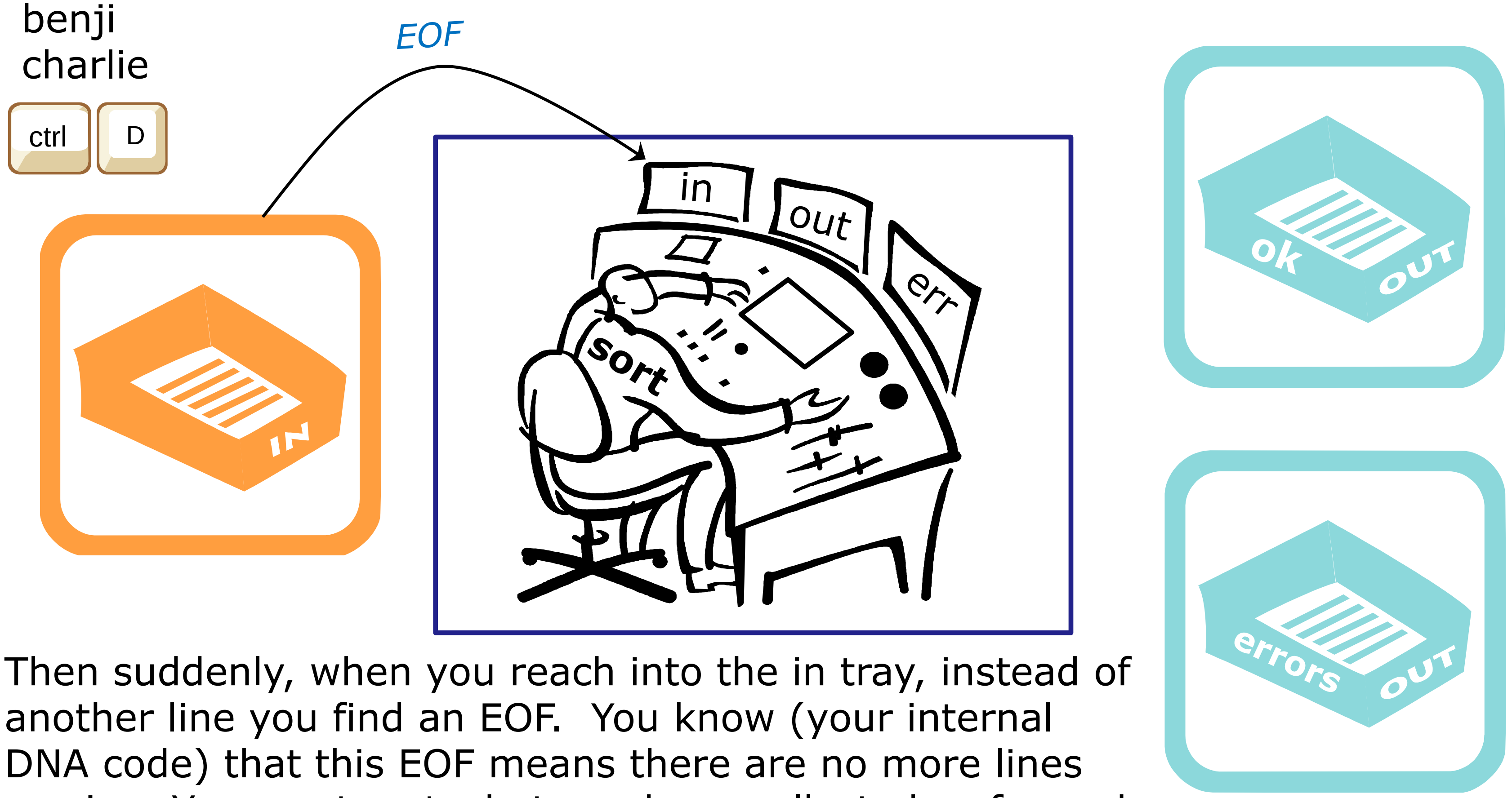
```
/home/cis90/simben $ sort
kayla
sky
bella
benji
charlie
```



Note: You work hard and fast. Every time your reach into the in tray there is another line for you. They just magically keep appearing from somewhere into your in tray. You have no idea where they are coming from.

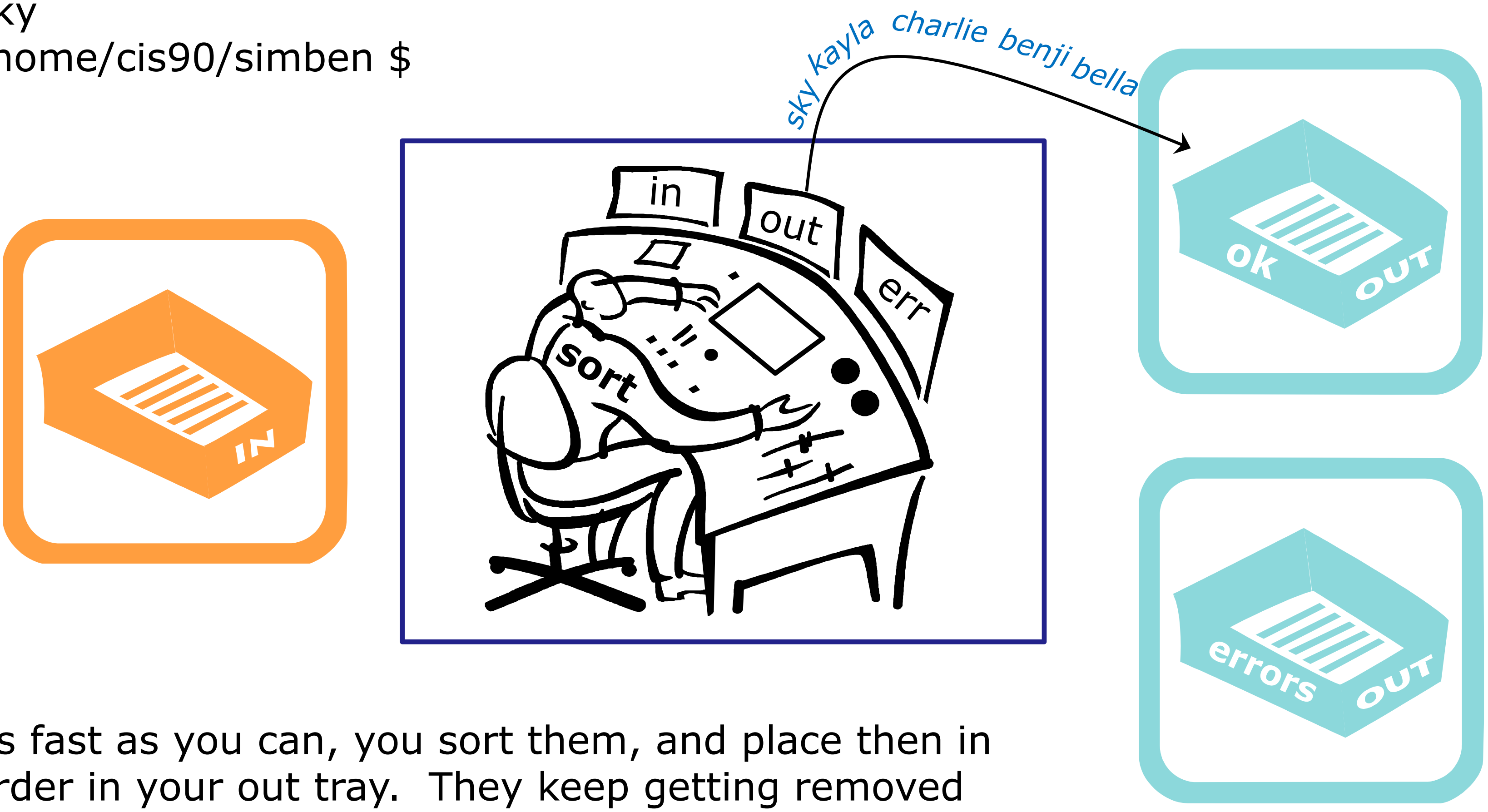
CIS 90 - Lesson 8

```
/home/cis90/simben $ sort
kayla
sky
bella
benji
charlie
```



Then suddenly, when you reach into the in tray, instead of another line you find an EOF. You know (your internal DNA code) that this EOF means there are no more lines coming. You must sort what you have collected so far and place them, in order, into your out tray.

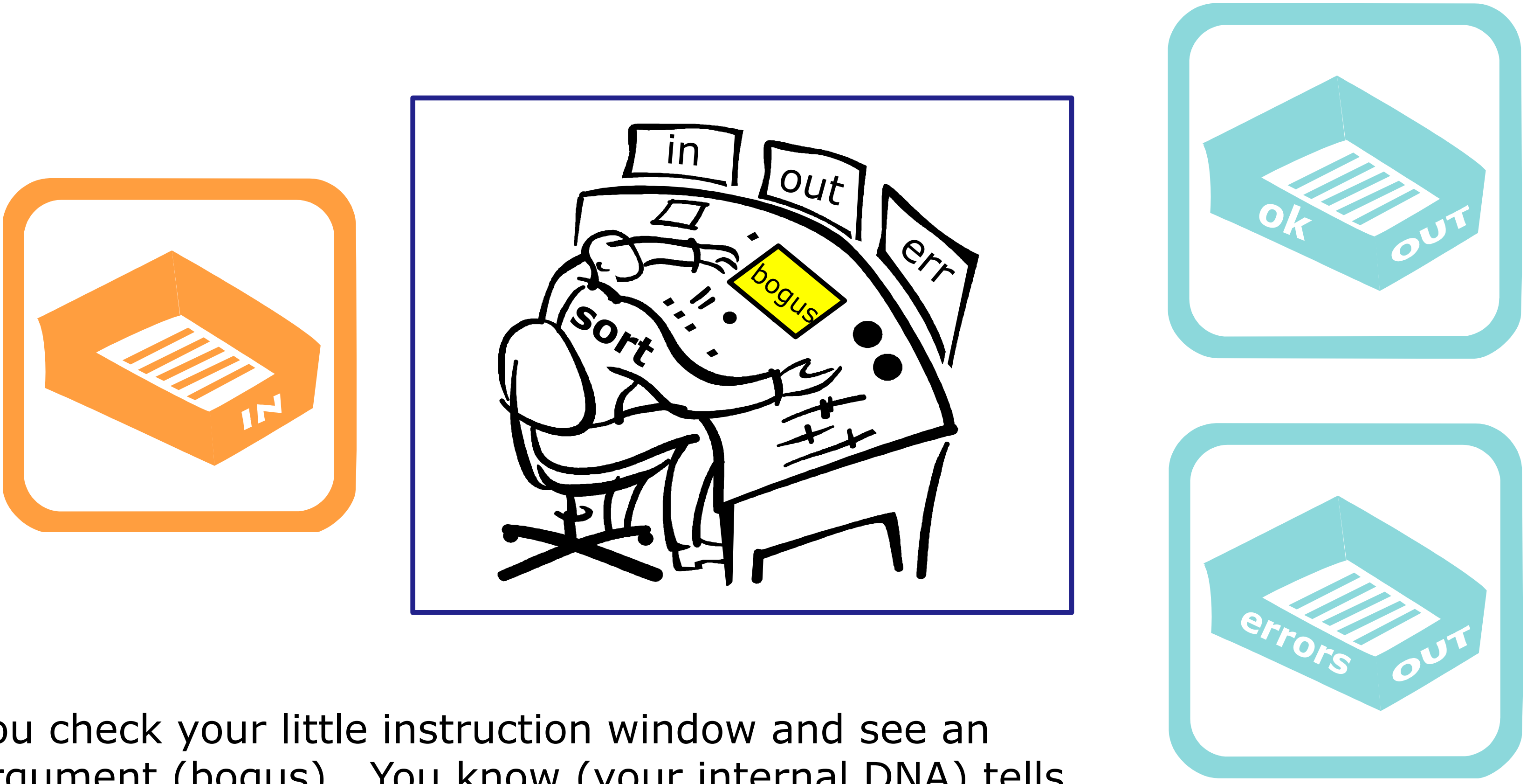
```
bella
benji
charlie
kayla
sky
/home/cis90/simben $
```



As fast as you can, you sort them, and place then in order in your out tray. They keep getting removed magically from the out tray. You have no idea where they go.

