Rich's lesson module checklist

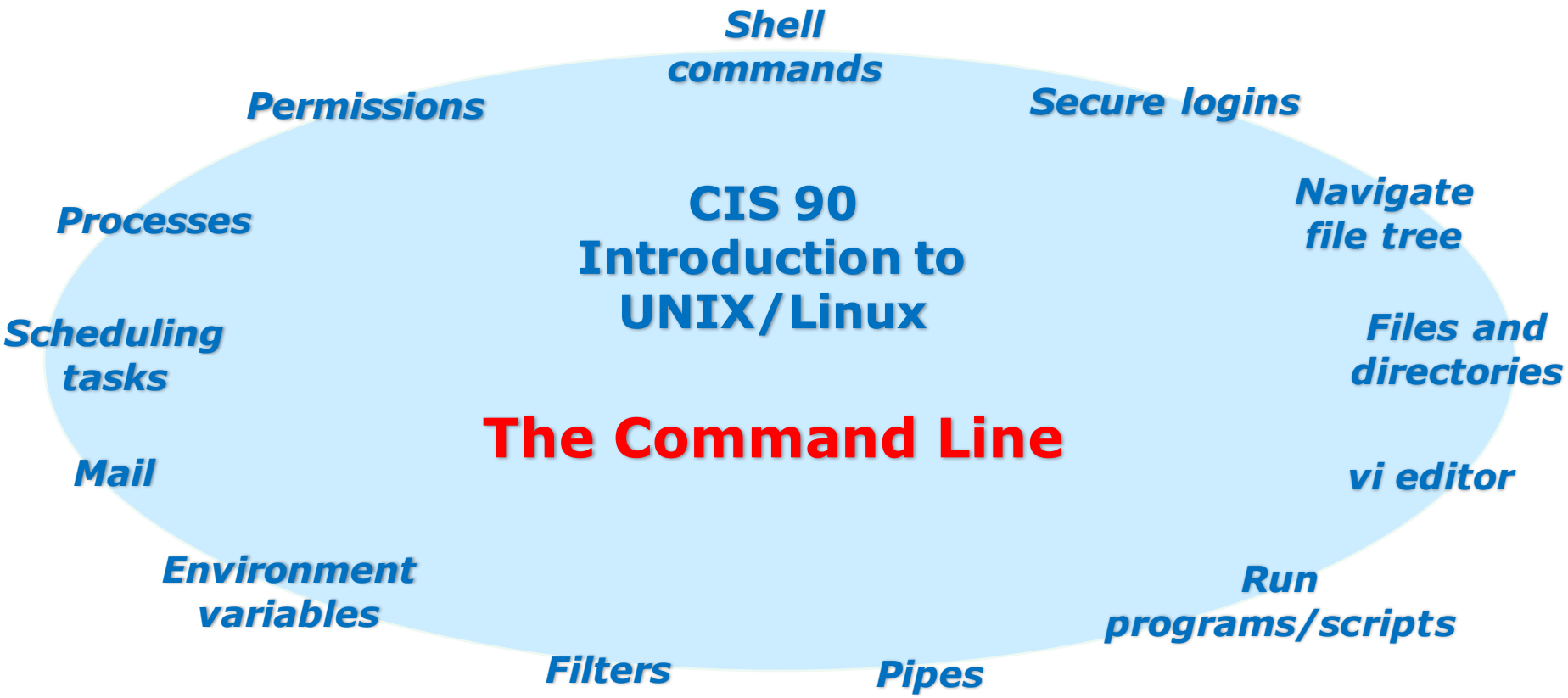
- ❑ Slides, Project, Lab X1 and Lab X2 posted
- ❑ WB converted from PowerPoint
- ❑ Print out agenda slide and annotate page numbers

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

- ❑ CUPS & printer demo equipment
- ❑ LabX1 and Project posted
- ❑ Timer lock set on turnin directory

- ❑ Backup slides, CCC info, handouts on flash drive
- ❑ Spare 9v battery for mic
- ❑ Key card for classroom door

