



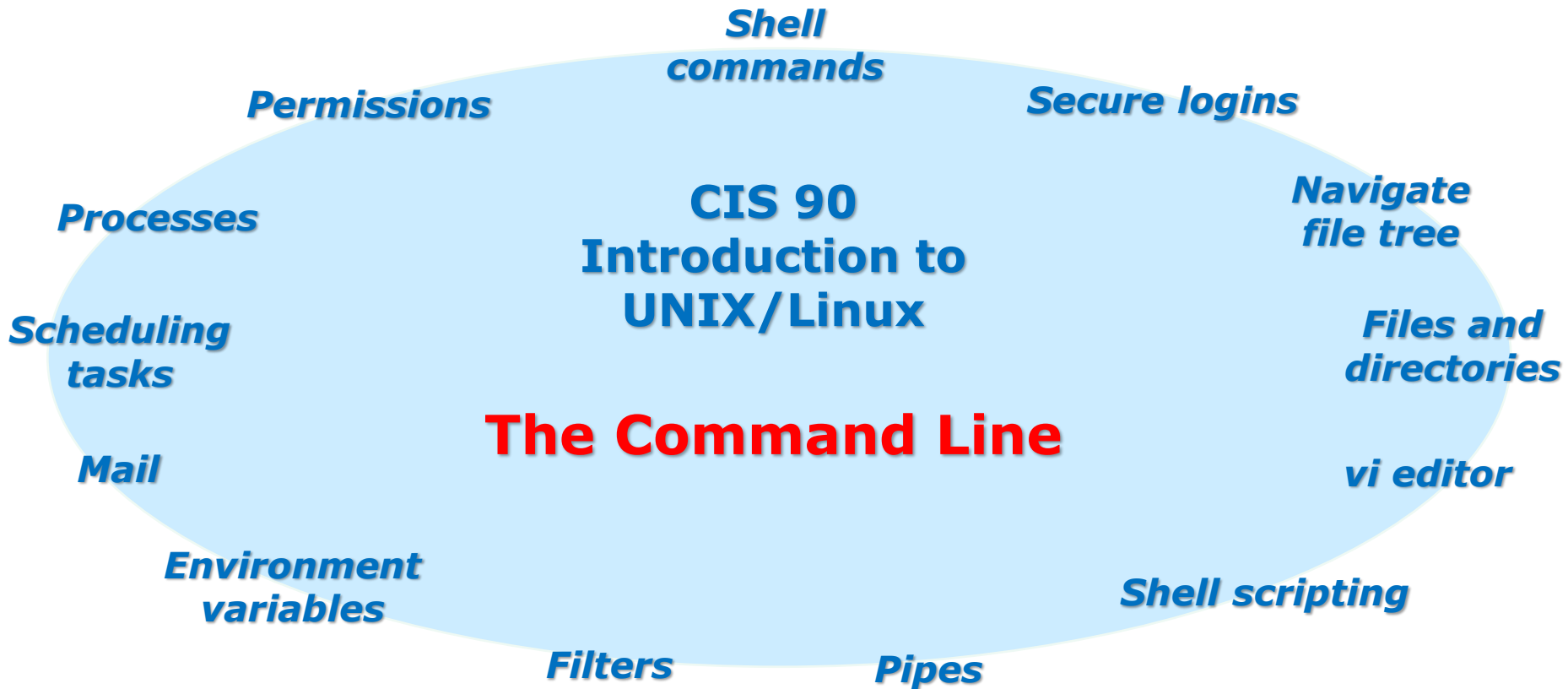
## Rich's lesson module checklist

*Last updated 11/26/2018*

- Zoom recording named and published for previous lesson
- Slides, Project, Lab X1 and Lab X2 posted
- Print out agenda slide and annotate page numbers
  
- Flash cards
- 1st minute quiz
- Web Calendar updated
  
- Lock turnin directory at midnight (scripts/schedule-submit-locks)
- CUPS & printer demo equipment (optional)
- Lab X1 and X2 posted
- Code samples in depot/scripts directory
  
- Backup slides, CCC info, handouts on flash drive
- Spare 9v battery for mic
- Key card for classroom door

<https://zoom.us>

- Putty + Slides + Chrome
- Enable/Disable attendee sharing  
^ > Advanced Sharing Options > Only Host
- Enable/Disable attended annotations  
Share > More > Disable Attendee Sharing



### **Student Learner Outcomes**

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

# Introductions and Credits



Jim Griffin

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



Rich Simms

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

And thanks to:

- John Govsky for many teaching best practices: e.g. the First Minute quizzes, the online forum, and the point grading system. John's site: <http://teacherjohn.com/>
- Jaclyn Kostner for many webinar best practices: e.g. mug shot page.



## Student checklist - Before class starts

Rich's Cabrillo College CIS Classes  
CIS 90 Calendar

CIS 90 (Fall 2014) Calendar

Course Dates: [Calendar](#)

[CIS 90](#)

Lesson	Date	Topics	Link
		<b>Class and Litera Overview</b> <ul style="list-style-type: none"> <li>Understand how the course will work</li> <li>High-level overview of computers, operating systems, and virtual machines</li> <li>Overview of LINUX/Linux market and architecture</li> <li>Using SSH for remote network exits</li> <li>Using terminals and the command line</li> </ul>	
	9/2	<b>Methods</b> <a href="#">Presentation slides (download)</a>	(pdf)
		<b>Supplemental</b> <ul style="list-style-type: none"> <li>Howto #148: Logging into Opus (download)</li> </ul>	2.4.5 p163-172 p164-172 (pdf)
		<b>Assignments</b> <ul style="list-style-type: none"> <li>Student Survey</li> <li>Lab 1</li> </ul>	
		<b>CCS Center</b> <a href="#">Enter virtual classroom</a>	
		<b>Quiz 1</b>	
		<b>Commands</b>	

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



# Student checklist - Before class starts

Google

ConferZoom

Downloaded PDF of Lesson Slides. I like Foxit Reader so I can take notes using annotations.

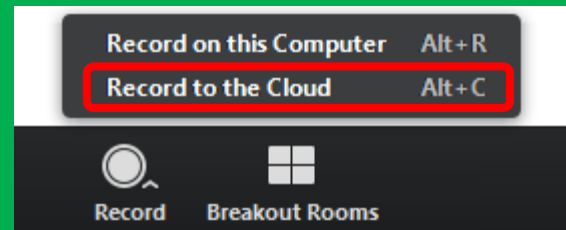
The screenshot shows a Zoom meeting interface with several windows open. The main window displays a login page for 'Rich's Cabrillo College CIS 90' with the text 'Get into the car' overlaid. Other windows include the Google homepage, the CIS 90 website's 'CIS 90 Calendar' page, and a PDF of lesson slides titled 'CIS 90 - Lesson 1' with the subtitle '90 System Playground'. The Zoom meeting controls at the bottom show 'Unmute', 'Start Video', 'Invite', 'Participants', 'Share Screen', 'Chat', 'Record', and 'Leave Meeting'.

CIS 90 website Calendar page

One or more login sessions to Opus-II



# Start



# Start Recording

Audio Check



Start Recording

# Audio & video Check





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



Mikey



Jona



Joseph



Tara Marie



Fredi



Carina



Isaac



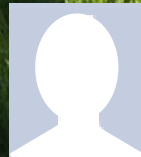
Matthew



Erik



Tony



Branden



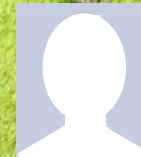
Dominic



Ryan L.



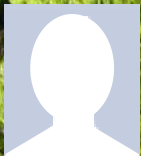
Alejandra



Blair



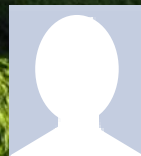
Zari



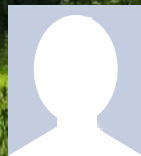
Victor



Danny



Gabriel



Janelly



Austin



Aaron



Ryan M.

## First Minute Quiz #10

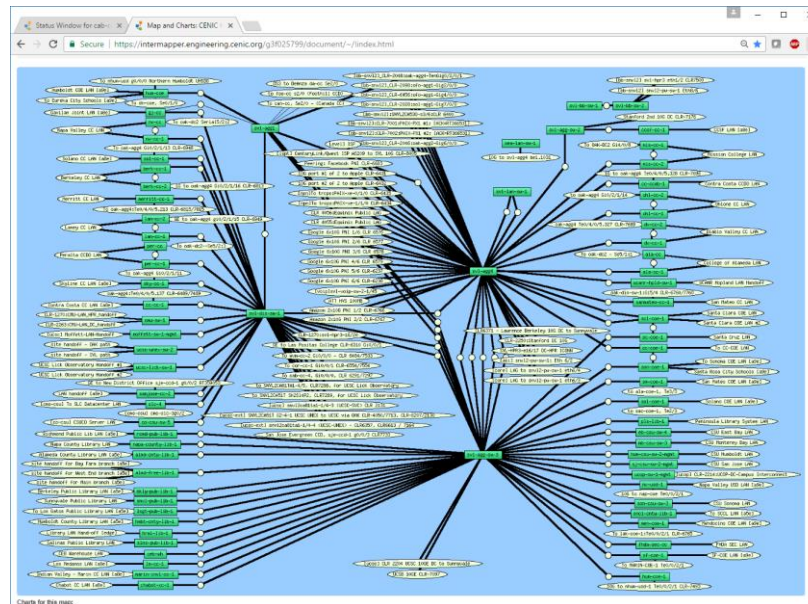
Please answer these questions **in the order** shown:

**Use ConferZoom White Board**

**email answers to: [risimms@cabrillo.edu](mailto:risimms@cabrillo.edu)**

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

# Network Check



[https://intermapper.engineering.cenic.org/g3f025799/  
document/~!/index.html](https://intermapper.engineering.cenic.org/g3f025799/document/~!/index.html)

# Shell Scripting and Printing

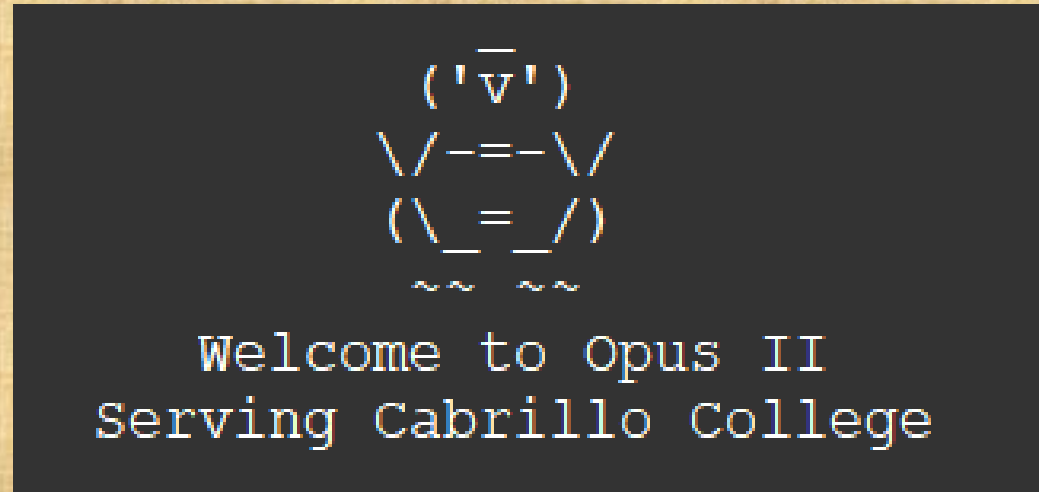
## Objectives

- Understand how to write a script and how they run.
- Learn how to print and manage print jobs waiting to print.

## Agenda

- Quiz
- Questions
- Breaking things in Lab 10
- Extra Credit Answer
- Lesson 12 review
- Grok that?
- Housekeeping
- Printers
- Printing in Linux
- Managing print jobs
- \$(cmd), date part II, exit status, color, sleep
- Shell scripting 101
- Final project myscript
- Final project grading rubric
- Final project permissions
- Umask again!
- Final project getting started
- Final project forum tips
- Scripting tips - echo
- Don't name your scripts "script"
- Review how scripts are run
- Assignment
- Wrap up

## Class Activity



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

## Class Activity



**Unit 3**

**Electronic Mail**

- Guest speaker: Denise Moore on OTC (On-The-Job) training programs
- Learn how to use the LINC communication tools write and /bin/mail
- Overview on and-to and mail

**Materials**

- Presentation slides ([download](#))

**Supplemental**

- Howto #318: Accessing vlab ([download](#))

**Assignment**

- Read/skim Lesson 3 slides

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

If you haven't already,  
download the lesson slides

## Class Activity

	<ul style="list-style-type: none"><li>• <a href="#">Read/skim Lesson 1 slides</a></li><li>• <a href="#">Student Survey</a></li><li>• <a href="#">Lab 1</a></li></ul>
	<b>ConferZoom</b> <ul style="list-style-type: none"><li>• <a href="#">Enter virtual classroom</a></li><li>• <a href="#">Class archives</a></li></ul>
	<b>Quiz 1</b>
	<b>Commenda</b> <ul style="list-style-type: none"><li>• Understand how the UNIX login operation</li></ul>

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

If you haven't already, join  
ConferZoom classroom



# Questions





# Questions?

Lesson material?

Labs? Tests?

How this course works?

• Graded work & tests  
in home directories

• Answers in  
/home/cis90/answers

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

- Francis Bacon

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

- Mahatma Gandhi

Chinese  
Proverb

他問一個問題，五分鐘是個傻子，他不問一個問題仍然是一個  
傻瓜永遠。

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

```
alias bill="cd /home/cis90/${LOGNAME%90}/poems/Shakespeare"
```



*What the heck was this all about?*

```
/home/cis90/milhom $ echo $LOGNAME
milhom90
```

```
/home/cis90/milhom $ echo ${#LOGNAME}
8
```

*Length of the string*

```
/home/cis90/milhom $ echo ${LOGNAME%90}
milhom
```

*Extracts "90" from end of string*

```
/home/cis90/milhom $ echo ${LOGNAME:3:3}
hom
```

*Substring extraction from position 3 length 3*

```
/home/cis90/milhom $ echo ${LOGNAME#mil}
hom90
```

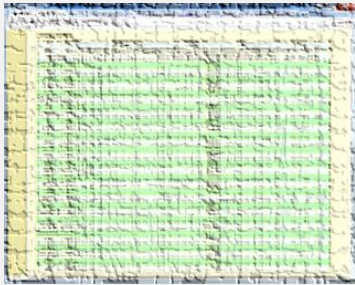
*Extracts "mil" from front of string*

*For MANY MORE ways to manipulate strings Google "bash string manipulation" or browse to:*

## Review your progress in the course

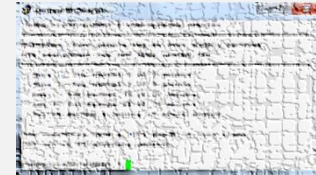
### Check the website Grades page

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



### Or check on Opus-II

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



Written by Jesse Warren a past CIS 90 Alumnus

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

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

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

### Points that could have been earned:

9 quizzes: 27 points  
 9 labs: 270 points  
 2 tests: 60 points  
 3 forum quarters: 60 points  
**Total: 417 points**

## Extra Credit

### On the forum

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

*In lesson slides (search for extra credit)*

### On some labs

**Extra credit (2 points)**

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

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



### On the website

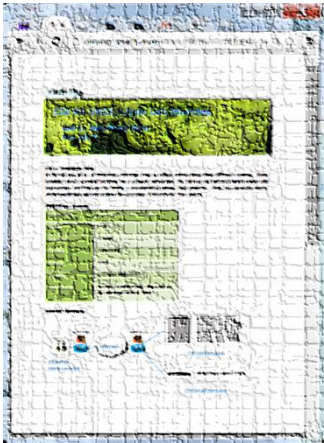
<http://simms-teach.com/cis90grades.php>

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

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

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

## Lab Assignments -- Pearls of Wisdom



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

## Getting Help When Stuck on an Assignment

- Google the topic/error message.
- Search the Lesson Slides (they are PDFs) for a relevant example on how to do something.
- Check the forum. Someone else may have run into the same issue and found a way past it. If not start a new topic, explain what you are trying to do and what you have tried so far.
- Talk to a STEM center tutor/assistant.
- Come see me during my office or lab hours:

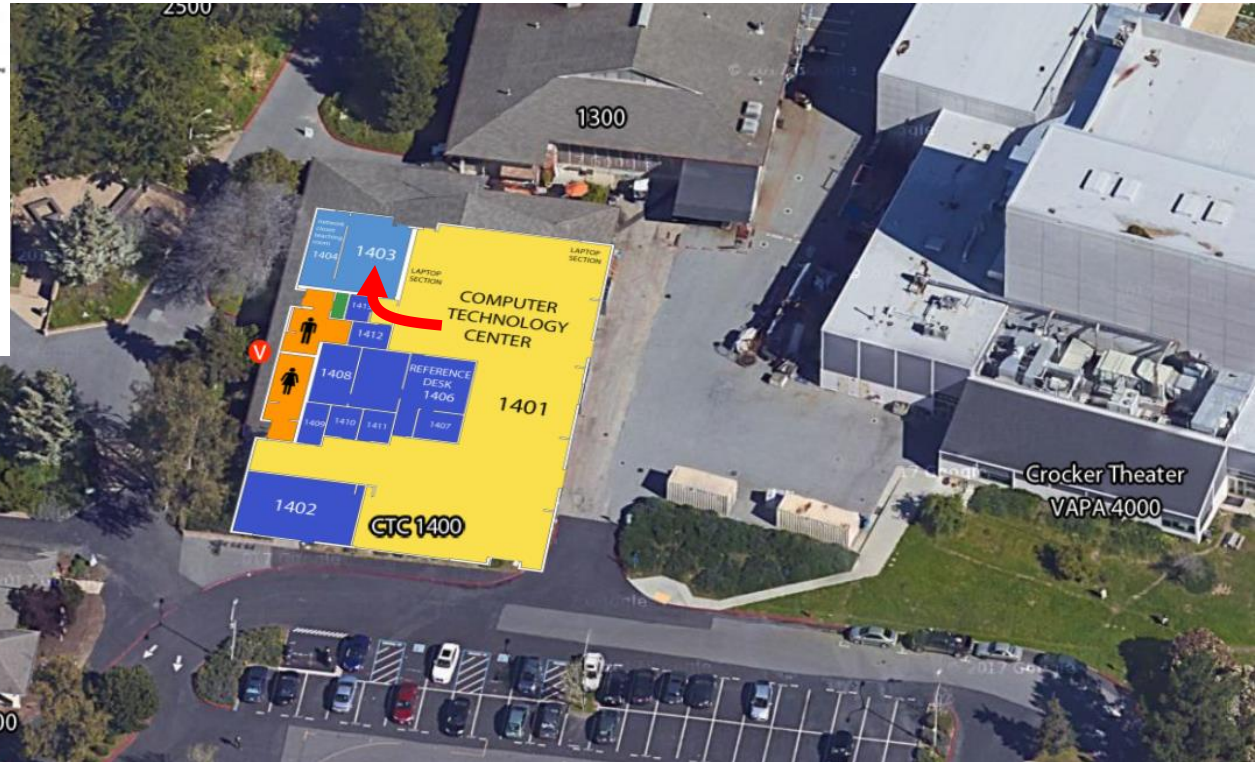
<https://www.cabrillo.edu/salsa/listing.php?staffId=1426>

**I'm in the CTC (room 1403) every Tuesday from 3:30-5:00 pm.**

- Make use of the Open Questions time at the start of every class.
- Make a cheat sheet of commands and examples so you never again get stuck on the same thing!

*CIS Labs always involve some troubleshooting!*

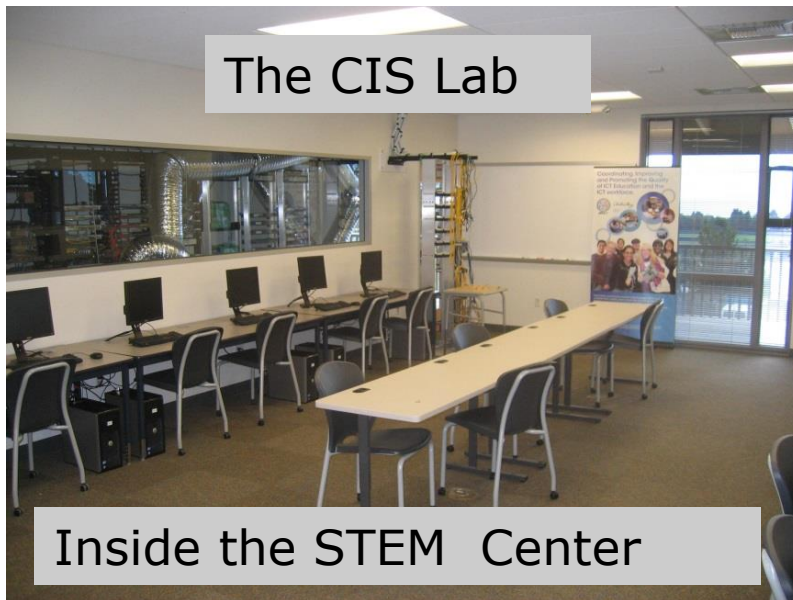
# CTC - Building 1400 On lower campus



I will be in the CTC (room 1403) every Tuesday afternoon from 3:30-5:00

## Help Available in the CIS Lab

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



**Rich's Cabrillo College CIS Classes**  
Home Page

Home

Resources

Forums

CIS Lab

Canvas

CIS Lab & Datacenter  
Aptos Campus

Home Resources NETLAB VLab Location

Announcements

The CIS Lab is in the STEM Center in building 800.  
A great place to work on lab assignments and get help from student lab assistants and instructors on the schedule below.

STEM CIS/CS hours

Today Jan 28 - Feb 3, 2018 Week

Time	Mon 1/29	Tue 1/30	Wed 1/31	Thu 2/1
10am				
11am				
12pm				
1pm				
2pm	Jeffrey Bergamini CS Instructor Carter Post CIS/CS	Jeffrey Bergamini CS Instructor Carter Post CIS/CS	Jeffrey Bergamini CS Instructor Carter Post CIS/CS	Jeffrey Bergamini CS Instructor Carter Post CIS/CS
3pm				
4pm				
5pm				
6pm				
7pm				

Events shown in time zone: Pacific Time

W3C XHTML 1.0 W3C CSS

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





# The slippery slope



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

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

Email: [risimms@cabrillo.edu](mailto:risimms@cabrillo.edu)



# Breaking things in Lab 10

## Did you break your path in Lab 10?

```
/home/cis90/simben $ type echo tty scavenger allscripts tryme dogbone
echo is a shell builtin
tty is /usr/bin/tty
scavenger is /usr/local/bin/scavenger
allscripts is /home/cis90/simben/./bin/allscripts
tryme is /home/cis90/simben/bin/tryme
dogbone is ./dogbone
```

*Are you getting unexpected "Command not found" errors today? If the highlighted directories above are not on your path then you will get them!*

*Note the echo command is built into the shell. We can always run it even if our shell path is broken.*

## Review of the path (PATH) variable

- Lab 10 often results in clobbered paths and students may think some or all of the commands have disappeared!
- The path is a list of directories each containing commands, programs and scripts.
- The path is used by the shell, during the search step, to locate commands to run.
- The PATH variable defines the directories (separated by ":"s) and the search order.
- NOTE: If your path gets clobbered it is still possible to run commands. However to do that you must specify the full absolute or relative pathname. For example, without a path you can still run the **tty** and **tryme** commands as follows:

```
/home/cis90/simben $ /usr/bin/tty Using an absolute pathname
```

```
/dev/pts/0
```

```
/home/cis90/simben $ bin/tryme Using a relative pathname
```

```
My name is "tryme"
```

```
I am pleased to make your acquaintance, Benji Simms
```

```
/tmp
```

## The path (PATH) variable ... a Review

### Examine your path:

After you  
finish Lab  
10 this one  
will be  
simplified →

```
/home/cis90/simben $ echo $PATH  
/usr/local/bin:/usr/bin:/usr/local/sbin:/usr/sbin:  
/home/cis90/simben/../bin:/home/cis90/simben/bin:.
```

1. **Determine the 2<sup>nd</sup> directory on the path above.**
2. **What is the name of the first command, in alphabetic order, found in this directory?**

*Put your answer in the chat window*

## The path (PATH) variable ... a Review

### Examine your path:

```
/home/cis90/simben $ echo $PATH  
/usr/local/bin:/usr/bin:/usr/local/sbin:/usr/sbin:  
/home/cis90/simben/./bin:/home/cis90/simben/bin:.
```

**On Opus-II why is /bin and /sbin not needed on your path?**

*Put your answer in the chat window*

## RHEL 7 merged /bin and /usr/bin, /sbin and /usr/sbin

```
[simben90@opus-ii ~]$ ls -ld /bin /usr/bin /sbin /usr/sbin
lrwxrwxrwx. 1 root root      7 Aug  4 2017 /bin -> usr/bin
lrwxrwxrwx. 1 root root      8 Aug  4 2017 /sbin -> usr/sbin
dr-xr-xr-x. 2 root root 32768 Mar 14 18:26 /usr/bin
dr-xr-xr-x. 2 root root 16384 Jan  7 14:48 /usr/sbin
[simben90@opus-ii ~]$
```

*Note that /bin is symbolically linked to /usr/bin. Likewise with /sbin and /usr/sbin*



# Life without a path



## Clobber your path on purpose

```
/home/cis90/simben $ oldpath=$PATH  
/home/cis90/simben $ unset PATH
```

*Backing up then  
breaking the current path*

```
x /home/cis90/simben $ tty  
-bash: tty: No such file or directory
```

*The tty command can no longer  
be run by typing just it's name.*

```
✓ /home/cis90/simben $ /usr/bin/tty  
/dev/pts/0
```

*On Opus-II the tty  
command is in the /usr/bin  
directory.*

*If we know that, a  
temporary workaround is to  
specify the command with  
an absolute pathname.*

## Life without a path

*Some commands still work without a path ... why?*

```
/home/cis90/simben $ echo "I want my path back"  
I want my path back
```

```
/home/cis90/simben $ type echo  
echo is a shell builtin
```

```
/home/cis90/simben $ type type  
type is a shell builtin
```

*The shell has some commands built into it. The shell does not have to search the path to find these commands so they are always available.*

## Class Activity

### Backup and clobber your path variable:

```
/home/cis90/simben $ oldpath=$PATH  
  
/home/cis90/simben $ unset PATH  
/home/cis90/simben $ echo $PATH  
  
/home/cis90/simben $ tty  
/home/cis90/simben $ /usr/bin/tty  
  
/home/cis90/simben $ echo "I want my path back"  
/home/cis90/simben $ type echo  
/home/cis90/simben $ type type
```

**Why does the echo command work with no path?**

*Put your answer in the chat window*

## Life without a path



```
/home/cis90/simben $ ls letter  
-bash: ls: No such file or directory
```



```
/home/cis90/simben $ /usr/bin/ls letter  
letter
```




*On Opus-II the **ls** command is in the **/usr/bin** directory.*


*If we know that, a temporary workaround is to specify the full absolute pathname of the command.*

## Making a path from scratch

### Fixing the path, one directory at a time ...

 /home/cis90/simben \$ **ls letter**  
-bash: ls: command not found



 /home/cis90/simben \$ **PATH=/usr/bin**  
/home/cis90/simben \$ **ls letter**  
letter



*The **ls** command is in /usr/bin so lets put that directory on the path.*

/home/cis90/simben \$ **echo \$PATH**  
/usr/bin

You try it

**Enter these commands:**

```
ls letter  
PATH=/usr/bin  
echo $PATH  
ls letter
```

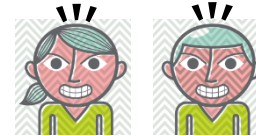
**What is your shell path now?**

*Put your answer in the chat window*

## Making a path from scratch



```
/home/cis90/simben $ allscripts
-bash: allscripts: command not found
```



```
/home/cis90/simben $ PATH=$PATH:/home/cis90/bin
/home/cis90/simben $ allscripts
```



The **allscripts** shell script is in `/home/cis90/bin` so let's append that directory to the path as well.

```
*****
*                               *
*           Fall 2012 CIS 90 Online Projects           *
*                               *
*****

1) Andrew
2) Ben
3) Benji
4) Bryn
5) Carlile
6) Carlos
  <snipped>
21) Ray
22) Rita
23) Sean C.
24) Sean F.
25) Shahram

99) Exit

Enter Your Choice:
```

You try it

**Enter these commands:**


```
allscripts  
PATH=$PATH:/home/cis90/bin  
echo $PATH  
allscripts
```

**What is your shell path now?**


*Put your answer in the chat window*



## Making a path from scratch

 /home/cis90/simben \$ **scavenge**  
-bash: scavenge: command not found



 /home/cis90/simben \$ **PATH=\$PATH:/usr/local/bin**  
/home/cis90/simben \$ **scavenge**  
#####  
# S C A V E N G E R H U N T #  
#####



The **scavenge** shell script is in `/usr/local/bin` so let's add that directory to the path as well

Welcome Benji,  
<snipped>

You try it

**Enter these commands:**

```
scavenge  
PATH=$PATH:/usr/local/bin  
echo $PATH  
scavenge
```

**What is your shell path now?**

*Put your answer in the chat window*

## Making a path from scratch



```
/home/cis90/simben $ tryme  
-bash: tryme: command not found
```



```
/home/cis90/simben $ PATH=$PATH:/home/cis90/simben/bin  
/home/cis90/simben $ tryme  
My name is "tryme"  
I am pleased to make your acquaintance, Benji Simms  
/tmp  
/home/cis90/simben $
```



*The **tryme** shell script is in your own bin directory so lets add that to the path as well*

## You try it

**Enter these commands:**

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

 *Change this to your  
own home directory*

or

```
tryme  
PATH=$PATH:$HOME/bin  
echo $PATH  
tryme
```

**What is your shell path now?**

*Put your answer in the chat window*

## Making a path from scratch

```
/home/cis90/simben $ cp ../depot/scripts/dogbone .  
/home/cis90/simben $ chmod +x dogbone  
/home/cis90/simben $ dogbone
```

✘ -bash: dogbone: command not found



```
/home/cis90/simben $ ./dogbone
```

✔ What is your name? Benji

What is your favorite bone? Chicken

Hi Benji, your favorite bone is Chicken



*A temporary  
workaround  
is to put a ./  
in front of the  
command*

*How can I run a script in the current directory without  
having to put a ./ in front of it?*

## Making a path from scratch



```
/home/cis90/simben $ dogbone  
-bash: dogbone: command not found
```



```
/home/cis90/simben $ PATH=$PATH:.  
/home/cis90/simben $ dogbone  
What is your name? Benji  
What is your favorite bone? Chicken  
Hi Benji, your favorite bone is Chicken
```



*Easy, just add  
the "." directory  
to the path*

## You try it

```
cd  
cp ../depot/scripts/dogbone .
```

*Did you do this the hard  
way or use tab completes?*

```
chmod +x dogbone
```

```
dogbone  
./dogbone
```

```
PATH=$PATH: .  
dogbone
```

**What is your shell path now?**

*Put your answer in the chat window*

## Making a path from scratch

### *Rebuilding the path by appending directories one at a time*

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

```
/home/cis90/simben $ PATH=/usr/bin      Start with /usr/bin which has all essential and
/home/cis90/simben $ echo $PATH        auxiliary UNIX/Linux commands
```

```
/usr/bin
```

```
/home/cis90/simben $ PATH=$PATH:/home/cis90/bin      Append the CIS 90 class bin directory
/home/cis90/simben $ echo $PATH
```

```
/usr/bin:/home/cis90/bin
```

```
/home/cis90/simben $ PATH=$PATH:/usr/local/bin      Append the /usr/local/bin directory
/home/cis90/simben $ echo $PATH
```

```
/usr/bin:/home/cis90/bin:/usr/local/bin
```

```
/home/cis90/simben $ PATH=$PATH:/home/cis90/simben/bin      Append your own student bin directory
/home/cis90/simben $ echo $PATH
```

```
/usr/bin:/home/cis90/bin:/usr/local/bin:/home/cis90/simben/bin
```

```
/home/cis90/simben $ PATH=$PATH:.      Append the current directory
/home/cis90/simben $ echo $PATH
```

```
/usr/bin:/home/cis90/bin:/usr/local/bin:/home/cis90/simben/bin:.
```

*CIS 90 class bin  
directory*

*/usr/local/bin  
directory*

*Student bin  
directory*

*Current  
directory*



## .bash\_profile

### *Making the path permanent using .bash\_profile*

```

/home/cis90/simben $ cat .bash_profile
# .bash_profile

# Get the aliases and functions
if [ -f ~/.bashrc ]; then
    . ~/.bashrc
fi

# User specific environment and startup programs

PATH=$PATH:/home/cis90/bin:$HOME/bin:.
BASH_ENV=$HOME/.bashrc
USERNAME=""
PS1='$PWD $ '
export USERNAME BASH_ENV PATH
umask 002
set -o ignoreeof
stty susp
eval `tset -s -m vt100:vt100 -m :\?${TERM:-ansi} -r -Q `

/home/cis90/simben $

```

*This customizes the normal path by appending the class bin directory, the student's bin directory and the "current" directory*



# Extra Credit Special Answer



## Extra Credit Special (from Lesson 12)

1) *Why did the prompt change?*

```
/home/cis90/simben $ bash  
[simben@opus ~]$ exit  
exit  
/home/cis90/simben $
```

2) *What command could be issued prior to the bash command above that would prevent the prompt from changing?*

For 2 points extra credit, email [risimms@cabrillo.edu](mailto:risimms@cabrillo.edu) answers to **both** questions before the Lesson 13 class starts



# Lesson 12

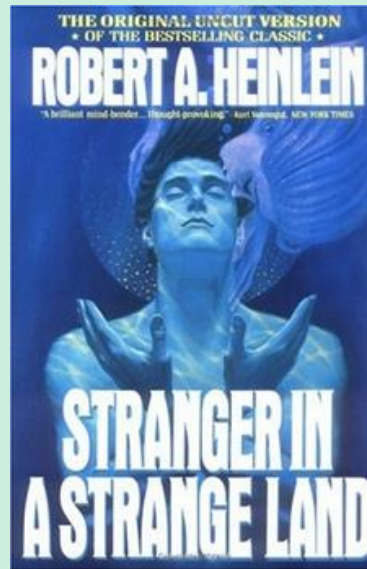
# Review

## The rules of the road for variables

**Process Rule #1:** When a shell forks a child, only copies of exported variables are made available to the child.

**Process Rule #2:** A child can modify the variables it receives but those modifications will not change the parent's variables.