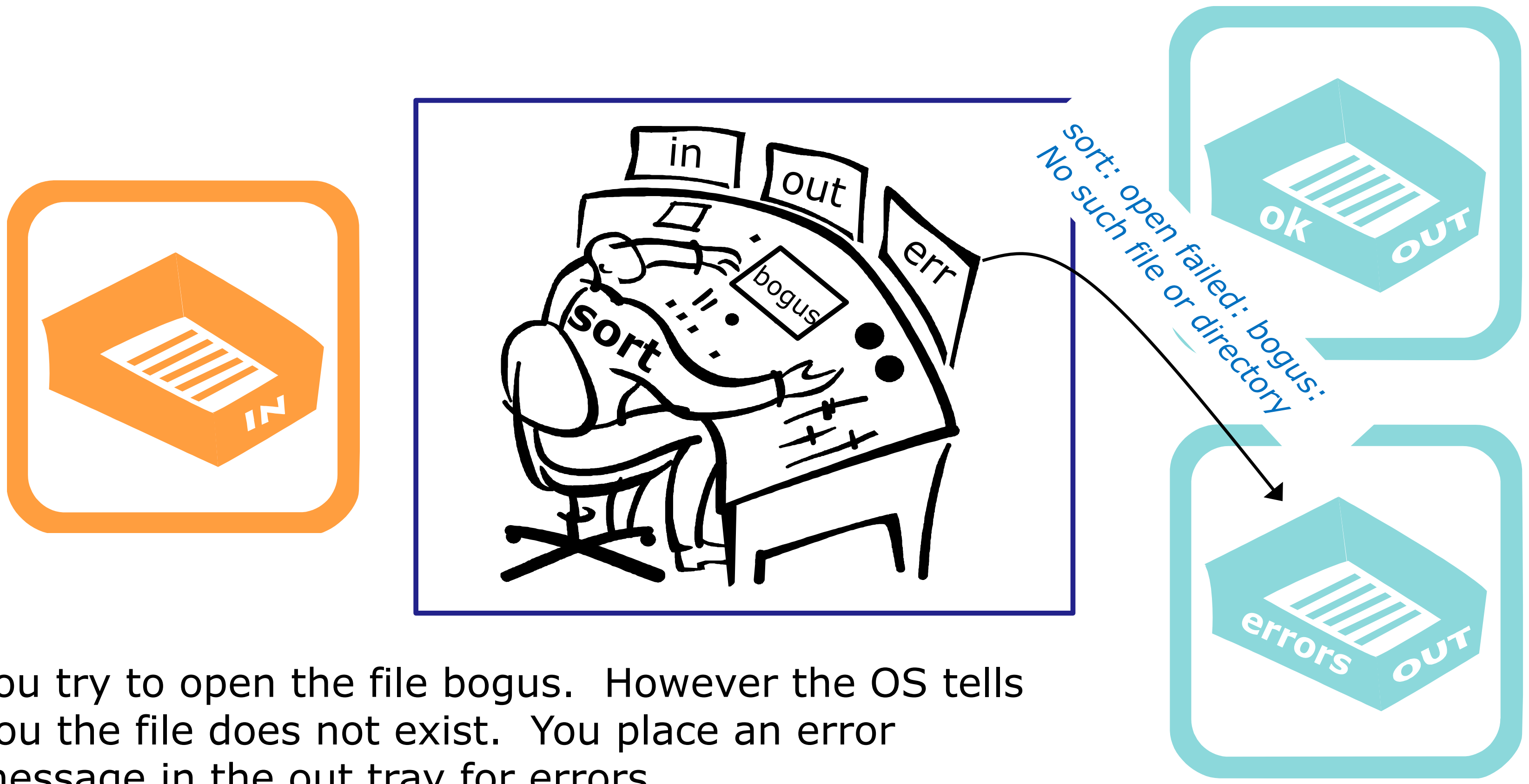
sort process example bad arg

```
/home/cis90/simben $ sort bogus
```



You check your little instruction window and see an argument (bogus). You know (your internal DNA) tells you this must be a file name containing lines to sort.

```
/home/cis90/simben $ sort bogus
sort: open failed: bogus: No such file or directory
```



You try to open the file bogus. However the OS tells you the file does not exist. You place an error message in the out tray for errors.

bringing it home

Ok, lets make the visualization a little more realistic

stdout (1)

stdin (0)

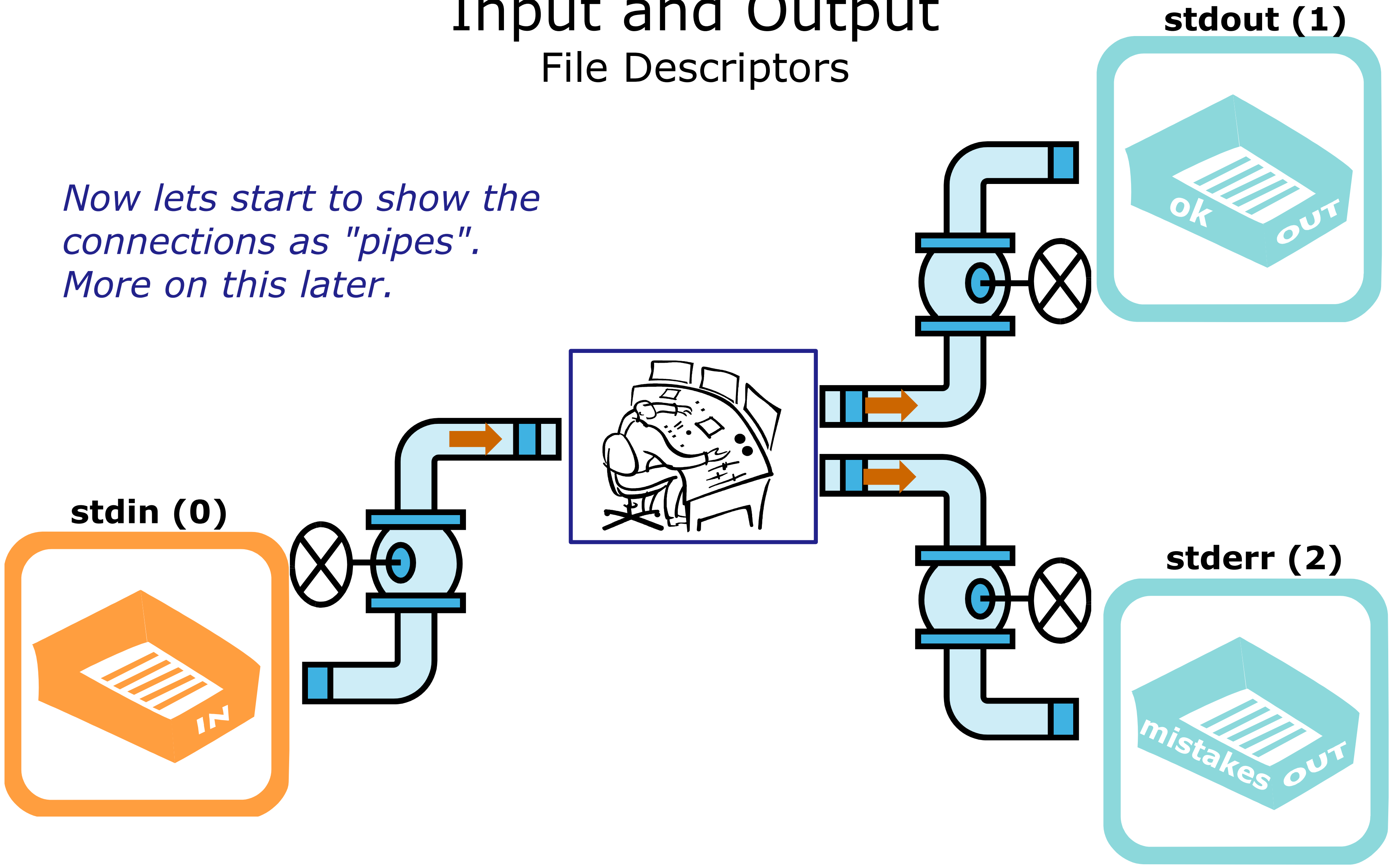
stderr (2)

mistakes
OUT

The actual in and out trays have names as well as numbers **... stdin (0) stdout (1**) and **stderr (2)**.

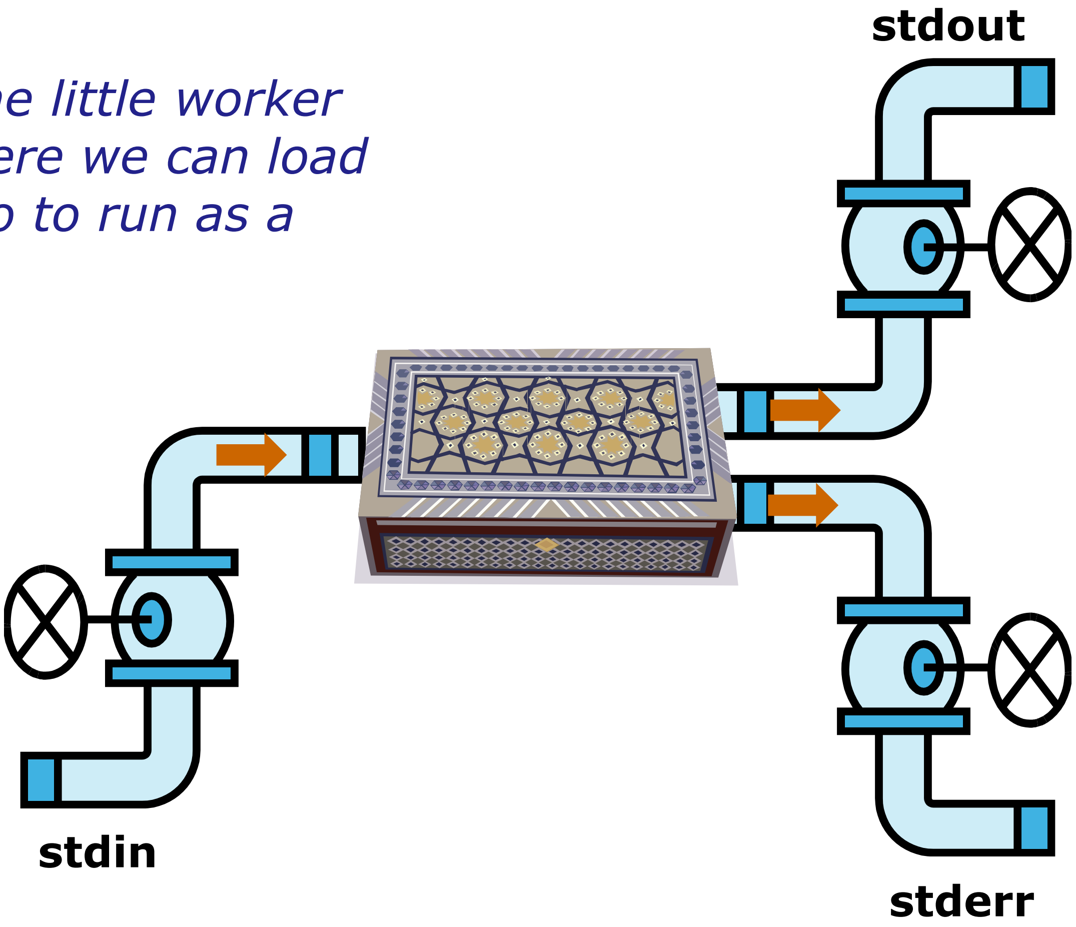
Input and Output
File Descriptors

Now lets start to show the connections as "pipes". More on this later.



Input and Output
File Descriptors

*Lets replace the little worker with a box where we can load **programs** into to run as a **process***



normal output is written to stdout

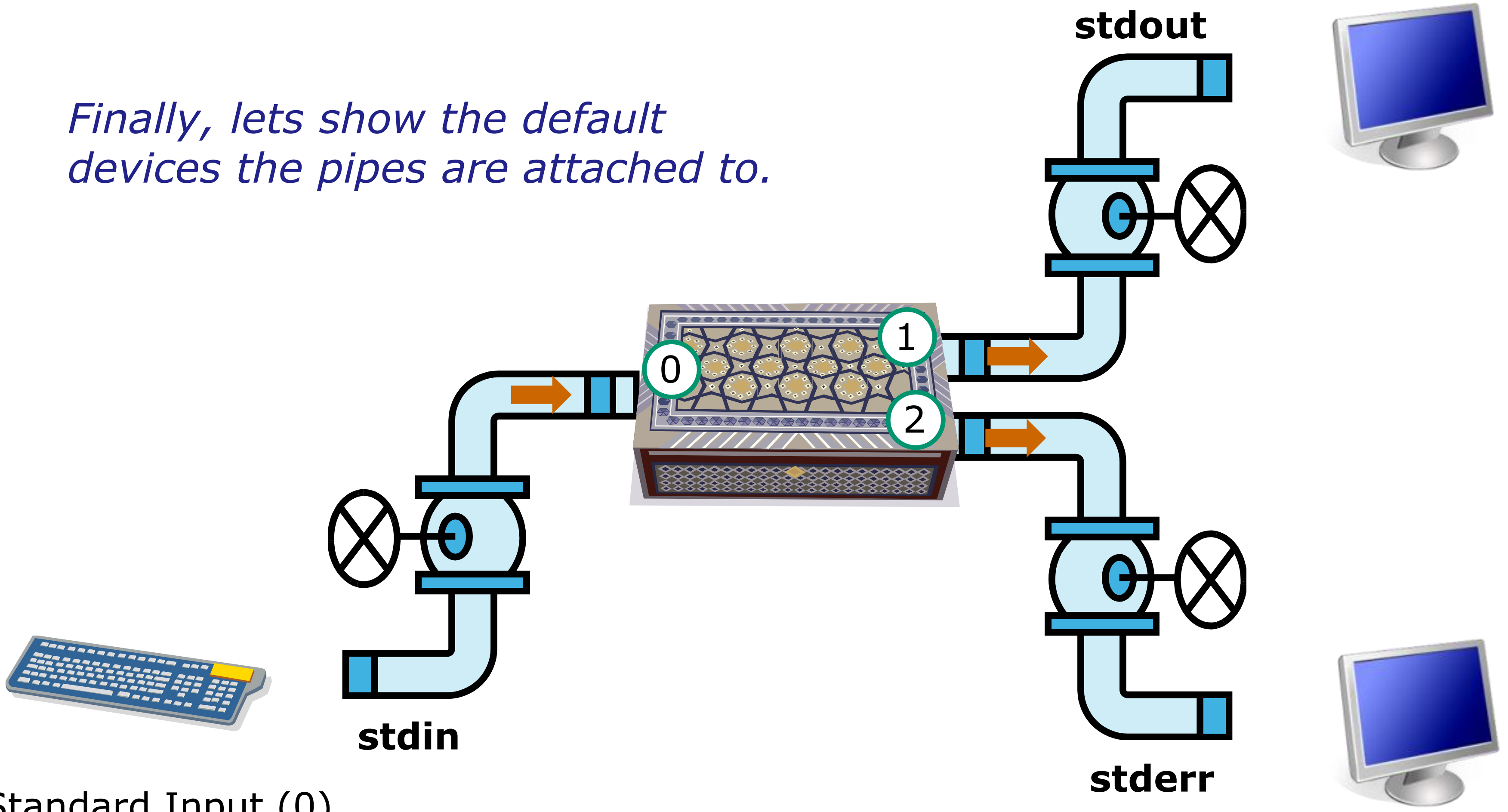
input (if necessary) is read from stdin

errors are written to stderr

Input and Output
File Descriptors

Finally, lets show the default devices the pipes are attached to.