Last updated 11/23/2016



Student Learner Outcomes

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

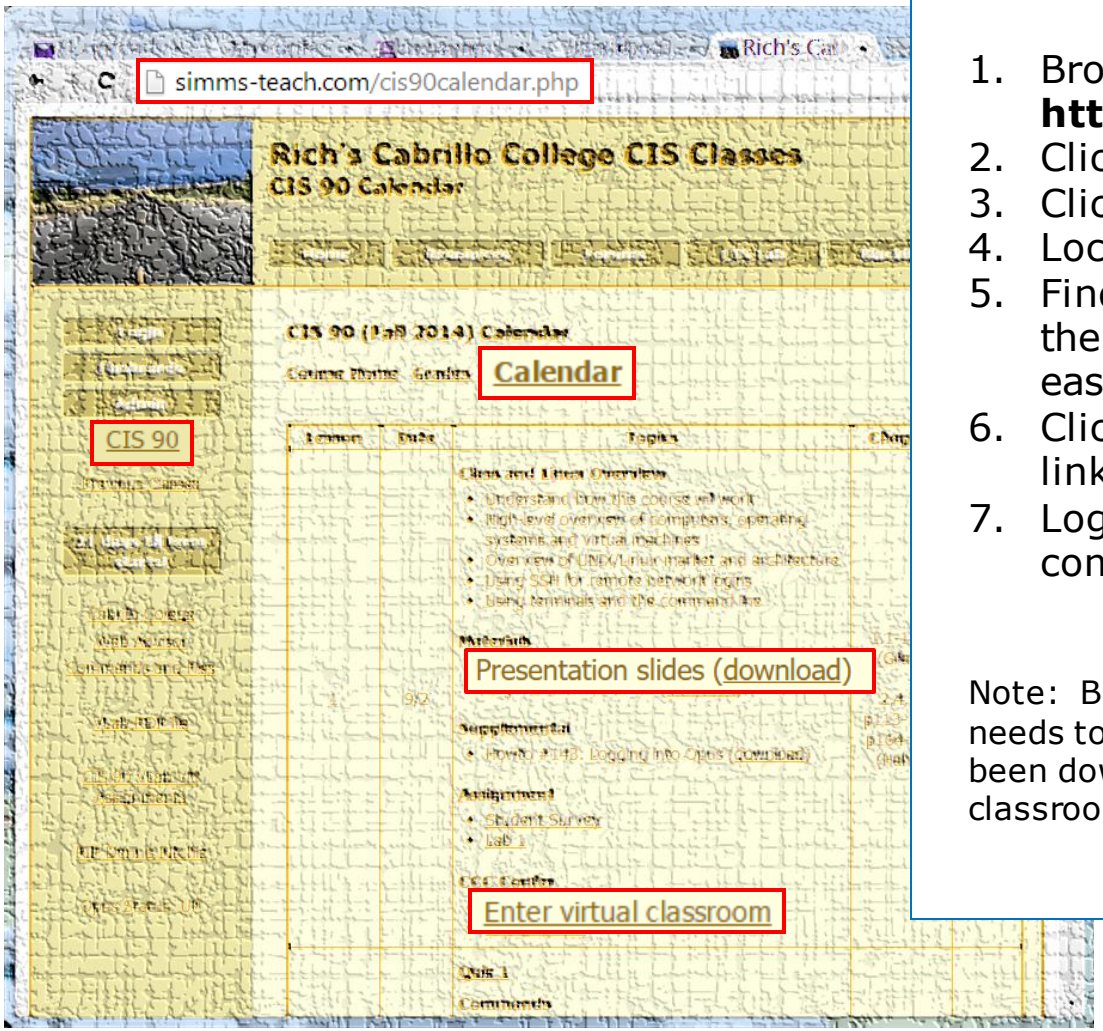
Introductions and Credits

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

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

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

Student checklist for attending class

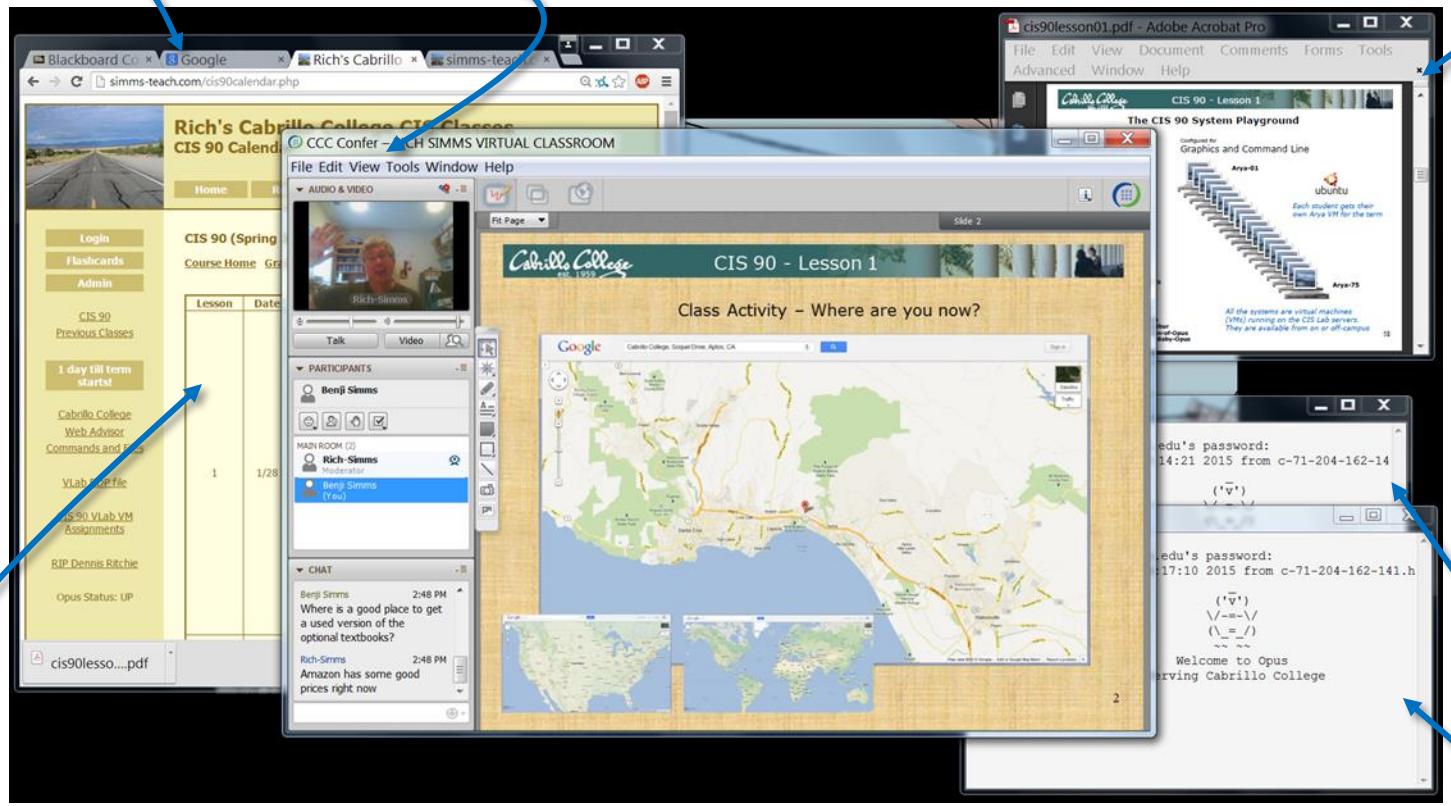


1. Browse to: **http://simms-teach.com**
2. Click the **CIS 90** link.
3. Click the **Calendar** link.
4. Locate today's lesson.