# grok that?



## The flowers script /home/cis90/bin/flowers

```
#!/bin/bash
#
# Useful alias:
# alias go='echo roses are \"$roses\" and violets are \"$violets\"'
#
echo
echo "==> Entering child process <=="
ps -f
echo "==> showing variables in child <=="
echo "  " roses are "'$roses'"
echo "  " violets are "'$violets'"
echo "==> setting variables in child <=="
roses=black
violets=orange
echo "  " roses are "'$roses'"
echo "  " violets are "'$violets'"
echo "==> Leaving child process <=="
echo
```

Show the parent, child  
and the ps processes

Show the values of the  
roses and violets variables

Set the values of the  
roses and violets variables  
to new values

## The flowers script /home/cis90/bin/flowers

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

```
==> Entering child process <==
```

UID	PID	PPID	C	STIME	TTY	TIME	CMD
simben90	17518	17512	0	08:32	pts/0	00:00:00	-bash
simben90	17568	17518	0	08:33	pts/0	00:00:00	/bin/bash /home/cis90/bin/flowers
simben90	17575	17568	8	08:33	pts/0	00:00:00	ps -f

```
==> showing variables in child <==
```

```
roses are ""
```

```
violets are ""
```

```
==> setting variables in child <==
```

```
roses are "black"
```

```
violets are "orange"
```

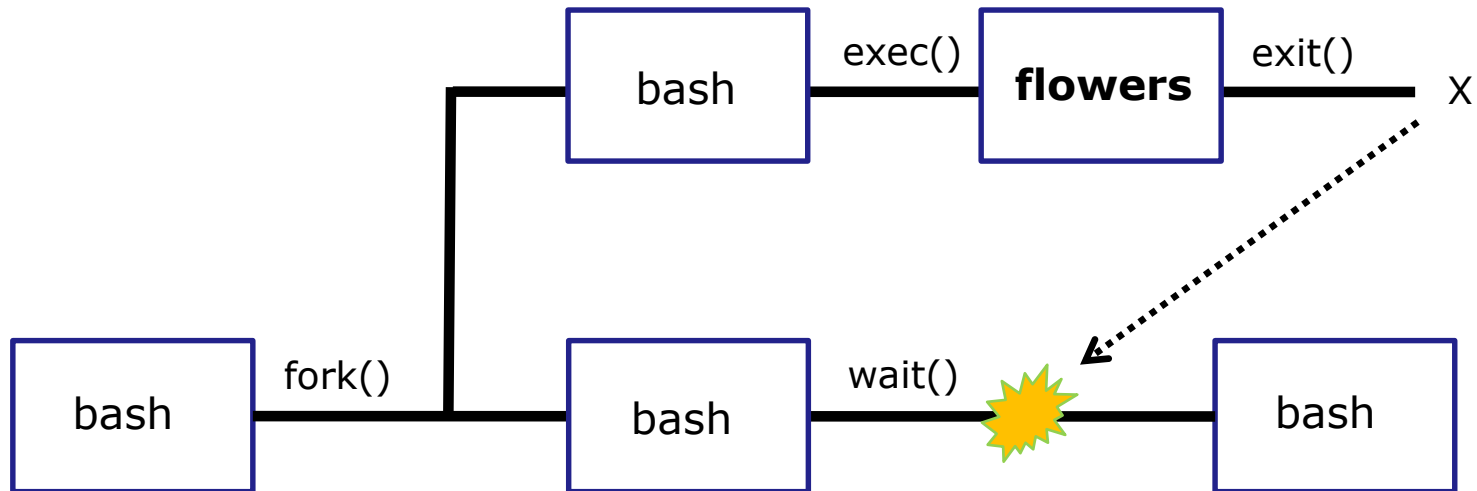
```
==> Leaving child process <==
```

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

```
#!/bin/bash
#
# Useful alias:
# alias go='echo roses are \"$roses\" and violets are \"$violets\"'
#
echo
echo "=="> Entering child process <=="
ps -f
echo "=="> showing variables in child <=="
echo " " roses are "'$roses'"
echo " " violets are "'$violets'"
echo "=="> setting variables in child <=="
roses=black
violets=orange
echo " " roses are "'$roses'"
echo " " violets are "'$violets'"
echo "=="> Leaving child process <=="
echo
```



## The flowers script /home/cis90/bin/flowers



Use the **flowers** script to test your understanding of how variables are handled with child processes

## Create an alias to show variable values

*Note, the double quotes are escaped. We don't want bash to treat them as special metacharacters. We just want the double quotes preserved so they can be seen in the output of the echo command.*

```
/home/cis90/simben $ alias go='echo roses are \"$roses\" and violets are \"$violets\"'
```

```
/home/cis90/simben $ alias go  
alias go='echo roses are \"$roses\" and violets are \"$violets\"'
```

```
/home/cis90/simben $ go  
roses are "" and violets are ""
```

*Since there are no shell variables named roses or violets the echo command prints nothing for them.*

## Activity

**Setup this alias so you can use it in activities that follow:**

```
alias go='echo roses are \"$roses\" and violets are \"$violets\"'
```

**What happens now when you type the go command?**

*Type your answer in the chat window*

## Use the alias to show the values of the two variables

```
/home/cis90/simben $ go  
roses are "" and violets are ""
```

```
/home/cis90/simben $ roses=red  
/home/cis90/simben $ go  
roses are "red" and violets are ""
```

*Now the roses variable  
has been created and  
initialized*

```
/home/cis90/simben $ violets=blue  
/home/cis90/simben $ go  
roses are "red" and violets are "blue"
```

*Now the violets variable  
has been created and  
initialized*

## Use the alias to show the values of the two variables

```
/home/cis90/simben $ unset roses  
/home/cis90/simben $ go  
roses are "" and violets are "blue"
```

*Now the roses  
variable no longer  
exists*

```
/home/cis90/simben $ unset violets  
/home/cis90/simben $ go  
roses are "" and violets are ""
```

*Now the violets  
variable no longer  
exists*

## Activity

```
/home/cis90/simben $ roses=red; violets=blue  
/home/cis90/simben $ go  
roses are "red" and violets are "blue"  
/home/cis90/simben $ env | grep roses  
/home/cis90/simben $ env | grep violets  
/home/cis90/simben $ flowers
```

**When the flowers script runs will it see the values of the roses and violets variables?**

*Write your answer in the chat window*

## ***NO**, the roses and violets variables were not exported*

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

```
==> Entering child process <==
```

UID	PID	PPID	C	STIME	TTY	TIME	CMD
simben90	25106	25059	0	17:16	pts/8	00:00:00	-bash
simben90	27052	25106	0	17:19	pts/8	00:00:00	/bin/bash /home/cis90/bin/flowers
simben90	27059	27052	0	17:19	pts/8	00:00:00	ps -f

```
==> showing variables in child <==
```

```
roses are ""  
violets are ""
```

*The child cannot view the values of the parent's non-exported variables (Rule #1)*

```
==> setting variables in child <==
```

```
roses are "black"  
violets are "orange"
```

```
==> Leaving child process <==
```

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

## Activity

```
/home/cis90/simben $ roses=red; violets=blue
/home/cis90/simben $ export roses
/home/cis90/simben $ env | grep roses
roses=red
/home/cis90/simben $ env | grep violets
/home/cis90/simben $ go
roses are "red" and violets are "blue"
/home/cis90/simben $ flowers
```

**When the flowers script runs will it see the value of the roses variable or the violets variable?**

*Write your answer in the chat window*





## *Yes, the flowers script can see the roses variable now which was exported*

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

```
==> Entering child process <==
```

UID	PID	PPID	C	STIME	TTY	TIME	CMD
simben90	25106	25059	0	17:16	pts/8	00:00:00	-bash
simben90	32147	25106	0	17:27	pts/8	00:00:00	/bin/bash /home/cis90/bin/flowers
simben90	32154	32147	0	17:27	pts/8	00:00:00	ps -f

```
==> showing variables in child <==
```

```
roses are "red"
```

```
violets are ""
```

*The child now sees the value of roses but not violets (Rule #1)*

```
==> setting variables in child <==
```

```
roses are "black"
```

```
violets are "orange"
```

```
==> Leaving child process <==
```

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

## Activity

```
/home/cis90/simben $ roses=red; violets=blue
/home/cis90/simben $ export roses violets
/home/cis90/simben $ env | grep roses
roses=red
/home/cis90/simben $ env | grep violets
violets=blue
/home/cis90/simben $ go
roses are "red" and violets are "blue"
/home/cis90/simben $ flowers
```

**Will the flowers process change the values of the roses and violets variables?**

*Write your answer in the chat window*



## **No**, the flowers script which runs as a child process cannot change the parent's variables

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

```
==> Entering child process <==
```

UID	PID	PPID	C	STIME	TTY	TIME	CMD
simben90	28732	28724	0	17:51	pts/0	00:00:00	-bash
simben90	29383	28732	0	18:11	pts/0	00:00:00	/bin/bash /home/cis90/bin/flowers
simben90	29390	29383	0	18:11	pts/0	00:00:00	ps -f

```
==> showing variables in child <==
```

```
roses are "red"
```

```
violets are "blue"
```

```
==> setting variables in child <==
```

```
roses are "black"
```

```
violets are "orange"
```

*The child can only change copies of the parents variables*

```
==> Leaving child process <==
```

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

```
roses are "red" and violets are "blue"
```

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

*The child cannot change the parent's variables (Rule #2)*

## Activity

```
/home/cis90/simben $ roses=red; violets=blue
/home/cis90/simben $ export roses violets
/home/cis90/simben $ env | grep roses
roses=red
/home/cis90/simben $ env | grep violets
violets=blue
/home/cis90/simben $ go
roses are "red" and violets are "blue"
/home/cis90/simben $ . flowers
```

**Now will the flowers process change the values of the roses and violets variables?**

*Write your answer in the chat window*

*Yes, if sourced, flowers will NOT run as a child process and so the variables are changed*

```
/home/cis90/simben $ . flowers
```

```
==> Entering child process <==
```

UID	PID	PPID	C	STIME	TTY	TIME	CMD
simben90	28732	28724	0	17:51	pts/0	00:00:00	-bash
simben90	29480	28732	0	18:15	pts/0	00:00:00	ps -f

```
==> showing variables in child <==
```

```
roses are "red"
```

```
violets are "blue"
```

```
==> setting variables in child <==
```

```
roses are "black"
```

```
violets are "orange"
```

```
==> Leaving child process <==
```

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

```
roses are "black" and violets are "orange"
```

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

```

/home/cis90/rodduk $ cat .bash_profile
# .bash_profile

# Get the aliases and functions
if [ -f ~/.bashrc ]; then
    . ~/.bashrc
fi

# User specific environment and startup programs

PATH=$PATH:$HOME/../../bin:$HOME/bin:..
BASH_ENV=$HOME/.bashrc
USERNAME=""
PS1='$PWD $ '
export USERNAME BASH_ENV PATH
umask 002
set -o ignoreeof
stty susp
eval `tset -s -m vt100:vt100 -m`

/home/cis90/rodduk $
    
```

*And now you know why the bash login scripts are sourced rather than run as child processes.*

*Note: the . (dot) and **source** commands are equivalent*

```

/home/cis90/rodduk $ cat .bashrc
# .bashrc

# User specific aliases and functions

# Source global definitions
if [ -f /etc/bashrc ]; then
    . /etc/bashrc
fi
alias print="echo -e"
    
```

## Activity

```
/home/cis90/simben $ roses=red; violets=blue
/home/cis90/simben $ export roses violets
/home/cis90/simben $ env | grep roses
roses=red
/home/cis90/simben $ env | grep violets
violets=blue
/home/cis90/simben $ go
roses are "red" and violets are "blue"
/home/cis90/simben $ exec flowers
```

**What will happen if flowers is exec'ed?**

*Write your answer in the chat window*



The flowers script overlays and replaces the bash code in your current process. It runs to completion and your session ends!

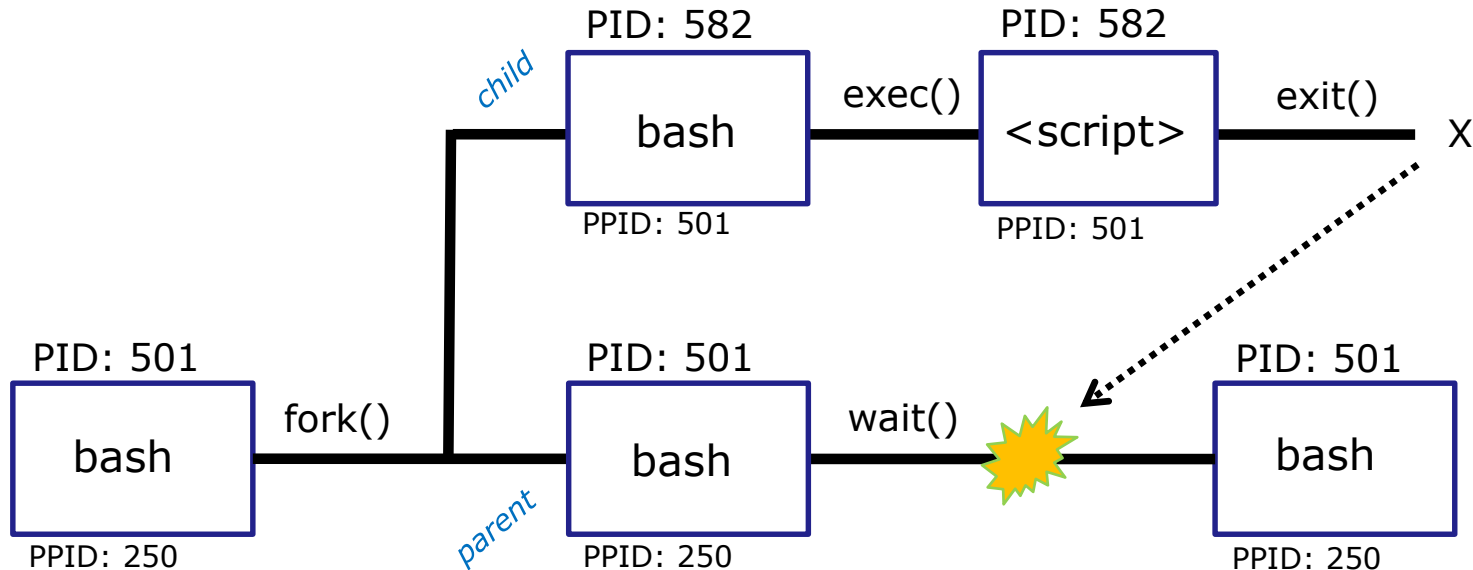


## The rules of the road for variables

**Process Rule #1:** When a shell forks a child, only copies of exported variables are made available to the child.

**Process Rule #2:** A child can modify the variables it receives but those modifications will not change the parent's variables.

# Running a script



## Scripts run as a child process and the rules apply:

- When a shell forks a child process, only copies of exported variables are made available to the child.
- A child process can modify the variables it receives but those modifications will not change the parent's variables.

*But what if we want a script to change the parent's variables?*

• and **SOURCE**

**Sometimes it is desirable to run a shell script (like `.bash_profile` or `.bashrc`) that will initialize or change shell variables in the parent environment.**

`• <script>`  
**source** <script> } *equivalent*

To do this, the shell (bash) provides a `•` (dot) or **source** command, which instructs the shell to execute the shell script itself, without spawning a child process to run the script, and then continue on where it left off.

In the generic example above, the commands in the file `<script-name>` are run by the parent process, and therefore, any changes made to the environment will last for the duration of the login session.

## Compare running vs sourcing a script

```
echo "smartphone=android" > google
echo 'echo smartphone is $smartphone' >> google
cat google
chmod +x google
```

*Check that your google file contains:*  
smartphone=android  
smartphone is \$smartphone

```
smartphone=iPhone
echo $smartphone
```

*Should be iPhone*

```
google
echo $smartphone
```

*Run google script as a  
child process*

```
. google
echo $smartphone
```

*Source google script so it runs  
as part of the parent process*

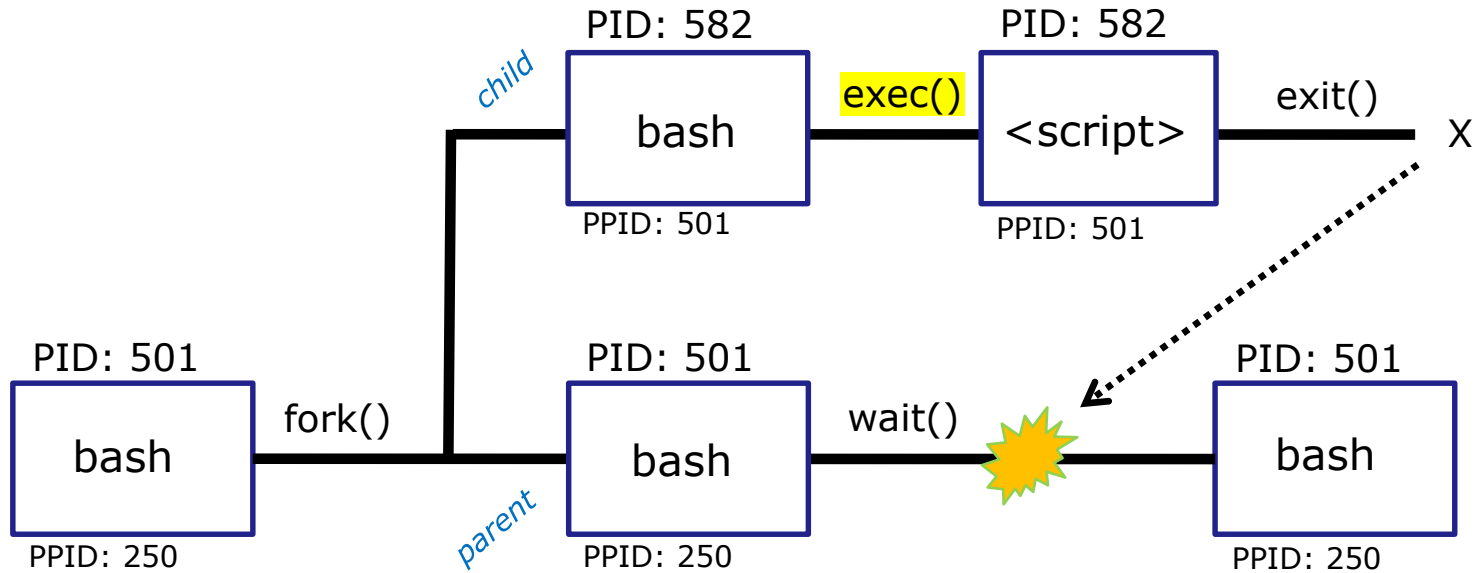
*Method 1*

*Method 2*

**Which method of running a script above  
changed the parent's smartphone variable?**

*Put your answer in the chat window*

# The exec system call



The exec() system call overlays the the child process with new code for the command being run

# exec command

**exec** *<command>*

If a UNIX command is run using the **exec** *<command>*, the bash code in the process is overlaid by the *<command>* code, when finished the process will terminate.

## Using exec command

```

/home/cis90/simben $ bash
[simben90@opus-ii ~]$ ps -l
F S  UID  PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S  1201 23951 23950  0  80   0 - 28881 do_wai pts/2        00:00:00 bash
0 S  1201 24018 23951  0  80   0 - 28880 do_wai pts/2        00:00:00 bash
0 R  1201 24062 24018  0  80   0 - 37235 -          pts/2        00:00:00 ps
[simben90@opus-ii ~]$ exec sh
sh-4.2$ ps -l
F S  UID  PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S  1201 23951 23950  0  80   0 - 28881 do_wai pts/2        00:00:00 bash
0 S  1201 24018 23951  0  80   0 - 28848 do_wai pts/2        00:00:00 sh
0 R  1201 24111 24018  0  80   0 - 37235 -          pts/2        00:00:00 ps
sh-4.2$ exec ksh
$ ps -l
F S  UID  PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S  1201 23951 23950  0  80   0 - 28881 do_wai pts/2        00:00:00 bash
0 S  1201 24018 23951  0  80   0 - 29280 do_wai pts/2        00:00:00 ksh
0 R  1201 24188 24018  0  80   0 - 37235 -          pts/2        00:00:00 ps
$ exec bash
[simben90@opus-ii ~]$ ps -l
F S  UID  PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S  1201 23951 23950  0  80   0 - 28881 do_wai pts/2        00:00:00 bash
0 S  1201 24018 23951  0  80   0 - 28881 do_wai pts/2        00:00:00 bash
0 R  1201 24252 24018  0  80   0 - 37235 -          pts/2        00:00:00 ps
[simben90@opus-ii ~]$ exit
exit
/home/cis90/simben $

```

*Run second bash as child process*

*Replaces second bash process code with sh code*

*Replaces sh code with ksh code*

*Replaces ksh code with bash code*

*Exit back to parent bash process*

You try it

```
bash
ps -l
exec sh
ps -l
exec ksh
ps -l
exec bash
ps -l
exit
```

**Did the shell PID change each time you exec'ed a different shell?**

*Put your answer in the chat window*



# Housekeeping



1. Lab 10 due by 11:59PM tonight
2. Use the **check10** script to check your work
3. Don't forget to **submit your work!**
4. Check you Opus-II mail to verify your submission was successful and complete.
5. After you submit your lab10 file you may comment out your riddle command in *.bash\_profile*
6. The Extra Credit Labs X1 and X2 (30 points each) are available. They will be graded the day after the final. Use **checkx2** to the second lab.
7. The **Final Project is available and due in two weeks.**

## Heads up on Final Exam

Test #3 (final exam) is **MONDAY December 10th 1-3:50PM**

<b>Mon</b>	12/10	<b>Test #3 (the final exam)</b>	<u>5 posts</u> <u>Lab X1</u> <u>Lab X2</u>
		<p><b>Time</b></p> <ul style="list-style-type: none"> <li>MONDAY 1:00PM - 3:50PM in Room 828 or online</li> </ul> <p><b>Materials</b></p> <ul style="list-style-type: none"> <li>Presentation slides (<u>download</u>)</li> <li>Test (<u>canvas</u>)</li> </ul> <p><b>ConferZoom</b></p> <ul style="list-style-type: none"> <li><u>Enter virtual classroom</u></li> <li><u>Class archives</u></li> </ul>	

*Extra credit Labs X1/X2  
and final posts  
**due by 11:59PM***

***Final grades available by  
the end of the next day***

- All students will take the test at the same time. The test must be completed by **3:50PM**.
- Working and long distance students can take the test online via ConferZoom and Canvas.
- Working students will need to plan ahead to arrange time off from work for the test.
- Test #3 is **mandatory** (even if you have all the points you want)

## FALL 2018 FINAL EXAMINATIONS SCHEDULE DECEMBER 10 TO DECEMBER 15

### DAYTIME FINAL SCHEDULE

**Daytime Classes:** All times in bold refer to the beginning times of classes. **MW/Daily** means Monday alone, Wednesday alone, Monday and Wednesday or any 3 or more days in any combination. **TTH** means Tuesday alone, Thursday alone, or Tuesday and Thursday. **Classes meeting other combinations of days and/or hours not listed must have a final schedule approved by the Division Dean.**

STARTING CLASS TIME / DAY(S)	EXAM HOUR	EXAM DATE
<i>Classes starting between:</i>		
6:30 am and 8:55 am, MW/Daily	7:00 am-9:50 am	Monday, December 10
9:00 am and 10:15 am, MW/Daily	7:00 am-9:50 am	Wednesday, December 12
10:20 am and 11:35 am, MW/Daily	10:00 am-12:50 pm	Monday, December 10
11:40 am and 12:55 pm, MW/Daily	10:00 am-12:50 pm	Wednesday, December 12
1:00 pm and 2:15 pm, MW/Daily	1:00 pm-3:50 pm	Monday, December 10
2:20 pm and 3:35 pm, MW/Daily	1:00 pm-3:50 pm	Wednesday, December 12
3:40 pm and 5:30 pm, MW/Daily	4:00 pm-6:50 pm	Wednesday, December 12

#### CIS 90

#### Introduction to UNIX/Linux

Provides a technical overview of the UNIX/Linux operating system, including hands-on experience with commands, files, and tools. Recommended Preparation: CIS 1L or CIS 72.

Transfer Credit: Transfers to CSU;UC

Section	Days	Times	Units	Instructor	Room
1	W	1:00PM-4:05PM	3.00	R.Simms	OL
&	Arr.	Arr.		R.Simms	OL
Section 1 is an ONLINE course. Meets weekly throughout the semester online during the scheduled times by remote technology with an additional 50 min online lab per week. For details, see instructor's web page at <a href="http://go.cabrillo.edu/online">go.cabrillo.edu/online</a> . This course has zero cost for textbooks.					
2	W	1:00PM-4:05PM	3.00	R.Simms	828
&	Arr.	Arr.		R.Simms	OL
Section 2 is a Hybrid ONLINE course. Meets weekly throughout the semester at the scheduled times with an additional 50 min online lab per week. For details, see instructor's web page at <a href="http://go.cabrillo.edu/online">go.cabrillo.edu/online</a> . This course has zero cost for textbooks.					



# Printers

Two predominate types of printers

- Thermal inkjet technology
- Laser, drum, toner technology



# Printing in Linux

# Printing Commands

## The ATT System V way

- lp (to print)
- lpstat (queue management)
- cancel (to remove jobs)

## The BSD (Berkeley Software Distribution) way

- lpr (to print)
- lpq (queue management)
- lprm (to remove jobs)

*BSD is a branch of UNIX that was developed at the University of California, Berkeley*

## And now CUPS ...

- Provides both System V and Berkeley based command-line interfaces
- Supports new Internet Printing Protocol
- Works with Samba



# CUPS

## lpstat command

Syntax: **lpstat** [*options*]

Example (Not on Opus-II):

```
rsimms@hugo:~$ lpstat -p  
printer HP_LaserJet_1320_series is idle.  enabled since Tue 08 May  
2012 08:46:45 PM PDT
```

*The -p option will show the  
available printers*

```
rsimms@hugo:~$ lpstat -p -d  
printer HP_LaserJet_1320_series is idle.  enabled since Tue 08 May  
2012 08:46:45 PM PDT  
system default destination: HP_LaserJet_1320_series
```

*The -d option will identify  
the default printer*

# CUPS

## lpstat command

On Opus-II

**What printers are available?**

**Which is the default printer?**

*Write your answers in the chat window*

# CUPS

## lp and lpr commands

*Use **lp** (or **lpr**) to print files*

```
/home/cis90/simben $ lp lab10  
request id is hplaser-5 (1 file(s))
```

```
/home/cis90/simben $ lp -d hplaser lab10  
request id is hplaser-6 (1 file(s))
```

*With **lp**, use the **-d** option to manually select the printer*

```
/home/cis90/simben $ lpr lab10
```

```
/home/cis90/simben $ lpr -P hplaser lab10
```

*With **lpr**, use the **-P** option to manually select a printer*

# CUPS

## lp and lpr commands

```
/home/cis90/simben $ echo "Print Me Quietly" | lpr -P hplaser  
/home/cis90/simben $
```

*Note that both lp and lpr will read from stdin.*

*This allows output from another command to be piped in*

# CUPS

## Practice Printing

**On Opus, print your lab10 and letter files**

```
lp lab10
```

```
lpstat
```

```
lpr letter
```

```
lpstat
```

```
echo "Print Me Quietly" | lpr -P hplaser
```

```
lpstat
```

*When finished type "done" in the chat window*



# Managing Print Jobs

# CUPS

## Showing jobs waiting to print

```
[root@benji ~]# lpq
hp7550 is not ready
Rank      Owner    Job      File(s)
Total Size
1st       root    22       myfile
1024 bytes
2nd       root    23       myfile
1024 bytes
3rd       root    24       myfile
1024 bytes
4th       root    25       myfile
1024 bytes
```

*Use **lpq** or **lpstat** with no options to show spooled print jobs*

```
[root@benji ~]# lpstat
hp7550-22                root                1024    Sat
15 Nov 2008 12:20:23 PM PST
hp7550-23                root                1024    Sat
15 Nov 2008 12:20:28 PM PST
hp7550-24                root                1024    Sat
15 Nov 2008 12:20:31 PM PST
hp7550-25                root                1024    Sat
15 Nov 2008 12:20:34 PM PST
```

# CUPS

## Removing/canceling pending print jobs

```
[root@benji ~]# lpq
hp7550 is not ready
Rank   Owner   Job    File(s)
Total Size
1st    root    22     myfile
1024 bytes
2nd    root    23     myfile
1024 bytes
3rd    root    24     myfile
1024 bytes
4th    root    25     myfile
1024 bytes
```

```
[root@benji ~]# cancel 22
[root@benji ~]# cancel 23
[root@benji ~]# lprm 24
[root@benji ~]# lprm 25
```

*Use **cancel** or **lprm**  
to remove print jobs*

```
[root@benji ~]# lpq
hp7550 is not ready
no entries
```

```
[root@benji ~]# lpstat
[root@benji ~]#
```



# CUPS

## Practice Printing

Cancel your print jobs on Opus-II

```
lpq  
lpstat
```

```
cancel <print job number>  
lpq
```

```
lprm <print job number>  
lpq
```

*When finished type "gone" in the chat window*

`$(some-command)`

## Utilizing `$(some-command)`

The **\$** metacharacter provides the "value" of:

- variables, e.g. `$PS1`
- commands, e.g. `$(some-command)`

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

```
/home/cis90/simben $ echo $(grep love poems/Shakespeare/* | wc -l)
11
```

```
/home/cis90/simben $ myname=$(grep $LOGNAME /etc/passwd | cut -f5 -d":")
/home/cis90/simben $ echo My name is $myname
My name is Benji Simms
```

*This is useful when you want to insert the output of a command into a sentence being echoed*

## Activity

```
dir=$(echo $PATH | cut -f6 -d":")  
echo The 6th directory on my PATH is $dir
```

*Paste the output of your echo command into the chat window*



# date command part II

# Utilizing the date command

```
/home/cis90/milhom/bin $ date  
Tue Nov 24 14:33:41 PST 2015
```

```
/home/cis90/milhom/bin $ date +%r  
02:33:53 PM
```

```
/home/cis90/milhom/bin $ date +%A  
Tuesday
```

```
/home/cis90/milhom/bin $ date +%m/%d/%Y  
11/24/2015
```

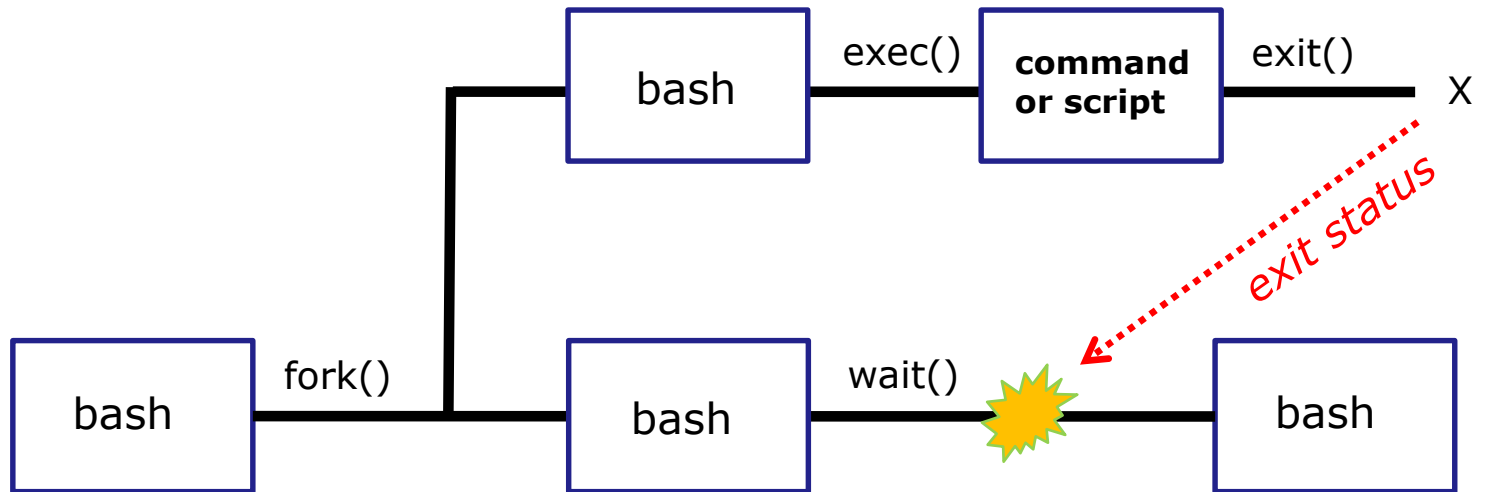


*See the man page on date for lots of other % codes*



# Communicating status back to parent

# The child can communicate status back to the parent



*The child process makes an `exit()` system call to release all resources. The child remains a zombie until the exit status is communicated to the parent.*



# Utilizing the status

**Yes, there is a variable named ?**

*This variable will be set to the exit status of the command or script that just ran.*

```
/home/cis90/milhom/bin $ grep bogus /etc/passwd > /dev/null  
/home/cis90/milhom/bin $ echo $?  
1 status=1 (grep found no matches)
```

```
/home/cis90/milhom/bin $ grep $LOGNAME /etc/passwd > /dev/null  
/home/cis90/milhom/bin $ echo $?  
0 status=0 (grep found one or more matches)
```


*A status=0 typically indicates success and non-zero values are error codes*

## Utilizing the status

```
/home/cis90/milhom/bin $ ping -c1 sun-hwa-iv.cis.cabrillo.edu  
PING sun-hwa-iv.cis.cabrillo.edu (172.20.90.61) 56(84) bytes of data.
```

```
--- sun-hwa-iv.cis.cabrillo.edu ping statistics ---  
1 packets transmitted, 0 received, 100% packet loss, time 0ms
```

```
/home/cis90/milhom/bin $ echo $?  
1
```

 *status=1 (sun-hwa-iv is down right now)*

```
/home/cis90/milhom/bin $ ping -c1 simms-teach.com
```

```
PING simms-teach.com (208.113.154.64) 56(84) bytes of data.  
64 bytes from apache2-dap.giles.dreamhost.com (208.113.154.64): icmp_seq=1 ttl=43 time=78.9 ms
```

```
--- simms-teach.com ping statistics ---  
1 packets transmitted, 1 received, 0% packet loss, time 164ms  
rtt min/avg/max/mdev = 78.957/78.957/78.957/0.000 ms
```

```
/home/cis90/milhom/bin $ echo $?  
0
```

 *status=0 (simms-teach.com website is up right now)*

## Utilizing the status

```
/home/cis90/milhom/bin $ ping -c1 cousin-of-opus.simms-teach.com  
ping: cousin-of-opus.simms-teach.com: Name or service not known  
/home/cis90/milhom/bin $ echo $?
```

2  *status=2 (there is no cousin-of-Opus system in that domain)*



# Color

## Using Color

Black 0;30	Green 0;32	Red 0;31	Brown 0;33
Dark Gray 1;30	Light Green 1;32	Light Red 1;31	Yellow 1;33
Blue 0;34	Cyan 0;36	Purple 0;35	Light Gray 0;37
Light Blue 1;34	Light Cyan 1;36	Light Purple 1;35	White 1;37

```

/home/cis90/simben/bin $ echo -e "\e[00;31mMy favorite color is RED\e[00m"
My favorite color is RED
/home/cis90/simben/bin $ echo -e "\e[00;34mMy favorite color is BLUE\e[00m"
My favorite color is BLUE
/home/cis90/simben/bin $ echo -e "\e[00;32mMy favorite color is GREEN\e[00m"
My favorite color is GREEN
/home/cis90/simben/bin $

```

*Use **echo -e "\e[0n;nm"** to turn on color and **\e[00m** to turn it off.*

*(the -e option enables interpretation of backslash escapes)*

## Using Color

```
/home/cis90/simben/bin $ echo -e "\e[00;32m"
```

*Change to  
color green*

```
/home/cis90/simben/bin $ head -4 ~/letter  
Hello Mother! Hello Father!
```

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

```
/home/cis90/simben/bin $ echo -e '\e[00m'
```

*Revert color  
back to normal*

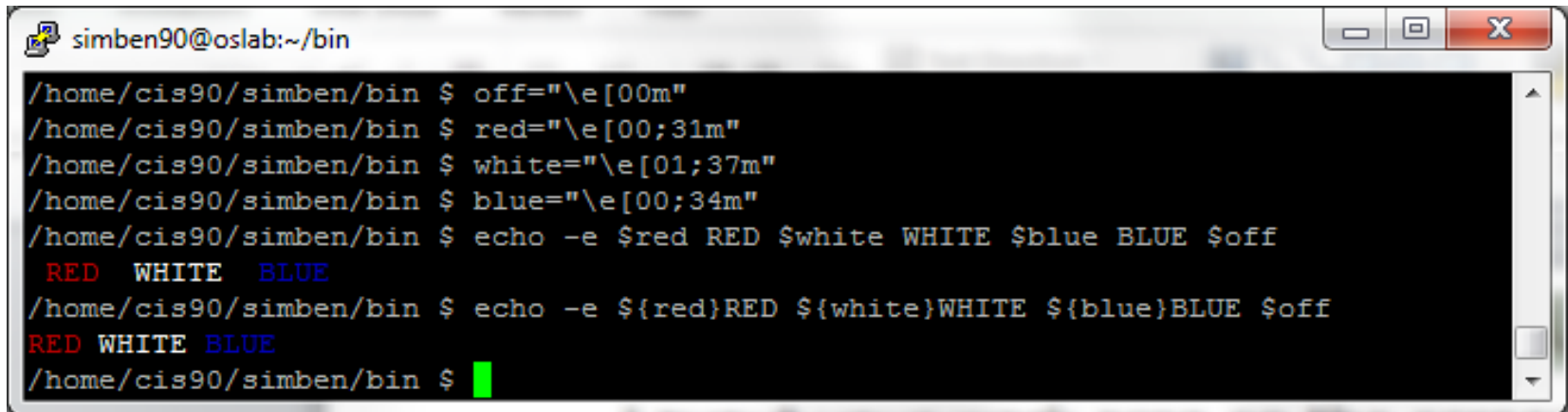
```
/home/cis90/simben/bin $
```

## Using Color

```

off="\e[00m"
red="\e[00;31m"
white="\e[01;37m"
blue="\e[00;34m"
echo -e $red RED $white WHITE $blue BLUE $off
echo -e ${red}RED ${white}WHITE ${blue}BLUE $off

```



The image shows a terminal window titled 'simben90@oslab:~/bin'. The terminal displays the following commands and their output:

```

/home/cis90/simben/bin $ off="\e[00m"
/home/cis90/simben/bin $ red="\e[00;31m"
/home/cis90/simben/bin $ white="\e[01;37m"
/home/cis90/simben/bin $ blue="\e[00;34m"
/home/cis90/simben/bin $ echo -e $red RED $white WHITE $blue BLUE $off
RED WHITE BLUE
/home/cis90/simben/bin $ echo -e ${red}RED ${white}WHITE ${blue}BLUE $off
RED WHITE BLUE
/home/cis90/simben/bin $ █

```

*Demonstrating the use of variables and curly braces to make color easier to use.*

Curly braces are used to clearly separate the variable name from adjacent text strings:

`$redRED` is null

`${red}RED` is `"\e[00;31mRED"`



# Final Project

# myscript



```

milhom90@oslab:~/bin
#!/bin/bash
#
# menu: A simple menu template
#
while true
do
    clear
    echo -n "
        CIS 90 Final Project
    1) Task 1
    2) Task 2
    3) Task 3
    4) Task 4
    5) Task 5
    6) Exit

    Enter Your Choice: "
    read RESPONSE
    case $RESPONSE in
        1)    # Commands for Task 1
            ;;
        2)    # Commands for Task 2
            ;;
        3)    # Commands for Task 3
            ;;
        4)    # Commands for Task 4
            ;;
        5)    # Commands for Task 5
            ;;
        6)    exit 0
            ;;
        *)    echo "Please enter a number between 1 and 6"
            ;;
    esac
    echo -n "Hit the Enter key to return to menu "
    read dummy
done
~

```

*You will modify and extend this script for your final project*

# Final Project

*If you did not do this last week, please do so now*

## Getting Started

1) On Opus-II, cd to your home directory and enter:

```
cd  
cp ../depot/myscript bin/
```