Standard Output (1)
defaults to the user's terminal



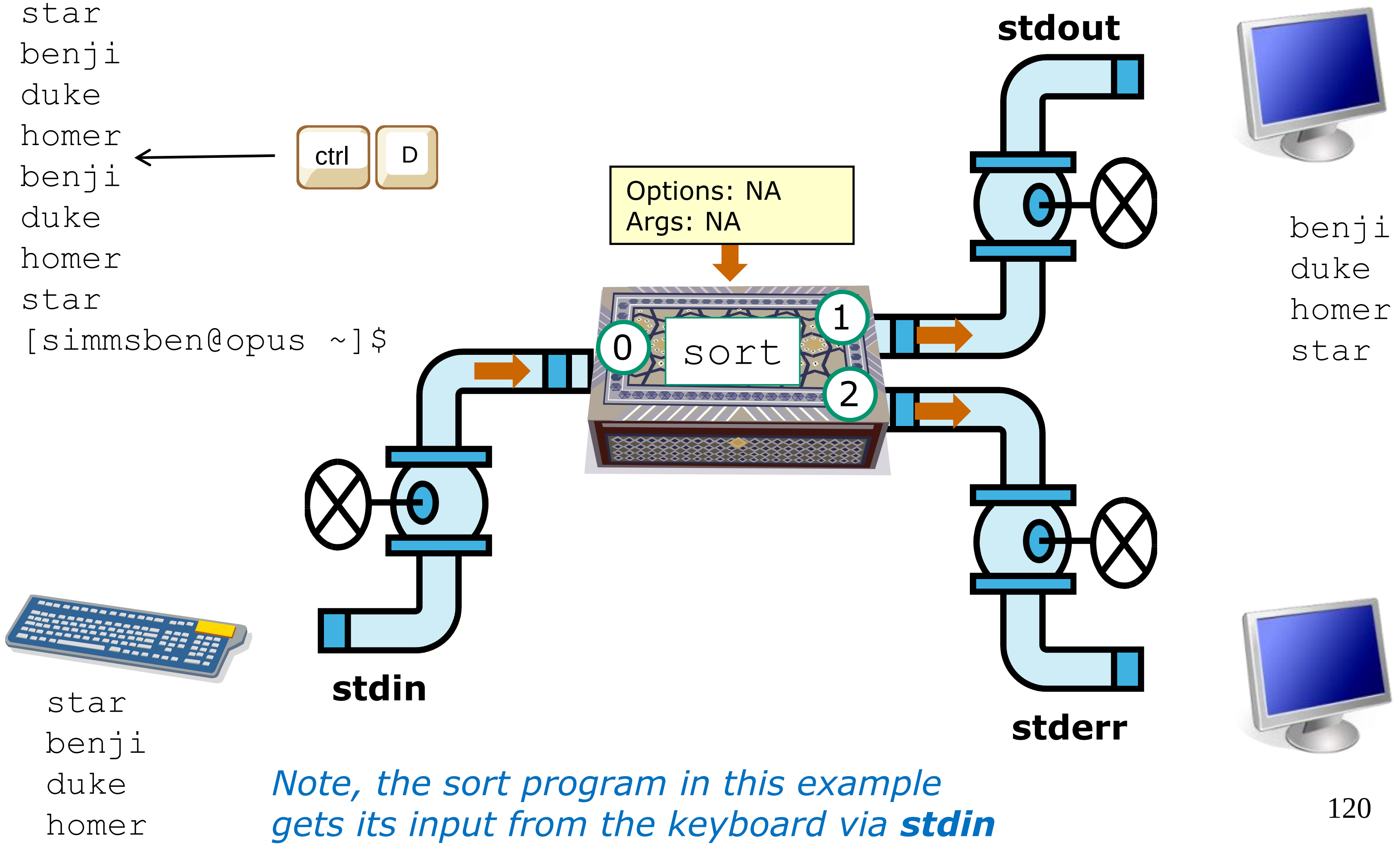
Standard Input (0)
defaults to the user's keyboard

Standard Error (2)
defaults to the user's terminal

Input and Output

File Descriptors

```
[simmsben@opus ~]$ sort
star
benji
duke
homer
benji
duke
homer
star
[simmsben@opus ~]$
```



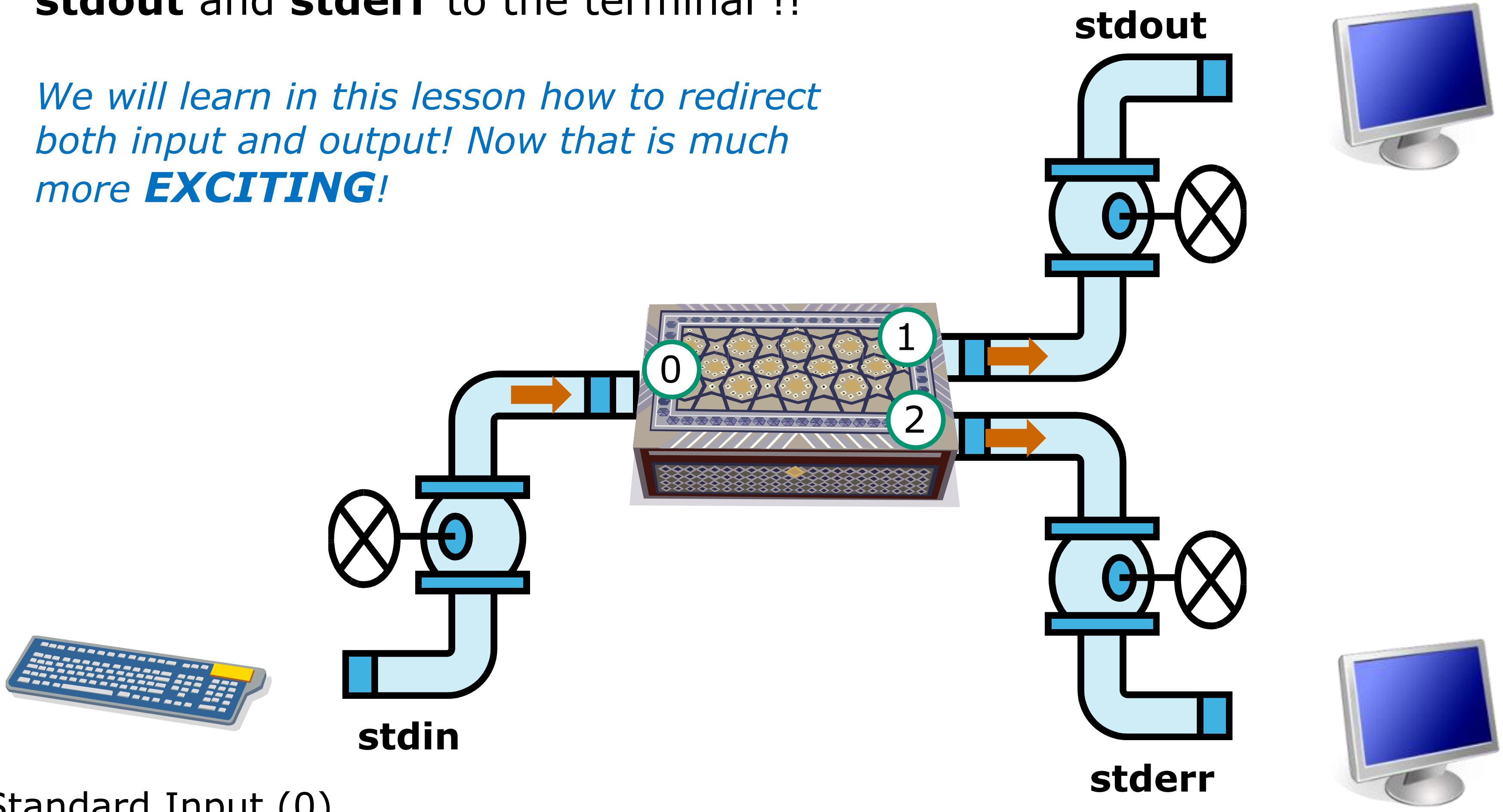
*Note, the sort program in this example gets its input from the keyboard via **stdin***

File Redirection

Life would be ***BORING*** if **stdin** was always attached to the keyboard, and **stdout** and **stderr** to the terminal !!

*We will learn in this lesson how to redirect both input and output! Now that is much more **EXCITING**!*

Standard Output (1)
defaults to the user's terminal



Standard Input (0)
defaults to the user's keyboard

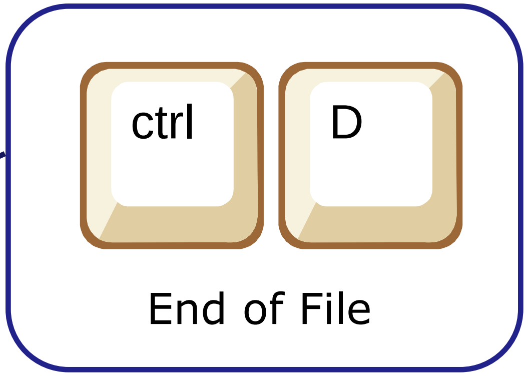
Standard Error (2)
defaults to the user's terminal

Input and Output

File Redirection

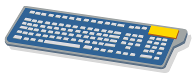
Let's look at the sort example again

```
/home/cis90/simben $ sort
duke
benji
star
homer
benji
duke
homer
star
/home/cis90/simben $
```



Input and Output

File Redirection



Read from **stdin**

Written to **stdout**

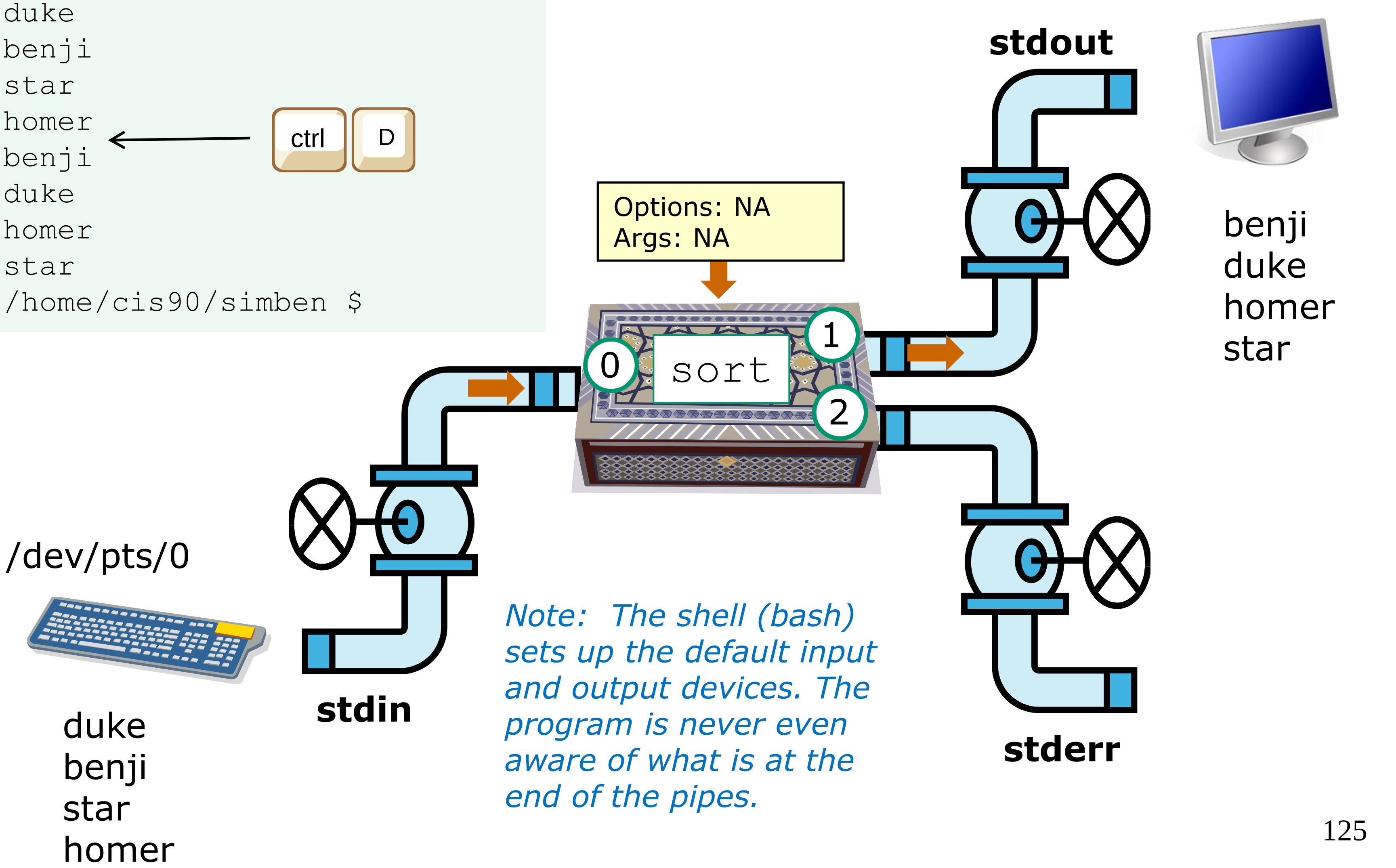
```
/home/cis90/simben $ sort
duke
benji
star
homer
benji
duke
homer
star
/home/cis90/simben $
```

"End of File"

*The sort program reads lines from **stdin** (attached to keyboard), performs the sort, then writes to **stdout** (attached to terminal)*

Example program to process: sort command

```
/home/cis90/simben $ sort
duke
benji
star
homer
benji
duke
homer
star
/home/cis90/simben $
```



Note: The shell (bash) sets up the default input and output devices. The program is never even aware of what is at the end of the pipes.