2) Give your script execute permissions with:

```
chmod +x bin/myscript
```

3) Run the script:

```
myscript
```

# Final Project

```
simben90@oslabr:~$  
*****  
*           Spring 2017 CIS 90 Online Projects           *  
*****  
1) Alison  
2) Benji  
3) Cameron  
4) Cristian  
5) Daniel H.  
6) Dillon  
7) Duke  
8) Gracie  
9) Hans  
10) Harold  
11) Homer  
12) Ian C.  
13) Ian J.  
14) Jasen  
15) Joshua  
16) Julian  
17) Justin  
18) Ken  
19) Luis  
20) Melissa  
21) Nicholas  
22) Nigel  
23) Philip  
24) Roberto  
25) Ryan  
26) Samantha  
27) Sam  
28) Stephen  
29) Steven  
30) Tess  
  
99) Exit  
  
Enter Your Choice: █
```

*Before leaving class today,  
make sure you can run your  
**myscript** from **allscripts***



# Final Project Grading Rubric



Possible Points	Requirements
30	Implementing all five tasks (6 points each): <ul style="list-style-type: none"> <li>Requirements for each task: <ul style="list-style-type: none"> <li>Minimum of 12 "original" lines of bash script</li> <li>Has one or more non-generic comments to explain what it is doing</li> <li>Has user interaction</li> </ul> </li> </ul>
24	At least six bash constructs from this list: <ul style="list-style-type: none"> <li>Redirecting stdin (4 points)</li> <li>Redirecting stdout (4 points)</li> <li>Redirecting stderr (4 points)</li> <li>Use of permissions (4 points)</li> <li>Use of filename expansion characters (4 points)</li> <li>Use of absolute path (4 points)</li> <li>Use of relative path (4 points)</li> <li>Use of a PID (4 points)</li> <li>Use of inodes (4 points)</li> <li>Use of links (4 points)</li> <li>Use of color (4 points)</li> <li>Use of scheduling (4 points)</li> <li>Use of a GID or group (4 points)</li> <li>Use of a UID or user (4 points)</li> <li>Use of a /dev/tty device (4 points)</li> <li>Use of a signal (4 points)</li> <li>Use of piping (4 points)</li> <li>Use of an environment variable (4 points)</li> <li>Use of /bin/mail (4 points)</li> <li>Use of a conditional (4 points)</li> <li>Use of \$(<i>command</i>)</li> </ul> <p>The maximum for this section is 24 points.</p>
6	Present your script to the class
<b>Points lost</b>	
-15	Fails to run from <b>allscripts</b>
-15	Other students in the class are unable to read and execute <b>your script</b> .
-15	Error messages are displayed when running one or more tasks
-up to 90	No credit for any task which contains unoriginal script code that: <ul style="list-style-type: none"> <li>Doesn't give full credit to the original author.</li> <li>Doesn't indicate where the code was obtained from.</li> <li>Doesn't include licensing terms.</li> <li>Violates copyright or licensing terms.</li> </ul>
-up to 90	For any "malware" scripts that steal credentials, exfiltrate confidential information, remove or encrypt a user's files or creates a denial of service condition on Opus-II.
<b>Extra credit</b>	
30	Up to three additional tasks (10 points each)

## Grading Rubric for Final Project

*Plagiarizing another author's code is a NO-NO! All points lost!*

*Scripts that result in unauthorized hacking" is a NO-NO! All points lost!*



# Final Project


# permissions

# Permissions

*A past forum post ...*

**Ha Ha Class**  
Dby on Tue May 12, 2009 12:22 pm

I'm sure this is some kind of payback for last week "Hacking" attempt 😊



```
File Edit View Terminal Help
#!/bin/bash
# menu: A simple menu example
while true
do
clear
echo -n "***** will fail his Final Project\n"
1) Job 1
2) Task 2
3) Task 3
4) Task 4
5) Task 5
6) Exit
Enter Your Choice:
read RESPONSE
case $RESPONSE in
1) # Complete Task 1
echo "***** got hacked!!!!"
echo "what is your name?"
read NAME
echo "what are ur hobbies?"
"myscript" 42L, 646C
```

I will find out who did this 😊😂

~~~~~

ps. Im going to pass 😊

*Uh, oh ... someone got hacked!*

## Group Write Permissions

**ls -l /home/cis90/\*/bin/myscript**

```
rsimms@opus-ii:~
[rsimms@opus-ii ~]$ date
Sun Apr 29 18:39:03 PDT 2018
[rsimms@opus-ii ~]$ ls -l /home/cis90/*/bin/myscript
-rwxrwxr-x. 1 arrdav90 cis90 739 Apr 25 10:07 /home/cis90/arrdav/bin/myscript
-rwxrwxr-x. 1 ausedg90 cis90 700 Apr 25 10:01 /home/cis90/ausedg/bin/myscript
-rwxrwxr-x. 1 banric90 cis90 781 Apr 25 10:01 /home/cis90/banric/bin/myscript
-rwxrwxr-x. 1 broada90 cis90 782 Apr 25 10:21 /home/cis90/broada/bin/myscript
-rwxrwxr-x. 1 chudar90 cis90 549 Apr 26 13:59 /home/cis90/chudar/bin/myscript
-rwxrwxr-x. 1 farcia90 cis90 549 Apr 25 10:51 /home/cis90/farcia/bin/myscript
-rwxrwxr-x. 1 milhom90 cis90 781 Apr 24 12:56 /home/cis90/milhom/bin/myscript
-rwxrwxr-x. 1 monele90 cis90 698 Apr 25 10:09 /home/cis90/monele/bin/myscript
-rwxrwxr-x. 1 ohapau90 cis90 717 Apr 25 10:04 /home/cis90/ohapau/bin/myscript
-rwxrwxr-x. 1 ottlai90 cis90 689 Apr 25 10:03 /home/cis90/ottlai/bin/myscript
-rwxrwxr-x. 1 pernat90 cis90 702 Apr 25 10:12 /home/cis90/pernat/bin/myscript
-rwxrwxr-x. 1 plabra90 cis90 700 Apr 25 10:17 /home/cis90/plabra/bin/myscript
-rwxrwxr-x. 1 ranlui90 cis90 751 Apr 25 10:12 /home/cis90/ranlui/bin/myscript
-rwxrw-r--. 1 rocces90 cis90 725 Apr 25 10:00 /home/cis90/rocces/bin/myscript
-rwxr-x---. 1 simben90 cis90 549 Apr 23 16:11 /home/cis90/simben/bin/myscript
-rwxrwxr-x. 1 telnat90 cis90 711 Apr 25 10:17 /home/cis90/telnat/bin/myscript
-rwxrwxr-x. 1 vanjoa90 cis90 795 Apr 29 18:27 /home/cis90/vanjoa/bin/myscript
-rwxrwxr-x. 1 wilnov90 cis90 704 Apr 25 09:59 /home/cis90/wilnov/bin/myscript
-rwxrwxr-x. 1 winsha90 cis90 701 Apr 25 10:02 /home/cis90/winsha/bin/myscript
[rsimms@opus-ii ~]$
```

Which **myscript** files can only be edited by their owner?  
 Which ones could be edited by anyone in the CIS 90 class?  
 Which ones could be edited by anyone on Opus-II?



## Group Read and Execute Permissions

```

rsimms@opus-ii-~
[rsimms@opus-ii ~]$ date
Sun Apr 29 18:39:40 PDT 2018
[rsimms@opus-ii ~]$ /home/cis90/bin/checkmyscripts
-rwxr-x---. 1 simben90 cis90 549 Apr 23 16:11 /home/cis90/simben/bin/myscript
-rwxrwxr-x. 1 milhom90 cis90 781 Apr 24 12:56 /home/cis90/milhom/bin/myscript
ls: cannot access /home/cis90/rodduk/bin/myscript: No such file or directory
ls: cannot access /home/cis90/angjak/bin/myscript: No such file or directory
-rwxrwxr-x. 1 ausedg90 cis90 700 Apr 25 10:01 /home/cis90/ausedg/bin/myscript
-rwxrwxr-x. 1 banric90 cis90 781 Apr 25 10:01 /home/cis90/banric/bin/myscript
ls: cannot access /home/cis90/bilfri/bin/myscript: No such file or directory
-rwxrwxr-x. 1 chudar90 cis90 549 Apr 26 13:59 /home/cis90/chudar/bin/myscript
ls: cannot access /home/cis90/klenat/bin/myscript: No such file or directory
-rwxrwxr-x. 1 ohapau90 cis90 717 Apr 25 10:04 /home/cis90/ohapau/bin/myscript
ls: cannot access /home/cis90/olscla/bin/myscript: No such file or directory
-rwxrwxr-x. 1 ottlai90 cis90 689 Apr 25 10:03 /home/cis90/ottlai/bin/myscript
-rwxrwxr-x. 1 pernat90 cis90 702 Apr 25 10:12 /home/cis90/pernat/bin/myscript
ls: cannot access /home/cis90/ragjet/bin/myscript: No such file or directory
-rwxrw-r--. 1 rocces90 cis90 725 Apr 25 10:00 /home/cis90/rocces/bin/myscript
-rwxrwxr-x. 1 vanjoa90 cis90 795 Apr 29 18:27 /home/cis90/vanjoa/bin/myscript
-rwxrwxr-x. 1 wilnov90 cis90 704 Apr 25 09:59 /home/cis90/wilnov/bin/myscript
-rwxrwxr-x. 1 arrdav90 cis90 739 Apr 25 10:07 /home/cis90/arrdav/bin/myscript
-rwxrwxr-x. 1 broadaa90 cis90 782 Apr 25 10:21 /home/cis90/broadaa/bin/myscript
-rwxrwxr-x. 1 farcia90 cis90 549 Apr 25 10:51 /home/cis90/farcia/bin/myscript
ls: cannot access /home/cis90/fuldan/bin/myscript: No such file or directory
ls: cannot access /home/cis90/kankim/bin/myscript: No such file or directory
-rwxrwxr-x. 1 monele90 cis90 698 Apr 25 10:09 /home/cis90/monele/bin/myscript
ls: cannot access /home/cis90/padhen/bin/myscript: No such file or directory
-rwxrwxr-x. 1 plabra90 cis90 700 Apr 25 10:17 /home/cis90/plabra/bin/myscript
-rwxrwxr-x. 1 ranlui90 cis90 751 Apr 25 10:12 /home/cis90/ranlui/bin/myscript
-rwxrwxr-x. 1 telnat90 cis90 711 Apr 25 10:17 /home/cis90/telnat/bin/myscript
-rwxrwxr-x. 1 winsha90 cis90 701 Apr 25 10:02 /home/cis90/winsha/bin/myscript
[rsimms@opus-ii ~]$

```

*Which myscript files cannot be run by classmates?*

## Class Activity

Note: One of the requirements for the final project is setting permissions on your script so that all cis90 members can read and run it.

To meet this requirement use:

```
cd
chmod 750 bin bin/myscript
ls -ld bin bin/myscript
```

When finished check that your script can be run by other CIS 90 students:

```
su - tbd1090
  (use the "funny Cabrillo" password)
allscripts
exit
```

*Run you script and write "success" or "not working" into the chat window*

umask  
again!

# Permissions

## Why can other classmates modify my scripts?

### *Before Lab 10*

```
/home/cis90/simben/bin $ umask
0002
/home/cis90/simben $ rm newscript; touch newscript
/home/cis90/simben $ ls -l newscript
-rw-rw-r-- 1 simben cis90 0 Nov 23 16:17 newscript
/home/cis90/simben $ chmod +x newscript
/home/cis90/simben $ ls -l newscript
-rwxrwxr-x 1 simben cis90 0 Nov 23 16:17 newscript
```

### *After Lab 10*

```
/home/cis90/simben $ umask
0006
/home/cis90/simben $ rm newscript; touch newscript
/home/cis90/simben $ ls -l newscript
-rw-rw---- 1 simben cis90 0 May 12 08:44 newscript
/home/cis90/simben $ chmod +x newscript
/home/cis90/simben $ ls -l newscript
-rwxrwx--x 1 simben cis90 0 May 12 08:44 newscript
```

*Because your umask setting allows group members to have write permission on any new files you create!*

# Permissions

```
[rodduk90@opus-ii bin]$ cat /home/cis90/rodduk/.bash_profile
```

```
# .bash_profile
```

```
# Get the aliases and functions
```

```
if [ -f ~/.bashrc ]; then
```

```
    . ~/.bashrc
```

```
fi
```

```
# User specific environment and startup programs
```

```
PATH=$PATH:$HOME/../../bin:$HOME/bin:..
```

```
BASH_ENV=$HOME/.bashrc
```

```
USERNAME=""
```

```
PS1='$PWD $ '
```

```
export USERNAME BASH_ENV PATH
```

```
umask 002
```

```
set -o ignoreeof
```

```
stty susp
```

```
eval `tset -s -m vt100:vt100 -m :\?${TERM:-ansi} -r -Q `
```

*Note your umask is defined in .bash\_profile which runs every time you login. In lab 10 you change this setting to 006.*

## Class Activity

- Change your umask to 026
- Can group or other users modify future new files now?
- Try it, **touch** a new file and check the permissions with **ls -l**

How would you make this a permanent umask setting?

*Write your answer in the chat window*



# Final Project Getting Started

# What takes longer?



**Writing the script?**

**Or deciding what to script?**





One way to get started ... select a random command to build a script around

### Commands

|        |         |        |       |
|--------|---------|--------|-------|
| .      | echo    | lpstat | sort  |
| at     | env     | ls     | spell |
| banner | exit    | mail   | su    |
| bash   | export  | man    | tail  |
| bc     | file    | me     | tee   |
| cal    | find    |        | touch |
| cancel | finger  | more   | type  |
| cat    | grep    | mv     | umask |
| cd     | head    | passwd | uname |
| chgrp  | history |        | unset |
| chmod  | id      |        | vi    |
| chown  | jobs    | rm     | wc    |
| clear  | kill    | rmdir  | who   |
| cp     | ln      | set    | write |
| date   | lp/lpr  | sleep  | xxd   |



*For this example we will pick the grep command*

# Research your command by reading the man page and googling examples

The image shows two overlapping windows. The background window is a terminal titled 'rsimms@opus:~/cis90/project' displaying the man page for 'grep'. The foreground window is a web browser showing search results for 'linux grep command examples'.

**Terminal Window (man grep):**

```

GREP (1)
NAME
    grep, egrep, fgrep - print lines matching a pattern

SYNOPSIS
    grep [options] PATTERN [FILE...]
    grep [options] [-e PATTERN | -f FILE] [FILE...]

DESCRIPTION
    Grep searches the named input FILES (or standard input, if no files are
    named, or the file name - is given) for lines containing the pattern
    given PATTERN. By default, grep prints the matching lines.

    In addition, two variant programs egrep and fgrep are provided. Egrep
    is the same as grep -E. Fgrep is the same as grep -F.

OPTIONS
    -A NUM, --after-context=NUM
        Print NUM lines of trailing context after matching lines.
        Line containing -- between contiguous groups of options.

    -a, --text
        Process a binary file as if it were text; this option is
        implied for files whose name ends in .gz, .bz2, or .xz.
        --binary-files=TYPE
        If the first four characters of a file indicate that the file
        is binary, use TYPE to check for a regular expression match.
        TYPE may be 'text', 'binary', or 'no-match'.

    -B NUM, --before-context=NUM
        Print NUM lines of leading context before matching lines.
        Line containing -- between contiguous groups of options.

    -c, --count
        Print only the number of matching lines.

    -C NUM, --context=NUM
        Print NUM lines of context before and after each matching line.
        Line containing -- between contiguous groups of options.

    -d DIR, --directories=DIR
        If DIR is 'only-files', only regular files are searched.
        If DIR is 'only-directories', only directories are searched.
        If DIR is 'ignore', neither files nor directories are searched.
        If DIR is 'recurse', the default behavior is used.

    -E PATTERN, --extended-regexp PATTERN
        Interpret PATTERN as an extended regular expression.

    -f FILE, --file=FILE
        Interpret PATTERN as a list of lines from FILE, one pattern per
        line.

    -G PATTERN, --perl-regexp PATTERN
        Interpret PATTERN as a Perl-compatible regular expression.

    -h, --help
        Display this help message.

    -i, --ignore-case
        Ignore case distinctions in both the PATTERN and the input files.

    -I, --text-only
        Only search text files.

    -L, --list-only
        Only print the names of files that do not contain any matches.

    -l, --files-with-matches
        Only print the names of files that contain at least one matching
        line.

    -m NUM, --max-count=NUM
        Stop searching a file as soon as NUM occurrences of the pattern
        have been found.

    -n, --line-number
        Print line numbers of each matching line.

    -N, --line-number=NUM
        Print line numbers of each matching line starting from NUM.

    -o, --only-matching
        Only print the part of the line matching the PATTERN.

    -q, --quiet, --silent
        Suppress all normal output.

    -r, --recursive
        Recursively search subdirectories of the given FILE(s).

    -R, --recursive-only
        Recursively search only subdirectories of the given FILE(s).

    -s, --no-messages
        Suppress error messages.

    -S, --size-limit=SIZE
        Stop searching a file as soon as SIZE bytes of memory have been
        used.

    -t, --text
        Process only text files.

    -T, --text-only
        Only search text files.

    -v, --invert-match
        Invert the sense of the search; only non-matching lines are printed.

    -w, --word-regexp
        Interpret PATTERN as a word-regular expression.

    -x, --line-regexp
        Interpret PATTERN as a line-regular expression.

    -y, --perl-regexp
        Interpret PATTERN as a Perl-compatible regular expression.

    -Z, --binary-files=TYPE
        If the first four characters of a file indicate that the file
        is binary, use TYPE to check for a regular expression match.
        TYPE may be 'text', 'binary', or 'no-match'.
    
```

**Web Browser Window (Google Search Results):**

Search query: linux grep command examples

Results:

- [HowTo: Use grep Command In Linux / UNIX \[ Examples \]](#)  
www.cyberciti.biz/faq/howto-use-grep-command-in-linux-unix/  
Aug 2, 2007 – How do I use **grep command** in Linux and Unix like operating systems? Can you give me a simple **example of grep command**? The grep ...
- [15 Practical Grep Command Examples In Linux / UNIX](#)  
www.thegeekstuff.com/.../15-practical-unix-grep-command-example...  
Mar 26, 2009 – You should get a grip on the **Linux grep command**. This is part of the on-going **15 Examples** series, where 15 detailed **examples** will be ...
- [Linux and UNIX grep command help and examples](#)  
www.computerhope.com/unix/ugrep.htm  
40+ items – Information about the Unix **grep command**, including syntax and ...  
A NUM, --after-context=NUM Print NUM lines of trailing context after matching ...  
binary-files=TYPE If the first four characters of a file indicate that the file

*Review the various options and arguments for the command*

Next, decide what you want to do with the command you selected. For this example we will:

1. Start a new task in **myscript**
2. Customize the menu for the new task
3. Start with a simple **grep** command
4. Add some simple interaction
5. Add successive grep commands that experiment with different options
6. Iterate till happy with it.

## Start hacking the menu!

*Customize the menu options for Task 1*

*After*

```
rodduk90@oslab:~/bin
#!/bin/bash
#
# menu: A simple menu template
#
while true
do
    clear
    echo -n "
        CIS 90 Final Project
    1) Task 1
    2) Task 2
    3) Task 3
    4) Task 4
    5) Task 5
    6) Exit

    Enter Your Choice: "
    read RESPONSE
    case $RESPONSE in
        1) # Commands for Task 1
            ;;
        2) # Commands for Task 2
            ;;
        *)
            ;;
    esac
done
"myscript" 37L, 546C
```

*Before*

```
rodduk90@oslab:~/bin
#!/bin/bash
#
# menu: A simple menu template
#
while true
do
    clear
    echo -n "
        CIS 90 Final Project
    1) Hacking with the grep command
    2) Task 2
    3) Task 3
    4) Task 4
    5) Task 5
    6) Exit

    Enter Your Choice: "
    read RESPONSE
    case $RESPONSE in
        1) # Commands for Task 1
            ;;
        2) # Commands for Task 2
            ;;
        *)
            ;;
    esac
done
-- INSERT --
10,5-12 Top
```

← → C www.catb.org/jargon/html/H/hacker.html

**hacker:** n.

[originally, someone who makes furniture with an axe]

1. A person who enjoys exploring the details of programmable systems and how to stretch their capabilities, as opposed to most users, who prefer to learn only the minimum necessary. RFC1392, the *Internet Users' Glossary*, usefully amplifies this as: A person who delights in having an intimate understanding of the internal workings of a system, computers and computer networks in particular.
2. One who programs enthusiastically (even obsessively) or who enjoys programming rather than just theorizing about programming.
3. A person capable of appreciating [hack value](#).
4. A person who is good at programming quickly.
5. An expert at a particular program, or one who frequently does work using it or on it; as in 'a Unix hacker'. (Definitions 1 through 5 are correlated, and people who fit them congregate.)
6. An expert or enthusiast of any kind. One might be an astronomy hacker, for example.
7. One who enjoys the intellectual challenge of creatively overcoming or circumventing limitations.
8. [deprecated] A malicious meddler who tries to discover sensitive information by poking around. Hence password hacker, network hacker. The correct term for this sense is [cracker](#).

The term 'hacker' also tends to connote membership in the global community defined by the net (see [the network](#). For discussion of some of the basics of this culture, see the [How To Become A Hacker](#) FAQ. It also implies that the person described is seen to subscribe to some version of the hacker ethic (see [hacker ethic](#)).

It is better to be described as a hacker by others than to describe oneself that way. Hackers consider themselves something of an elite (a meritocracy based on ability), though one to which new members are gladly welcome. There is thus a certain ego satisfaction to be had in identifying yourself as a hacker (but if you claim to be one and are not, you'll quickly be labeled [bogus](#)). See also [geek](#), [wannabee](#).

This term seems to have been first adopted as a badge in the 1960s by the hacker culture surrounding TMRC and the MIT AI Lab. We have a report that it was used in a sense close to this entry's by teenage radio hams and electronics tinkerers in the mid-1950s.

*Hacking (building, exploring) is not cracking (malicious)*

# Layout your work area on the screen

```

rodduk90@oslab:~/bin
#!/bin/bash
#
# menu: A simple menu template
#
while true
do
    clear
    echo -n "
        CIS 90 Final Project
    1) Hacking with the grep command
    2) Task 2
    3) Task 3
    4) Task 4
    5) Task 5
    6) Exit

    Enter Your Choice: "
    read RESPONSE
    case $RESPONSE in
        1) # Commands for Task 1
            ;;
        2) # Commands for Task 2
            ;;
        3) # Commands for Task 3
            ;;
        4) # Commands for Task 4
            ;;
        5) # Commands for Task 5
            ;;
        6) exit 0
            ;;
        *) echo "Please enter a number between 1 and 6"
            ;;
    esac
    echo -n "Hit the Enter key to return to menu "
    read dummy
done
~
~
~
-- INSERT --
1,12 All
    
```

1st

```

rodduk90@oslab:~/bin
/home/cis90/rodduk $ cd bin
/home/cis90/rodduk/bin $ myscript
    
```

2nd

```

rodduk90@oslab:~
GREP(1)
NAME
    grep, egrep, fgrep - print lines matching a pattern

SYNOPSIS
    grep [OPTIONS] PATTERN [FILE...]
    grep [OPTIONS] [-e PATTERN | -f FILE] [FILE...]

DESCRIPTION
    grep searches the named input FILES (or standard input if no files are
    named, or if a single hyphen-minus (-) is given as file name) for lines
    containing a match to the given PATTERN. By default, grep prints the
    matching lines.

    In addition, two variant programs egrep and fgrep are available. egrep
    is the same as grep -E. fgrep is the same as grep -F. Direct
    invocation as either egrep or fgrep is deprecated, but is provided to
    allow historical applications that rely on them to run unmodified.

OPTIONS
    Generic Program Information
    --help Print a usage message briefly summarizing these command-line
    :
    
```

3rd

Utilize screen real estate with multiple windows:

- the 1<sup>st</sup> for vi,
- the 2<sup>nd</sup> for testing **myscript**,
- and a 3<sup>rd</sup> for experimenting or showing man pages

# Test your menu change

```

rodduk90@oslab:~/bin
#!/bin/bash
#
# menu: A simple menu template
#
while true
do
    clear
    echo -n "
        CIS 90 Final Project
    1) Hacking with the grep command
    2) Task 2
    3) Task 3
    4) Task 4
    5) Task 5
    6) Exit

    Enter Your Choice: "
    read RESPONSE
    case $RESPONSE in
        1) # Commands for Task 1
            ;;
        2) # Commands for Task 2
            ;;
        3) # Commands for Task 3
            ;;
        4) # Commands for Task 4
            ;;
        5) # Commands for Task 5
            ;;
        6) exit 0
            ;;
        *) echo "Please enter a number between 1 and 6"
            ;;
    esac
    echo -n "Hit the Enter key to return to menu "
    read dummy
done
~
~
~
"myscript" 37L, 569C written          1,11          All
    
```

```

rodduk90@oslab:~/bin
        CIS 90 Final Project
    1) Hacking with the grep command
    2) Task 2
    3) Task 3
    4) Task 4
    5) Task 5
    6) Exit

    Enter Your Choice: █
    
```

*Changes work!*

```

rodduk90@oslab:~
GREP(1)                                GREP(1)
NAME
    grep, egrep, fgrep - print lines matching a pattern

SYNOPSIS
    grep [OPTIONS] PATTERN [FILE...]
    grep [OPTIONS] [-e PATTERN | -f FILE] [FILE...]

DESCRIPTION
    grep searches the named input FILES (or standard input if no files are
    named, or if a single hyphen-minus (-) is given as file name) for lines
    containing a match to the given PATTERN. By default, grep prints the
    matching lines.

    In addition, two variant programs egrep and fgrep are available. egrep
    is the same as grep -E. fgrep is the same as grep -F. Direct
    invocation as either egrep or fgrep is deprecated, but is provided to
    allow historical applications that rely on them to run unmodified.

OPTIONS
    Generic Program Information
    --help Print a usage message briefly summarizing these command-line
    :
    
```

Run **myscript** in the 2<sup>nd</sup> window and verify your changes work

# Find the location to insert your new task commands

```

rodduk90@oslab:~/bin
3) Task 3
4) Task 4
5) Task 5
6) Exit

Enter Your Choice: "
read RESPONSE
case $RESPONSE in
  1)  # Commands for Task 1
      ;;
  2)  # Commands for Task 2
      ;;
  3)  # Commands for Task 3
      ;;
  4)  # Commands for Task 4
      ;;
  5)  # Commands for Task 5
      ;;
  6)  exit 0
      ;;
  *)  echo "Please enter a number between 1 and 6"
      ;;
esac
-- INSERT --
12,5-12 78%
  
```

*Insert your new script commands here*

*Now its time to add some commands to the task.*

*Be sure to insert commands **after** the generic comment and **before** the **;;***



# Add a simple command first and test it

```

rodduk90@oslab:~/bin
#!/bin/bash
#
# menu: A simple menu template
#
while true
do
    clear
    echo -n "
        CIS 90 Final Project
    1) Hacking with the grep command
    2) Task 2
    3) Task 3
    4) Task 4
    5) Task 5
    6) Exit


    Enter Your Choice: "
    read RESPONSE
    case $RESPONSE in
        1) # Commands for Task 1
            grep beauty poems/**
            ;;
        2) # Commands for Task 2
            ;;
        3) # Commands for Task 3
            ;;
        4) # Commands for Task 4
            ;;
        5) # Commands for Task 5
            ;;
        *) echo "Please enter a number between 1 and 6"
            ;;
    esac
    echo -n "Hit the Enter key to return to menu "
    read dummy
done
~
~
"myscript" 38L, 593C written          21,15-29    All
    
```

```

rodduk90@oslab:~/bin

        CIS 90 Final Project
    1) Hacking with the grep command
    2) Task 2
    3) Task 3
    4) Task 4
    5) Task 5
    6) Exit

    Enter Your Choice: 1
grep: poems/**: No such file or directory
Hit the Enter key to return to menu █
    
```

 *Oops, the change broke the script! Why? Because the relative path (beauty poems/\*\*) does not work from the bin directory*

```

rodduk90@oslab:~/
/home/cis90/rodduk $ grep beauty poems/**
poems/Shakespeare/sonnet1:That thereby beauty's rose might never die,
poems/Shakespeare/sonnet10:    That beauty still may live in thine or thee.
poems/Shakespeare/sonnet11:Herein lives wisdom, beauty, and increase;
poems/Shakespeare/sonnet17:If I could write the beauty of your eyes,
poems/Shakespeare/sonnet2:And dig deep trenches in thy beauty's field,
poems/Shakespeare/sonnet2:Then being ask'd, where all thy beauty lies,
poems/Shakespeare/sonnet2:How much more praise deserv'd thy beauty's use,
poems/Shakespeare/sonnet2:Proving his beauty by succession thine.
poems/Shakespeare/sonnet4:Upon thyself thy beauty's legacy?
poems/Shakespeare/sonnet4:    Thy unus'd beauty must be tomb'd with thee,
poems/Shakespeare/sonnet5:Beauty's effect with beauty were bereft,
poems/Shakespeare/sonnet7:Yet mortal looks adore his beauty still,
poems/Shakespeare/sonnet9:But beauty's waste hath in the world an end,
poems/Yeats/old:And loved your beauty with love false or true,
/home/cis90/rodduk $ █
    
```

Experiment with a **grep** command in 3<sup>rd</sup> window

In the 1<sup>st</sup> window add the new grep command then save with **<esc>:w** (don't quit vi)

Run **myscript** in the 2<sup>nd</sup> second window to test change.

# Fix it and test again

```

rodduk90@oslab:~/bin
#!/bin/bash
#
# menu: A simple menu template
#
while true
do
    clear
    echo -n "
        CIS 90 Final Project
    1) Hacking with the grep command
    2) Task 2
    3) Task 3
    4) Task 4
    5) Task 5
    6) Exit

    Enter Your Choice: "
    read RESPONSE
    case $RESPONSE in
        1) # Commands for Task 1
            grep beauty /home/cis90/rodduk/poems/*/*
            ;;
        2) # Commands for Task 2
            ;;
        3) # Commands for Task 3
            ;;
        4) # Commands for Task 4
            ;;
        5) # Commands for Task 5
            ;;
        *) echo "Please enter a number between 1 and 6"
            ;;
    esac
    echo -n "Hit the Enter key to return to menu "
    read dummy
done
~
~
"myscript" 38L, 612C written                21,33-47    All
    
```

```

rodduk90@oslab:~/bin
        CIS 90 Final Project
    1) Hacking with the grep command
    2) Task 2
    3) Task 3
    4) Task 4
    5) Task 5
    6) Exit

    Enter Your Choice: 1
/home/cis90/rodduk/poems/Shakespeare/sonnet1:That thereby beauty's rose might ne
ver die,
/home/cis90/rodduk/poems/Shakespeare/sonnet10: That beauty still may live in th
ine or thee.
/home/cis90/rodduk/poems/Shakespeare/sonnet11:Herein lives wisdom, beauty, and i
ncrease;
/home/cis90/rodduk/poems/Shakespeare/sonnet17:If I could write the beauty of you
r eyes,
/home/cis90/rodduk/poems/Shakespeare/sonnet2:And dig deep trenches in thy beauty
's field,
/home/cis90/rodduk/poems/Shakespeare/sonnet2:Then being ask'd, where all thy bea
uty lies,
/home/cis90/rodduk/poems/Shakespeare/sonnet2:How much more praise deserv'd thy b
eauty's use,
/home/cis90/rodduk/poems/Shakespeare/sonnet2:Proving his beauty by succession th
ine.
/home/cis90/rodduk/poems/Shakespeare/sonnet4:Upon thyself thy beauty's legacy?
/home/cis90/rodduk/poems/Shakespeare/sonnet4: Thy unus'd beauty must be tomb'd
with thee,
/home/cis90/rodduk/poems/Shakespeare/sonnet5:Beauty's effect with beauty were be
reft,
/home/cis90/rodduk/poems/Shakespeare/sonnet7:Yet mortal looks adore his beauty s
till,
/home/cis90/rodduk/poems/Shakespeare/sonnet9:But beauty's waste hath in the worl
d an end,
/home/cis90/rodduk/poems/Yeats/old:And loved your beauty with love false or true
,
Hit the Enter key to return to menu
    
```

Fix worked! 😄

Fix task in 1<sup>st</sup> window by using an absolute pathname then save with **<esc>:w**

Re-run **myscript** in the 2<sup>nd</sup> second window and test your change. To do this quickly hit **Ctrl-C** then **<up arrow>** key.

```

/home/cis90/rodduk/poems/Shakespeare/sonnet5:Beauty's effect with beauty were bereft,
/home/cis90/rodduk/poems/Shakespeare/sonnet7:Yet mortal looks adore his beauty still,
/home/cis90/rodduk/poems/Shakespeare/sonnet9:But beauty's waste hath in the world an end,
/home/cis90/rodduk/poems/Yeats/old:And loved your beauty with love false or true,
/home/cis90/rodduk $
    
```

## Add some interaction

```

rodduk90@oslab:~/bin
#!/bin/bash
#
# menu: A simple menu template
#
while true
do
    clear
    echo -n "
    CIS 90 Final Project
    1) Hacking with the grep command
    2) Task 2
    3) Task 3
    4) Task 4
    5) Task 5
    6) Exit

    Enter Your Choice:
    read RESPONSE
    case $RESPONSE in
        1) # Commands for Task 1
            echo "Are you ready to search for beauty in the poems?"
            read response
            grep beauty /home/cis90/rodduk/poems/*/*
            ;;
        2) # Commands for Task 2
            ;;
        3) # Commands for Task 3
            ;;
        4) # Commands for Task 4
            ;;
        5) # Commands for Task 5
            ;;
        6) exit 0
            ;;
        *) echo "Please enter a number between 1 and 6"
            ;;
    esac
    echo -n "Hit the Enter key to return to menu "
    read dummy
done
"myscript" 40L, 711C written
    
```

*Let's add some interaction*

1) # Commands for Task 1

```

echo "Are you ready to search for beauty in the poems?"
read response
grep beauty /home/cis90/rodduk/poems/*/*
;;
    
```

```

rodduk90@oslab:~/bin

    CIS 90 Final Project
    1) Hacking with the grep command
    2) Task 2
    3) Task 3
    4) Task 4
    5) Task 5
    6) Exit

    Enter Your Choice: 1
    Are you ready to search for beauty in the poems?

    /home/cis90/rodduk/poems/Shakespeare/sonnet1:That thereby beauty's rose might never die,
    /home/cis90/rodduk/poems/Shakespeare/sonnet10: That beauty still may live in thine or thee.
    /home/cis90/rodduk/poems/Shakespeare/sonnet11:Herein lives wisdom, beauty, and increase;
    /home/cis90/rodduk/poems/Shakespeare/sonnet17:If I could write the beauty of your eyes,
    /home/cis90/rodduk/poems/Shakespeare/sonnet2:And dig deep trenches in thy beauty's field,
    /home/cis90/rodduk/poems/Shakespeare/sonnet2:Then being ask'd, where all thy beauty lies,
    /home/cis90/rodduk/poems/Shakespeare/sonnet2:How much more praise deserv'd thy beauty's use,
    /home/cis90/rodduk/poems/Shakespeare/sonnet2:Proving his beauty by succession thine.
    /home/cis90/rodduk/poems/Shakespeare/sonnet4:Upon thyself thy beauty's legacy?
    /home/cis90/rodduk/poems/Shakespeare/sonnet4: Thy unus'd beauty must be tomb'd with thee,
    /home/cis90/rodduk/poems/Shakespeare/sonnet5:Beauty's effect with beauty were bereft,
    /home/cis90/rodduk/poems/Shakespeare/sonnet7:Yet mortal looks adore his beauty still,
    /home/cis90/rodduk/poems/Shakespeare/sonnet9:But beauty's waste hath in the world an end,
    /home/cis90/rodduk/poems/Yeats/old:And loved your beauty with love false or true,
    Hit the Enter key to return to menu
    
```

*And it works!*

# Try a new option on the command

```

rodduk90@oslab:~/bin
#!/bin/bash
#
# menu: A simple menu template
#
while true
do
    clear
    echo -n "
    CIS 90
    1) Hacking with the grep command
    2) Task 2
    3) Task 3
    4) Task 4
    5) Task 5
    6) Exit

    Enter Your Choice:
    read RESPONSE
    case $RESPONSE in
        1) # Commands for Task 1
            echo "Are you ready to search for beauty in the poems?"
            read dummy
            grep -h beauty /home/cis90/rodduk/poems/*/*
            ;;
        2) # Commands for Task 2
            ;;
        3) # Commands for Task 3
            ;;
        4) # Commands for Task 4
            ;;
        5) # Commands for Task 5
            ;;
        6) exit 0
        *) echo "Please enter a number between 1 and 6."
            ;;
    esac
    echo -n "Hit the Enter key to return to menu: "
    read dummy
done
"myscript" 40L, 714C written
    
```

*Let's try the -h option and not print the leading file names*

```

1) # Commands for Task 1
echo "Are you ready to search for beauty in the poems?"
read response
grep -h beauty /home/cis90/rodduk/poems/*/*
;;
    
```

```

rodduk90@oslab:~/bin
CIS 90 Final Project
1) Hacking with the grep command
2) Task 2
3) Task 3
4) Task 4
5) Task 5
6) Exit

Enter Your Choice: 1
Are you ready to search for beauty in the poems?
1
That thereby beauty's rose might never die,
    That beauty still may live in thine or thee.
Herein lives wisdom, beauty, and increase;
If I could write the beauty of your eyes,
And dig deep trenches in thy beauty's field,
Then being ask'd, where all thy beauty lies,
How much more praise deserv'd thy beauty's use,
Proving his beauty by succession thine.
Upon thyself thy beauty's legacy?
    Thy unus'd beauty must be tomb'd with thee,
Beauty's effect with beauty were bereft,
Yet mortal looks adore his beauty still,
But beauty's waste hath in the world an end,
And loved your beauty with love false or true,
Hit the Enter key to return to menu
    
```

*And it works!*

# Add a new feature

Let's count the strings found now

1) # Commands for Task 1  
 echo "Are you ready to search for beauty in the poems?"  
 read response  
 grep -h beauty /home/cis90/rodduk/poems/\*/\*  
 echo "Ready to count them?"  
 read response  
 grep -h beauty /home/cis90/rodduk/poems/\*/\* | wc -l  
 ;;

```

#!/bin/bash
#
# menu: A s
#
while true
do
  cle
  ech
  1) # Commands for Task 1
  echo "Are you ready to search for beauty in the poems?"
  read dummy
  grep -h beauty /home/cis90/rodduk/poems/*/*
  echo "Ready to count them?"
  read dummy
  grep -h beauty /home/cis90/rodduk/poems/*/* | wc -l
  ;;
  2) # Commands for Task 2
  ;;
  3) # Commands for Task 3
  ;;
  4) # Commands for Task 4
  ;;
  5) # Commands for Task 5
  ;;
  6) exit 0
  ;;
  *) echo "Please enter a number between 1 and 6"
  ;;
esac
"myscript" 43L, 839C written
    
```

Test it and it works!

## How many points so far?

```
1) # Commands for Task 1
echo "Are you ready to search for beauty in the poems?"
read response
grep -h beauty /home/cis90/rodduk/poems/*/*
echo "Ready to count them?"
read response
grep -h beauty /home/cis90/rodduk/poems/*/* | wc -l
;;
```

*We haven't met the requirements yet for a task but we do have 12 points from using 3 of the constructs on the list.*

Implementing all five tasks (6 points each):

- Requirements for each task:
  - NO** - Minimum of 12 "original" lines of bash script
  - NO** - Has one or more non-generic comments to explain what it is doing
  - ✓ - Has user interaction

At least six bash constructs from this list:

- Redirecting stdin (4 points)
- Redirecting stdout (4 points)
- Redirecting stderr (4 points)
- Use of permissions (4 points)
- ✓ • Use of filename expansion characters (4 points)
- ✓ • Use of absolute path (4 points)
- Use of relative path (4 points)
- Use of a PID (4 points)
- Use of inodes (4 points)
- Use of links (4 points)
- Use of color (4 points)
- Use of scheduling (4 points)
- Use of a GID or group (4 points)
- Use of a UID or user (4 points)
- Use of a /dev/tty device (4 points)
- Use of a signal (4 points)
- ✓ • Use of piping (4 points)
- Use of an environment variable (4 points)
- Use of /bin/mail (4 points)
- Use of a conditional (4 points)
- Use of \$(command)

The maximum for this section is 24 points.

## Let's add some more code

Add some more lines to let the user specify the string to search for

```
1) # Commands for Task 1
echo "Are you ready to search for beauty in the poems?"
read response
grep -h beauty /home/cis90/rodduk/poems/*/*
echo "Ready to count them?"
read response
grep -h beauty /home/cis90/rodduk/poems/*/* | wc -l
echo "Enter a new string to search for"
read string
echo searching for "'$string'"
grep -h --color $string /home/cis90/rodduk/poems/*/*
count=$(grep -h --color $string /home/cis90/rodduk/poems/*/* | wc -l)
echo "I found $count lines containing $string" ;;
;;
```

```
echo "Enter a new string to search for"
read string
echo searching for "'$string'"
grep -h --color $string /home/cis90/rodduk/
;;
```

```
rodduk90@opus-ii-~/bin
Proving his beauty by succession thine.
Upon thyself thy beauty's legacy?
    Thy unus'd beauty must be tomb'd with thee,
Beauty's effect with beauty were bereft,
Yet mortal looks adore his beauty still,
But beauty's waste hath in the world an end,
And loved your beauty with love false or true,
Ready to count them?

14
Enter a new string to search for
sweet
searching for "sweet"
And sweetest, in the gale, is heard
sweetens a world;
sweetness,
all his sweet and shaggy life,
Thyself thy foe, to thy sweet self too cruel.
To show me worthy of thy sweet respect:
To thy sweet will making addition thus.
Thou of thyself thy sweet self dost deceive,
    Leese but their show, their substance still lives sweet.
I found 9 lines containing sweet
Hit the Enter key to return to menu
```

Test it and  
it works!

## Check the score again

```
1) # Commands for Task 1
echo "Are you ready to search for beauty in the poems?"
read response
grep -h beauty /home/cis90/rodduk/poems/*/*
echo "Ready to count them?"
read response
grep -h beauty /home/cis90/rodduk/poems/*/* | wc -l
echo "Enter a new string to search for"
read string
echo searching for "'$string'"
grep -h --color $string /home/cis90
count=$(grep -h --color $string /ho
echo "I found $count lines containi
;;
```

### Implementing all five tasks (6 points each):

- Requirements for each task:
- ✓ - Minimum of 12 "original" lines of bash script
- NO - Has one or more non-generic comments to explain what it is doing
- ✓ - Has user interaction

### At least six bash constructs from this list:

- Redirecting stdin (4 points)
- Redirecting stdout (4 points)
- Redirecting stderr (4 points)
- Use of permissions (4 points)
- ✓ • Use of filename expansion characters (4 points)
- ✓ • Use of absolute path (4 points)
- Use of relative path (4 points)
- Use of a PID (4 points)
- Use of inodes (4 points)
- Use of links (4 points)
- Use of color (4 points)
- Use of scheduling (4 points)
- Use of a GID or group (4 points)
- Use of a UID or user (4 points)
- Use of a /dev/tty device (4 points)
- Use of a signal (4 points)
- ✓ • Use of piping (4 points)
- Use of an environment variable (4 points)
- Use of /bin/mail (4 points)
- Use of a conditional (4 points)
- ✓ • Use of \$(command)

The maximum for this section is 24 points.

*We have at least 12 lines of code now and we have 16 points from using 4 constructs on the list.*

c -1)



## Lets add some non-generic comments

*Use non-generic comments to help others understand what you are doing*

```
1) # Task 1 - grep command explored
# Simple grep for "beauty" with -h option to suppress filenames
echo "Are you ready to search for beauty in the poems?"
read response
grep -h beauty /home/cis90/rodduk/poems/*/*
# This time count the matches
echo "Ready to count them?"
read response
grep -h beauty /home/cis90/rodduk/poems/*/*
# Let user select search string
echo "Enter a new string to search for"
read string
echo searching for "'$string'"
grep -h --color $string /home/cis90/rodduk/poems/*/*
count=$(grep -h --color $string /home/cis90/rodduk/poems/*/*)
echo "I found $count lines containing $string"
;;
```

Implementing all five tasks (6 points each):

- Requirements for each task:
- ✓ - Minimum of 12 "original" lines of bash script
- ✓ - Has one or more non-generic comments to explain what it is doing
- ✓ - Has user interaction

At least six bash constructs from this list:

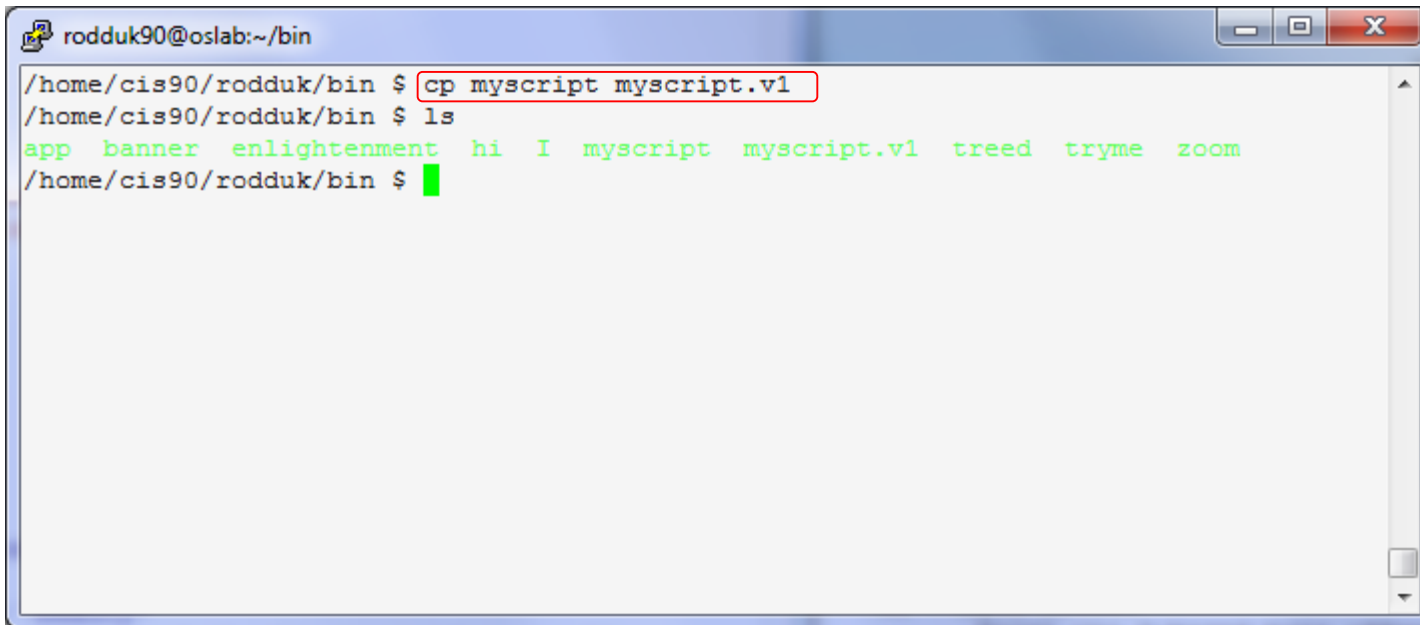
- Redirecting stdin (4 points)
- Redirecting stdout (4 points)
- Redirecting stderr (4 points)
- Use of permissions (4 points)
- ✓ • Use of filename expansion characters (4 points)
- ✓ • Use of absolute path (4 points)
- Use of relative path (4 points)
- Use of a PID (4 points)
- Use of inodes (4 points)
- Use of links (4 points)
- Use of color (4 points)
- Use of scheduling (4 points)
- Use of a GID or group (4 points)
- Use of a UID or user (4 points)
- Use of a /dev/tty device (4 points)
- Use of a signal (4 points)
- ✓ • Use of piping (4 points)
- Use of an environment variable (4 points)
- Use of /bin/mail (4 points)
- Use of a conditional (4 points)
- ✓ • Use of \$(command)

The maximum for this section is 24 points.

*Yay ... we have one task finished and four constructs implemented for 22 points!*

## Backup your work!

`cp myscript myscript.v1` *after first day of work*



```

rodduk90@oslab:~/bin
/home/cis90/rodduk/bin $ cp myscript myscript.v1
/home/cis90/rodduk/bin $ ls
app banner enlightenment hi I myscript myscript.v1 treed tryme zoom
/home/cis90/rodduk/bin $

```

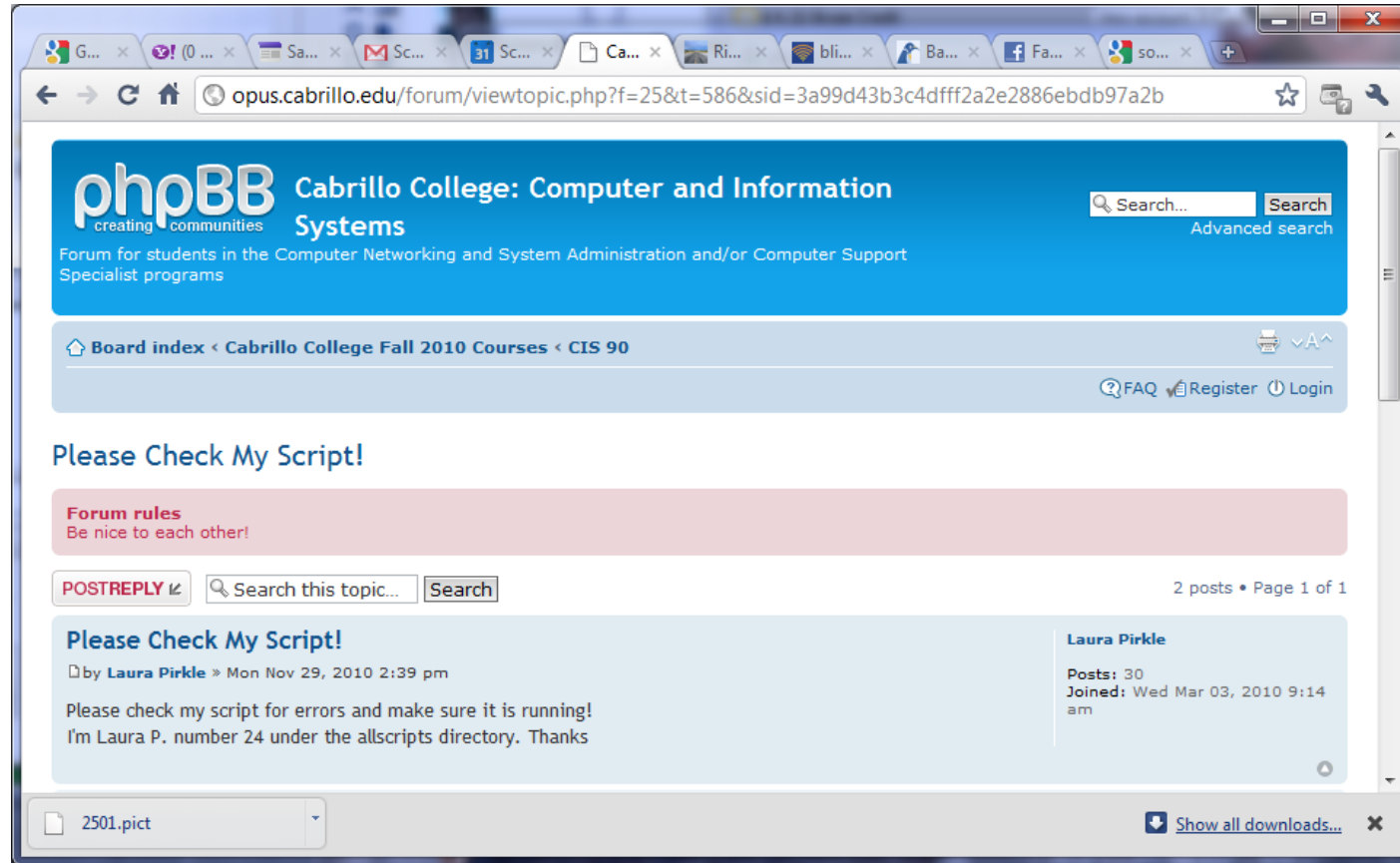
`cp myscript myscript.v2` *after second day of work*

`cp myscript myscript.v3` *and so on ...*

`cp myscript myscript.v4`

*Always be able to revert back to an earlier version in case you clobber the current one!*

# Have others test your script



*The ask others on the forum to check your script and give you feedback*

## Plan extra time for:

- Figuring out how to do what you really want to do!
- Removing syntax errors
- Removing logic errors
- Posting script code on the forum and asking others to view it and suggest how to fix it
- Sleeping on it

*Don't wait till the last minute  
to start your project!*



# Final Project forum tips

## Use the forum effectively to get help

*Not so good ...*

**Preview:**

Help!

My script is getting weird error

- Homer

*Neither code nor output is shown which makes it very hard for someone else to understand what you are trying to do.*

## Use the forum effectively to get help

*Better ... but requires viewer to log into Opus-II and you may have modified the script since posting*

### Preview:

Help!

My script is getting weird error

My script is here:

/home/cis90/milhom/bin/myscript

And this is the error:

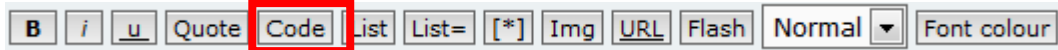
CODE: SELECT ALL

```
/home/cis90/simben/bin $ ./script99
simben90
-rwxr-x--- 1 simben90 cis90 10489 Apr 30 07:33 /home/cis90/simben/bin/myscript
./script99: line 8: unexpected EOF while looking for matching `"'
./script99: line 16: syntax error: unexpected end of file
/home/cis90/simben/bin $
```

- Homer

*This post provides the location of the script and the error message which enables others to help you find and fix the problem*

## Use the forum effectively to get scripting help



### Preview:

Help!

My script is getting weird error

This is the script:

CODE: SELECT ALL

```
#!/bin/bash
# Test script
#
echo $LOGNAME
dir=/home/cis90/simben
ls -l $dir/bin/myscript
if [ -f "$dir/bin/myscript" ]; then
    echo you have a myscript file in the bin directory
else
    echo there is no myscript file in your bin directory!]
fi
exit
```

And this is the error:

CODE: SELECT ALL

```
/home/cis90/simben/bin $ ./script99
simben90
-rwxr-x--- 1 simben90 cis90 10489 Apr 30 07:33 /home/cis90/simben/bin/myscript
./script99: line 8: unexpected EOF while looking for matching `"'
./script99: line 16: syntax error: unexpected end of file
/home/cis90/simben/bin $
```

- Homer

*Best ...*

*This post shows both the code and the output using code tags which makes it a lot easier for others to understand what you are doing and offer help.*





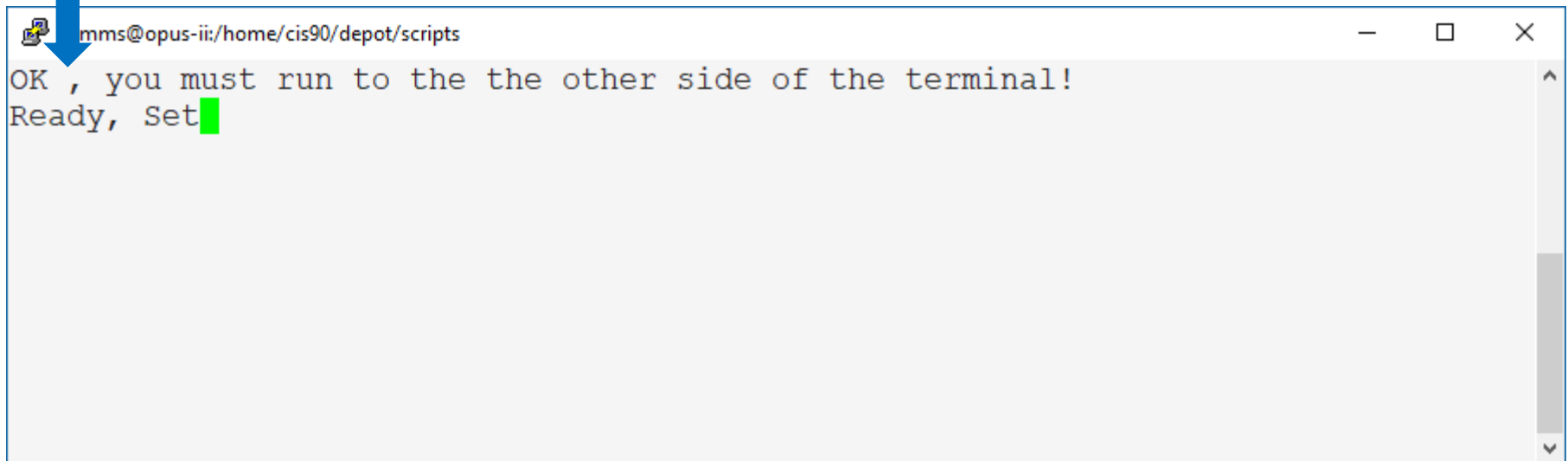
# Debugging Tips

## Tracing your code with echos and pauses

*Crud! The first name is not showing up.*



*Let's look at your code.*



```
mms@opus-ii:/home/cis90/depot/scripts
OK , you must run to the the other side of the terminal!
Ready, Set
```

See: `/home/cis90/depot/scripts/broken`

## Tracing your code with echos and pauses

```
#!/bin/bash
count=60
gid=$(grep "^cis90:" /etc/group | cut -f3 -d":")
numStudents=$(grep ":$gid:" /etc/passwd | grep -v tbd | grep -v "^cis90:" |
wc -l)
studentNum=$((RANDOM%numStudents))
userRecord=$(grep ":$gid:" /etc/passwd | grep -v tbd | grep -v "^cis90:" |
head -n $studentNum | tail -n1)
first=$(echo $userRecord | cut -f5 -d ":" | cut -f1 -d " ") ←
clear
echo "OK $first, you must run to the the other side of the terminal!"
echo -n "Ready"; sleep 2; echo -n ", Set"; sleep 2; banner GO; sleep 1
for (( i=1; i<=$count; i++ )); do
  clear
  row=2; col=$i; foregroundColor=1
  tput setf $foregroundColor
  tput cup $row $col
  echo -n "$first"
  sleep .05
done
tput reset
banner $first made it!
exit
```

*It's broken, first should get set to a random first name.*



*Try some tracing.*



See: `/home/cis90/depot/scripts/broken`

## Tracing your code with echos and pauses

*What's tracing?*



*Add a bunch of echos and pauses to see what is going on. Like this.*



```
gid=$(grep "^cis90:" /etc/group | cut -f3 -d":")
echo TRACE gid=$gid
```

```
numStudents=$(grep ":$gid:" /etc/passwd | grep -v tbd | grep -v "^cis90:" | wc -l)
echo TRACE numStudents=$numStudents
```

```
studentNum=$((RANDOM%$numstudents))
echo TRACE studentNum=$studentNum
```

```
userRecord=$(grep ":$gid:" /etc/passwd | grep -v tbd | grep -v "^cis90:" | head -n
$studentNum | tail -n1)
echo TRACE userRecord=$userRecord
read -p "Press Enter to continue ..." reply
first=$(echo $userRecord | cut -f5 -d ":" | cut -f1 -d " ")
```

# Tracing your code with echos and pauses

*What the heck! An error on line 7 and studentNum is not getting set!*



*Let's look at the code and see why.*



```

milhom90@opus-ii:~/bin
/home/cis90/milhom/bin $ ./broken
TRACE gid=1090
TRACE numStudents=28
./broken: line 7: RANDOM%: syntax error: operand expected (error token is "%")
TRACE studentNum=
head: option requires an argument -- 'n'
Try 'head --help' for more information.
TRACE userRecord=
Press Enter to continue ... █
    
```

## Tracing your code with echos and pauses

*Oops! The "S" in the numStudents variable was not capitalized.*



*Fix it and let's try again.*



```
gid=$(grep "^cis90:" /etc/group | cut -f3 -d":")
echo TRACE gid=$gid
numStudents=$(grep ":$gid:" /etc/passwd | grep -v tbd | grep -v "^cis90:" | wc -l)
echo TRACE numStudents=$numStudents
studentNum=$((RANDOM%numStudents))
echo TRACE studentNum=$studentNum
userRecord=$(grep ":$gid:" /etc/passwd | grep -v tbd | grep -v "^cis90:" | head -n
$studentNum)
echo TRACE userRecord=$userRecord
read -p "Press Enter to continue ..." reply
first=$(echo $userRecord | cut -f5 -d ":" | cut -f1 -d " ")
```

## Tracing your code with echos and pauses

*That's better. I see userRecord was correctly assigned a random line from /etc/passwd now*



*Cool! I see Ryan's name moving across the screen now!*



```
milhom90@opus-ii:~/bin  
  
Ryan█
```

# Tracing your code with echos and pauses

*It works! I'm going to take out those tracing statements now*



*Just search for TRACE in vi to light them up.*



```
milhom90@opus-ii:~/bin
##### # # # # #
# # # # #
# # # # #
##### # # # # #
# # # # #
# # # # #
# # # # #

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

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

/home/cis90/milhom/bin $
```





# Shell Scripting 101

# Shell Scripts

- In its simplest form a shell script can just be a list of commands in a file .
- Read "r" and execute "x" permissions must be enabled on the script file.
- The script must be on your path or you must use an absolute or relative pathname to run it.
- Putting `#!/bin/bash` on line 1 specifies which program should be used to execute the script. The default, if not specified, is `/bin/bash`. Note this enables vi to use color syntax.
- Putting the `exit` command at the end triggers a system call to the kernel to terminate the process and release all resources. Note a numerical status can be specified as an argument (e.g. `exit 20`) which will be communicated back to the parent process.

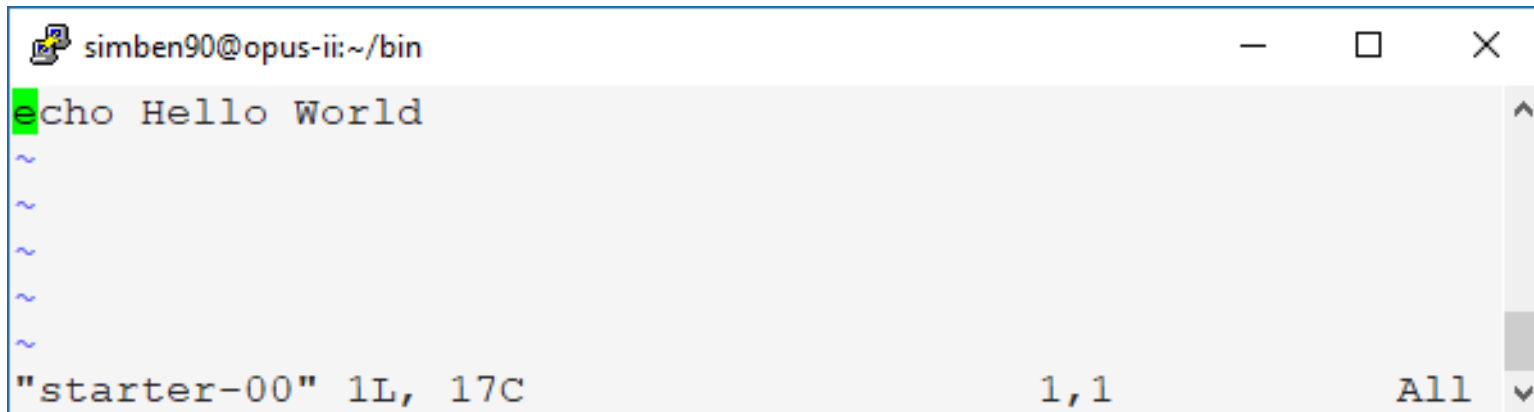
# Example Scripts

- starter-00:# Description: Hello World
- starter-01:# Description: Just a bunch of commands
- starter-02:# Description: Sh-bang, comments and exit
- starter-03:# Description: Using variables and \$(command) construct
- starter-04:# Description: Clearing and pausing
- starter-05:# Description: Reading user input
- starter-06:# Description: Arguments and exit codes
- starter-07:# Description: Using color
- starter-08:# Description: Simple loop through list
- starter-09:# Description: Simple loop through records in a file
- starter-10:# Description: Simple loop through range of integers
- starter-11:# Description: Simple loop for counting and parsing words in random poem lines
- starter-12:# Description: Demonstrate simple if statement
- starter-13:# Description: Scrape a web page for data
- starter-14:# Description: Remotely control via ssh a Hue smart light
- starter-15:# Description: Remotely turn off via ssh a Hue smart light
- starter-16:# Description: Random numbers, terminal text placement and color
- starter-17:# Description: Display a message on the STEM center LEDs



# Hello World

```
/home/cis90/simben $ cd bin  
/home/cis90/simben/bin $ cp ~/.../depot/scripts/starter-00 .  
/home/cis90/simben/bin $ vi starter-00
```



```
simben90@opus-ii:~/bin  
echo Hello World  
~  
~  
~  
~  
~  
"starter-00" 1L, 17C 1,1 All
```

Use  :wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-00  
/home/cis90/simben/bin $ starter-00
```

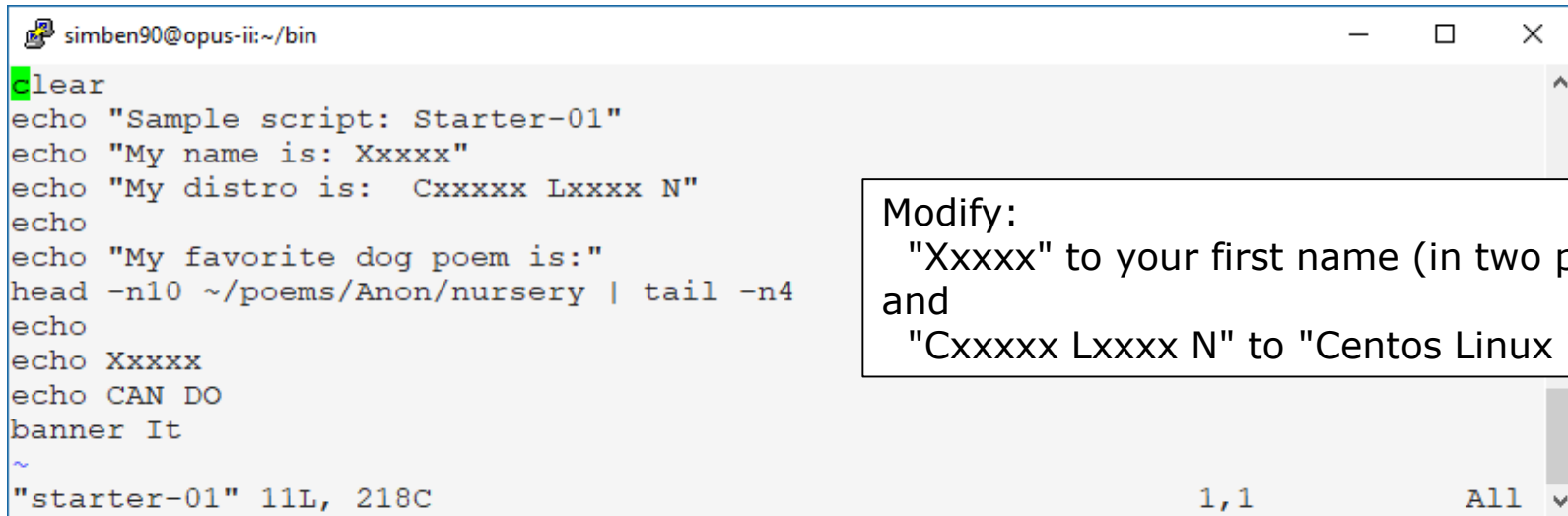
**What was the output from your script?**

*Put your answer in the chat window*

```
/home/cis90/simben/bin $ ./starter-00  
Hello World  
/home/cis90/simben/bin $
```

## Just a bunch of commands

```
/home/cis90/simben $ cd bin
/home/cis90/simben/bin $ cp ../../depot/scripts/starter-01 .
/home/cis90/simben/bin $ vi starter-01
```



```
simben90@opus-ii:~/bin
clear
echo "Sample script: Starter-01"
echo "My name is: Xxxxx"
echo "My distro is: Cxxxxx Lxxxx N"
echo
echo "My favorite dog poem is:"
head -n10 ~/poems/Anon/nursery | tail -n4
echo
echo Xxxxx
echo CAN DO
banner It
~
"starter-01" 11L, 218C 1,1 All
```

Modify:  
 "Xxxxx" to your first name (in two places)  
 and  
 "Cxxxxx Lxxxx N" to "Centos Linux 7"

Use  **:wq** to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-01
/home/cis90/simben/bin $ starter-01
```

**What was the first line of output from the script's head command?**

*Put your answer in the chat window*

```
/home/cis90/simben/bin $ ./starter-01
Sample script: Starter-01
My name is: Xxxxx
My distro is: Cxxxxx Lxxxx N

My favorite dog poem is:
Hark! Hark! The dogs do bark!
The beggars are coming to town.
Some in rags, some in tags,
and some in velvet gowns.

Xxxxx
CAN DO

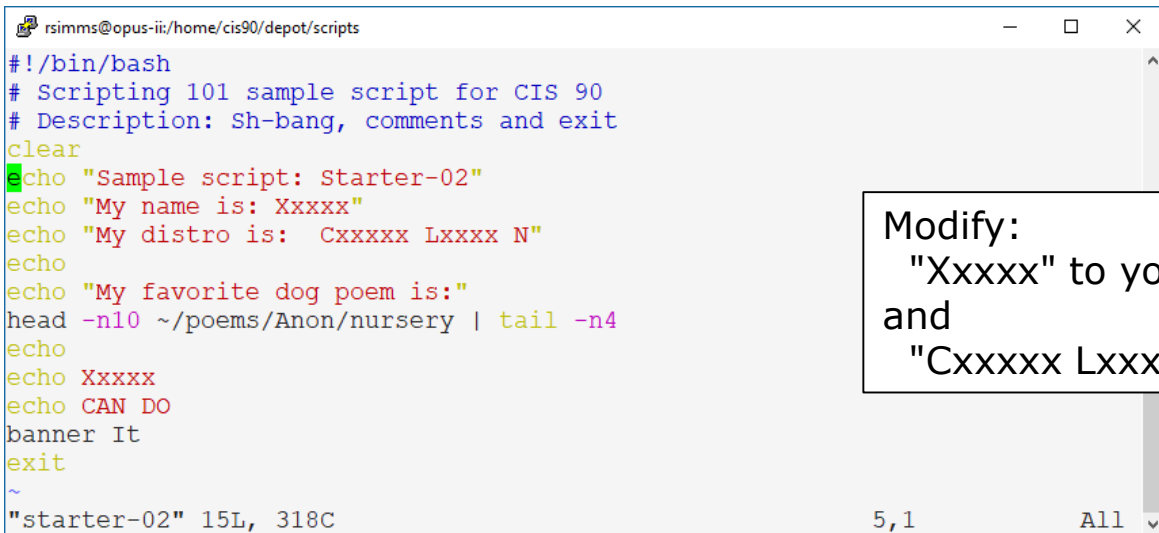
### #####
# #
# #
# #
# #
# #
### #

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



## Sh-bang, comments and exit

```
/home/cis90/simben $ cd bin
/home/cis90/simben/bin $ cp ../../depot/scripts/starter-02 .
/home/cis90/simben/bin $ vi starter-02
```



```
rsimms@opus-ii:/home/cis90/depot/scripts
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Description: Sh-bang, comments and exit
clear
echo "Sample script: Starter-02"
echo "My name is: Xxxxx"
echo "My distro is: Cxxxxx Lxxxx N"
echo
echo "My favorite dog poem is:"
head -n10 ~/poems/Anon/nursery | tail -n4
echo
echo Xxxxx
echo CAN DO
banner It
exit
~
"starter-02" 15L, 318C      5,1      All
```

Modify:  
"Xxxxx" to your first name (in two places)  
and  
"Cxxxxx Lxxxx N" to "Centos Linux 7"

Use  :wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-02
/home/cis90/simben/bin $ starter-02
```

**What does vi do when it sees #!/bin/bash as the first line of the file?**

*Put your answer in the chat window*

```
/home/cis90/simben/bin $ ./starter-02
Sample script: Starter-02
My name is: Xxxxx
My distro is: Cxxxxx Lxxxx N

My favorite dog poem is:
Hark! Hark! The dogs do bark!
The beggars are coming to town.
Some in rags, some in tags,
and some in velvet gowns.