Activity

```
/home/cis90/simben $ sort
duke
benji
star
homer
benji
duke
homer
star
/home/cis90/simben $
```

Read from **stdin**

Written to **stdout**

ctrl D

"End of File"

Now you try it with your own list

Input and Output
File Redirection

But what if we could tell the shell (bash) to change the devices at the end of the pipes? We can!

The input and output of a program can be **redirected** from and to other files:

0< ***filename***

To redirect stdin

1> ***filename***

To redirect stdout

2> ***filename***

To redirect stderr

>> ***filename***

To redirect and append from stdout

Input and Output
File Redirection

The redirection is specified on the command line using the syntax specified below …

The input and output of a program can be **redirected** from and to other files:

The 0 is optional

~~0~~< *filename*

Input will now come from *filename* rather than the keyboard.

The 1 is optional

~~1~~> *filename*

Output will now go to *filename* instead of the terminal.

2> *filename*

Error messages will now go to *filename* instead of the terminal.

>> *filename*

Output will now be appended to *filename*.

Input and Output

File Redirection

Lets try redirecting stdout …

sort writes to stdout, and stdout has been redirected to the file dogsinorder

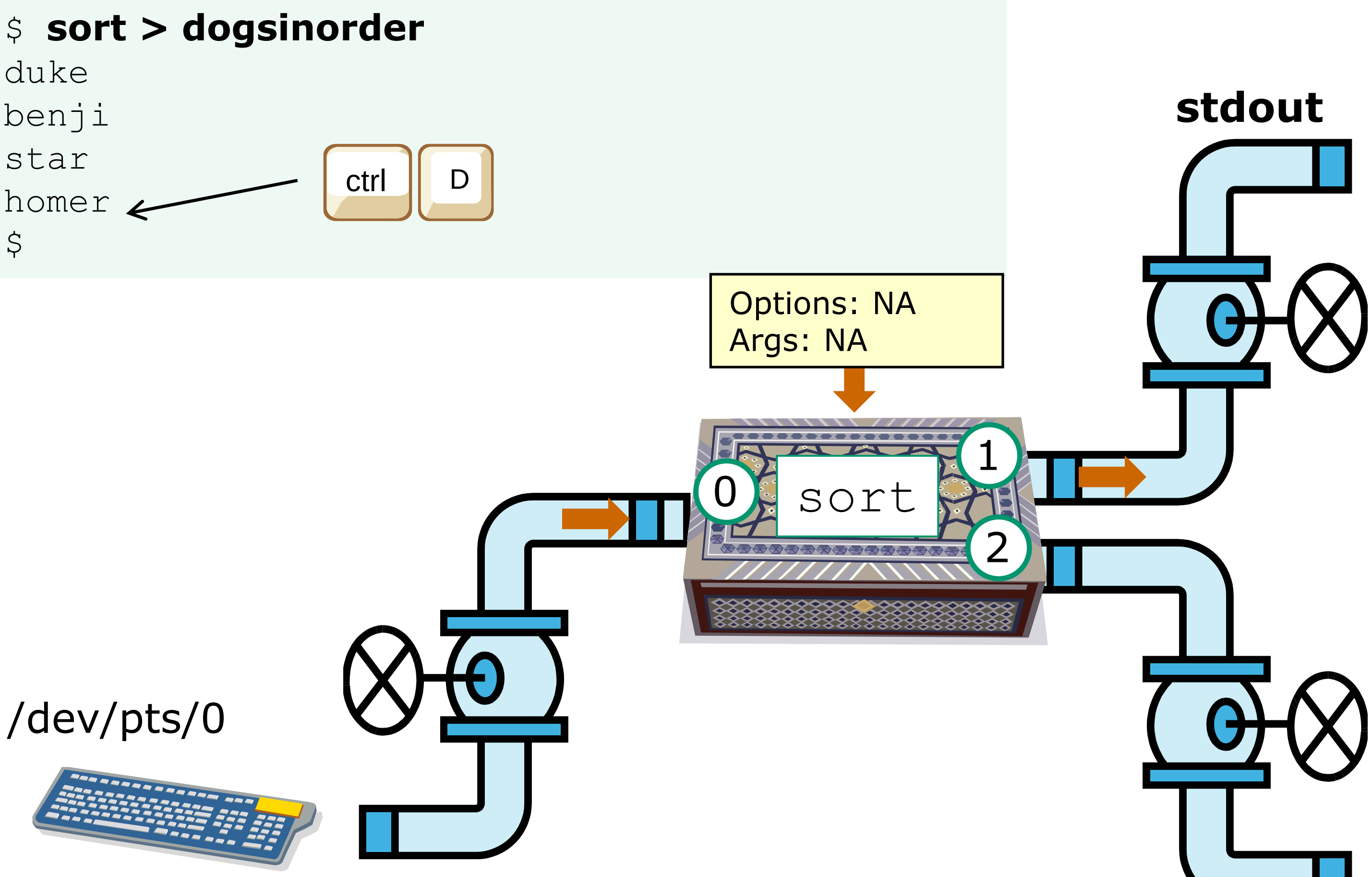
```
[simmsben@opus ~]$ sort > dogsinorder
duke
benji
star
homer
[simmsben@opus ~]$ cat  dogsinorder
benji
duke
homer
star
[simmsben@opus ~]$
```

ctrl D

If the file dogsinorder does not exist, it is created. If it does exist it is emptied!

Example program to process: sort command

```
$ sort > dogsinorder
duke
benji
star
homer
$
```



```
$ cat dogsinorder
benji
duke
homer
star
```

duke
benji
star
homer

*Note: sort doesn't know about the keyboard (/dev/pts/0) or dogsinorder file. It just reads from **stdin** and writes to **stdout**.*

Input and Output

File Redirection

Create a file named names and fill it with your favorite dog names to use in the next example

```
/home/cis90/simben $ echo duke  >  names
/home/cis90/simben $ echo benji  >>  names
/home/cis90/simben $ echo star  >>  names
/home/cis90/simben $ echo homer >> names
```

Note, the use of >> to append the output of the echo command to the end of the names file

```
/home/cis90/simben $ cat names
duke
benji
star
homer
```

/

Input and Output

File Redirection

Let's try redirecting BOTH stdin and stdout …

```
[simben@opus ~]$ cat names
duke
benji
star
homer
[simben@opus ~]$ sort  < names  > dogsinorder
```

input is redirected from the file names

output is redirected to the file dogsinorder

```
[simben@opus ~]$ cat dogsinorder
benji
duke
homer
star
[simben@opus ~]$
```

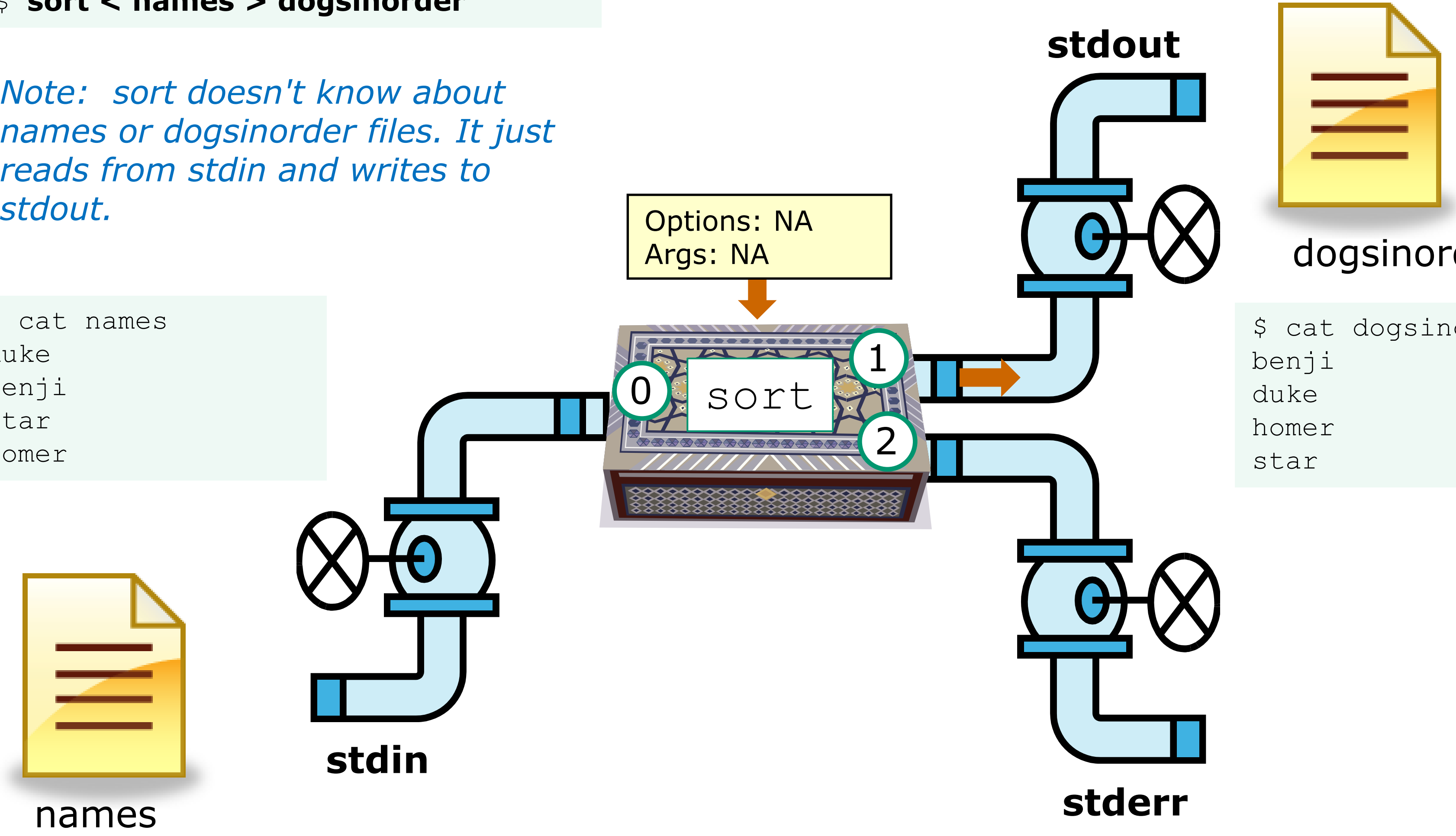
Note: The bash shell handles the command line parsing and redirection. The sort command has no idea what stdin or stdout are connected to.

Example program to process: sort command

```
$ sort < names > dogsinorder
```

Note: sort doesn't know about names or dogsinorder files. It just reads from stdin and writes to stdout.

```
$ cat names
duke
benji
star
homer
```



```
$ cat dogsinorder
benji
duke
homer
star
```

In this example, sort is getting it's input from stdin, which has been connected to the names file

Input and Output

File Redirection

Output is redirected to the file dogsinorder.

Now let's try something different. The difference on the command line is very subtle. The names file is now an ***argument*** *passed to sort from the command line.*

The sort program writes to ***stdout*** *and has no idea* ***stdout*** *is really connected to the file dogsinorder. It is the shell that opens the file dogsinorder.*

```
[simben@opus ~]$ sort names > dogsinorder
[simben@opus ~]$ cat dogsinorder
benji
duke
homer
star
[simben@opus ~]$
```