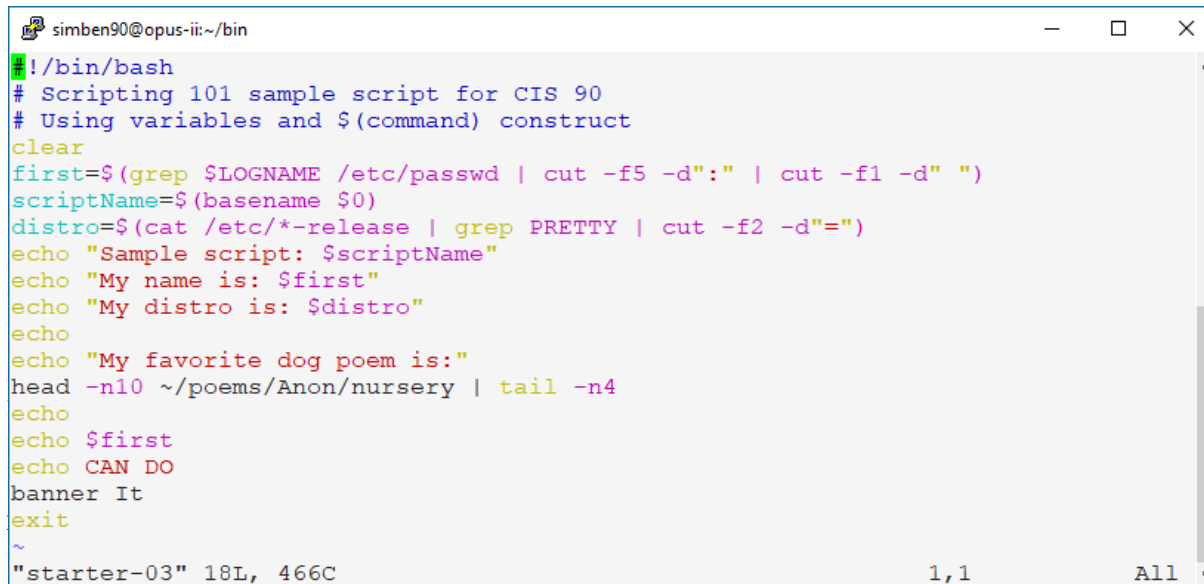
Xxxxx
CAN DO

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

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

## Throwing in variables

```
/home/cis90/simben $ cd bin
/home/cis90/simben/bin $ cp ../../depot/scripts/starter-03 .
/home/cis90/simben/bin $ vi starter-03
```



```
simben90@opus-ii:~/bin
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Using variables and $(command) construct
clear
first=$(grep $LOGNAME /etc/passwd | cut -f5 -d":" | cut -f1 -d" ")
scriptName=$(basename $0)
distro=$(cat /etc/*-release | grep PRETTY | cut -f2 -d"=")
echo "Sample script: $scriptName"
echo "My name is: $first"
echo "My distro is: $distro"
echo
echo "My favorite dog poem is:"
head -n10 ~/poems/Anon/nursery | tail -n4
echo
echo $first
echo CAN DO
banner It
exit
~
"starter-03" 18L, 466C 1,1 All
```

*Notice the use of \$(some command) construct to initialize variables to the output of the command.*

*The basename command extracts the last file on a pathname.*

Use **Esc**:wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-03
/home/cis90/simben/bin $ starter-03
```

**If you run Benji's script (~simben90/bin/starter-03) is your first name still correct?**

*Put your answer in the chat window*

```
/home/cis90/simben/bin $ ./starter-03
Sample script: starter-03
My name is: Benji
My distro is: "CentOS Linux 7 (Core)"

My favorite dog poem is:
Hark! Hark! The dogs do bark!
The beggars are coming to town.
Some in rags, some in tags,
and some in velvet gowns.

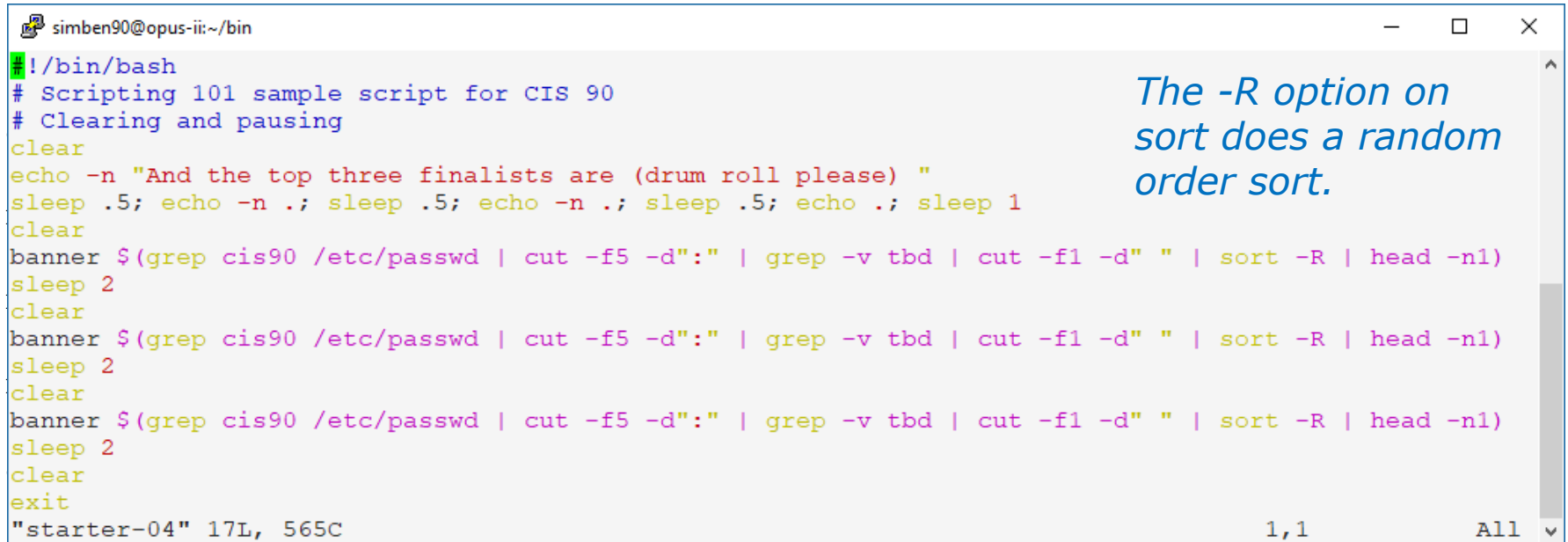
Benji
CAN DO

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

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

## Clearing and Pausing

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ~/.../depot/scripts/starter-04 .
/home/cis90/simben/bin $ vi starter-04
```



```
simben90@opus-ii:~/bin
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Clearing and pausing
clear
echo -n "And the top three finalists are (drum roll please) "
sleep .5; echo -n .; sleep .5; echo -n .; sleep .5; echo .; sleep 1
clear
banner $(grep cis90 /etc/passwd | cut -f5 -d":" | grep -v tbd | cut -f1 -d" " | sort -R | head -n1)
sleep 2
clear
banner $(grep cis90 /etc/passwd | cut -f5 -d":" | grep -v tbd | cut -f1 -d" " | sort -R | head -n1)
sleep 2
clear
banner $(grep cis90 /etc/passwd | cut -f5 -d":" | grep -v tbd | cut -f1 -d" " | sort -R | head -n1)
sleep 2
clear
exit
"starter-04" 17L, 565C
```

*The -R option on sort does a random order sort.*

Use **Esc**:wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-04
/home/cis90/simben/bin $ starter-04
```

**What does "sort -R | head -n1" in the pipeline do?**

*Put your answer in the chat window*

```
/cis90/simben/bin $ ./starter-04
```

And the top three finalists are (drum roll please) ...

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

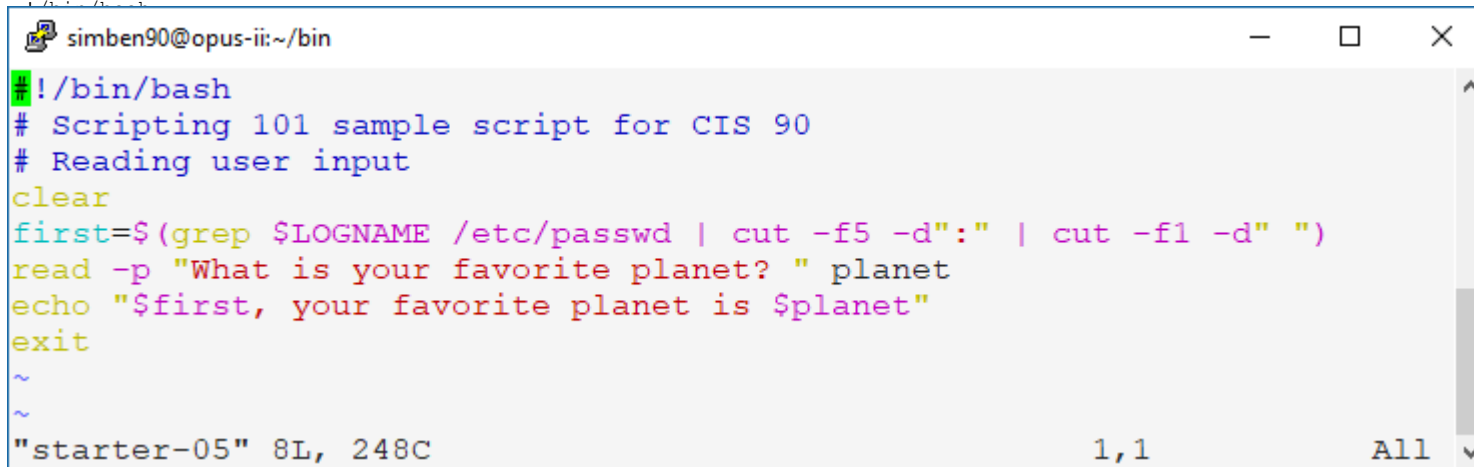
```
          # ##### #          #          #
#          # #          #          #          # #
#          # #          # #          #          # #
#          # #          # #          #          #
#          # #          # #          #          # #####
#          # #          # #          ##       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

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

*The names  
change randomly  
each time this  
script is run*

## Reading input from the user

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ../../depot/scripts/starter-05 .
/home/cis90/simben/bin $ vi starter-05
```



```
simben90@opus-ii:~/bin
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Reading user input
clear
first=$(grep $LOGNAME /etc/passwd | cut -f5 -d":" | cut -f1 -d" ")
read -p "What is your favorite planet? " planet
echo "$first, your favorite planet is $planet"
exit
~
~
"starter-05" 8L, 248C 1,1 All
```

*The -p option on read produces a prompt.*

Use  :wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-05
/home/cis90/simben/bin $ starter-05
```

**What does the -p option on the read command do?**

*Put your answer in the chat window*

```
/home/cis90/simben/bin $ ./starter-05  
What is your favorite planet? Mars  
Benji, your favorite planet is Mars  
/home/cis90/simben/bin $
```



## Arguments and Exit Status

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ../../depot/scripts/starter-06 .
/home/cis90/simben/bin $ vi starter-06
```

```
simben90@opus-ii:~/bin
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Arguments and exit codes
clear
echo The first argument passed by the shell to this script is: $1
echo The second argument passed by the shell to this script is: $2
echo
read -p "Enter an integer between 0 and 255 to return to the parent process: " code
exit $code
~
"starter-06" 9L, 319C 1,1 All
```

Use  **:wq** to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-06
/home/cis90/simben/bin $ ls [be]*
/home/cis90/simben/bin $ starter-06 [be]*
/home/cis90/simben/bin $ echo $?
```

*Be sure to add  
some arguments  
when you run  
starter-06*

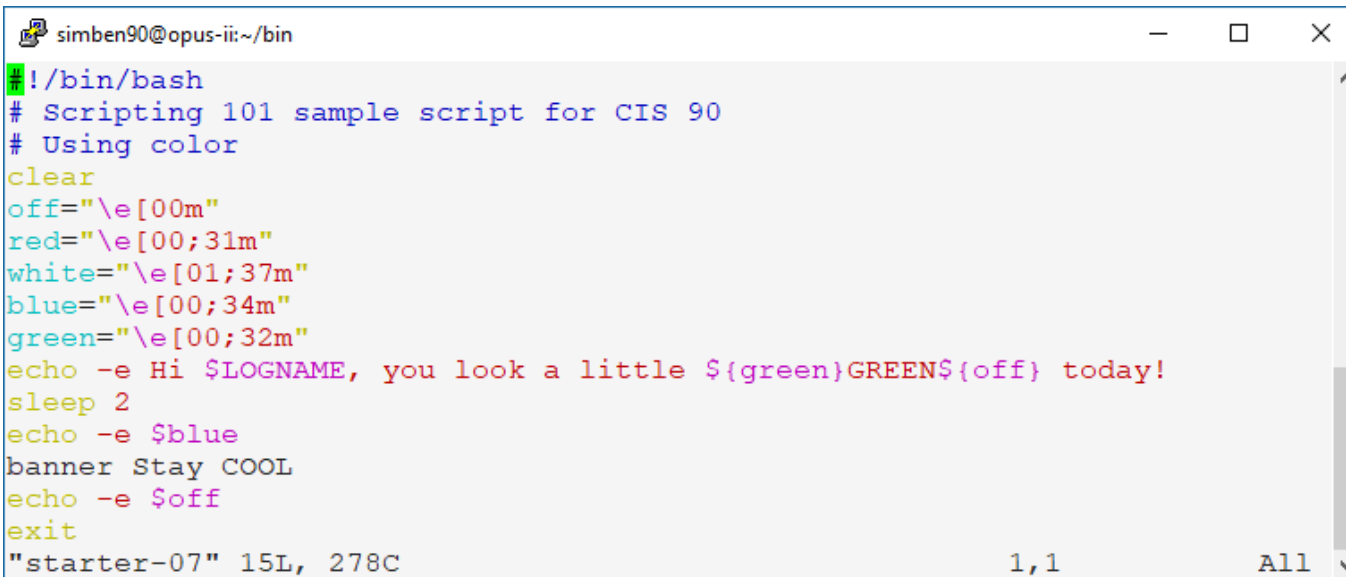
**Did the script ever see the "[be]\*" typed by the user?**

*Put your answer in the chat window*

```
/home/cis90/simben/bin $ ./starter-06 "Santa Cruz" Capitola  
The first argument passed by the shell to this script is: Santa Cruz  
The second argument passed by the shell to this script is: Capitola  
  
Enter an integer between 0 and 255 to return to the parent process: 101  
/home/cis90/simben/bin $ echo $?  
101
```

## Using color

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ../../depot/scripts/ starter-07 .
/home/cis90/simben/bin $ vi starter-07
```



```
simben90@opus-ii:~/bin
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Using color
clear
off="\e[00m"
red="\e[00;31m"
white="\e[01;37m"
blue="\e[00;34m"
green="\e[00;32m"
echo -e Hi $LOGNAME, you look a little ${green}GREEN${off} today!
sleep 2
echo -e $blue
banner Stay COOL
echo -e $off
exit
"starter-07" 15L, 278C 1,1 All
```

*Don't forget the -e option on echo so the escape sequences will work.*

Use **Esc** :wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-07
/home/cis90/simben/bin $ starter-07
```

**What would happen if you deleted the "echo -e \$off" line?**

*Put your answer in the chat window*

```
simben90@opus-ii:~/bin
/home/cis90/simben/bin $ starter-07
Hi simben90, you look a little GREEN today!

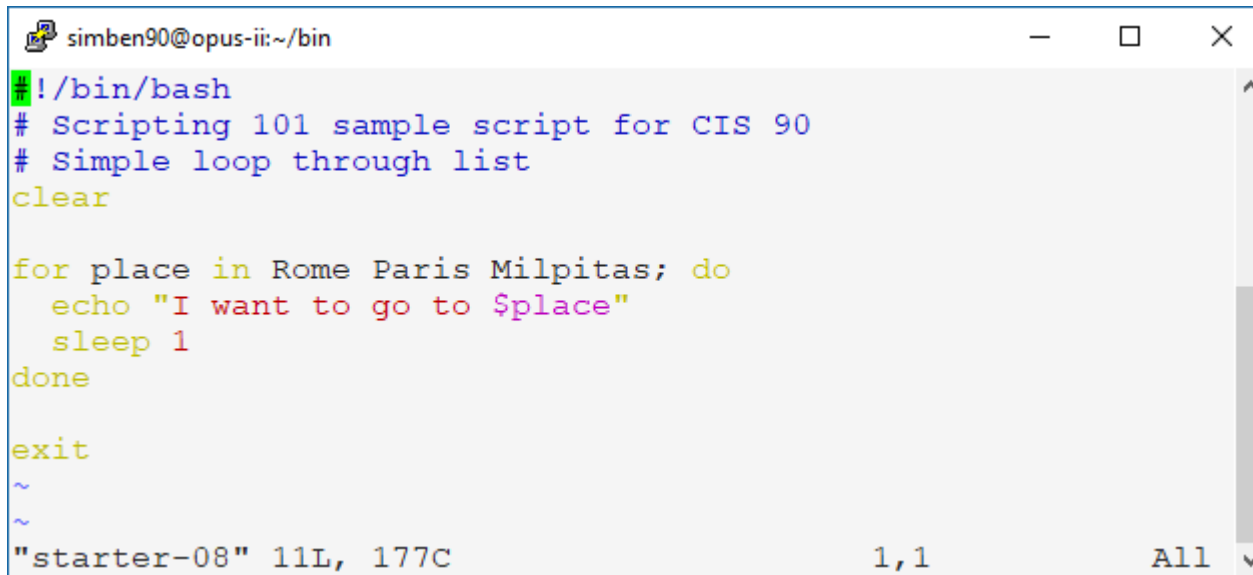
#####          #####          #          #          #
#          #          #          # #          #          #
#          #          #          #          #          #
#####          #          #          #          #
          #          #          #####          #
#          #          #        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

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

/home/cis90/simben/bin $ █
```

## Simple loop through list

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ../../depot/scripts/ starter-08 .
/home/cis90/simben/bin $ vi starter-08
```



```
simben90@opus-ii:~/bin
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Simple loop through list
clear

for place in Rome Paris Milpitas; do
    echo "I want to go to $place"
    sleep 1
done

exit
~
~
"starter-08" 11L, 177C          1,1          All
```

*Indenting the commands that are looped will make your code more readable by others.*

Use **Esc** **:wq** to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-08
/home/cis90/simben/bin $ starter-08
```

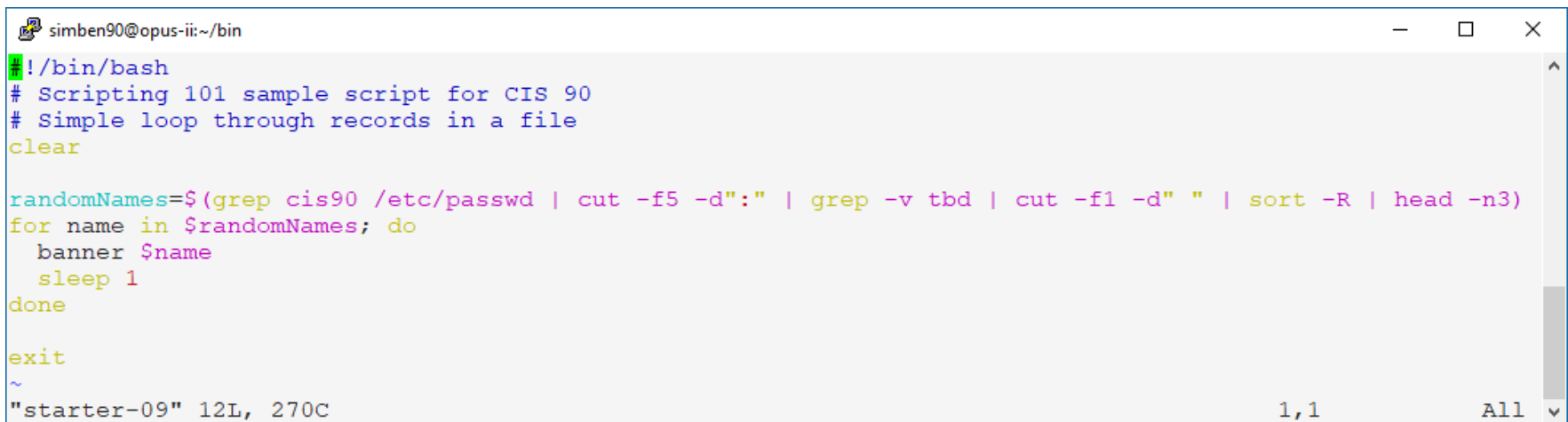
**Try and add a new place after Milpitas. Did it work?**

*Put your answer in the chat window*

```
/home/cis90/simben/bin $ starter-08  
I want to go to Rome  
I want to go to Paris  
I want to go to Milpitas
```

## Simple loop through records in a file

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ../../depot/scripts/ starter-09 .
/home/cis90/simben/bin $ vi starter-09
```



```
simben90@opus-ii:~/bin
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Simple loop through records in a file
clear

randomNames=$(grep cis90 /etc/passwd | cut -f5 -d":" | grep -v tbd | cut -f1 -d" " | sort -R | head -n3)
for name in $randomNames; do
    banner $name
    sleep 1
done

exit
~
"starter-09" 12L, 270C 1,1 All
```

Use  :wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-09
/home/cis90/simben/bin $ starter-09
```

**What was the final name your script output?**

*Put your answer in the chat window*



```
/home/cis90/simben/bin $ starter-09
```

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

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

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

*The names  
change randomly  
each time this  
script is run*

```
/home/cis90/simben/bin $ starter-09
```

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

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

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



## Simple loop through range of integers

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ../../depot/scripts/ starter-10 .
/home/cis90/simben/bin $ vi starter-10
```

```
simben90@opus-ii:~/bin
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Simple loop through range of integers
clear

echo "The hosts in the 192.168.1.0/24 network:"
sleep 1
for ((i=1; i<=254; i++)); do
    echo IP address = 192.168.1.$i
done

exit
~
~
"starter-10" 12L, 229C 1,1 All
```

Use **Esc** :wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-10
/home/cis90/simben/bin $ starter-10
```

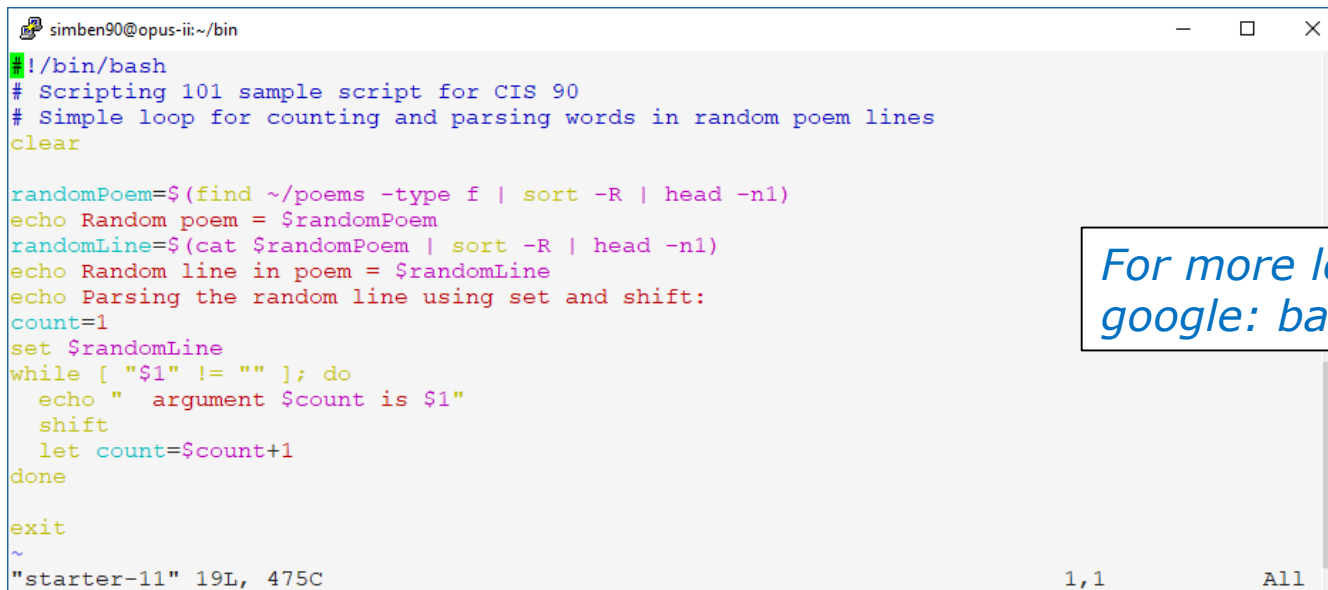
**How would you pipe the output of this script to the more command?**

*Put your answer in the chat window*

```
/home/cis90/simben/bin $ starter-10
The hosts in the 192.168.1.0/24 network:
IP address = 192.168.1.1
IP address = 192.168.1.2
IP address = 192.168.1.3
IP address = 192.168.1.4
IP address = 192.168.1.5
IP address = 192.168.1.6
IP address = 192.168.1.7
IP address = 192.168.1.8
IP address = 192.168.1.9
IP address = 192.168.1.10
IP address = 192.168.1.11
IP address = 192.168.1.12
IP address = 192.168.1.13
<snipped>
IP address = 192.168.1.249
IP address = 192.168.1.250
IP address = 192.168.1.251
IP address = 192.168.1.252
IP address = 192.168.1.253
IP address = 192.168.1.254
/home/cis90/simben/bin $
```

# Simple loop for parsing a line and counting arguments

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ../../depot/scripts/ starter-11 .
/home/cis90/simben/bin $ vi starter-11
```



```
simben90@opus-ii:~/bin
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Simple loop for counting and parsing words in random poem lines
clear

randomPoem=$(find ~/poems -type f | sort -R | head -n1)
echo Random poem = $randomPoem
randomLine=$(cat $randomPoem | sort -R | head -n1)
echo Random line in poem = $randomLine
echo Parsing the random line using set and shift:
count=1
set $randomLine
while [ "$1" != "" ]; do
    echo " argument $count is $1"
    shift
    let count=$count+1
done

exit
~
"starter-11" 19L, 475C 1,1 All
```

*For more loop examples  
google: bash loop examples*

Use **Esc**:wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-11
/home/cis90/simben/bin $ starter-11
```

**What does the let command do inside the loop?**

*Put your answer in the chat window*

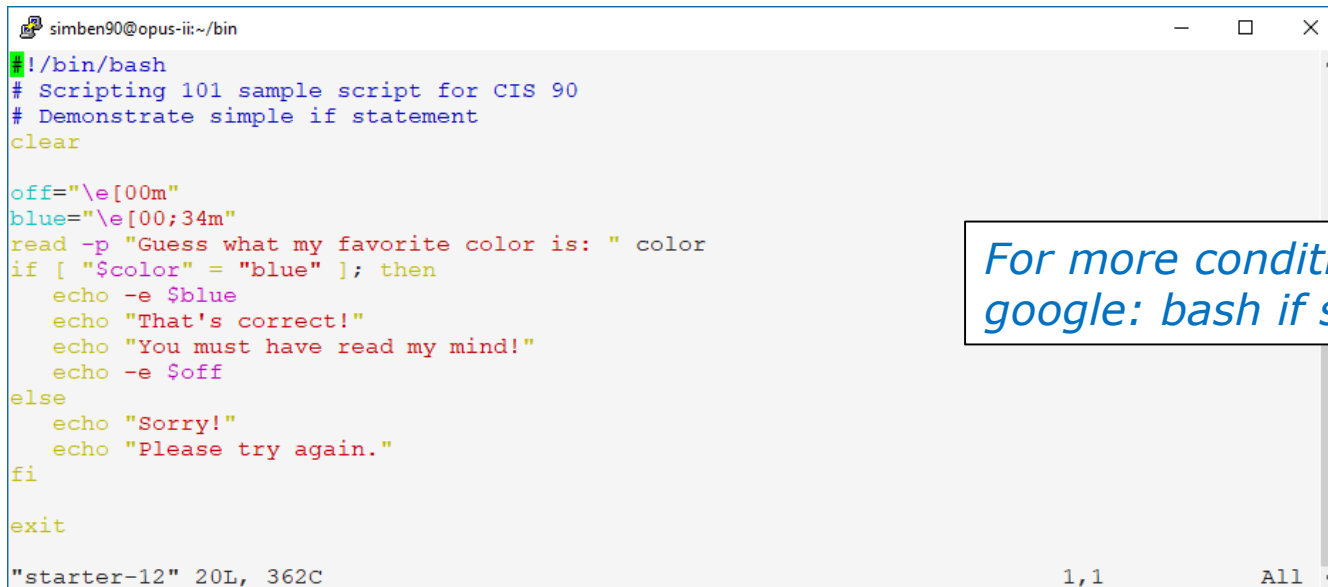
```
/home/cis90/simben/bin $ starter-11  
Random poem = /home/cis90/simben/poems/Anon/ant  
Random line in poem = 'till one who seemed the least  
Parsing the random line using set and shift:  
  argument 1 is 'till  
  argument 2 is one  
  argument 3 is who  
  argument 4 is seemed  
  argument 5 is the  
  argument 6 is least
```

*The poem and line  
in the poem  
changes randomly  
each time this  
script is run.*

```
/home/cis90/simben/bin $ starter-11  
Random poem = /home/cis90/simben/poems/Angelou/bird  
Random line in poem = his bars of rage  
Parsing the random line using set and shift:  
  argument 1 is his  
  argument 2 is bars  
  argument 3 is of  
  argument 4 is rage  
/home/cis90/simben/bin $
```

## Simple if-then-else conditional

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ~/.../depot/scripts/ starter-12 .
/home/cis90/simben/bin $ vi starter-12
```



```
simben90@opus-ii:~/bin
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Demonstrate simple if statement
clear

off="\e[00m"
blue="\e[00;34m"
read -p "Guess what my favorite color is: " color
if [ "$color" = "blue" ]; then
    echo -e $blue
    echo "That's correct!"
    echo "You must have read my mind!"
    echo -e $off
else
    echo "Sorry!"
    echo "Please try again."
fi

exit

"starter-12" 20L, 362C                               1,1                               All
```

*For more conditional examples  
google: bash if statement*

Use  :wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-12
/home/cis90/simben/bin $ starter-12
```

**What command closes the if statement?**

*Put your answer in the chat window*

```
simben90@opus-ii:~/bin
/home/cis90/simben/bin $ starter-12
Guess what my favorite color is: green
Sorry!
Please try again.
/home/cis90/simben/bin $ █
```

*Blue is the correct answer!*

```
simben90@opus-ii:~/bin
/home/cis90/simben/bin $ starter-12
Guess what my favorite color is: blue

That's correct!
You must have read my mind!

/home/cis90/simben/bin $ █
```

# Scraping data from a web page

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ../../depot/scripts/ starter-13 .
/home/cis90/simben/bin $ vi starter-13
```

```
simben90@opus-ii:~/bin
~/bin/bash
# Scripting 101 sample script for CIS 90
# Scrape a web page for data
clear

url="http://aqicn.org/city/california/santa-cruz/santa-cruz-soquel-avenue/"
aqi=$(curl $url 2> /dev/null | sed 's/></>\n</g' | grep aqi>gtvalue | grep -o ">.*<" | tr -d "><")
echo "Current AQI (Air Quality Index)"
echo "=====
banner " $aqi"
echo "
Good (0-50)
Moderate (51-100)
Unhealthy for Sensitive Groups (101-150)
Unhealthy (151-200)
Very Unhealthy (201-300)
Hazardous (301-500)
"
exit

"starter-13" 20L, 508C 1,1 All
```

*curl* downloads the web page specified by the URL argument

Using *tr* to delete any ">" or "<" characters

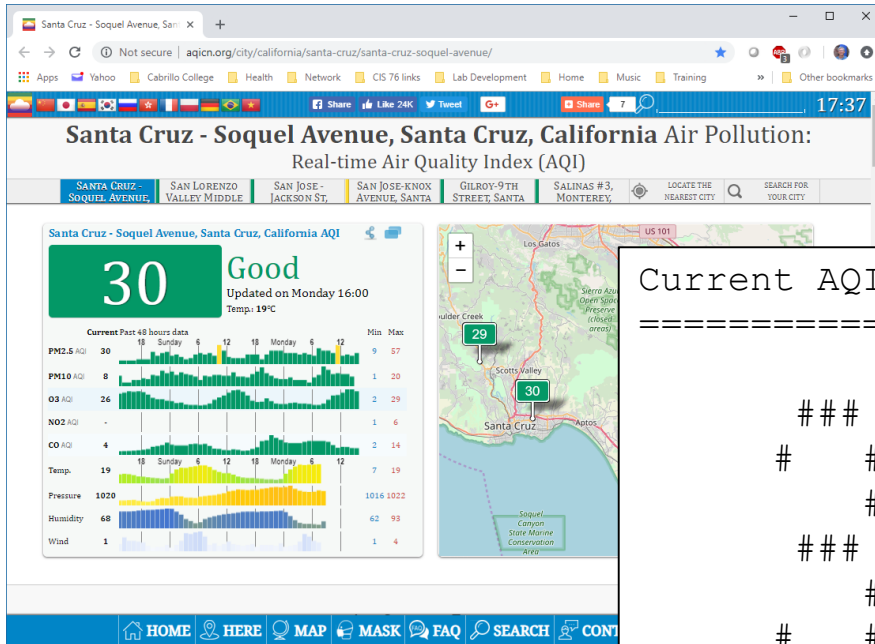
Using *sed* to insert a newline character between every "><" found on the web page

The *-o* option on *grep* only outputs the matched text

Use **Esc** :wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-13
/home/cis90/simben/bin $ starter-13
```

**Open the web page in your browser to check the AQI value. Is your script correct?**  
*Put your answer in the chat window*



## Current AQI (Air Quality Index)

```

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

- Good (0-50)
- Moderate (51-100)
- Unhealthy for Sensitive Groups (101-150)
- Unhealthy (151-200)
- Very Unhealthy (201-300)
- Hazardous (301-500)

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



# Remotely controlling a Hue smart light's brightness

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ../../depot/scripts/ starter-14 .
/home/cis90/simben/bin $ vi starter-14
```



```
rsimms@opus-iii:/home/cis90/depot/scripts
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Description: Remotely control via ssh a Hue smart light
clear
echo Browse to: http://microlab.simms-teach.com
hostname=brienne.simms-teach.com
port=2225
hueBridge=192.168.1.189
hueUser=A-VW-9HV1-1WQ4W1H7VCHKXZ4J08XK4R-0FAR1X

read -p "Enter brightness value (0-255) [50]: " custom
if [ "$custom" = "" ]; then custom=50; fi

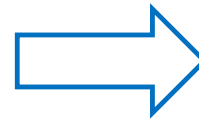
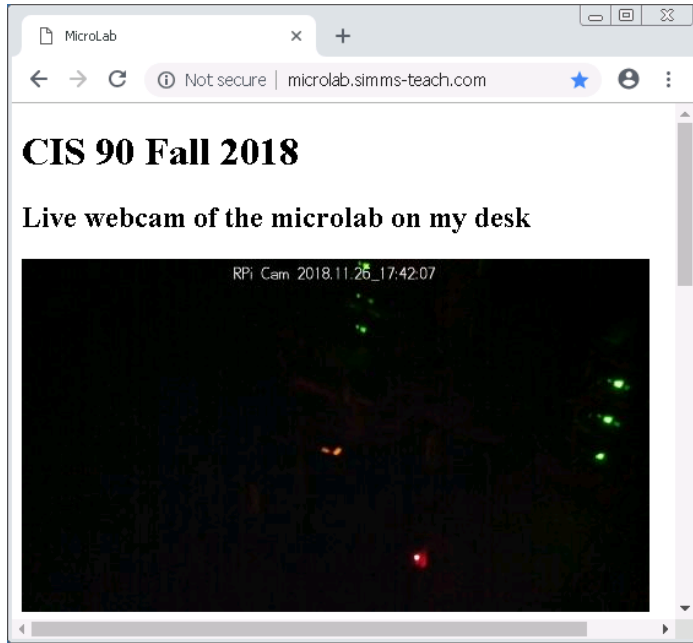
settings={"on":true,"bri":$custom}
url="http://$hueBridge/api/$hueUser/lights/1/state"
encoded=$(echo "curl -H Accept:application/json -X PUT --data '$settings' $url > hue-status" | base64 -w 0)
ssh -p $port $LOGNAME@$hostname "echo $encoded | base64 -d > hue-script; chmod +x hue-script; ./hue-script; echo; cat hue-status"
exit
~
"starter-14" 19L, 715C 3,1 All
```

Use **Esc**:wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-14
/home/cis90/simben/bin $ starter-14
```

**Can you turn my light on to full brightness level (255)?**


*Put your answer in the chat window*



```
[simben90@son-of-opus bin]$ starter-14
Browse to: http://microlab.simms-teach.com
Enter brightness value (0-255) [50]: 210
simben90@brienne.simms-teach.com's password:
 % Total    % Received % Xferd  Average Speed   Time    Time       Time  Current
                                 Dload  Upload  Total  Spent    Left  Speed
  0      0     0     0     0     0     0     0     0  ---:--:--  ---:--:--  ---:--:--    0
[{"success":{"/lights/1/state/on":true}},{"success":{"/lights/1/state/bri":210}}]100  102    0
81 100   21  5178  1342 --:--:-- --:--:-- --:--:--  5400
[simben90@son-of-opus bin]$
```

# Remotely turning off a Hue smart light

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ../../depot/scripts/ starter-15 .
/home/cis90/simben/bin $ vi starter-15
```



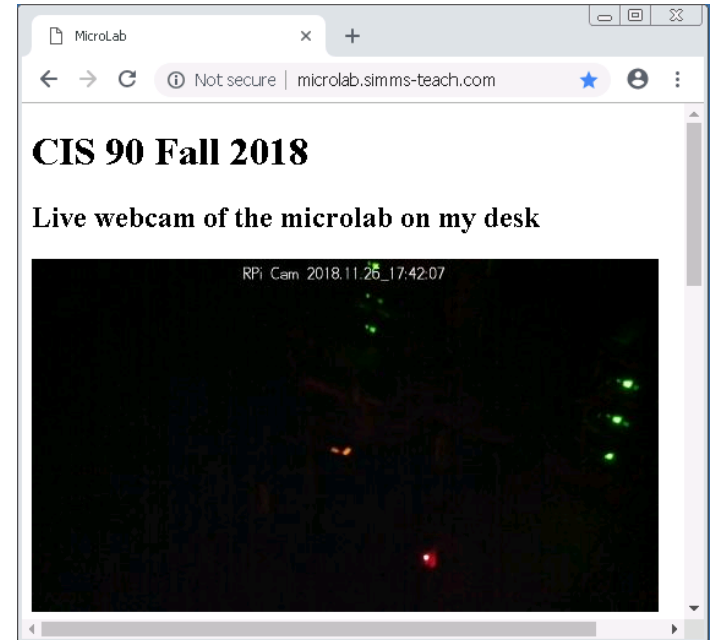
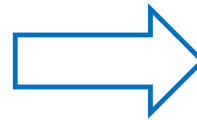
```
rsimms@opus-ii:/home/cis90/depot/scripts
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Description: Remotely turn off via ssh a Hue smart light
clear
echo Browse to: http://microlab.simms-teach.com
hostname=brienne.simms-teach.com
port=2225
scriptFile=hue-script
hueBridge=192.168.1.199
hueUser=7A-WV-9HVVYVQCANTHTVCMHXZ108XK6R-01AR1X

settings={"on":false}
url="http://$hueBridge/api/$hueUser/lights/1/state"
encoded=$(echo "curl -H Accept:application/json -X PUT --data '$settings' $url > hue-status" | base64 -w 0)
ssh -p $port $LOGNAME@$hostname "echo $encoded | base64 -d > hue-script; chmod +x hue-script; ./hue-script; echo; cat hue-status"
exit
~
~
~
"starter-15" 17L, 625C 1,1 All
```

Use **Esc** :wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-15
/home/cis90/simben/bin $ starter-15
```