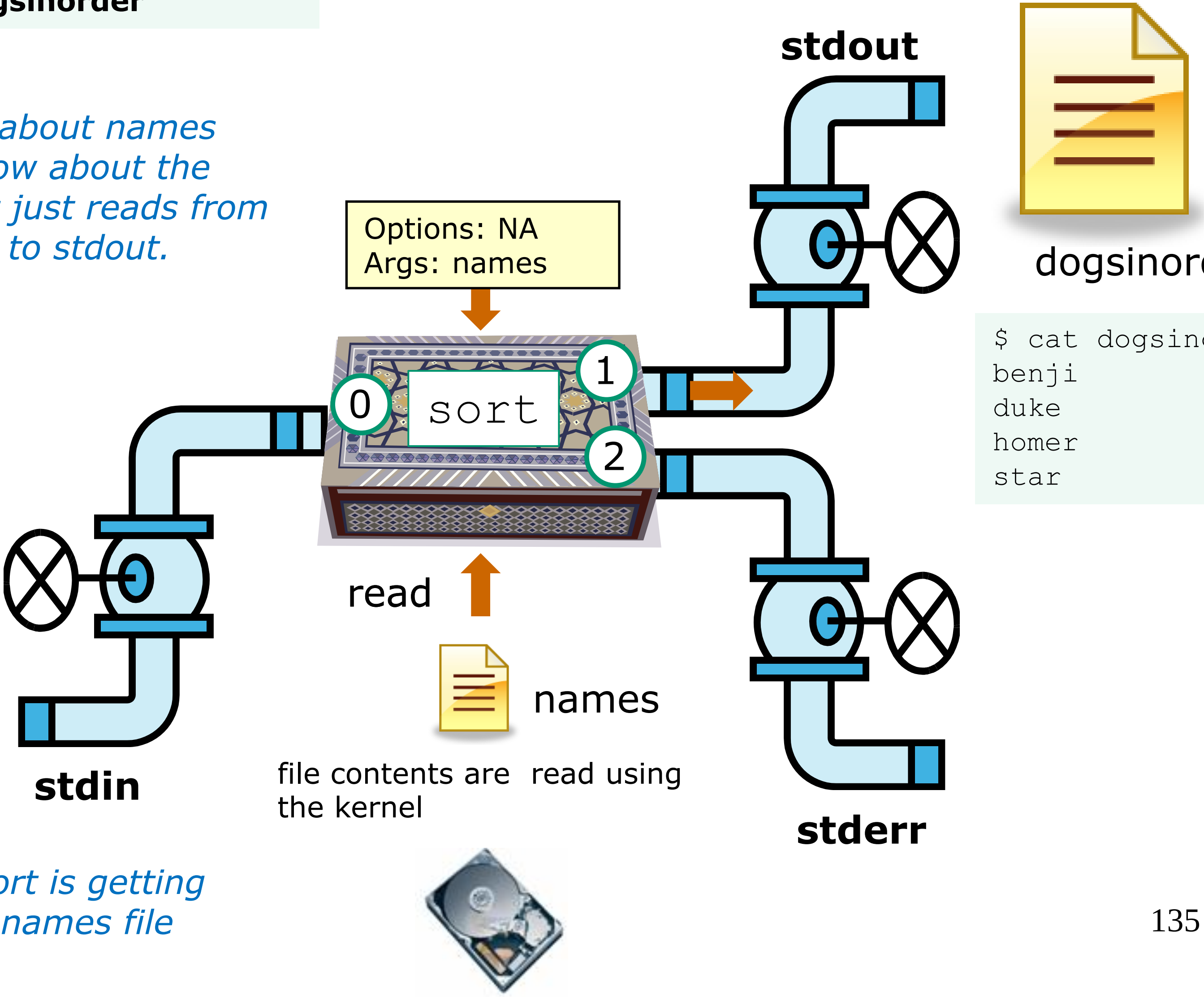
The sort program is fully aware of the names file.

It is the sort program's responsibility to directly open this file and read it. This is done by the sort code making requests to the kernel to read data from the file on the hard drive.

Example program to process: sort command

```
$ sort names > dogsinorder
```

Note: sort knows about names file but doesn't know about the dogsinorder file. It just reads from names and writes to stdout.



```
$ cat dogsinorder
benji
duke
homer
star
```

In this example, sort is getting it's input from the names file

Input and Output

File Redirection

OK, another little twist, lets pass in an option as well this time

specifying an option (for reverse order)

names is an argument passed to the sort command

sort writes to stdout, which is redirected to the file dogsinorder

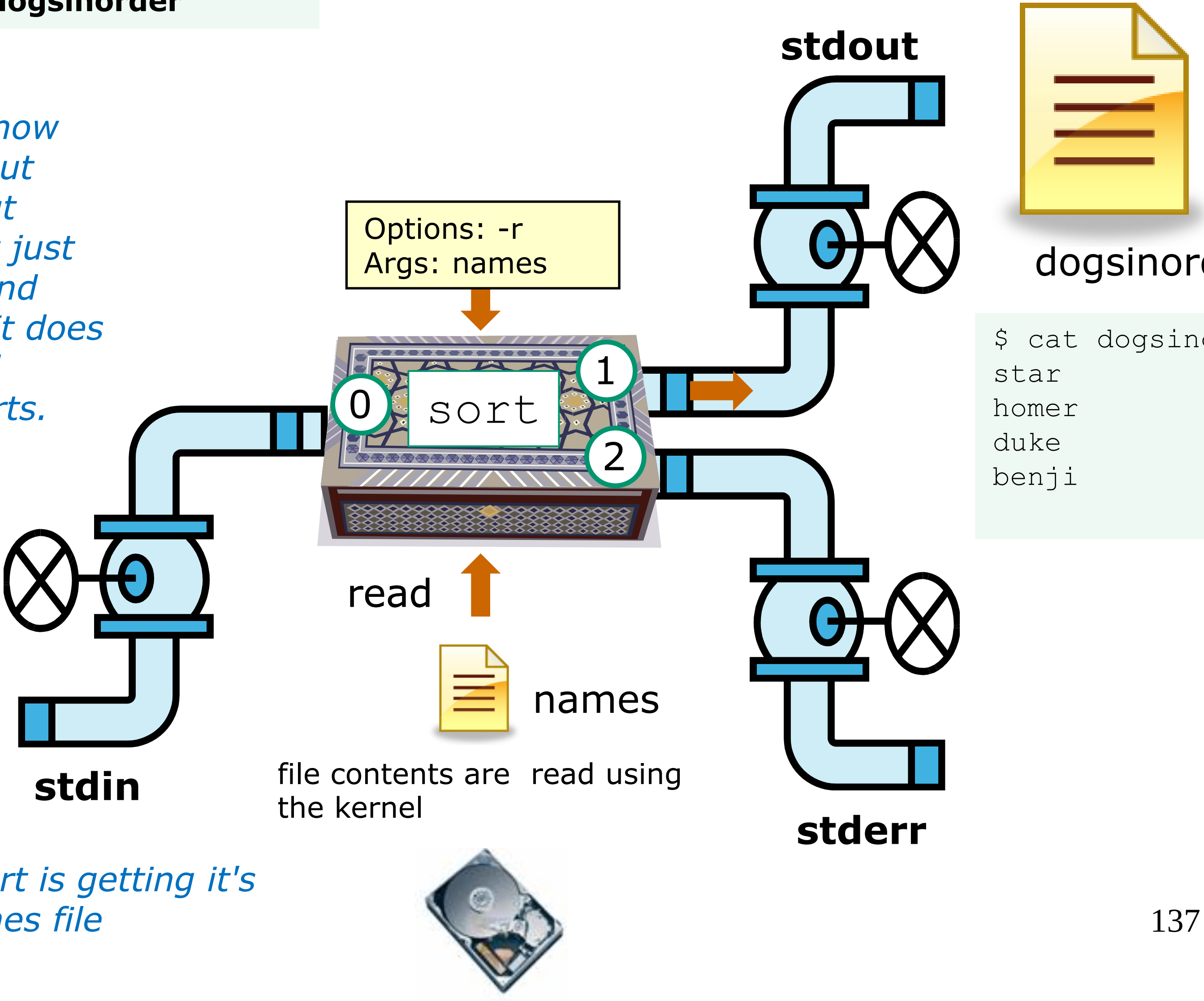
```
[simben@opus ~]$ sort -r names > dogsinorder
[simben@opus ~]$ cat dogsinorder
star
homer
duke
benji
[simben@opus ~]$
```

This -r option does the sort in reverse order

Example program to process: sort command

```
$ sort -r names > dogsinorder
```

Note: sort does know about names file but doesn't know about dogsinorder file. It just reads names file and writes to stdout. It does see the option and modifies how it sorts.



```
$ cat dogsinorder
star
homer
duke
benji
```

In this example, sort is getting it's input from the names file

Input and Output

File Redirection

/dev/pts/0

```
[simben@opus ~]$ cat names
duke
benji
star
homer
[simben@opus ~]$
[simben@opus ~]$ tty
/dev/pts/0
[simben@opus ~]$ sort names > /dev/pts/1
[simben@opus ~]$
```

Note, everything in UNIX is a file so we can even redirect to another terminal

/dev/pts/1

```
[simben@opus ~]$ tty
/dev/pts/1
[simben@opus ~]$ benji
duke
homer
star
```

Input and Output
File Redirection

Be careful using > for redirection!

```
[simben@opus ~]$ echo "Hello World" > message
[simben@opus ~]$ cat message
Hello World
[simben@opus ~]$ echo "Hello Universe" >> message
[simben@opus ~]$ cat message
Hello World
Hello Universe
```

>> appends to the end of the file

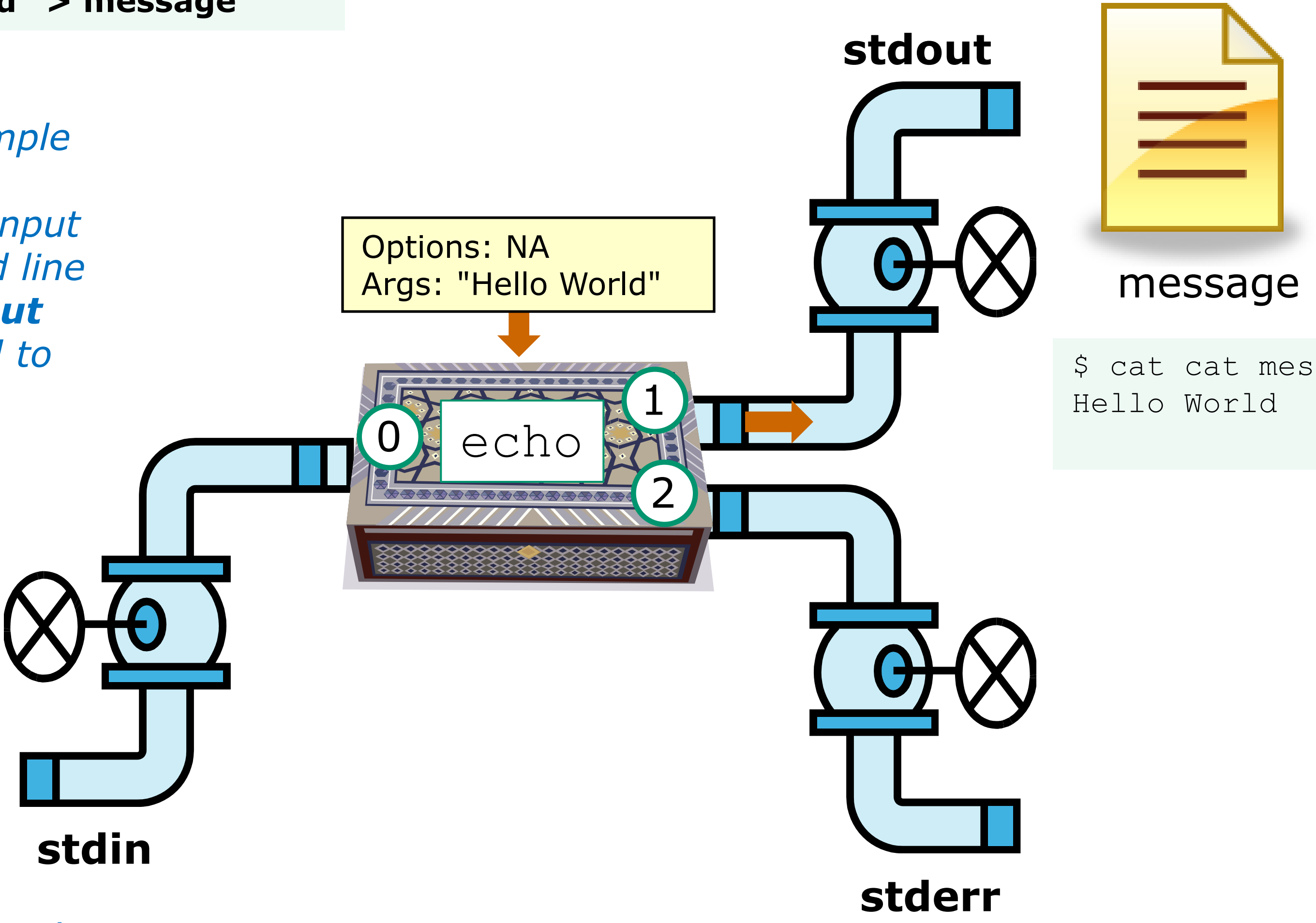
```
[simben@opus ~]$ echo "Oops" > message
[simben@opus ~]$ cat message
Oops
[simben@opus ~]$ > message
[simben@opus ~]$ cat message
[simben@opus ~]$
```

*> will **overwrite** anything already in the file!*

Example program to process: echo command

```
$ echo "Hello World" > message
```

*Note: In this example echo does not use **stdin**. It gets its input from the command line and writes to **stdout** which is redirected to the file message.*



```
$ cat cat message
Hello World
```

In this example, echo is getting it's input from the command line

Input and Output

File Redirection

Another example …

```
[simben@opus ~]$ ls -lR > snapshot
ls: ./Hidden: Permission denied
[simben@opus ~]$ head -10 snapshot
.:
total 296
-rw-rw-r--  1 simben cis90      51 Sep 24 17:13 1993
-rw-r--r-- 21 guest90  cis90  10576 Jul 20  2001 bigfile
drwxr-x---  2 simben cis90    4096 Oct  8 09:05 bin
drwx--x---  4 simben cis90    4096 Oct  8 09:00 class
-rw-------  1 simben cis90     484 Sep 24 18:13 dead.letter
drwxrwxr-x  2 simben cis90    4096 Oct  8 09:05 docs
-rw-rw-r--  1 simben cis90      22 Oct 20 10:51 dogsinorder
drwx------  2 simben cis90    4096 Oct 16 09:17 edits
[simben@opus ~]$
[simben@opus ~]$ ls -lR > snapshot 2> errors
[simben@opus ~]$ cat errors
ls: ./Hidden: Permission denied
[simben@opus ~]$
```