**Can you turn my light off?**  
*Put your answer in the chat window*



```
[simben90@son-of-opus bin]$ starter-15
Browse to: http://microlab.simms-teach.com
simben90@brienne.simms-teach.com's password:
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left   Speed
100    54      0   42     0     0     0     0  --:--:--  --:--:--  --:--:--    0
100    12    2764    789  --:--:--  --:--:--  --:--:--  2800
[{"success":{"/lights/1/state/on":false}}] [simben90@son-of-opus bin]$
```

# Random numbers, terminal text placement and color

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ../../depot/scripts/ starter-16 .
/home/cis90/simben/bin $ vi starter-16
```

```
rsimms@opus-ii:/home/cis90/depot/scripts
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Description: Random numbers, terminal text color and placement
read -p "Enter a number between 1 and 500: " size
gid=$(grep "^cis90:" /etc/group | cut -f3 -d":")
numStudents=$(grep ":$gid:" /etc/passwd | grep -v tbd | grep -v "^cis90:" | wc -l)
clear
for (( i=1; i<=size; i++ )); do
  studentNum=$((RANDOM%numStudents))
  first=$(grep ":$gid:" /etc/passwd | grep -v tbd | grep -v "^cis90:" | head -n $studentNum | tail -n1 | cut -f1 -d " ")
  foregroundColor=$((RANDOM%8))
  backgroundColor=$((RANDOM%8))
  row=$((RANDOM%20))
  col=$((RANDOM%60))
  tput setf $foregroundColor
  tput setb $backgroundColor
  tput cup $row $col
  echo -n "$first"
  echo -en "\e[0m"
  tput cup 22 0
  echo -n "row=$row col=$col foreground color=$foregroundColor background color=$backgroundColor "
  sleep .5
done
tput reset
echo $PS1
exit
```

"starter-16" 27L, 899C 1,1 All

Use **Esc** :wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-16
/home/cis90/simben/bin $ starter-16
```

**How could you spread the text across more columns?**

*Put your answer in the chat window*

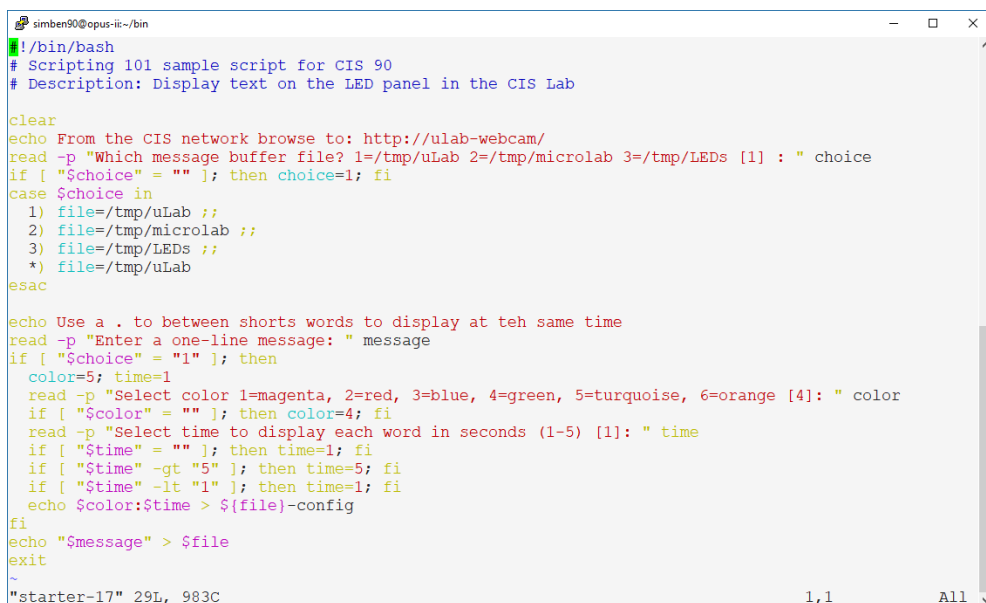
```
simben90@opus-ii:~/bin
/home/cis90/simben/bin $ ./starter-16
Enter a number between 1 and 500: 50

Austin
Janelly Duke
Joseph Tara
Jona Fredi Matthew Tara
Joseph
AaErik Blair
Ryan GDominicJanelly
Branden AlejandrTara Erik
Gabriel Ryan Tara Tara
Tara Isaac Tara
Erik Carina
Alejandra JoseFredi Tony
Ryan Isaac Danny
Danny Tara

row=12 col=13 foreground color=0 background color=0
/home/cis90/simben/bin $ █
```

## Display a message on the STEM center LEDs

```
/home/cis90/simben/bin $ cd ~/bin
/home/cis90/simben/bin $ cp ../../depot/scripts/ starter-17 .
/home/cis90/simben/bin $ vi starter-17
```



```
simben90@opus-ii-~/bin
#!/bin/bash
# Scripting 101 sample script for CIS 90
# Description: Display text on the LED panel in the CIS Lab

clear
echo From the CIS network browse to: http://ulab-webcam/
read -p "Which message buffer file? 1=/tmp/uLab 2=/tmp/microlab 3=/tmp/LEDs [1] : " choice
if [ "$choice" = "" ]; then choice=1; fi
case $choice in
  1) file=/tmp/uLab ;;
  2) file=/tmp/microlab ;;
  3) file=/tmp/LEDs ;;
  *) file=/tmp/uLab
esac

echo Use a . to between shorts words to display at teh same time
read -p "Enter a one-line message: " message
if [ "$choice" = "1" ]; then
  color=5; time=1
  read -p "Select color 1=magenta, 2=red, 3=blue, 4=green, 5=turquoise, 6=orange [4]: " color
  if [ "$color" = "" ]; then color=4; fi
  read -p "Select time to display each word in seconds (1-5) [1]: " time
  if [ "$time" = "" ]; then time=1; fi
  if [ "$time" -gt "5" ]; then time=5; fi
  if [ "$time" -lt "1" ]; then time=1; fi
  echo $color:$time > ${file}-config
fi
echo "$message" > $file
exit
~
"starter-17" 29L, 983C 1,1 All
```

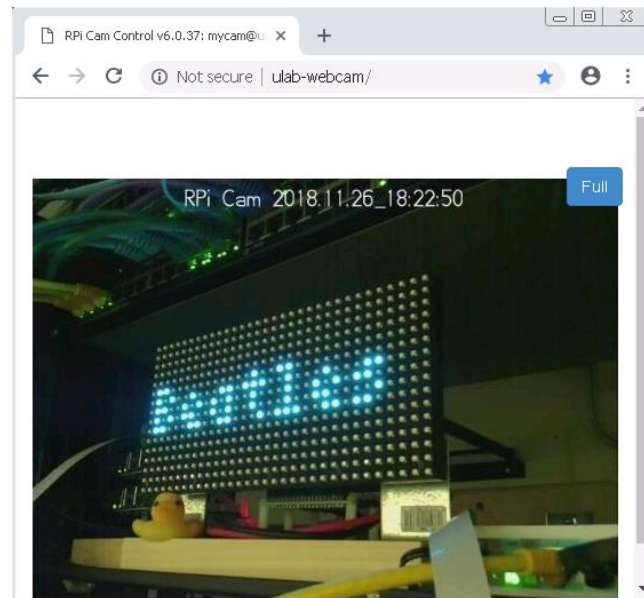
Use  :wq to save file and quit vi

```
/home/cis90/simben/bin $ chmod +x starter-17
/home/cis90/simben/bin $ starter-17
```

**If you are off campus view the webcam from your Arya VM (via VLab).  
Did it work?**

*Put your answer in the chat window*

```
/home/cis90/simben/bin $ ./starter-17
From the CIS network browse to: http://ulab-webcam/
Which message buffer file? 1=/tmp/uLab 2=/tmp/microlab 3=/tmp/LEDs [1] : 1
Use a . to between shorts words to display at teh same time
Enter a one-line message: Beatles
Select color 1=magenta, 2=red, 3=blue, 4=green, 5=turquoise, 6=orange [4]: 5
Select time to display each word in seconds (1-5) [1]: 10
/home/cis90/simben/bin $
```







Don't name  
your scripts  
"script"!

# Don't name your scripts "script"

```
[simben90@opus bin]$ ls -l script  
-rwxr-x--- 1 simben90 cis90 47 Nov 23 16:44 script
```

```
[simben90@opus bin]$ cat script  
echo "Hello from the script file named script"
```

*What would happen if you ran the script above?*

# Don't name your scripts "script"

```
[simben90@opus bin]$ cat script  
echo "Hello from the script file named script"
```

```
[simben90@opus bin]$ script  
Script started, file is typescript
```



*Why the heck doesn't  
my script do what it's  
supposed to do?*

# Don't name your scripts "script"

```
[simben90@opus bin]$ cat script
echo "Hello from the script file named script"
```

```
[simben90@opus bin]$ script
Script started, file is typescript
```



*Why the heck doesn't my script do what it's supposed to do?*

```
[simben90@opus bin]$ Where is my script?
```

```
bash: Where: command not found
```

```
[simben90@opus bin]$ exit
```

```
Script done, file is typescript
```

```
[simben90@opus bin]$ cat typescript
```

```
Script started on Wed 13 May 2009 08:00:02 AM PDT
```

```
[simben90@opus bin]$ Where is my script?
```

```
bash: Where: command not found
```

```
[simben90@opus bin]$ exit
```

```
Script done on Wed 13 May 2009 08:00:47 AM PDT
```

```
[simben90@opus bin]$
```



# Don't name your scripts "script"

*Why doesn't script do what it is supposed to do? ... because script is the name of an existing UNIX command!*

```
[simben90@opus bin]$ man script
[simben90@opus bin]$
```

The screenshot shows a terminal window titled "roddyduk@opus:~/bin" with a window manager title bar. The terminal displays the output of the command "man script". The output is formatted as a man page with sections for NAME, SYNOPSIS, DESCRIPTION, and Options.

```
SCRIPT (1) BSD General Commands Manual SCRIPT (1)
NAME
    script - make typescript of terminal session
SYNOPSIS
    script [-a] [-c COMMAND] [-f] [-q] [-t] [file]
DESCRIPTION
    Script makes a typescript of everything printed on your terminal. It is
    useful for students who need a hardcopy record of an interactive session
    as proof of an assignment, as the typescript file can be printed out
    later with lpr(1).

    If the argument file is given, script saves all dialogue in file. If no
    file name is given, the typescript is saved in the file typescript.

Options:
    -a      Append the output to file or typescript, retaining the prior con-
            tents.
    -c COMMAND
            Run the COMMAND rather than an interactive shell. This makes it
            easy for a script to capture the output of a program that behaves
            differently when its stdout is not a tty.
```

# Don't name your scripts "script"

*There are (at least) two files named script on Opus*

```
[simben90@opus bin]$ type script
script is hashed (/usr/bin/script)
[simben90@opus bin]$ file /usr/bin/script
/usr/bin/script: ELF 32-bit LSB executable, Intel 80386, version 1
(SYSV), for GNU/Linux 2.6.9, dynamically linked (uses shared libs),
for GNU/Linux 2.6.9, stripped
```

```
[simben90@opus bin]$ type /home/cis90/simben/bin/script
/home/cis90/simben/bin/script is /home/cis90/simben/bin/script
[simben90@opus bin]$ file /home/cis90/simben/bin/script
/home/cis90/simben/bin/script: ASCII text
[simben90@opus bin]$
```

**Question:** *Why did bash run the script in /usr/bin instead of the script in /home/cis90/simben/bin?*

# Don't name your scripts "script"

**Question:** Why did bash run the script in /usr/bin instead of the script in /home/cis90/simben/bin?

The Linux **script** command is in this directory

```
[simben90@opus bin]$ echo $PATH  
/usr/kerberos/bin:/usr/local/bin:/bin:/usr/bin:/home/cis90/bin:  
/home/cis90/simben/bin:.
```

Our script, named **script**, is in this directory

**Answer:** bash searches the path in the order the directories are listed. It finds the script command in /user/bin first.

# Don't name your scripts "script"

*To override the PATH you can always specify an absolute pathname to the file you want to run:*

```
[simben90@opus bin]$ /home/cis90/simben/bin/script  
Hello from the script file named script
```

```
[simben90@opus bin]$ ./script  
Hello from the script file named script
```

*Note the shell treats the . above as "here" which in this case is /home/cis90/simben/bin*



## Try the script command

- Use the **script** command to start recording
- Type various commands of your choice
- Type **exit** or hit **Ctrl-D** to end recording
- Use **cat typescript** to see what you recorded

This would be a good way to record a session such as working one of the lab assignments for future reference.


*When finished type "done" in the chat window*

# Assignment



# Start your project!

*Cabrillo College*



**CIS 90 Final Project**  
Developing a bash script  
Fall 2015

**Final Project**

For the final project you will be writing custom front-ends to your favorite Linux commands. To do this you will write a shell script that interacts with the user to get input, then use that input to call a Linux command. You will start with a template that you can modify and extend.

**Forum**

Use the forum to brainstorm script ideas, clarify requirements, and get help if you are stuck. When you have tested your script and think it is bug free then use the forum to ask others to test it some more. Post any valuable tips or lessons learned as well. Forum is at: <http://oslab.cis.cabrillo.edu/forum/>

**Commands**

|        |         |        |       |
|--------|---------|--------|-------|
| .      | echo    | lpstat | sort  |
| at     | env     | ls     | spell |
| banner | exit    | mail   | su    |
| bash   | export  | man    | tail  |
| bc     | file    | msg    | tee   |
| cal    | find    | mkdir  | touch |
| cancel | finger  | more   | type  |
| cat    | grep    | mv     | umask |
| cd     | head    | passwd | uname |
| chgrp  | history | ps     | unset |
| chmod  | id      | pwd    | vi    |
| chown  | jobs    | rm     | wc    |
| clear  | kill    | rmdir  | who   |
| cp     | ln      | set    | write |
| date   | lp/lpr  | sleep  | xxd   |

*Start early and finish on time!*



# Wrap up

Commands:

lp, lpr  
cancel, lprm  
lpq, lpstat

- Linux print command
- cancel print job
- Show print queue

Web:

<http://hostname:631>  
<http://hostname:9100>

- CUPS web based management utility
- HP JetDirect printer

## Next Class

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

*No Quiz  
No Lab due*

**Work on final project - due in two weeks!**

Optional extra credit labs

## Project Workshop

- See if you can get one “starter” task scripted and working before leaving class today.
- Grade your starter script using the Final Project rubric.

Implementing all five tasks (6 points each):

- Requirements for each task:
  - Minimum of 12 “original” lines of bash script
  - Has one or more non-generic comments to explain what it is doing
  - Has user interaction

At least six bash constructs from this list:

- Redirecting stdin (4 points)
- Redirecting stdout (4 points)
- Redirecting stderr (4 points)
- Use of permissions (4 points)
- Use of filename expansion characters (4 points)
- Use of absolute path (4 points)
- Use of relative path (4 points)
- Use of a PID (4 points)
- Use of inodes (4 points)
- Use of links (4 points)
- Use of color (4 points)
- Use of scheduling (4 points)
- Use of a GID or group (4 points)
- Use of a UID or user (4 points)
- Use of a /dev/tty device (4 points)
- Use of a signal (4 points)
- Use of piping (4 points)
- Use of an environment variable (4 points)
- Use of /bin/mail (4 points)
- Use of a conditional (4 points)
- Use of  $\$(command)$

The maximum for this section is 24 points.

End Meeting

End  
Meeting





# Backup



# Review

```
function runningScript ()  
{
```

## The rules of the road for variables

- Rule 1: A child process can only see variables the parent has exported.
- Rule 2: A child process cannot change the parent's variables.

## Running a Script

```
/home/cis90/simben $ cat mydate  
#!/bin/bash  
echo "Hola $LOGNAME"  
date +%m/%d/%Y  
echo $myvar1 $myvar2 $myvar3
```

*Add this line to  
the last script we  
made*

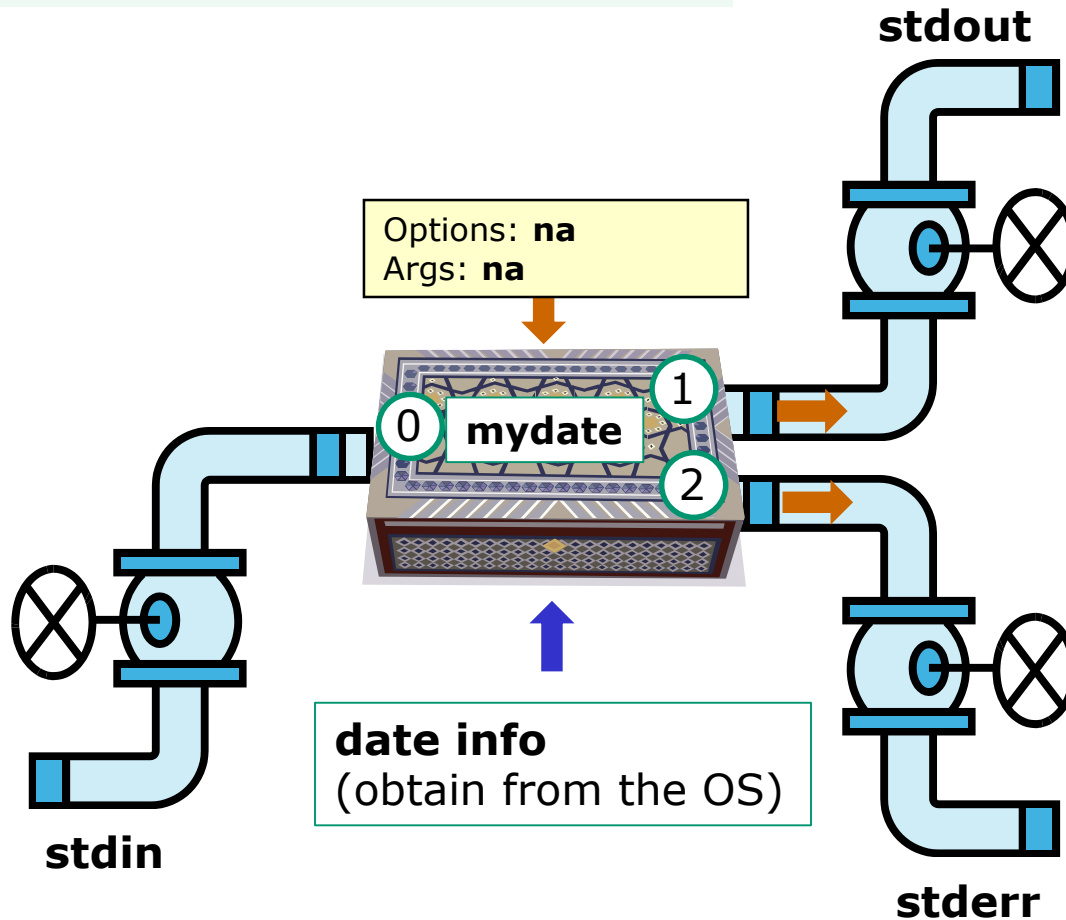
*Don't initialize  
them yet*

```
/home/cis90/simben $ mydate  
Hola simben90  
05/16/2013  
  
/home/cis90/simben $
```

*Because the variables  
don't exist yet the last  
echo statement prints a  
blank line*

# Running a Script

```
$ mydate
```



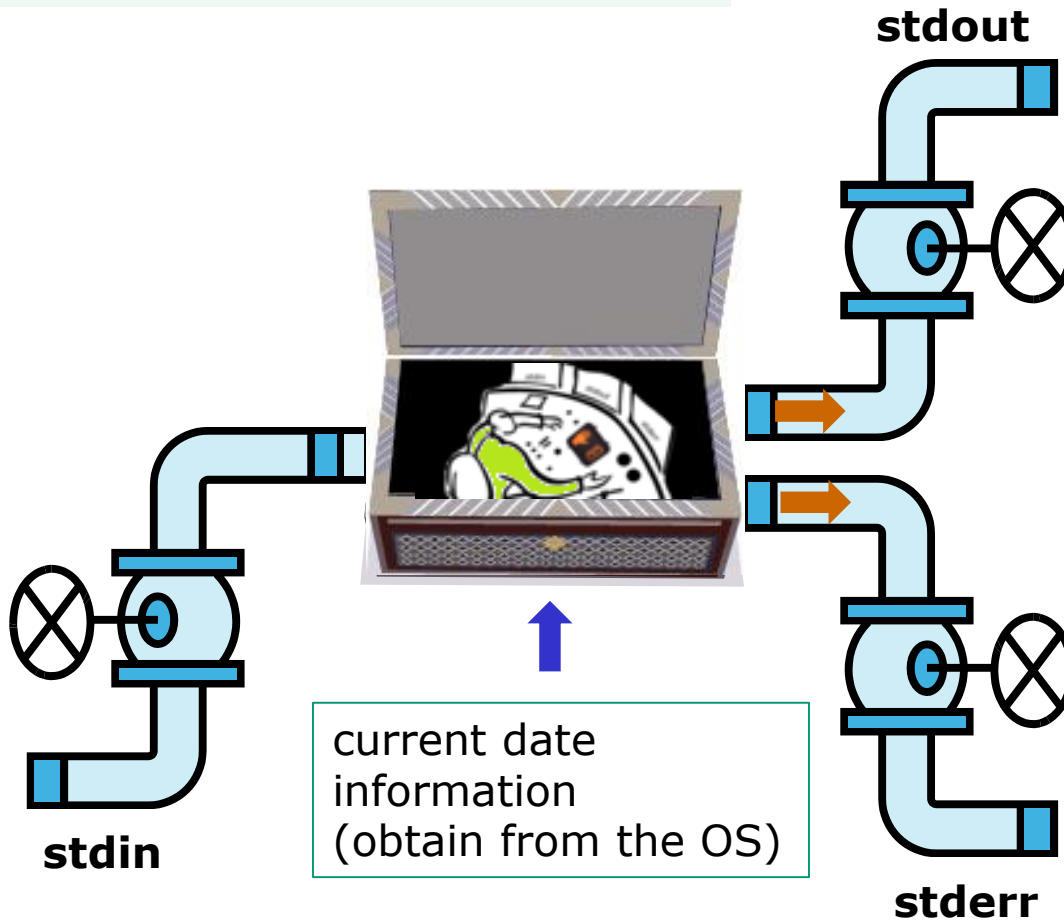
```
Hola simben90  
05/09/2013
```

*In this example, output from **myscript** goes to **stdout**.*

*stdout has not been redirected so it goes to the default terminal device (your screen).*

# Running a Script

```
$ mydate
```

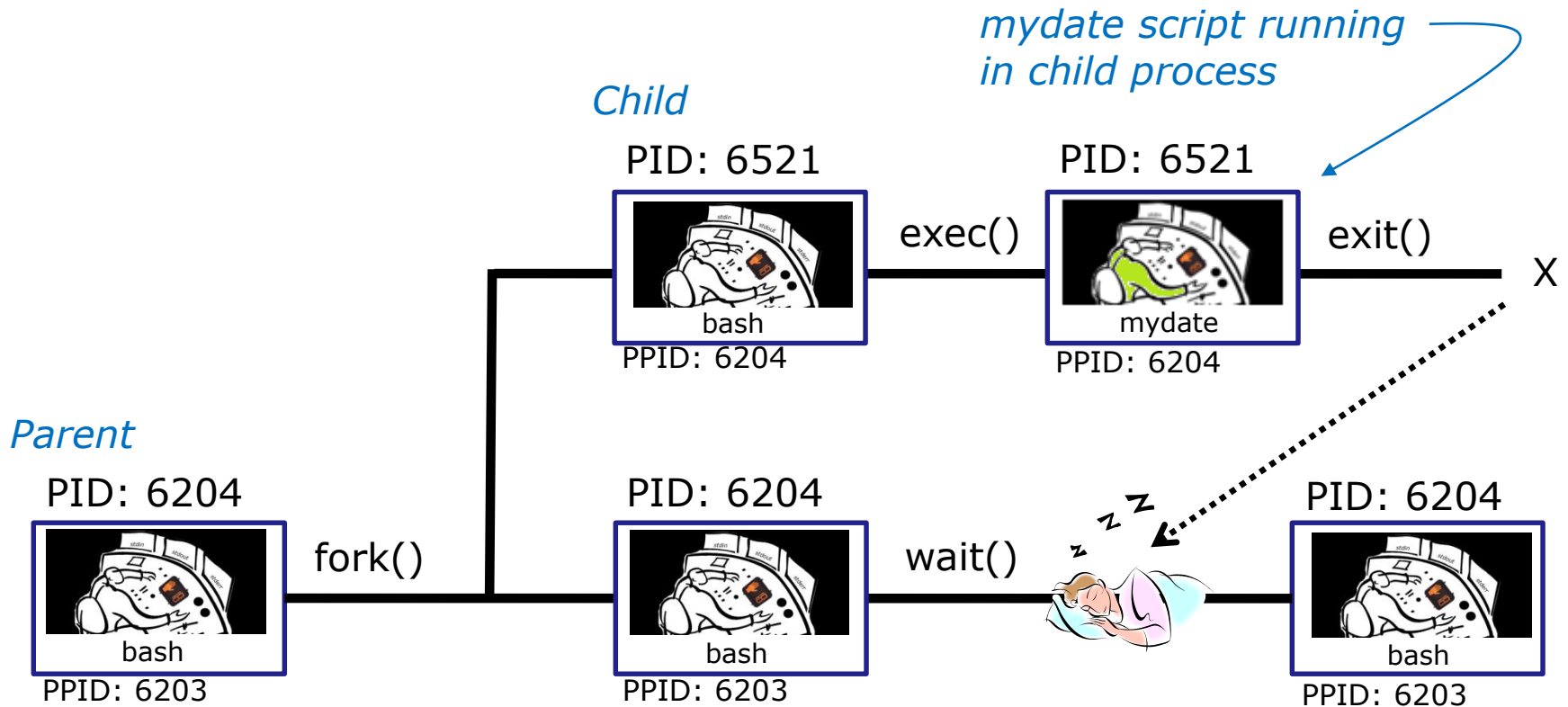


```
Hola simben90  
05/16/2012
```

*A sneak peek into memory  
to see what our process  
looks like!*



# Running a Script



Whenever you run any command, program, or script it runs as a **child process**

## Running a Script

```
/home/cis90/simben $ cat mydate  
#!/bin/bash  
echo "Hola $LOGNAME"  
date +%m/%d/%Y'  
echo $myvar1 $myvar2 $myvar3
```

*In the parent process, initialize the three variables*

```
/home/cis90/simben $ myvar1=Tic; myvar2=Tac; myvar3=Toe  
/home/cis90/simben $ echo $myvar1 $myvar2 $myvar3  
Tic Tac Toe
```

*What happens if we run **mydate** now?*



## Running a Script

```
/home/cis90/simben $ cat mydate  
#!/bin/bash  
echo "Hola $LOGNAME"  
date +%m/%d/%Y'  
echo $myvar1 $myvar2 $myvar3
```

```
/home/cis90/simben $ myvar1=Tic; myvar2=Tac; myvar3=Toe  
/home/cis90/simben $ echo $myvar1 $myvar2 $myvar3  
Tic Tac Toe
```

```
/home/cis90/simben $ mydate  
Hola simben90  
05/09/2012
```

*Running **mydate**  
(as a child process)*

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

***Why no Tic Tac Toe output?***

## Running a Script

```
/home/cis90/simben $ export myvar1  
/home/cis90/simben $ mydate  
Hola simben90  
05/09/2012  
Tic
```

*Rule 1: A child process can only see variables the parent has exported*

```
/home/cis90/simben $ export myvar2  
/home/cis90/simben $ mydate  
Hola simben90  
05/09/2012  
Tic Tac
```

```
/home/cis90/simben $ export myvar3  
/home/cis90/simben $ mydate  
Hola simben90  
05/09/2012  
Tic Tac Toe
```

## Running a Script

```
/home/cis90/simben $ echo $myvar1 $myvar2 $myvar3  
Tic Tac Toe
```

```
/home/cis90/simben $ cat mydate
```

```
#!/bin/bash
```

```
echo "Hola $LOGNAME"
```

```
date +%m/%d/%Y'
```

```
echo $myvar1 $myvar2 $myvar3
```

```
myvar1=red myvar2=white myvar3=blue
```

```
echo $myvar1 $myvar2 $myvar3
```

*Add these  
new lines*

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

```
Hola simben90
```

```
05/09/2012
```

```
Tic Tac Toe
```

```
red white blue
```

*Rule 2: A child process  
cannot change the  
parent's variables.*

```
/home/cis90/simben $ echo $myvar1 $myvar2 $myvar3
```

```
Tic Tac Toe
```

## Running a Script

*Unless we want them to*

```
/home/cis90/simben $ echo $myvar1 $myvar2 $myvar3  
Tic Tac Toe
```

```
/home/cis90/simben $ source mydate  
Hola simben90  
05/09/2012  
Tic Tac Toe  
red white blue
```

*Sourcing a script causes the instructions to be run in the parent process. A child process is not created*

```
/home/cis90/simben $ echo $myvar1 $myvar2 $myvar3  
red white blue
```

```
}  
while не розумію  
do  
    runningScript  
done
```



# RPi Zero Envy 4500 Configuration via CUPS

# CUPS Demo on RPi and HP Envy 4500

## Raspberry Pi configuration (Jessie)

1. Bootup with monitor
2. Connect to wireless uLab network  
(might need HDMI monitor and keyboard)
3. As root:
  - usermod -a -G lpadmin *username***
  - apt-get update**
  - apt-get install cups cups-bsd**
  - apt-get install hplip**
  - apt-get install sysvbanner**
  - apt-get install tightvncserver**
  - Enable remote administration on CUPS
4. As *username*:
  - vncserver**

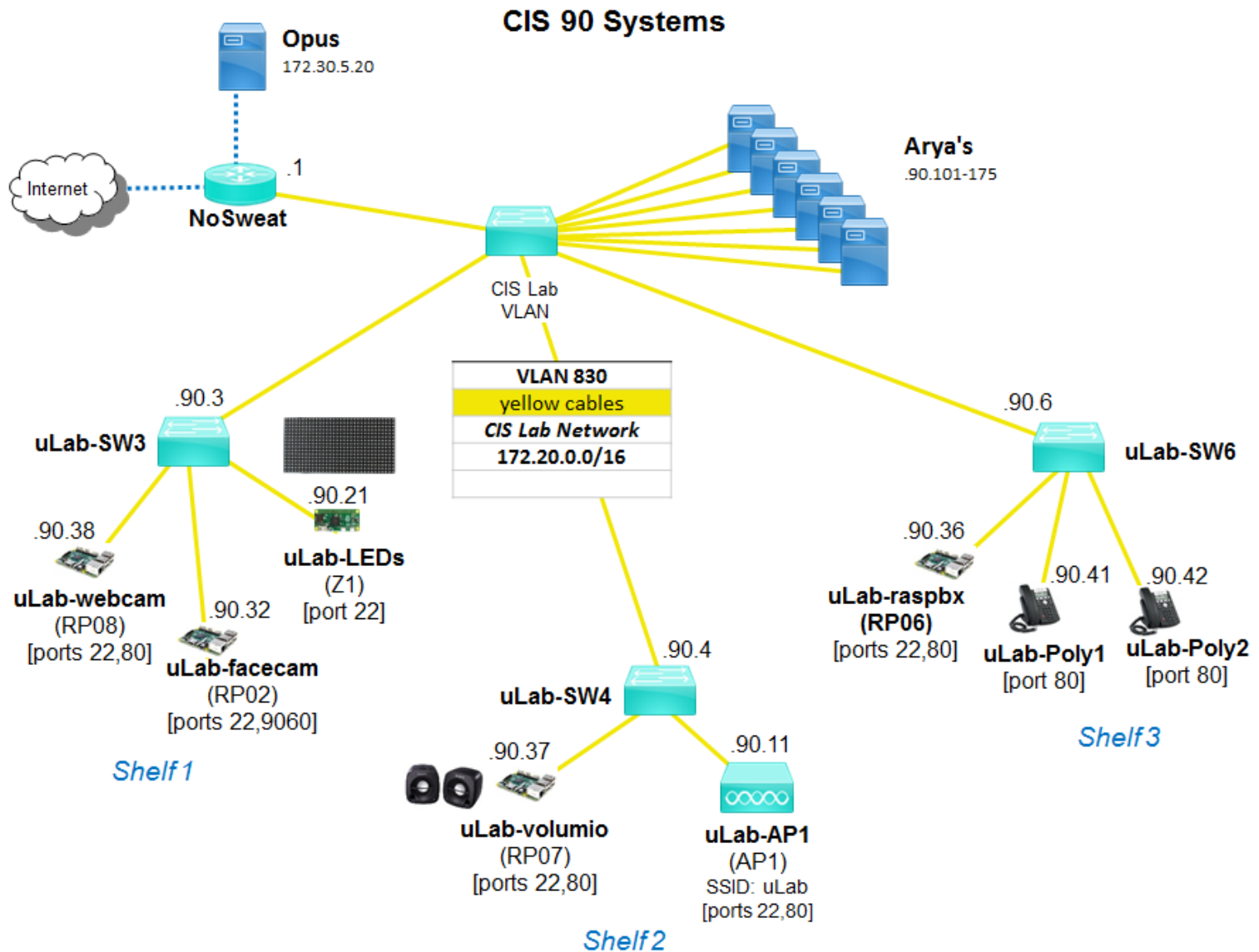
## Classroom Instructor PC

- Browse to `http://<printer-IP>:631`
- Run Elmo Image Mate in expert mode and rotate image

Troubleshoot if needed:

- Instructor PC: install tightvnc from `http://www.tightvnc.com/`
- Run TightVNC Viewer and connect to: `<Raspberry Pi IP>:5901`

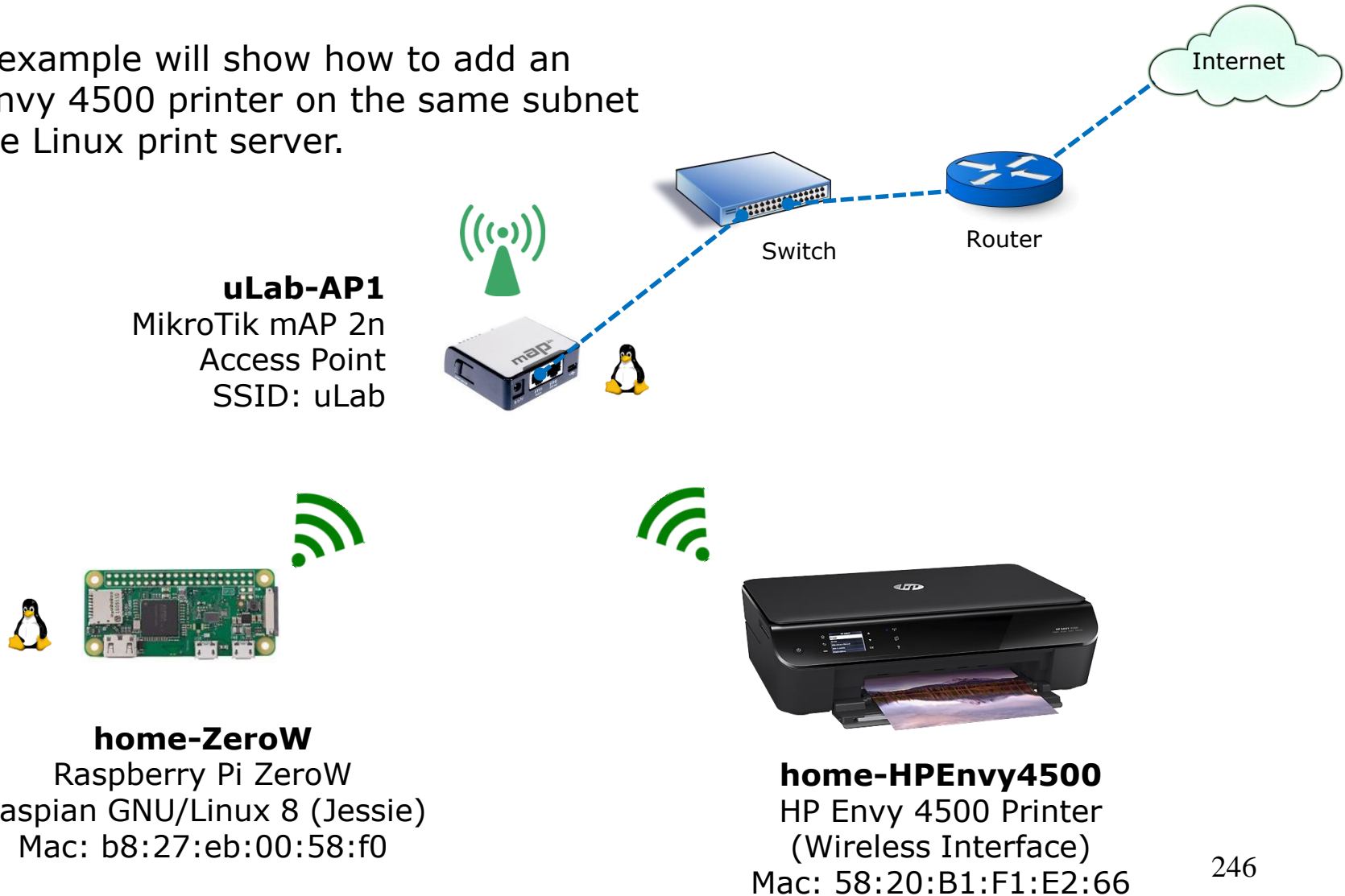
| Hostname        | MAC               | IP            | Ports                                              |
|-----------------|-------------------|---------------|----------------------------------------------------|
| home-PanTilt    | b8:27:eb:66:ce:79 | 172.20.90.230 | <code>http://&lt;ip-address&gt;:80 and 9595</code> |
| home-ZeroW      | b8:27:eb:00:58:f0 | 172.20.90.231 | <code>http://&lt;ip-address&gt;:631</code>         |
| home-HPEnvy4500 | 58:20:B1:F1:E2:66 | 172.20.90.232 | <code>http://&lt;ip-address&gt;:80</code>          |





# CUPS Demo on RPi Zero and HP Envy 4500

This example will show how to add an HP Envy 4500 printer on the same subnet as the Linux print server.