Note: errors are written to stderr, which defaults to the terminal

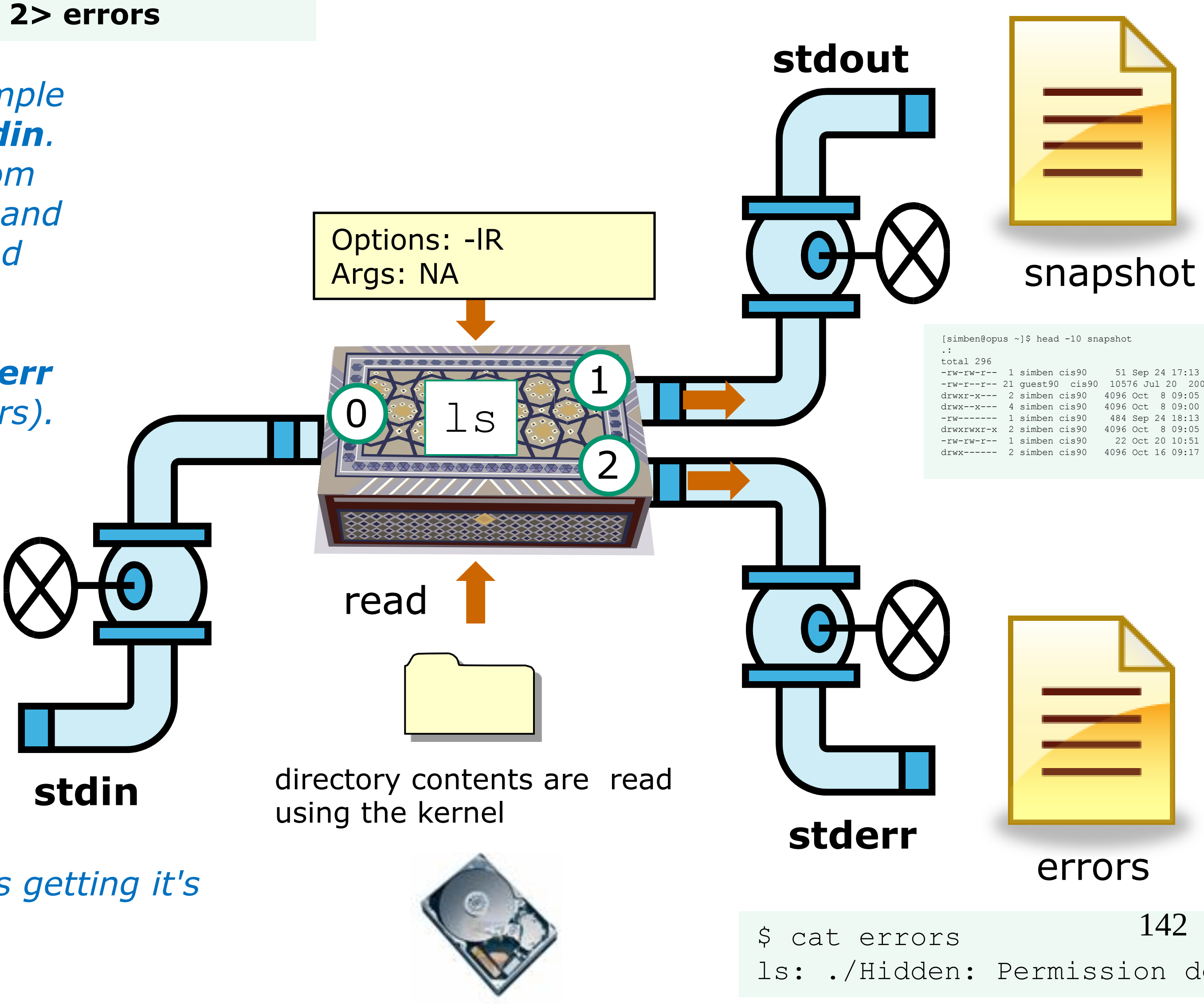
> redirects stdout to file named snapshot

2> redirects stderr to file named errors

Example program to process: ls command

```
$ ls -lR > snapshot 2> errors
```

*Note: In this example ls does not use **stdin**. It gets its input from the command line and the OS (kernel) and writes to **stdout** (redirected to snapshot) and **stderr** (redirected to errors).*



```
[simben@opus ~]$ head -10 snapshot
.:
total 296
-rw-rw-r--  1 simben cis90     51 Sep 24 17:13 1993
-rw-r--r-- 21 guest90  cis90  10576 Jul 20  2001 bigfile
drwxr-x---  2 simben cis90   4096 Oct  8 09:05 bin
drwx--x---  4 simben cis90   4096 Oct  8 09:00 class
-rw-------  1 simben cis90    484 Sep 24 18:13 dead.letter
drwxrwxr-x  2 simben cis90   4096 Oct  8 09:05 docs
-rw-rw-r--  1 simben cis90     22 Oct 20 10:51 dogsinorder
drwx------  2 simben cis90   4096 Oct 16 09:17 edits
```

In this example, ls is getting it's input from the OS

```
$ cat errors
ls: ./Hidden: Permission denied
```

Input and Output
File Redirection

Another example … using all three

```
[simben@opus ~]$ echo 2+2 > math
[simben@opus ~]$ bc < math
4
[simben@opus ~]$ echo 4/0 >> math
[simben@opus ~]$ cat math
2+2
4/0
[simben@opus ~]$ bc < math
4
Runtime error (func=(main), adr=5): Divide by zero
[simben@opus ~]$ bc  < math  > answers  2> errors
[simben@opus ~]$ cat answers
4
[simben@opus ~]$ cat errors
Runtime error (func=(main), adr=5): Divide by zero
[simben@opus ~]$
```

Note: bc reads from stdin which is redirected to math

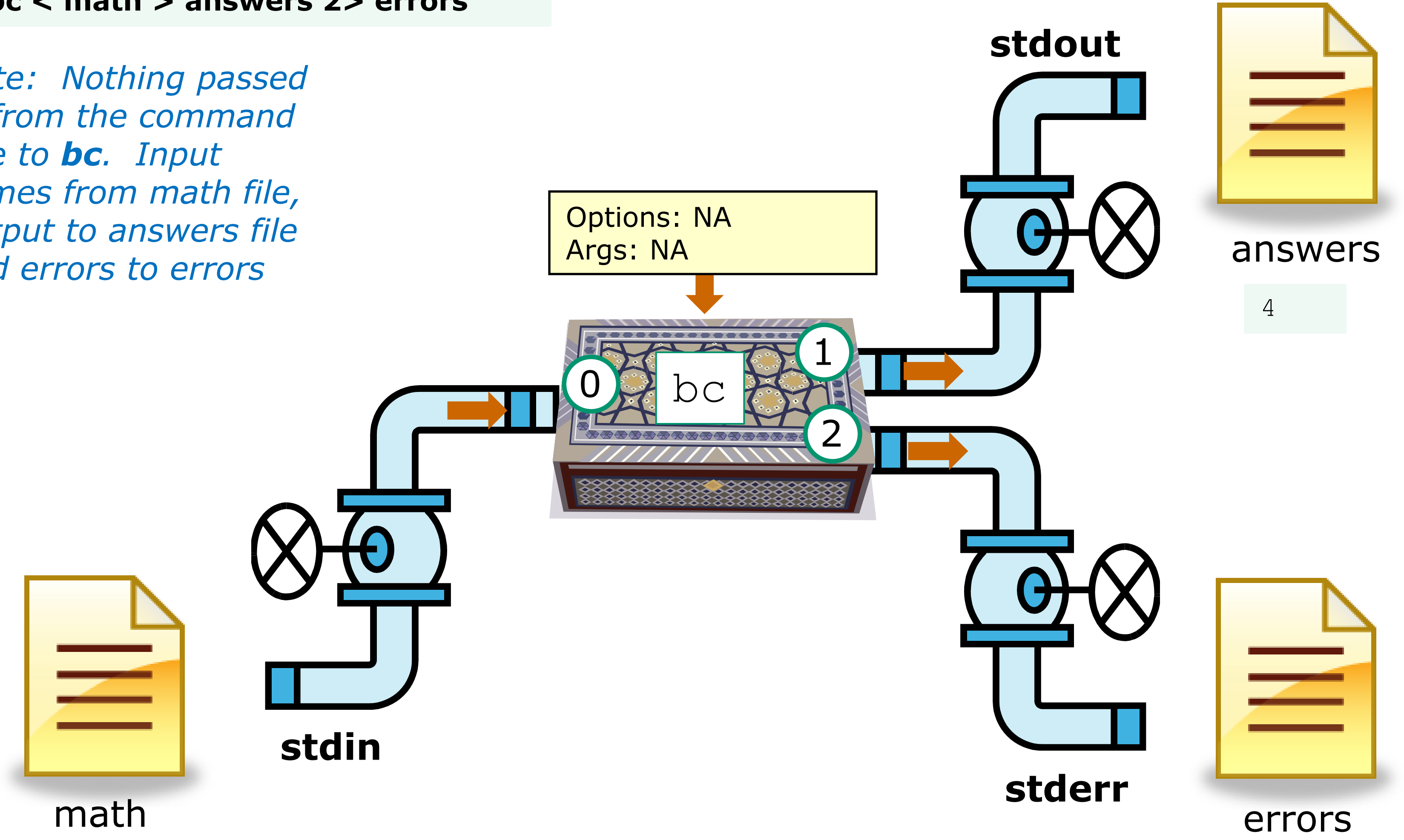
dividing by zero always results in an error

*input from math (via **stdin**), normal output to answers (via **stdout**) and error output to errors (via **stderr**)*

Example program to process: bc command

```
$ bc < math > answers 2> errors
```

*Note: Nothing passed in from the command line to **bc**. Input comes from math file, output to answers file and errors to errors file*



```
4
```

```
2+2
4/0
```

```
Runtime error (func=(main), adr=5): Divide by zero
```

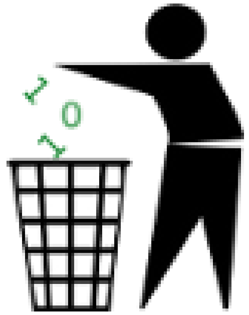
The bit bucket

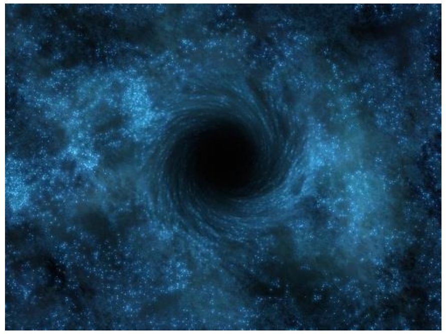
/dev/null

/dev/null = “bit bucket”

A bit bucket is very handy. You can throw whatever you want into it and never see it again!

http://www.adrianmouat.com/bit-bucket/





http://didyouknowarchive.com/?p=1755

It’s like having your own black hole to discard those unwanted bits into!

/dev/null = “bit bucket”

Whatever you redirect to the device file above you will never see again

```
/home/cis90/simben $ echo Clean up your room! > orders
/home/cis90/simben $ cat orders
Clean up your room!
/home/cis90/simben $

/home/cis90/simben $ echo Clean up your room! > /dev/null
/home/cis90/simben $ cat /dev/null
/home/cis90/simben $
```

Pipelines

Input and Output
Pipelines

Commands may be chained together in such a way that the **stdout** of one command is "piped" into the **stdin** of a second process.

Filters

A program that both reads from **stdin** and writes to **stdout**.

Tees

A filter program that reads **stdin** and writes it to **stdout and the file** specified as the argument.

Input and Output
Pipelines

Let's count the lines in letter

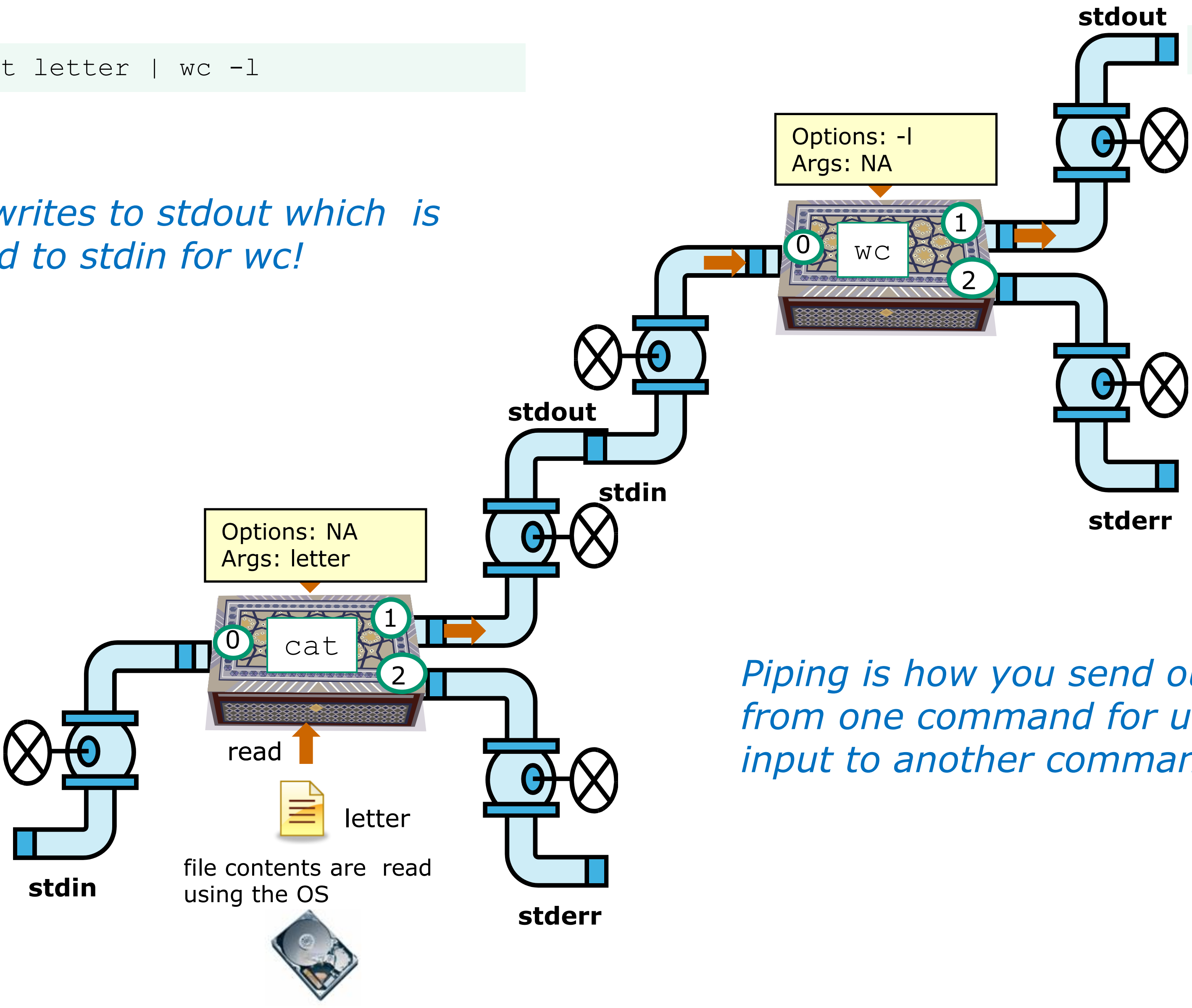
```
[simben@opus ~]$ cat letter | wc -l
28
[simben@opus ~]$
```

Example program to process: cat and wc commands

```
$ cat letter | wc -l
```

```
28
```

cat writes to stdout which is piped to stdin for wc!



Piping is how you send output from one command for use as input to another command

Note:

*Use **redirection** operators (<, >, >>, 2>) to redirect input and output from and to **files***

*Use the **pipe** operator (|) to pipe output from one **command** for use as input to another **command***

Why pipelines?

Task: Save a sorted list of users and a count of how many users are logged on

Method I - use intermediate temporary files

```
[simben@opus ~]$ who
simben pts/0        2008-10-19 18:36 (dsl-63-249-103-107.cruzio.com)
simben pts/1        2008-10-19 18:27 (dsl-63-249-103-107.cruzio.com)
rsimms   pts/2        2008-10-20 17:33 (dsl-63-249-103-107.cruzio.com)
bolasale pts/4        2008-10-21 10:43 (dsl-63-249-97-17.cruzio.com)
[simben@opus ~]$ who > tempfile
[simben@opus ~]$ sort tempfile
bolasale pts/4        2008-10-21 10:43 (dsl-63-249-97-17.cruzio.com)
simben pts/0        2008-10-19 18:36 (dsl-63-249-103-107.cruzio.com)
simben pts/1        2008-10-19 18:27 (dsl-63-249-103-107.cruzio.com)
rsimms   pts/2        2008-10-20 17:33 (dsl-63-249-103-107.cruzio.com)
[simben@opus ~]$ sort tempfile > users
[simben@opus ~]$ wc -l users
4 users
[simben@opus ~]$ cat users
bolasale pts/4        2008-10-21 10:43 (dsl-63-249-97-17.cruzio.com)
simben pts/0        2008-10-19 18:36 (dsl-63-249-103-107.cruzio.com)
simben pts/1        2008-10-19 18:27 (dsl-63-249-103-107.cruzio.com)
rsimms   pts/2        2008-10-20 17:33 (dsl-63-249-103-107.cruzio.com)
```

Why pipelines?

Method II - uses pipes

```
[simben@opus ~]$ who | sort | tee users | wc -l
4
[simben@opus ~]$ cat users
bolasale pts/4        2008-10-21 10:43 (dsl-63-249-97-17.cruzio.com)
simben pts/0         2008-10-19 18:36 (dsl-63-249-103-107.cruzio.com)
simben pts/1         2008-10-19 18:27 (dsl-63-249-103-107.cruzio.com)
rsimms   pts/2        2008-10-20 17:33 (dsl-63-249-103-107.cruzio.com)
[simben@opus ~]$
```

Same result as Method 1 but accomplished on a single line with no intermediate files to clean up

Building a pipeline one command at a time

Let break it down a little to see what's going on …

```
[simben@opus ~]$ who        who is logged in
simben pts/0        2008-10-19 18:36 (dsl-63-249-103-107.cruzio.com)
simben pts/1        2008-10-19 18:27 (dsl-63-249-103-107.cruzio.com)
rsimms   pts/2        2008-10-20 17:33 (dsl-63-249-103-107.cruzio.com)
bolasale pts/4        2008-10-21 10:43 (dsl-63-249-97-17.cruzio.com)
[simben@opus ~]$ who | sort      who is logged in and sorted
bolasale pts/4        2008-10-21 10:43 (dsl-63-249-97-17.cruzio.com)
simben pts/0        2008-10-19 18:36 (dsl-63-249-103-107.cruzio.com)
simben pts/1        2008-10-19 18:27 (dsl-63-249-103-107.cruzio.com)
rsimms   pts/2        2008-10-20 17:33 (dsl-63-249-103-107.cruzio.com)
[simben@opus ~]$ who | sort | wc -l      who is logged in, sorted and counted
4
[simben@opus ~]$ who | sort | tee users | wc -l     who is logged in, sorted, counted
4                                                    and saved in file named users
[simben@opus ~]$ cat users
bolasale pts/4        2008-10-21 10:43 (dsl-63-249-97-17.cruzio.com)
simben pts/0        2008-10-19 18:36 (dsl-63-249-103-107.cruzio.com)
simben pts/1        2008-10-19 18:27 (dsl-63-249-103-107.cruzio.com)
rsimms   pts/2        2008-10-20 17:33 (dsl-63-249-103-107.cruzio.com)
```

Miscellaneous Commands

Tools for your toolbox

NEW **find** - Find file or content of a file

NEW **grep** - "Global Regular Expression Print"

sort - sort

NEW **spell** - spelling correction

wc - word count

tee - split output

find command

Find Command

Syntax:

find *<search-directory>* **-name** *<filename>*
-type *<filetype>*
-user *<username>*
-exec *<command>* **{} \;**

*The **find** command can be used to search for files from any point in the UNIX file tree and continue recursively down the tree as far as it goes.*

find command with no options or arguments

*The **find** command by itself lists all files in the current directory and recursively down into any sub-directories.*

```
[simben@opus poems]$ find
.
./Blake
./Blake/tiger
./Blake/jerusalem
./Shakespeare
./Shakespeare/sonnet1
./Shakespeare/sonnet2
./Shakespeare/sonnet3
./Shakespeare/sonnet4
./Shakespeare/sonnet5
./Shakespeare/sonnet7
./Shakespeare/sonnet9
./Shakespeare/sonnet10
./Shakespeare/sonnet15
./Shakespeare/sonnet17
./Shakespeare/sonnet26
./Shakespeare/sonnet35
./Shakespeare/sonnet11
./Shakespeare/sonnet6
./Yeats
./Yeats/whitebirds
./Yeats/mooncat
./Yeats/old
./Anon
./Anon/ant
./Anon/nursery
./Anon/twister
[simben@opus poems]$
```

find command issued in the poems directory will list the Blake, Shakespeare and Yeats directories and their contents

note: reduced font size so it will fit on this slide

Specifying a starting point as an argument

One or more starting directories in the file tree can be specified as an argument to the find command which will list recursively all files and sub-folders from that directory and down

```
/home/cis90/simben $ find /etc/ssh
/etc/ssh
/etc/ssh/ssh_config
/etc/ssh/ssh_host_dsa_key.pub
/etc/ssh/moduli
/etc/ssh/ssh_host_key
/etc/ssh/ssh_host_dsa_key
/etc/ssh/ssh_host_rsa_key.pub
/etc/ssh/ssh_host_rsa_key
/etc/ssh/ssh_host_key.pub
/etc/ssh/sshd_config
/home/cis90/simben $
```

find command starting from the /etc/ssh directory

Using options for search criteria

The -name option can be used select only matching filenames

```
[simben@opus ~]$ find -name 'sonnet*'
find: ./Hidden: Permission denied
./poems/Shakespeare/sonnet1
./poems/Shakespeare/sonnet2
./poems/Shakespeare/sonnet3
./poems/Shakespeare/sonnet4
./poems/Shakespeare/sonnet5
./poems/Shakespeare/sonnet7
./poems/Shakespeare/sonnet9
./poems/Shakespeare/sonnet10
./poems/Shakespeare/sonnet15
./poems/Shakespeare/sonnet17
./poems/Shakespeare/sonnet26
./poems/Shakespeare/sonnet35
./poems/Shakespeare/sonnet11
./poems/Shakespeare/sonnet6
[simben@opus ~]$
```

Note:

No starting point for the search is specified, so find will start in the current directory which in this example is simben’s home directory

-name 'sonnet*'
is an option passed to the find command directing it to only look for files with names starting with “sonnet”

All those permission errors

An error is printed for every directory lacking read permission!

```
[simben@opus ~]$ find /home/cis90 -name sonnet6
find: /home/cis90/guest/.ssh: Permission denied
find: /home/cis90/guest/Hidden: Permission denied
/home/cis90/guest/Poems/Shakespeare/sonnet6
find: /home/cis90/guest/.gnupg: Permission denied
find: /home/cis90/guest/.gnome2: Permission denied
find: /home/cis90/guest/.gnome2_private: Permission denied
find: /home/cis90/guest/.gconf: Permission denied
find: /home/cis90/guest/.gconfd: Permission denied
find: /home/cis90/simben/Hidden: Permission denied
```

<snipped>

```
find: /home/cis90/wichemic/class: Permission denied
find: /home/cis90/crivejoh/Hidden: Permission denied
/home/cis90/crivejoh/poems/Shakespeare/sonnet6
[simben@opus ~]$
```

Yuck! How annoying is this?

Using find command with the bit bucket

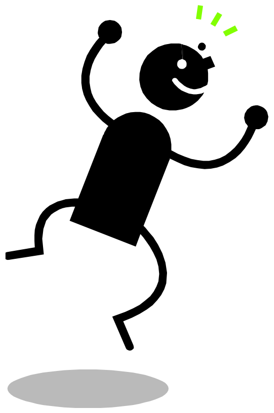
the "bit bucket"

This is why we want a bit bucket

```
[simben@opus ~]$ find  /home/cis90 -name sonnet6  2> /dev/null
/home/cis90/guest/Poems/Shakespeare/sonnet6
/home/cis90/simben/poems/Shakespeare/sonnet6
/home/cis90/stanlcha/poems/Shakespeare/sonnet6
/home/cis90/seatocol/poems/Shakespeare/sonnet6
/home/cis90/wrigholi/poems/Shakespeare/sonnet6
/home/cis90/dymesdia/poems/Shakespeare/sonnet6
/home/cis90/lyonsrob/poems/Shakespeare/sonnet6
/home/cis90/ybarrser/poems/Shakespeare/sonnet6
/home/cis90/ybarrser/poems/Sonnets/sonnet6
/home/cis90/valdemar/poems/Shakespeare/sonnet6
/home/cis90/elliokat/poems/Shakespeare/sonnet6
/home/cis90/jessuwes/poems/Shakespeare/sonnet6
/home/cis90/luisjus/poems/Shakespeare/sonnet6
/home/cis90/meyerjas/poems/Shakespeare/sonnet6
/home/cis90/bergelyl/sonnet6
/home/cis90/bergelyl/poems/Shakespeare/sonnet6
/home/cis90/gardnnic/poems/Shakespeare/sonnet6
/home/cis90/mohanchi/poems/Shakespeare/sonnet6
/home/cis90/whitfbob/poems/Shakespeare/sonnet6
/home/cis90/crivejoh/poems/Shakespeare/sonnet6
[simben@opus ~]$
```

Ahhh … much better!

All the annoying error messages are redirected to the bit bucket



find command

Task: How many files (approximately) are on Opus?

start searching in /
(the top of the file tree)

```
[simben@opus ~]$ find / 2> /dev/null | wc -l
154033
```

*use the output of the **find** command as input to the **wc** command to count the number of files*

redirect permission errors into the bit bucket (discard them)

Note, this will not count any files in directories you don't have read permission for.