# Raspberry Pi ZeroW



IP Address for this printer is:  
192.168.88.117 (home)  
172.30.90.231 (room 828)

```
pi@home-ZeroW: ~  
login as: pi  
pi@192.168.88.117's password:  
  
The programs included with the Debian GNU/Linux system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*/copyright.  
  
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent  
permitted by applicable law.  
Last login: Tue Apr 25 07:02:51 2017 from 192.168.88.108  
pi@home-ZeroW:~$
```

*Logging into the ZeroW  
via SSH port 22*

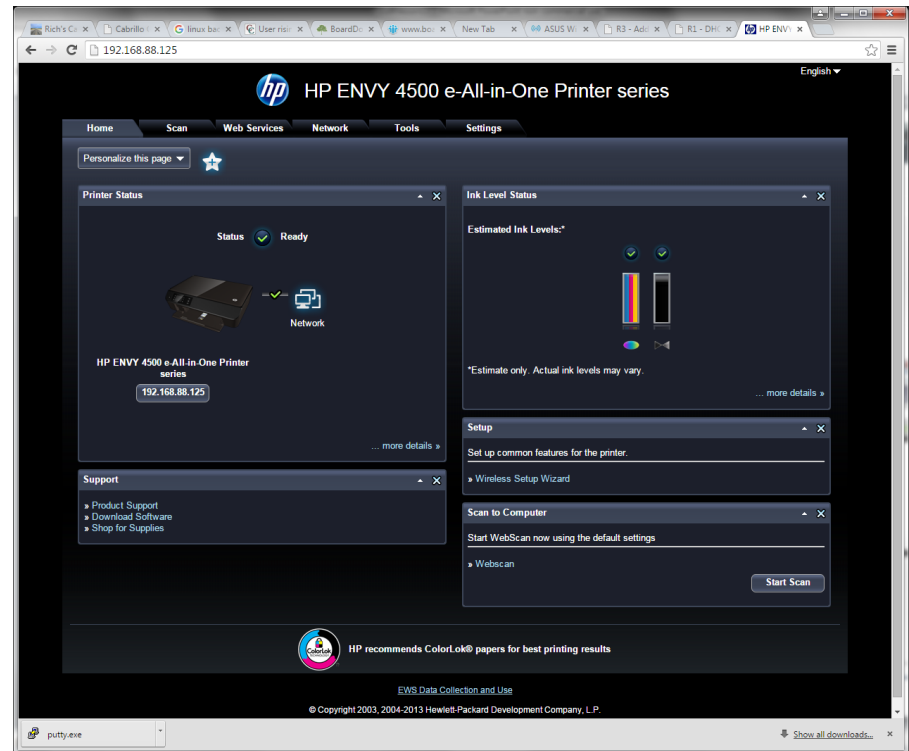
*Browsing to the CUPS  
service on port 631*

# HP Envy 4500 Printer

Networked HP printers have a built in web-server



IP Address for this printer is:  
192.168.88.115 (home)  
172.30.90.232 (room 828)



*Browsing to the IP address of the printer*



# RPi

## Envy 4500

### Configuration

#### via CUPS

# CUPS Demo on RPi and HP Envy 4500

## Raspberry Pi configuration (Jessie)

1. Bootstrap with monitor
2. Connect to wireless uLab network  
(might need HDMI monitor and keyboard)
3. As root:
  - usermod -a -G lpadmin *username***
  - apt-get update**
  - apt-get install cups cups-bsd**
  - apt-get install hplip**
  - apt-get install sysvbanner**
  - apt-get install tightvncserver**
  - Enable remote administration on CUPS
4. As *username*:
  - vncserver**

## Classroom Instructor PC

- Instructor PC: install tightvnc from <http://www.tightvnc.com/>
- Browse to `http://<printer-IP>:631`
- Run Elmo Image Mate in expert mode and rotate image

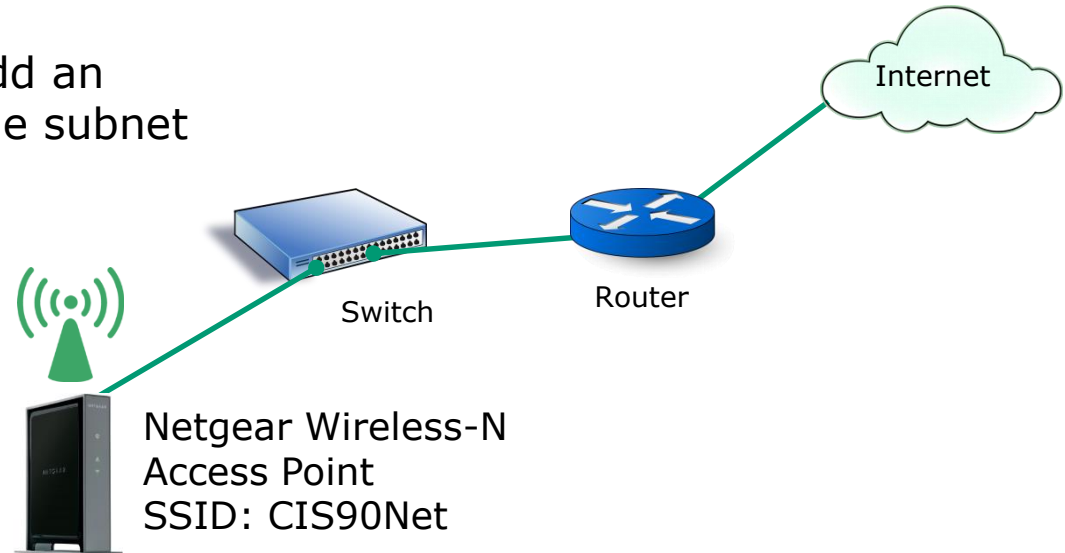
Troubleshoot if needed:


- Run TightVNC Viewer and connect to: `<Raspberry Pi IP>:5901`

| Hostname        | MAC               | IP            | Ports                                              |
|-----------------|-------------------|---------------|----------------------------------------------------|
| home-PanTilt    | b8:27:eb:66:ce:79 | 172.20.90.230 | <code>http://&lt;ip-address&gt;:80 and 9595</code> |
| home-ZeroW      | b8:27:eb:00:58:f0 | 172.20.90.231 | <code>http://&lt;ip-address&gt;:631</code>         |
| home-HPEnvy4500 | 58:20:B1:F1:E2:66 | 172.20.90.232 | <code>http://&lt;ip-address&gt;:80</code>          |

## CUPS Demo on RPi and HP Envy 4500

This example will show how to add an HP Envy 4500 printer on the same subnet as the Linux server.



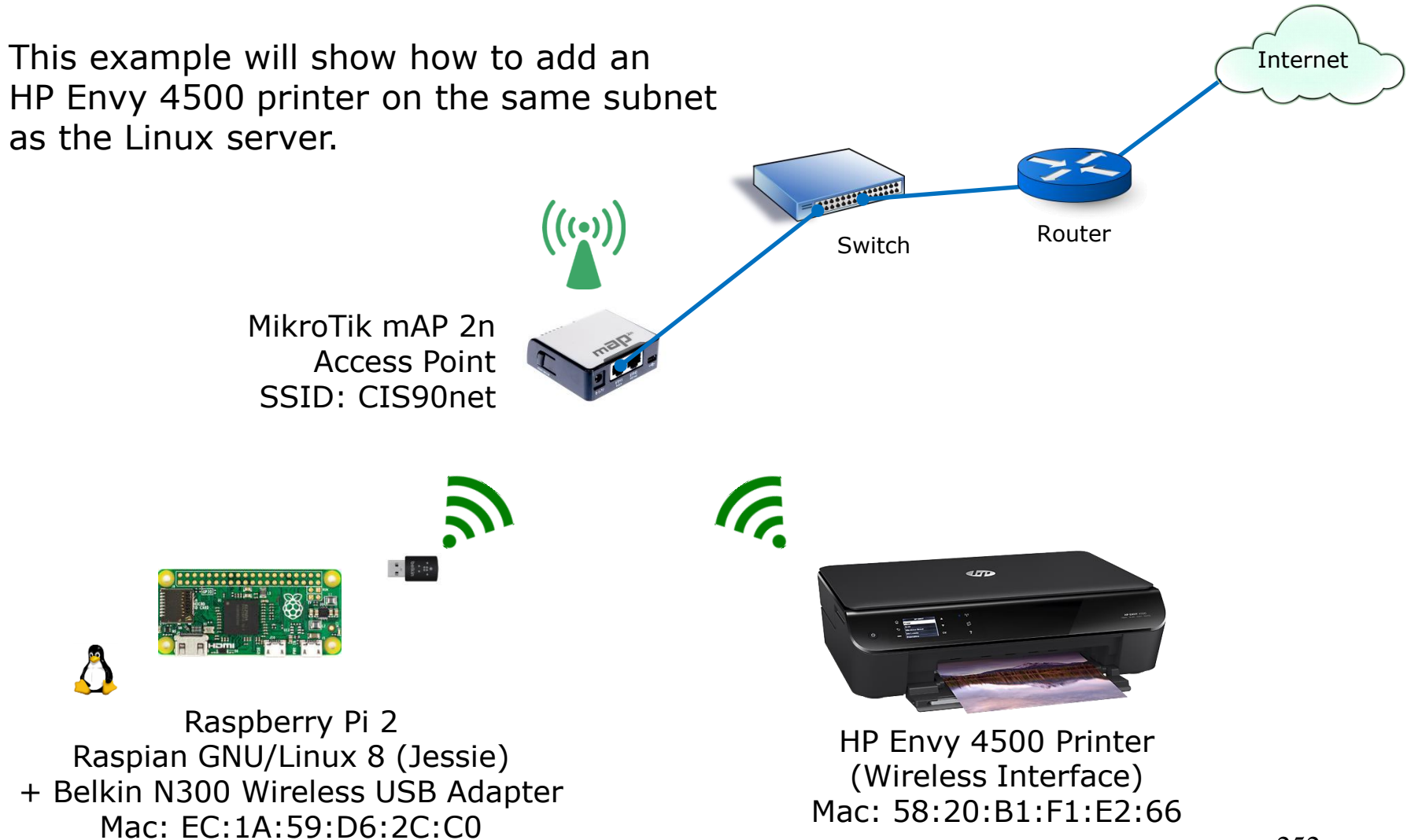
 Raspberry Pi 2  
Raspian GNU/Linux 8 (Jessie)  
+ Belkin N300 Wireless USB Adapter  
Mac: EC:1A:59:D6:2C:C0



HP Envy 4500 Printer  
(Wireless Interface)  
Mac: 58:20:B1:F1:E2:66

# CUPS Demo on RPi Zero and HP Envy 4500

This example will show how to add an HP Envy 4500 printer on the same subnet as the Linux server.

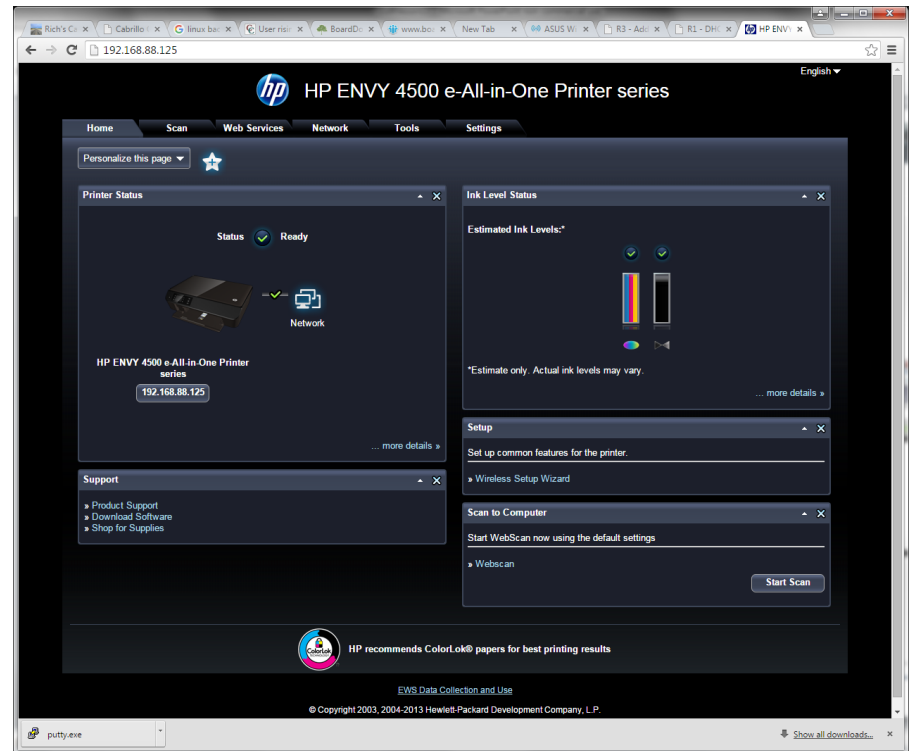


# CUPS Demo on RPi and HP Envy 4500

Networked HP printers have a built in web-server



IP Address for this printer is:  
192.168.88.125 (home)  
172.30.1.35 (room 828)



*Browsing to the IP address of the printer*



# CUPS Demo on RPi and HP Envy 4500



Local access with  
monitor, keyboard  
and mouse



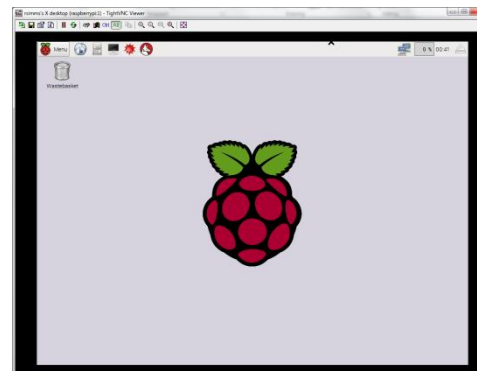
IP Address for this RPi is:

- 192.168.88.122 (home)
- 172.30.1.34 (room 828)

```
csimms@raspberrypi:~$ ssh csimms@192.168.88.122
csimms@192.168.88.122's password:
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Mon Nov 30 23:28:20 2015 from 172.30.1.226
csimms@raspberrypi:~$ vncserver
New 'X' desktop is raspberrypi:1
Starting applications specified in /home/csimms/.vnc/xstartup
log file is /home/csimms/.vnc/raspberrypi:1.log
csimms@raspberrypi:~$
```

SSH access  
over network



VNC access  
over network

Browse to CUPS service at <server-ip-address>:631

The screenshot shows a web browser window titled "rsimms's X desktop (raspberrypi:1) - TightVNC Viewer". The browser's address bar contains "http://192.168.88.122:631/". The page content includes a navigation menu with "Home", "Administration", "Classes", "Online Help", "Jobs", and "Printers". The main heading is "CUPS 1.7.5", followed by a description: "CUPS is the standards-based, open source printing system developed by Apple Inc. for OS\* X and other UNIX\*-like operating systems." To the right is the "UNIX PRINTING SYSTEM" logo. Below are three columns of links: "CUPS for Users" (Overview of CUPS, Command-Line Printing and Options, What's New in CUPS 1.7, User Forum), "CUPS for Administrators" (Adding Printers and Classes, Managing Operation Policies, Printer Accounting Basics, Server Security, Using Kerberos Authentication, Using Network Printers, cupsd.conf Reference), and "CUPS for Developers" (Introduction to CUPS Programming, CUPS API, Filter and Backend Programming, HTTP and IPP APIs, PPD API, Raster API, PPD Compiler Driver Information File Reference, Developer Forum). A footer note states: "CUPS and the CUPS logo are trademarks of Apple Inc. Copyright 2007-2014 Apple Inc. All rights reserved."

## Select Administration tab

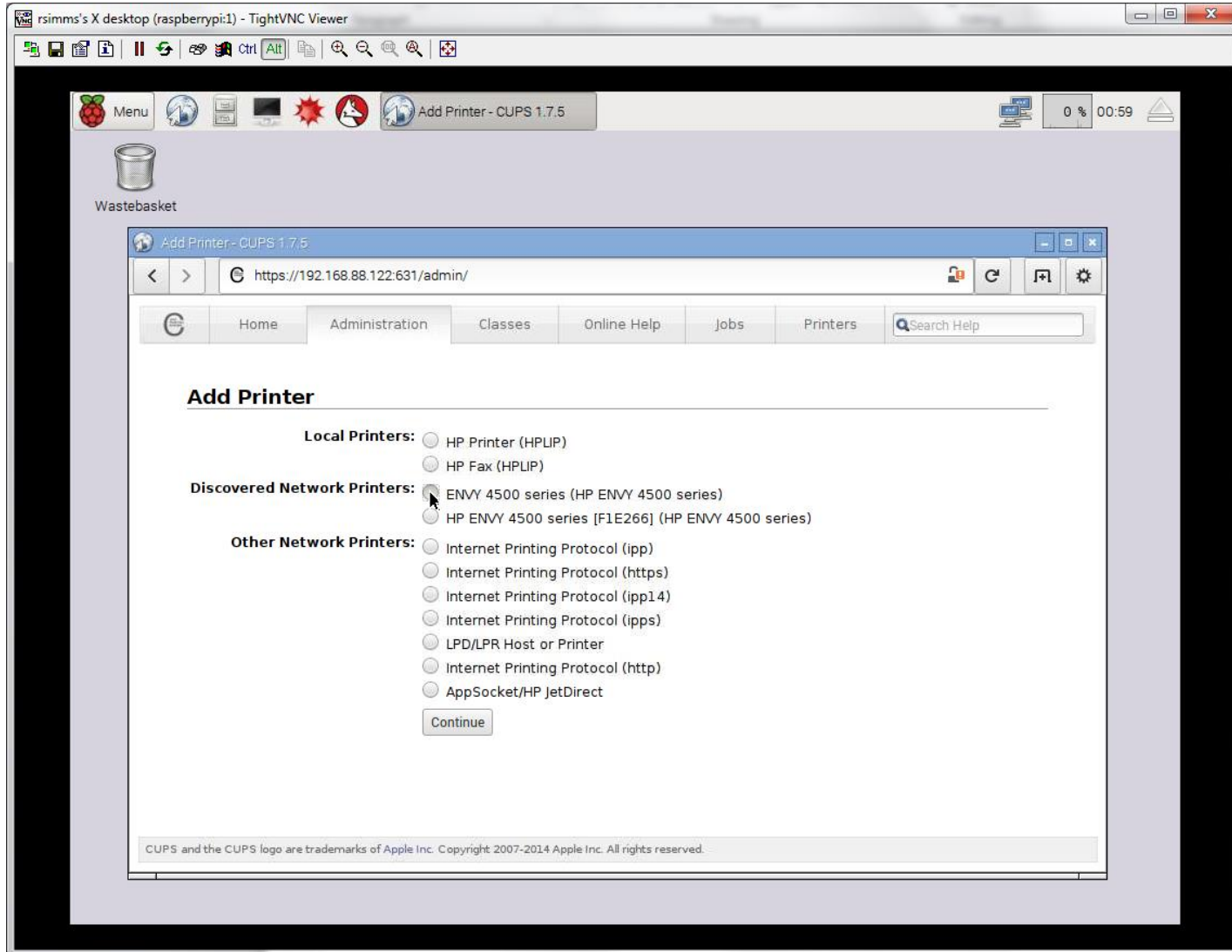
The screenshot shows a web browser window titled "rsimms's X desktop (raspberrypi:1) - TightVNC Viewer". The browser address bar shows "http://192.168.88.122:631/admin". The page has a navigation menu with tabs for "Home", "Administration", "Classes", "Online Help", "Jobs", and "Printers". The "Administration" tab is selected. The main content area is divided into several sections:

- Printers:** Contains buttons for "Add Printer", "Find New Printers", and "Manage Printers".
- Classes:** Contains buttons for "Add Class" and "Manage Classes".
- Jobs:** Contains a button for "Manage Jobs".
- RSS Subscriptions:** Contains a button for "Add RSS Subscription".
- Server:** Contains buttons for "Edit Configuration File", "View Access Log", "View Error Log", and "View Page Log".
- Server Settings:** Includes a section for "Advanced" settings with several checkboxes:
  - Share printers connected to this system
    - Allow printing from the Internet
  - Allow remote administration
  - Use Kerberos authentication (FAQ)
  - Allow users to cancel any job (not just their own)
  - Save debugging information for troubleshootingA "Change Settings" button is located below these options.

Click Add Printer button and authenticate with user belonging to lpadadmin group

The screenshot shows a desktop environment with a Raspberry Pi icon in the top-left corner. The desktop background is a light purple color. A window titled "Administration - CUPS 1.7.5" is open, displaying the CUPS Administration web interface. The browser address bar shows "https://192.168.88.122:631/admin/". The interface includes a navigation menu with "Home", "Administration", "Classes", "Online Help", "Jobs", and "Printers". The "Printers" section is active, showing buttons for "Add Printer", "Find New Printers", "Manage Printers", "Edit Configuration File", "View Access Log", and "View Error Log". A modal dialog box is overlaid on the interface, titled "The site 192.168.88.122:631 requests a username and password". The dialog contains the following fields and options: "Server message: CUPS", "Username: rsimms", "Password: [masked]", and a checkbox for "Remember password". The dialog has "Cancel" and "OK" buttons. The desktop taskbar at the bottom shows a "Menu" button, a "Wastebasket" icon, and a system tray with a clock showing "00:59" and a battery level indicator at "1%".

CUPS discovers and displays printers found on network. Select the printer to install.



## Add some information about the printer

The screenshot shows a desktop environment with a taskbar at the top containing icons for Menu, network, volume, and power. A window titled "Add Printer - CUPS 1.7.5" is open, displaying a web interface for adding a printer. The browser address bar shows "https://192.168.88.122:631/admin". The interface includes a navigation menu with "Home", "Administration", "Classes", "Online Help", "Jobs", and "Printers". The main content area is titled "Add Printer" and contains the following fields:

- Name:** HP\_ENVY\_4500\_series (Note: May contain any printable characters except "/", "#", and space)
- Description:** HP ENVY 4500 series (Note: Human-readable description such as "HP Laserjet with Duplexer")
- Location:** The den at home (Note: Human-readable location such as "Lab 1")
- Connection:** socket://192.168.88.125:9100
- Sharing:**  Share This Printer

A "Continue" button is located below the sharing options. At the bottom of the page, a footer reads: "CUPS and the CUPS logo are trademarks of Apple Inc. Copyright 2007-2014 Apple Inc. All rights reserved."

## Add the printer

The screenshot shows a desktop environment with a Raspberry Pi icon and a 'Wastebasket' icon. A window titled 'Add Printer - CUPS 1.7.5' is open, displaying the CUPS administration interface. The browser address bar shows 'https://192.168.88.122:631/admin'. The interface includes a navigation menu with 'Home', 'Administration', 'Classes', 'Online Help', 'Jobs', and 'Printers'. The main content area is titled 'Add Printer' and contains the following information:

- Name:** HP\_ENVY\_4500\_series
- Description:** HP ENVY 4500 series
- Location:** The den at home
- Connection:** socket://192.168.88.125:9100
- Sharing:** Do Not Share This Printer
- Make:** HP (with a button 'Select Another Make/Manufacturer')
- Model:** A dropdown menu is open, showing a list of printer models. The first item, 'HP Envy 4500 Series, hpcups 3.14.6 (en)', is selected and highlighted.

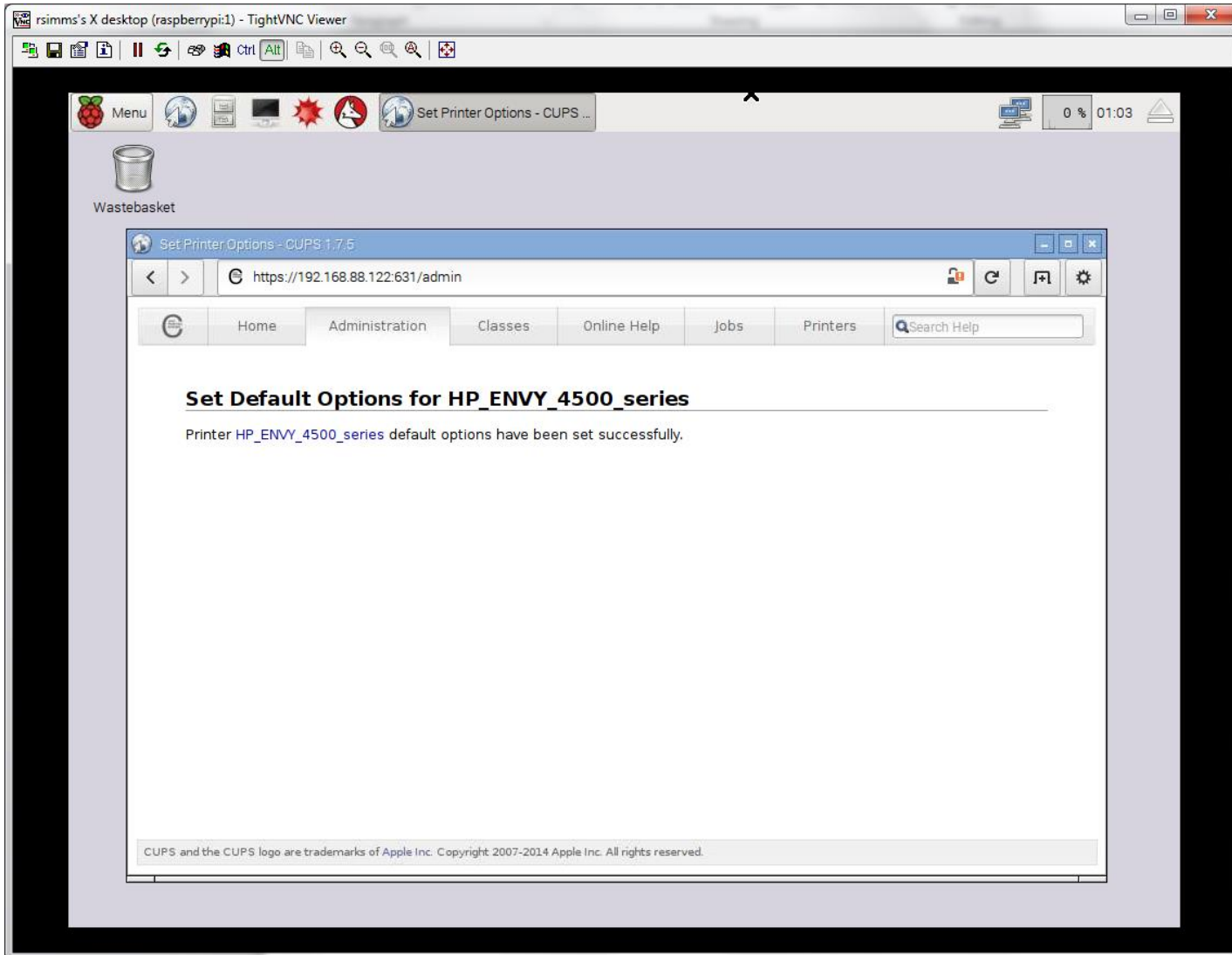
Below the model list, there is a section 'Or Provide a PPD File:' with a 'Choose File' button and '(None)' text. At the bottom of the form is an 'Add Printer' button. A footer note states: 'CUPS and the CUPS logo are trademarks of Apple Inc. Copyright 2007-2014 Apple Inc. All rights reserved.'

## Set printing defaults

The screenshot shows a desktop environment with a taskbar at the top containing a menu icon, a Raspberry Pi logo, and a window titled "Set Printer Options - CUPS ...". The main window is a web browser displaying the CUPS administration page for an HP ENVY 4500 series printer. The page title is "Set Default Options for HP\_ENVY\_4500\_series". Below the title are four tabs: "General", "Options Installed", "Banners", and "Policies". The "General" tab is selected. The "General" section contains five dropdown menus: "Media Size" (set to "Letter 8.5x11 in"), "Double-Sided Printing" (set to "Off"), "Output Mode" (set to "Color"), "Media Type" (set to "Plain Paper"), and "Print Quality" (set to "Normal"). A "Set Default Options" button is located at the bottom of the form.



Printer added and ready!

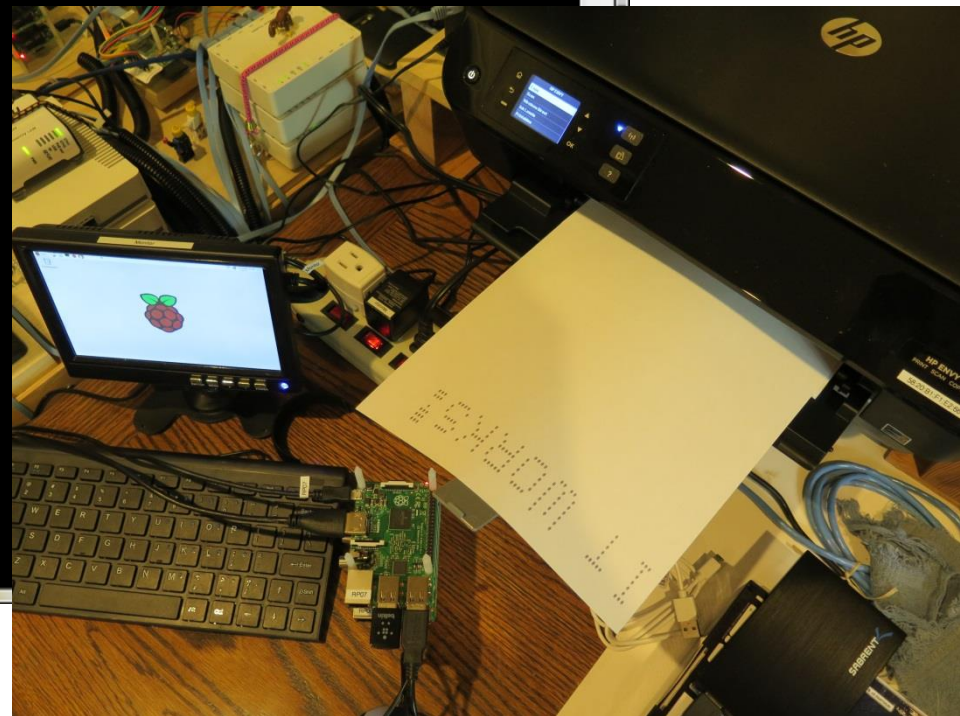


## Make it the default printer

The screenshot shows a Raspberry Pi desktop environment accessed via TightVNC. The desktop includes a menu, system tray with network, volume, and power icons, and a taskbar with a Raspberry Pi icon and a window titled 'HP\_ENVY\_4500\_series - C...'. A web browser window is open to the printer's configuration page at [https://192.168.88.122:631/printers/HP\\_ENVY\\_4500\\_series](https://192.168.88.122:631/printers/HP_ENVY_4500_series). The page title is 'HP\_ENVY\_4500\_series (Idle, Accepting Jobs, Not Shared, Server Default)'. The 'Defaults' section shows the 'Set As Server Default' checkbox is checked. Other visible options include 'Maintenance', 'Administration', 'Modify Printer', 'Delete Printer', 'Set Default Options', and 'Set Allowed Users'. The 'Jobs' section shows a search bar and buttons for 'Show Completed Jobs' and 'Show All Jobs', with the text 'No jobs.' below. A footer note states: 'CUPS and the CUPS logo are trademarks of Apple Inc. Copyright 2007-2014 Apple Inc. All rights reserved.'

Test from the command line to verify it works

```
rsimms@raspberrypi: ~  
rsimms@raspberrypi:~ $ banner "It Works!" | lp  
request id is HP_ENVY_4500_series-8 (0 file(s))  
rsimms@raspberrypi:~ $ █
```





# Photosmart c309n Configuration via CUPS

## Instructor Configuration Notes

```
(portwenn) NoPar#show ip dhcp binding
```

```
HP Photosmart Premium 18:A9:05:01:2D:30 => 172.30.1.xxx
```

```
Banana Pi (BP01) 02:d5:09:c0:f0:0f => 172.30.1.xxx
```

```
apt-get update
```

```
apt-get install tightvncserver
```

```
vncserver
```

```
apt-get install cups
```

```
apt-get install iceweasel
```

```
ssh <bp01-ip> 'vncserver'
```

```
TightVNC Viewer (www.tightvnc.com, typical install)
```

```
(opus) Remote Host: <bp01-ip>:5901
```

```
service cups start
```

```
Internet > iceweasel
```

```
http://localhost:631
```

```
AppSocket/HP JetDirect
```

```
socket://<printer-ip>:9100
```



**Make:** HP

**Model:**

- HP Photosmart Prem c310 Series, hpcups 3.12.6 (en)
- HP Photosmart Prem c410 Series hpijs, 3.12.6 (en)
- HP Photosmart Prem c410 Series, hpcups 3.12.6 (en)
- HP Photosmart Prem-web c309n-s hpijs, 3.12.6 (en)
- HP Photosmart Prem-web c309n-s, hpcups 3.12.6 (en)**
- HP Photosmart Premium c309g-m hpijs, 3.12.6 (en)
- HP Photosmart Premium c309g-m, hpcups 3.12.6 (en)
- HP PhotoSmart Pro B8300 CUPS/pdfioijs/hpijs (en)
- HP Photosmart Pro b8300 Series hpijs, 3.12.6 (en)
- HP Photosmart Pro b8300 Series, hpcups 3.12.6 (en)

# CUPS

Example printer configuration

Printer: HP PhotoSmart Premium C309n-s  
Connection: LAN



# CUPS



Networked HP printers have a built in web-server

IP Address for this printer is 192.168.1.100

HP Photosmart Prem-Web C309n-s

192.168.1.100

Status: Ready Tuesday, 2015-04-28 08:58:38

Device Information

Status

Device: HP Photosmart Prem-Web C309n-s  
Status: Ready

Estimated Ink Levels:

Items Needing Attention:

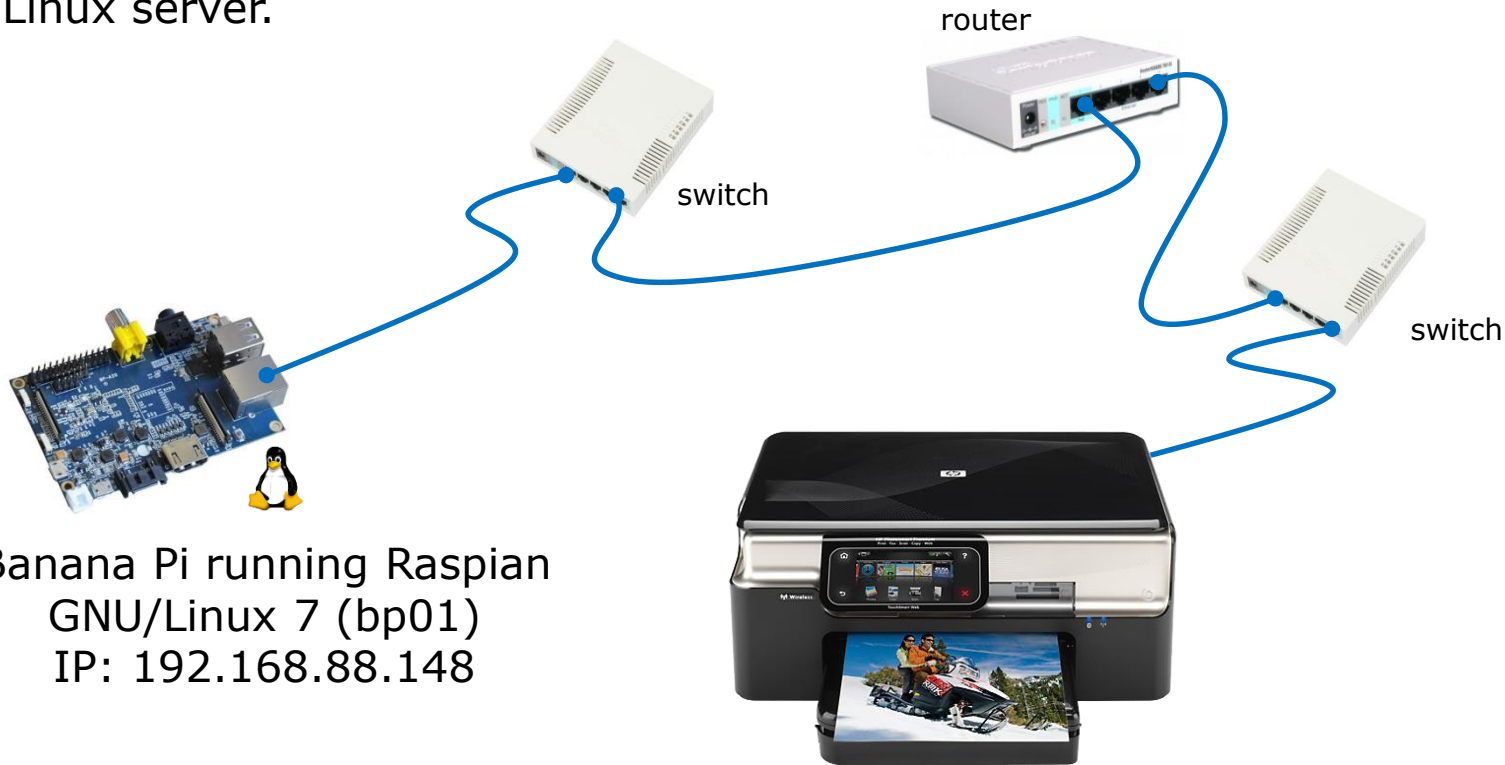
\*Estimate only. Actual ink levels may vary.