Is there a user on Opus that will get a higher count when using this command?

find command

Task: Find sonnet6 files starting in parent directory

```
[simben@opus ~]$ find .. -name "sonnet6" 2> /dev/null
../guest/Poems/Shakespeare/sonnet6
../simben/poems/Shakespeare/sonnet6
../stanlcha/poems/Shakespeare/sonnet6
../seatocol/poems/Shakespeare/sonnet6
../wrigholi/poems/Shakespeare/sonnet6
../dymesdia/poems/Shakespeare/sonnet6
../lyonsrob/poems/Shakespeare/sonnet6
../ybarrser/poems/Shakespeare/sonnet6
../ybarrser/poems/Sonnets/sonnet6
../valdemar/poems/Shakespeare/sonnet6
../elliokat/poems/Shakespeare/sonnet6
../jessuwes/poems/Shakespeare/sonnet6
../luisjus/poems/Shakespeare/sonnet6
../meyerjas/poems/Shakespeare/sonnet6
../bergelyl/sonnet6
../bergelyl/poems/Shakespeare/sonnet6
../gardnnic/poems/Shakespeare/sonnet6
../mohanchi/poems/Shakespeare/sonnet6
../whitfbob/poems/Shakespeare/sonnet6
../crivejoh/poems/Shakespeare/sonnet6
[simben@opus ~]$
```

Note:

.. *is a relative pathname to the parent directory. This is where the find command will start searching from.*

-name "sonnet6" *is an option passed to the find command directing it to only look for files named "sonnet6"*

2> /dev/null *redirects stderr to the "bit bucket" which discards any permission errors*

find command

Find all directories here in my home directory and down

```
[simben@opus ~]$ find . -type d
.
./.mozilla
./.mozilla/extensions
./.mozilla/plugins
./bin
./Hidden
find: ./Hidden: Permission denied
./poems
./poems/Blake
./poems/Shakespeare
./poems/Yeats
./poems/Anon
./olddir
./newdir
./edits
./docs
./etc
./class
./class/labs
./class/exams
./misc
```

Note:

. *is a relative pathname to "here". This is where the find command will start searching from.*

-type d *is an option passed to the find command directing it to only look for directories*

find command

Task: Find all directories, starting here in my home directory, that start with a capital B, S, Y or A.

start from "here"

specifies directories only

```
[simben@opus ~]$ find . -type d -name '[BSYA]*'
find: ./Hidden: Permission denied
./poems/Blake
./poems/Shakespeare
./poems/Yeats
./poems/Anon
[simben@opus ~]$
```

specifies only files whose names start with a B, S, Y or A

find command

Task: Find all files starting your current location that contain town

```
[simben@opus ~]$ find .  -name '*town*'
find: ./Hidden: Permission denied
./edits/small_town
./edits/better_town
[simben@opus ~]$
```

find command

Task: Find all ordinary files, starting in the /home directory, containing the word bones.

do not descend into directories on other file systems

ordinary files only. Other types are l (symbolic link), d (directory)

```
$ find /home -mount -type f -exec grep -l "bones" {} \; 2> /dev/null
/home/cis90/simben/stash
$
```

execute this command on what files are found

grep command

grep command

Syntax

grep *<options>* "*search string*" *<filenames…>*

grep -R *<options>* "search string" *<startdirectory>*

*The **grep** (Global Regular Expression Print) command searches for content inside of files. The **-R** will search recursively. Some other useful search options are **-i** (case insensitive), **-w** (whole word), **-v** (does not contain)*

grep command

Task: Find the word love in Shakespeare's sonnets

```
[simben@opus poems]$ grep love Shakespeare/son*
Shakespeare/sonnet10:For shame deny that thou bear'st love to any,
Shakespeare/sonnet10:Shall hate be fairer lodg'd then gentle love?
Shakespeare/sonnet10:   Make thee another self for love of me,
Shakespeare/sonnet15:   And all in war with Time for love of you,
Shakespeare/sonnet26:Lord of my love, to whom in vassalage
Shakespeare/sonnet26:   Then may I dare to boast how I do love thee,
Shakespeare/sonnet3:Of his self-love, to stop posterity?
Shakespeare/sonnet3:Calls back the lovely April of her prime,
Shakespeare/sonnet4:Unthrifty loveliness, why dost thou spend
Shakespeare/sonnet5:The lovely gaze where every eye doth dwell
Shakespeare/sonnet9:    No love toward others in that bosom sits
[simben@opus poems]$
```

Looking for love in all the wrong places?

grep command

Task: Find all lines with love and hate

```
[simben@opus poems]$ grep love Shakespeare/son* | grep hate
Shakespeare/sonnet10:Shall hate be fairer lodg'd then gentle love?
[simben@opus poems]$
```

grep command

Task: Find simmsben in /etc/passwd

```
/home/cis90/simben $ grep simben90 /etc/passwd
simben90:x:1001:190:Benji Simms:/home/cis90/simben:/bin/bash
```

Task: Now show what line it is on

```
/home/cis90/simben $ grep -n simben90 /etc/passwd
49:simben90:x:1001:190:Benji Simms:/home/cis90/simben:/bin/bash
```

grep with the -i option

Look for "so" in sonnet3, sonnet4 and sonnet5

```
/home/cis90/simben $ grep so poems/Shakespeare/sonnet[345]
poems/Shakespeare/sonnet3:Thou dost beguile the world, unbless some mother.
poems/Shakespeare/sonnet3:For where is she so fair whose unear'd womb
poems/Shakespeare/sonnet3:Or who is he so fond will be the tomb,
poems/Shakespeare/sonnet5:A liquid prisoner pent in walls of glass,
```

Look for "so" (case insensitive) in sonnet3, sonnet4 and sonnet5

```
/home/cis90/simben $ grep -i so poems/Shakespeare/sonnet[345]
poems/Shakespeare/sonnet3:Thou dost beguile the world, unbless some mother.
poems/Shakespeare/sonnet3:For where is she so fair whose unear'd womb
poems/Shakespeare/sonnet3:Or who is he so fond will be the tomb,
poems/Shakespeare/sonnet3:So thou through windows of thine age shalt see,
poems/Shakespeare/sonnet4:So great a sum of sums, yet canst not live?
poems/Shakespeare/sonnet5:A liquid prisoner pent in walls of glass,
```

Use the -i option to make searches case insensitive

grep with the -w option

Look for "so" in sonnet3, sonnet4 and sonnet5

```
/home/cis90/simben $ grep so poems/Shakespeare/sonnet[345]
poems/Shakespeare/sonnet3:Thou dost beguile the world, unbless some mother.
poems/Shakespeare/sonnet3:For where is she so fair whose unear'd womb
poems/Shakespeare/sonnet3:Or who is he so fond will be the tomb,
poems/Shakespeare/sonnet5:A liquid prisoner pent in walls of glass,
```

Look for "so" (whole word only) in sonnet3, sonnet4 and sonnet5

```
/home/cis90/simben $ grep -w so poems/Shakespeare/sonnet[345]
poems/Shakespeare/sonnet3:For where is she so fair whose unear'd womb
poems/Shakespeare/sonnet3:Or who is he so fond will be the tomb,
```

Use the -w option for whole word only searches

grep with the -R option

Search recursively for "kind"

starting in the home directory

discard permission errors

```
/home/cis90/simben $ grep -R kind . 2> /dev/null
./poems/Shakespeare/sonnet10:Be as thy presence is gracious and kind,
./poems/Shakespeare/sonnet10:Or to thyself at least kind-hearted prove:
./poems/Shakespeare/sonnet35:   Let no unkind, no fair beseechers kill;
./poems/Yeats/mooncat:When two close kindred meet,
./poems/Anon/ant:distorted out of kind,
./letter:Mother, Father, kindly disregard this letter.
./bin/enlightenment:    echo "to find out what kind of file \"what_am_i\" is"
./misc/mystery: echo "to find out what kind of file \"what_am_i\" is"
```

Use the -R option to search recursively

grep command

Background
Apache is the worlds most popular web server and it's installed on Opus. Try it, you can browse to oslab.cabrillo.edu.

Every Apache configuration file must specify the location (an absolute pathname) of the documents to publish on the world wide web. This is done with the **DocumentRoot** directive. This directive is found in every Apache configuration file.

All configuration files are kept in /etc.

Tasks
- Can you use **grep** to find the Apache configuration file?
  *Hint: use the **-R** option to recursively search all sub-directories*

- What are the names of the files in Apache's document root directory on Opus?
  *Hint: Use the **ls** command on the document root directory*

spell command

spell command

spell - find misspelled words

*The **spell** command is used to check spelling*

spell command

Task: Run a spell check on the magna_cart file

```
/home/cis90/simben $ cd docs
/home/cis90/simben/docs $ ls
magna_carta  MarkTwain  policy
/home/cis90/simben/docs $ spell magna_carta
Anjou
Arundel
Aymeric
Bergh
Daubeny
de
honour
kingdon
Pandulf
Poitou
Poppeley
seneschal
subdeacon
Warin
```

The spell command will show any words not found in the dictionary.

spell command

Task: Count the number of misspelled words

```
/home/cis90/simben/docs $ spell magna_carta | wc -l
14
```

tee command

tee command

Tee

A filter program that reads **stdin** and writes it to **stdout** AND **the file** specified as the argument.

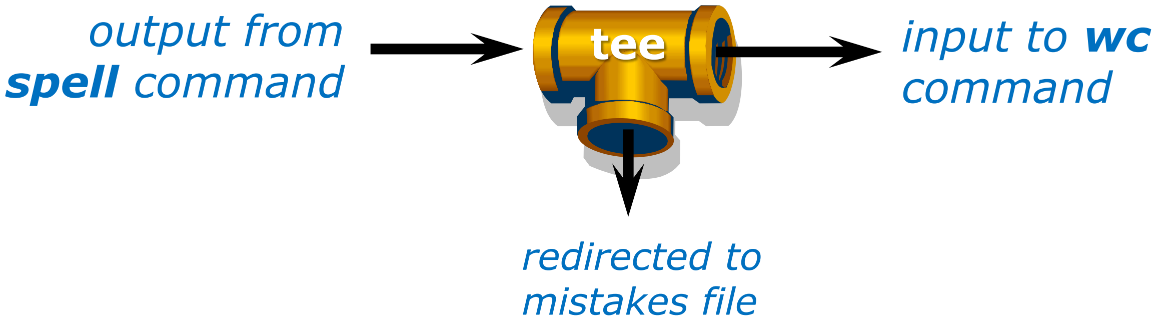
For example, the following command sends a sorted list of the current users logged on to the system to the screen, and saves an unsorted list to the file users.

```
who | tee users | sort
```

tee command

```
/home/cis90/simben $ head edits/spellk
Spell Check

Eye halve a spelling chequer
It came with my pea sea
It plainly marques four my revue
Miss steaks eye kin knot sea.
Eye strike a key and type a word
And weight four it two say
Weather eye am wrong oar write

/home/cis90/simben $ spell edits/spellk | tee mistakes | wc -l
1
/home/cis90/simben $ cat mistakes
chequer
```

This is how you do a spell check , save the misspelled words in a file and count them in a single command



Pipeline Practice

Class Exercise
Pipeline Tasks

Background
The **last** command searches through /var/log/wtmp and prints out a list of users logged in since that file was created.

Task
Can you see the last times you were logged in on a Wednesday and then count them?

```
cat /var/log/wtmp* > logins
last -f logins | grep $LOGNAME
last -f logins | grep $LOGNAME | grep "Wed"
last -f logins | grep $LOGNAME | grep "Wed" | wc -l
```

On what days do you log in the most? the least?

Class Exercise
Pipeline Tasks

Background
The **cut** command can cut a field out of a line of text where each field is delimitated by some character.

The */etc/passwd* file uses the ":" as the delimiter between fields. The 5th field is a comment field for the user account.

Task
Build up a pipeline, one pipe at a time:

```
cat /etc/passwd
cat /etc/passwd | grep $LOGNAME
cat /etc/passwd | grep $LOGNAME | cut -f 5 -d ":"
```

What gets printed with the last pipeline?

Wrap up

New commands:

find	find files or content
grep	look for text strings
sort	perform sorts
spell	spell checking
tee	save output to a file
wc	count lines or words in a file

Next Class

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

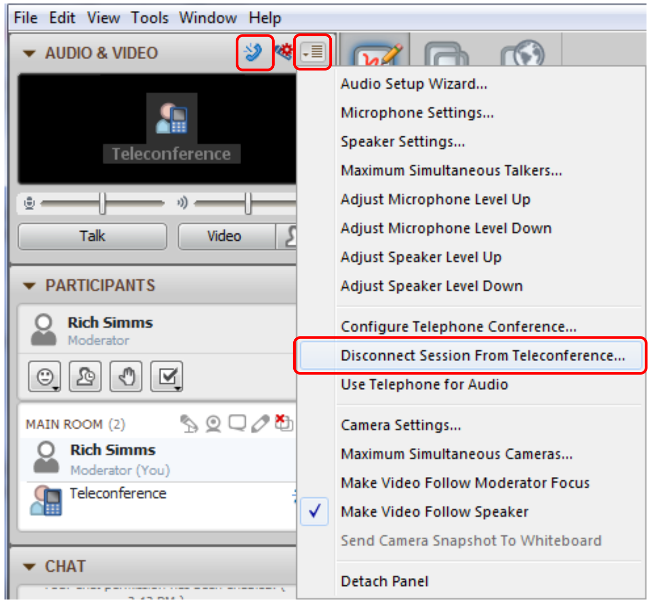
Lab 7

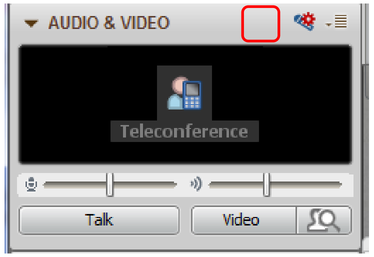
Quiz questions for next class:

- How do you redirect error messages to the bit bucket?
- What command could you use to get an approximate count of all the files on Opus and ignore the permission errors?
- For **sort dognames > dogsinorder** where does the sort process obtain the actual names of the dogs to sort?
    a) stdin
    b) the command line
    c) directly from the file dognames

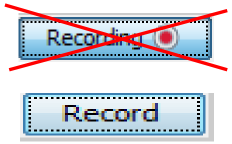
Backup

[ ] Disconnect session to Teleconference


File Edit View Tools Window Help
AUDIO & VIDEO
Teleconference
Talk
Video
PARTICIPANTS
Rich Simms
Moderator
MAIN ROOM (2)
Rich Simms
Moderator (You)
Teleconference
CHAT
Audio Setup Wizard...
Microphone Settings...
Speaker Settings...
Maximum Simultaneous Talkers...
Adjust Microphone Level Up
Adjust Microphone Level Down
Adjust Speaker Level Up
Adjust Speaker Level Down
Configure Telephone Conference...
Disconnect Session From Teleconference...
Use Telephone for Audio
Camera Settings...
Maximum Simultaneous Cameras...
Make Video Follow Moderator Focus
Make Video Follow Speaker
Send Camera Snapshot To Whiteboard
Detach Panel



[ ] Turn recording off


~~Recording~~
Record