Details

| Device:                                |                                | Ink Cartridge: |                 |                                 |                              |             |
|----------------------------------------|--------------------------------|----------------|-----------------|---------------------------------|------------------------------|-------------|
| Product Name                           | HP Photosmart Prem-Web C309n-s | Color          | Supply Zone(PX) | First Installation Date (Y-M-D) | End-of-Warranty Date (Y-M-D) | Part Number |
| Product Model Number                   | CD734A                         | Black          | 2               | 2015-02-12                      | 2016-08-19                   | HP 564XL    |
| Product Serial Number                  | MY99H2718305DJ                 | Yellow         | 2               | 2015-03-19                      | 2016-09-23                   | HP 564XL    |
| Service ID                             | 20250                          | Cyan           | 2               | 2015-03-19                      | 2016-10-07                   | HP 564XL    |
| Printer ID                             | 2                              | Magenta        | 2               | 2015-03-19                      | 2016-10-14                   | HP 564XL    |
| Firmware Version                       | SPI2FN0948AR                   | Photo Black    | 2               | 2015-03-19                      | 2016-10-28                   | HP 564XL    |
| Automatic Two-Sided Printing Accessory | Installed                      |                |                 |                                 |                              |             |
| Admin Password                         | Not Set                        |                |                 |                                 |                              |             |
| Total Page Count                       | 1552                           |                |                 |                                 |                              |             |
| PCL Default Symbol Set                 | 341                            |                |                 |                                 |                              |             |

# CUPS

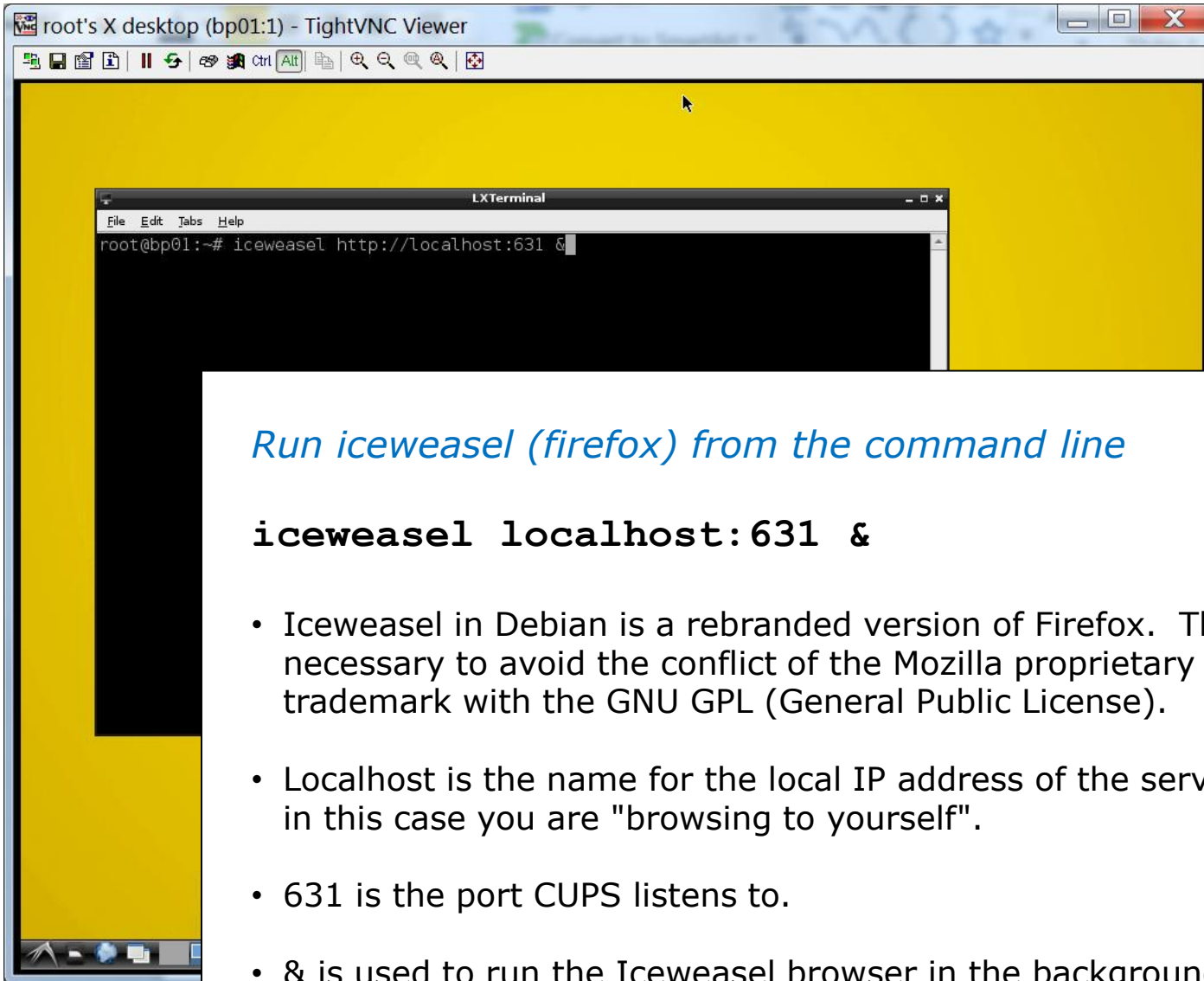
This example will show how to add an HP PhotoSmart Premium C309n-s printer located on a different subnet than the Linux server.



Banana Pi running Raspian  
GNU/Linux 7 (bp01)  
IP: 192.168.88.148

HP PhotoSmart Premium C309n-s (inky)  
IP: 192.168.1.100





*Run iceweasel (firefox) from the command line*

**iceweasel localhost:631 &**

- Iceweasel in Debian is a rebranded version of Firefox. This was necessary to avoid the conflict of the Mozilla proprietary trademark with the GNU GPL (General Public License).
- Localhost is the name for the local IP address of the server since in this case you are "browsing to yourself".
- 631 is the port CUPS listens to.
- & is used to run the Iceweasel browser in the background so we can continue to enter more commands in the terminal session if desired.

# CUPS



root's X desktop (bp01:1) - TightVNC Viewer

Or run iceweasel (firefox) from the menu from the start menu and browse to:

`http://localhost:631`

www.bananapi.com

- Accessories
- Education
- Electronics
- Graphics
- Internet
  - Dillo
  - Iceweasel
  - Midori
  - Midori Private Browsing
  - NetSurf Web Browser
  - wpa\_gui
- Other
- Programming
- Sound & Video
- System Tools
- Preferences
- Run
- Logout

17:56

The screenshot shows a web browser window titled "Home - CUPS 1.5.3 - Iceweasel" with the address bar set to "localhost:631". The page content includes a navigation menu with "Home", "Administration", "Classes", "Online Help", "Jobs", and "Printers". The main heading is "CUPS 1.5.3" with a subtext: "CUPS is the standards-based, open source printing system developed by Apple Inc. for Mac OS® X and other UNIX®-like operating systems." To the right is the "UNIX PRINTING SYSTEM" logo. Below are three columns of links: "CUPS for Users" (Overview of CUPS, Command-Line Printing and Options, What's New in CUPS 1.5, User Forum), "CUPS for Administrators" (Adding Printers and Classes, Managing Operation Policies, Printer Accounting Basics, Server Security, Using Kerberos Authentication, Using Network Printers, cupsd.conf Reference, Find Printer Drivers), and "CUPS for Developers" (Introduction to CUPS Programming, CUPS API, Filter and Backend Programming, HTTP and IPP APIs, PPD API, Raster API, PPD Compiler Driver Information File Reference, Developer Forum). The browser's taskbar at the bottom shows the time as 18:01.





root's X desktop (bp01:1) - TightVNC Viewer

Administration - CUPS 1.5.3 - Iceweasel

Administration - CUPS 1.5.3

localhost: 631/admin

Home Administration Classes Online Help Jobs Printers

**Printers**

Add Printer Find New Printers Manage Printers

**Classes**

Add Class Manage Classes

**Jobs**

Manage Jobs

**Server**

Edit Configuration File View Access Log View Error Log View Page Log

**Server Settings:**

Advanced ▶

- Show printers shared by other systems
- Share printers connected to this system
  - Allow printing from the Internet
- Allow remote administration
- Use Kerberos authentication (FAQ)
- Allow users to cancel any job (not just their own)
- Save debugging information for troubleshooting

Change Settings

**RSS Subscrip**

Add RSS Subscription

CUPS and the CUPS logo are trad

Administration - CUPS ... 18:02

Select the Administration tab and click Add Printer button to add the printer



root's X desktop (bp01:1) - TightVNC Viewer

Administration - CUPS 1.5.3 - Iceweasel

Connecting... x

localhost: 631/admin

Home Administration Classes Online Help Jobs Printers Search Help

### Printers

Add Printer Find New Printers Manage Printers

### Classes

Add Class Manage Classes

### Jobs

Manage Jobs

### Server

Edit Configuration File View Access Log View Error Log View Page Log

**Authentication Required**

A username and password are being requested by http://localhost:631. The site says: "CUPS"

User Name:

Password:

Cancel OK

Allow users to cancel any job (not just their own)

Save debugging information for troubleshooting

Change Settings

**RSS Subscrip**

Add RSS Subscription

*Must authenticate to add new printer*



root's X desktop (bp01:1) - TightVNC Viewer

Add Printer - CUPS 1.5.3 - Iceweasel

localhost:631/admin/

Home Administration Classes Online Help Jobs Printers Search Help

### Add Printer

**Local Printers:**

- HP Printer (HPLIP)
- HP Fax (HPLIP)

**Discovered Network Printers:**

**Other Network Printers:**

- Internet Printing Protocol (https)
- Internet Printing Protocol (ippes)
- Internet Printing Protocol (ipp)
- AppSocket/HP JetDirect
- Internet Printing Protocol (http)
- LPD/LPR Host or Printer
- Windows Printer via SAMBA
- Backend Error Handler

Continue

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Add Printer - CUPS 1.5...

18:05

*If your printer is on the same subnet as the Linux server then it will be discovered automatically. In this case it's not.*

*For networked HP printers select the JetDirect option.*



root's X desktop (bp01:1) - TightVNC Viewer

Add Printer - CUPS 1.5.3 - Iceweasel

localhost: 631/admin

Home Administration Classes Online Help Jobs Printers Search Help

## Add Printer

Connection:

Examples:

```
http://hostname: 631/ipp/  
http://hostname: 631/ipp/port1  
  
ipp://hostname/ipp/  
ipp://hostname/ipp/port1  
  
lpd://hostname/queue  
  
socket://hostname  
socket://hostname: 9100
```

See "Network Printers" for the correct URI to use with your printer.

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Add Printer - CUPS 1.5.... 18:07

`socket://<ip-of-printer>:9100`

*9100 is the port that the HP JetDirect module listens to*

root's X desktop (bp01:1) - TightVNC Viewer

Add Printer - CUPS 1.5.3 - Newseasel

localhost:631/admin

Home Administration Classes Online Help Jobs Printers Search Help

## Add Printer

**Name:**   
(May contain any printable characters except "/", "#", and space)

**Description:**   
(Human-readable description such as "HP LaserJet with Duplexer")

**Location:**   
(Human-readable location such as "Lab 1")

**Connection:** socket://192.168.1.100:9100

**Sharing:**  Share This Printer

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Add Printer - CUPS 1.5...

18:12



*Customize the printer properties*





root's X desktop (bp01:1) - TightVNC Viewer

Add Printer - CUPS 1.5.3 - Iceweasel

Add Printer - CUPS 1.5.3

localhost:631/admin

Home Administration Classes Online Help Jobs Printers Search Help

## Add Printer

**Name:** Inky  
**Description:** HP PhotoSmart Premium C309n-s  
**Location:** Desk at top of stairs  
**Connection:** socket://192.168.1.100:9100  
**Sharing:** Do Not Share This Printer

**Make:**

- Fujitsu
- Generic
- Genicom
- Gestetner
- Heidelberg
- Hitachi
- HP**
- IBM
- Imagen
- Imagistics
- Infoprint

Continue

**Or Provide a PPD File:** Browse... No file selected.  
Add Printer

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18:13

*Select the make of the printer  
and continue*



root's X desktop (bp01:1) - TightVNC Viewer

Add Printer - CUPS 1.5.3 - Iceweasel

localhost:631/admin

Home Administration Classes Online Help Jobs Printers Search Help

## Add Printer

**Name:** Inky  
**Description:** HP PhotoSmart Premium C309n-s  
**Location:** Desk at top of stairs  
**Connection:** socket://192.168.1.100:9100  
**Sharing:** Do Not Share This Printer  
**Make:** HP

**Model:**

- HP Photosmart Prem c410 Series hpjjs, 3.12.6 (en)
- HP Photosmart Prem c410 Series, hpcups 3.12.6 (en)
- HP Photosmart Prem-web c309n-s hpjjs, 3.12.6 (en)
- HP Photosmart Prem-web c309n-s, hpcups 3.12.6 (en)**
- HP Photosmart Premium c309g-m hpjjs, 3.12.6 (en)
- HP Photosmart Premium c309g-m, hpcups 3.12.6 (en)
- HP PhotoSmart Pro B8300 CUPS/pdfjois/hpjjs (en)
- HP Photosmart Pro b8300 Series hpjjs, 3.12.6 (en)
- HP Photosmart Pro b8300 Series, hpcups 3.12.6 (en)
- HP Photosmart Pro b8800 Series hpjjs, 3.12.6 (en)

**Or Provide a PPD File:**  No file selected.

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Add Printer - CUPS 1.5...

18:14

*Select the printer driver*



root's X desktop (bp01:1) - TightVNC Viewer

Set Printer Options - CUPS 1.5.3 Iceweasel

localhost:631/admin

Home Administration Classes Online Help Jobs Printers Search Help

## Set Default Options for Inky

[General](#) [Options Installed](#) [Banners](#) [Policies](#)

### General

Media Size: Letter 8.5x11in

Double-Sided Printing: Off

Media Source: Auto-Select

Output Mode: Color

Media Type: Automatic

Print Quality: Normal

Set Default Options

Set Printer Options - C...

18:15

*Set default printing options for new printer*



root's X desktop (bp01:1) - TightVNC Viewer

Inky - CUPS 1.5.3 - Iceweasel

Inky - CUPS 1.5.3

localhost:631/printers/Inky

Home Administration Classes Online Help Jobs Printers Search Help

## Inky (Idle, Accepting Jobs, Not Shared)

Maintenance Administration

**Description:** HP PhotoSmart Premium C309n-s  
**Location:** Desk at top of stairs  
**Driver:** HP Photosmart Prem-web c309n-s, hpcups 3.12.6 (color, 2-sided printing)  
**Connection:** socket://192.168.1.100:9100  
**Defaults:** job-sheets=none, none media=na\_letter\_8.5x11in sides=one-sided

### Jobs

Search in Inky:  Search Clear

Show Completed Jobs Show All Jobs

*Ready to roll!*

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# LaserJet 1320n Configuration via CUPS

# CUPS

Example printer configuration



Printer: HP LaserJet 1320n  
Connection: LAN

# CUPS



*The LaserJets have a web-based management utility*

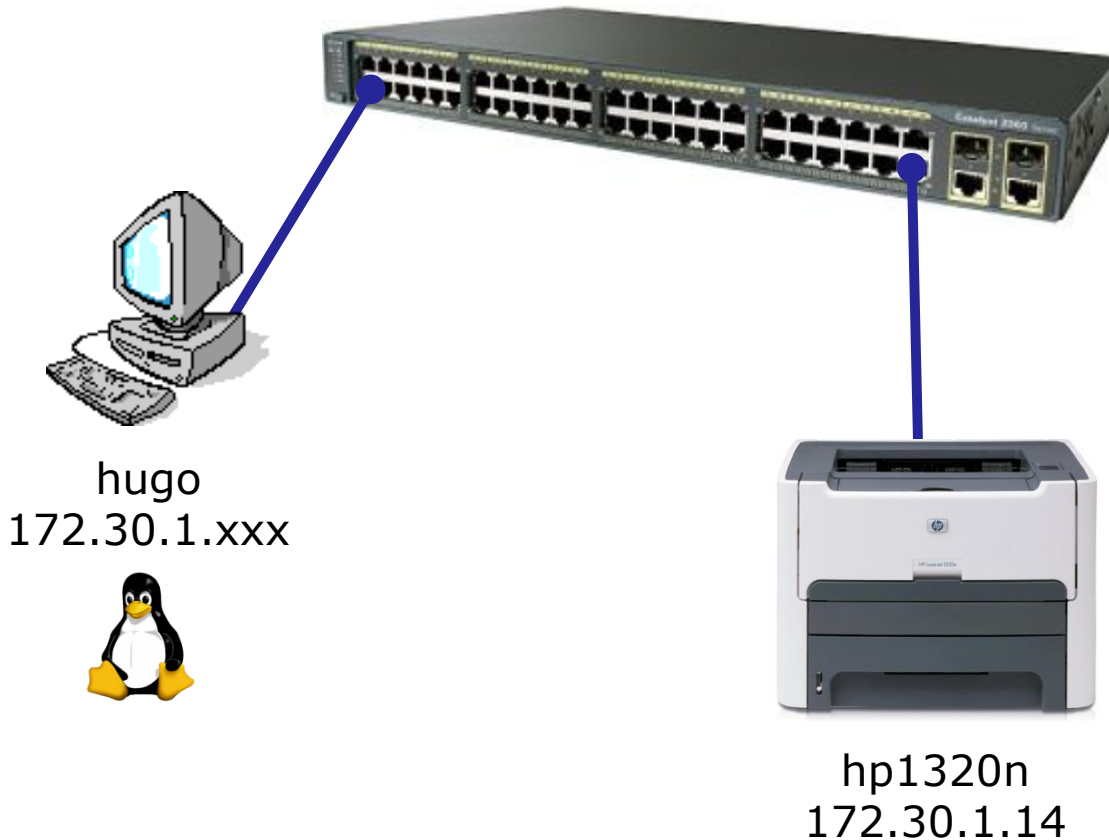
The screenshot shows a web browser window displaying the HP LaserJet 1320 series web-based management utility. The browser address bar shows the IP address 172.30.1.14. The page has a blue header with the HP logo and the text "hp LaserJet 1320 series". Below the header, there are tabs for "Information", "Settings", and "Networking". The "Information" tab is selected, showing a "Device Status" section with a "Status: Ready" indicator and buttons for "Refresh Status", "Enter", and "Cancel Job". Below this, there is a "Supplies" section with a "Toner: (% Remaining)" indicator and a progress bar showing 97% remaining for the "Black Cartridge". A "Supplies Details" link is provided. At the bottom, there is a "Product Information" section with a table of device details.

| Product Information    |                         |
|------------------------|-------------------------|
| Product Name:          | hp LaserJet 1320 series |
| Formatter Number:      | JH03T2Z                 |
| Product Serial Number: | CNHC6360LV              |
| Service ID:            | 16101                   |
| Firmware Datecode:     | 20041024                |
| Total Memory:          | 16 MBytes               |

*IP Address for this 1320n  
is 172.30.1.14*

# CUPS

*This example will show how to add the HP 1320n as a networked printer.*





# CUPS



The image shows a terminal window titled "Hugo [Running] - Oracle VM VirtualBox". The terminal output shows the following commands and results:

```
rsimms@hugo:~$ ps -l
F S  UID  PID  PPID  C  PRI  NI ADDR  SZ  WCHAN  TTY          TIME CMD
0 S  1000  1797  1787  2  80   0  -  1777 wait   pts/0    00:00:00 bash
0 R  1000  1856  1797  0  80   0  -  1172 -      pts/0    00:00:00 ps
rsimms@hugo:~$ ps -ef | grep cups
root      674    1  0  20:24 ?        00:00:00 /usr/sbin/cupsd -F
rsimms   1878  1797  0  20:26 pts/0    00:00:00 grep --color=auto cups
rsimms@hugo:~$ firefox localhost:631 &
```

A white text box is overlaid on the terminal window, containing the following text:

*Access the CUPS service using a web browser with*

```
rsimms@hugo:~$ firefox localhost:631 &
```

Hugo [Running] - Oracle VM VirtualBox

Machine View Devices Help

File Edit View History Bookmarks Tools Help

Home - CUPS 1.5.2


localhost:631

Google

Home Administration Classes Online Help Jobs Printers Search Help

## CUPS 1.5.2

CUPS is the standards-based, open source printing system developed by [Apple Inc.](#) for Mac OS® X and other UNIX®-like operating systems.



### CUPS for Users

- [Overview of CUPS](#)
- [Command-Line Printing and Options](#)
- [What's New in CUPS 1.5](#)
- [User Forum](#)

### CUPS for Administrators

- [Adding Printers and Classes](#)
- [Managing Operation Policies](#)
- [Printer Accounting Basics](#)
- [Server Security](#)
- [Using Kerberos Authentication](#)
- [Using Network Printers](#)
- [cupsd.conf Reference](#)
- [Find Printer Drivers](#)

### CUPS for Developers

- [Introduction to CUPS Programming](#)
- [CUPS API](#)
- [Filter and Backend Programming](#)
- [HTTP and IPP APIs](#)
- [PPD API](#)
- [Raster API](#)
- [PPD Compiler Driver Information File Reference](#)
- [Developer Forum](#)

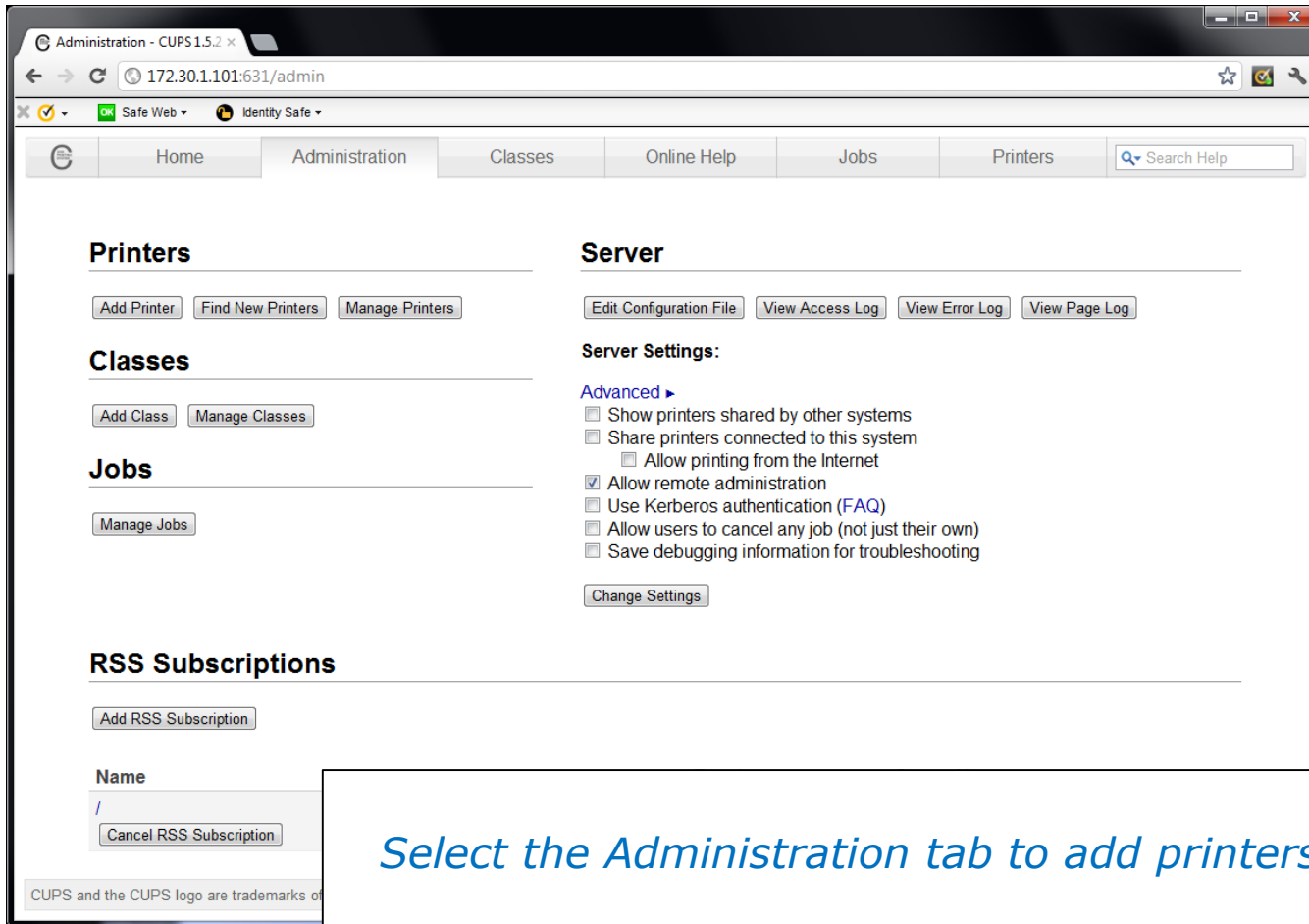
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The screenshot shows a web browser window with the address bar displaying "172.30.1.101:631". The page title is "Home - CUPS 1.5.2". The navigation menu includes "Home", "Administration", "Classes", "Online Help", "Jobs", and "Printers", along with a "Search Help" field. The main content area features the heading "CUPS 1.5.2" and a description: "CUPS is the standards-based, open source printing system developed by Apple Inc. for Mac OS® X and other UNIX®-like operating systems." To the right is the "UNIX PRINTING SYSTEM" logo. Below this, there are three columns of links: "CUPS for Users" (Overview of CUPS, Command-Line Printing and Options, What's New in CUPS 1.5, User Forum), "CUPS for Administrators" (Adding Printers and Classes, Managing Operation Policies, Printer Accounting Basics, Server Security, Using Kerberos Authentication, Using Network Printers, cupsd.conf Reference, Find Printer Drivers), and "CUPS for Developers" (Introduction to CUPS Programming, CUPS API, Filter and Backend Programming, HTTP and IPP APIs, PPD API, Raster API, PPD Compiler Driver Information File Reference, Developer Forum). A footer note states "CUPS and the CUPS logo are trademarks of Apple Inc., registered in the U.S. and other countries."

*Access the CUPS service remotely using a web browser on a different system*



The screenshot shows a web browser window titled "Administration - CUPS 1.5.2" with the address bar at "172.30.1.101:631/admin". The navigation menu includes "Home", "Administration", "Classes", "Online Help", "Jobs", and "Printers". The "Administration" tab is selected. The main content area is divided into several sections: "Printers" with buttons for "Add Printer", "Find New Printers", and "Manage Printers"; "Classes" with "Add Class" and "Manage Classes"; "Jobs" with "Manage Jobs"; "Server" with "Edit Configuration File", "View Access Log", "View Error Log", and "View Page Log"; "Server Settings" with an "Advanced" section containing checkboxes for "Show printers shared by other systems", "Share printers connected to this system" (with a sub-option "Allow printing from the Internet"), "Allow remote administration" (checked), "Use Kerberos authentication (FAQ)", "Allow users to cancel any job (not just their own)", and "Save debugging information for troubleshooting"; and "RSS Subscriptions" with an "Add RSS Subscription" button. A "Name" field with a slash "/" and a "Cancel RSS Subscription" button are also visible. A blue text box at the bottom of the screenshot reads: "Select the Administration tab to add printers".



The screenshot shows the CUPS 1.5.2 administration web interface. The browser address bar shows <https://172.30.1.101:631/admin/>. The interface has a navigation menu with "Home", "Administration", "Classes", "Online Help", "Jobs", and "Printers". The "Administration" section is active, showing "Printers" and "Server" sub-sections. A modal dialog box titled "Authentication Required" is displayed in the foreground. The dialog contains the following text: "The server 172.30.1.101:631 requires a username and password. The server says: CUPS." Below this text are two input fields: "User Name:" with the value "rsimms" and "Password:" with a masked value "\*\*\*\*\*". At the bottom of the dialog are "Log In" and "Cancel" buttons.

*Must authenticate to add new printer*



The screenshot shows a web browser window titled "Add Printer - CUPS 1.5.2" with the URL "https://172.30.1.101:631/admin/". The browser's address bar shows "https://172.30.1.101:631/admin/". The page has a navigation menu with "Home", "Administration", "Classes", "Online Help", "Jobs", and "Printers". A "Search Help" box is also present. The main content area is titled "Add Printer" and lists three categories of printers:

- Local Printers:**
  - HP Printer (HPLIP)
  - HP Fax (HPLIP)
- Discovered Network Printers:**
  - hp LaserJet 1320 series (9C595F) (hp hp LaserJet 1320 series)
  - hp LaserJet 1320 series (9C595F) (hp hp LaserJet 1320 series)
- Other Network Printers:**
  - Backend Error Handler
  - LPD/LPR Host or Printer
  - Internet Printing Protocol (https)
  - Internet Printing Protocol (ipp)
  - Internet Printing Protocol (ipp)
  - AppSocket/HP JetDirect
  - Internet Printing Protocol (http)
  - Windows Printer via SAMBA

A "Continue" button is located at the bottom of the list.

*Nice! CUPS service already discovered a printer on the network*



The screenshot shows a web browser window titled "Add Printer - CUPS 1.5.2" with the address bar displaying "https://172.30.1.101:631/admin". The browser interface includes a navigation menu with "Home", "Administration", "Classes", "Online Help", "Jobs", and "Printers", along with a "Search Help" field. The main content area is titled "Add Printer" and contains the following form fields:

- Name:** HP\_LaserJet\_1320\_series (Note: May contain any printable characters except "/", "#", and space)
- Description:** HP LaserJet 1320 series (Note: Human-readable description such as "HP LaserJet with Duplexer")
- Location:** Family room (Note: Human-readable location such as "Lab 1")
- Connection:** socket://172.30.1.14
- Sharing:**  Share This Printer

A "Continue" button is located at the bottom of the form.

*Customize printer description*



The screenshot shows the 'Add Printer' page in the CUPS 1.5.2 web interface. The browser address bar shows 'https://172.30.1.101:631/admin'. The page has a navigation menu with 'Home', 'Administration', 'Classes', 'Online Help', 'Jobs', and 'Printers'. The main content area is titled 'Add Printer' and contains the following information:

- Name:** HP\_LaserJet\_1320\_series
- Description:** HP LaserJet 1320 series
- Location:** Family room
- Connection:** socket://172.30.1.14
- Sharing:** Do Not Share This Printer
- Make:** HP (with a dropdown menu showing 'Select Another Make/Manufacturer')
- Model:** A list box containing several printer models, with 'HP LaserJet 1320 Series hpjps pcl3, 3.12.2 (en)' selected.

At the bottom, there is a section 'Or Provide a PPD File:' with a 'Choose File' button (showing 'No file chosen') and an 'Add Printer' button.

*Select the printer driver*





A screenshot of a web browser window titled "Set Printer Options - CUPS". The address bar shows "https://172.30.1.101:631/admin". The page has a navigation menu with "Home", "Administration", "Classes", "Online Help", "Jobs", and "Printers". The main content area is titled "Set Default Options for HP\_LaserJet\_1320\_series" and includes a "Query Printer for Default Options" button. Below this are tabs for "General", "Printout Mode", "Banners", and "Policies". The "General" tab is active, showing settings for "Media Size" (Letter), "Printout Mode" (Normal), "Media Source" (Printer default), and "Double-Sided Printing" (Off). A "Set Default Options" button is at the bottom.

*Set default printing options for new printer*



The screenshot shows a web browser window with the address bar displaying `https://172.30.1.101:631/printers/HP_LaserJet_1320_series`. The browser's status bar shows "Safe Web" and "Identity Safe". The page has a navigation menu with tabs for "Home", "Administration", "Classes", "Online Help", "Jobs", and "Printers". A search box labeled "Search Help" is located to the right of the "Printers" tab.

### HP\_LaserJet\_1320\_series (Idle, Accepting Jobs, Not Shared)

Maintenance  Administration

**Description:** HP LaserJet 1320 series  
**Location:** Family room  
**Driver:** HP LaserJet 1320 Series hpijs pcl3, 3.12.2 (color, 2-sided printing)  
**Connection:** socket://172.30.1.14  
**Defaults:** job-sheets=none, none media=na\_letter\_8.5x11in sides=one-sided

### Jobs

Search in HP\_LaserJet\_1320\_series:

No jobs.

*Ready to roll!*



The screenshot shows a web browser window with the URL `https://172.30.1.101:631/printers/HP_LaserJet_1320_series`. The browser's address bar shows "Safe Web" and "Identity Safe" indicators. The page has a navigation menu with tabs for Home, Administration, Classes, Online Help, Jobs, and Printers. The main content area is titled "HP\_LaserJet\_1320\_series (Processing, Accepting Jobs, Not Shared)". Below the title are two dropdown menus for "Maintenance" and "Administration". The page lists printer details: "Description: HP LaserJet 1320 series", "Location: Family room", "Driver: HP LaserJet 1320 Series hpijs pcl3, 3.12.2 (color, 2-sided printing)", "Connection: socket://172.30.1.14", and "Defaults: job-sheets=none, none media=na\_letter\_8.5x11in sides=one-sided". A "Jobs" section contains a search bar for "HP\_LaserJet\_1320\_series" with "Search" and "Clear" buttons, and two buttons for "Show Completed Jobs" and "Show All Jobs". It states "Showing 1 of 1 active job." Below this is a table with columns for ID, Name, User, Size, Pages, State, and Control. One job is listed with ID "HP\_LaserJet\_1320\_series-1", Name "Unknown", User "Withheld", Size "1k", Pages "Unknown", State "processing since", and Control buttons "Cancel Job" and "Move Job".

**HP\_LaserJet\_1320\_series (Processing, Accepting Jobs, Not Shared)**

Maintenance Administration

**Description:** HP LaserJet 1320 series  
**Location:** Family room  
**Driver:** HP LaserJet 1320 Series hpijs pcl3, 3.12.2 (color, 2-sided printing)  
**Connection:** socket://172.30.1.14  
**Defaults:** job-sheets=none, none media=na\_letter\_8.5x11in sides=one-sided

**Jobs**

Search in HP\_LaserJet\_1320\_series: Search Clear

Show Completed Jobs Show All Jobs

Showing 1 of 1 active job.

| ID                        | Name    | User     | Size | Pages   | State            | Control             |
|---------------------------|---------|----------|------|---------|------------------|---------------------|
| HP_LaserJet_1320_series-1 | Unknown | Withheld | 1k   | Unknown | processing since | Cancel Job Move Job |

*Printing a test page*



The screenshot shows a web browser window with the address bar displaying `https://172.30.1.101:631/printers/HP_LaserJet_1320_series`. The browser's address bar also shows "Safe Web" and "Identity Safe" indicators. The page has a navigation menu with tabs for "Home", "Administration", "Classes", "Online Help", "Jobs", and "Printers". A search box labeled "Search Help" is located to the right of the "Printers" tab. The main content area features the heading "HP\_LaserJet\_1320\_series (Idle, Accepting Jobs, Not Shared)". Below this heading are two dropdown menus for "Maintenance" and "Administration". The page lists the following details: "Description: HP LaserJet 1320 series", "Location: Family room", "Driver: HP LaserJet 1320 Series hpijs pcl3, 3.12.2 (color, 2-sided printing)", "Connection: socket://172.30.1.14", and "Defaults: job-sheets=none, none media=na\_letter\_8.5x11in sides=one-sided". A "Jobs" section contains a search box labeled "Search in HP\_LaserJet\_1320\_series:" with "Search" and "Clear" buttons. Below the search box are two buttons: "Show Completed Jobs" and "Show All Jobs". The text "No jobs." is displayed at the bottom of the jobs section.

*Printed ... this printer is ready to go!*