5. Find the **Presentation slides** for the lesson and **download** for easier viewing.
6. Click the **Enter virtual classroom** link to join CCC Confer.
7. Log into Opus with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

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

Student checklist for suggested screen layout

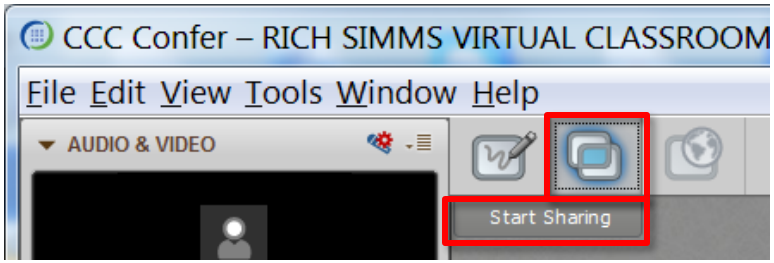
- ❑ *Google*
- ❑ *CCC Confer*
- ❑ *Downloaded PDF of Lesson Slides*



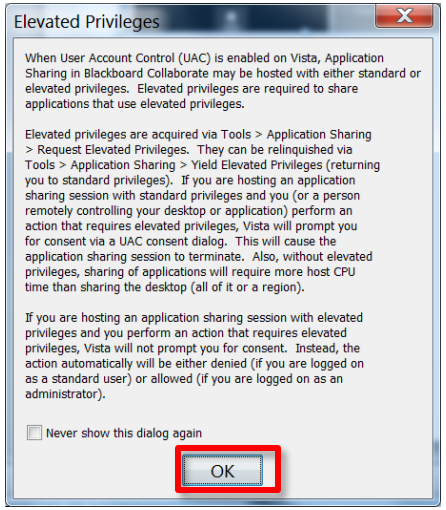
- ❑ *CIS 90 website Calendar page*
- ❑ *One or more login sessions to Opus*

Student checklist for sharing desktop with classmates

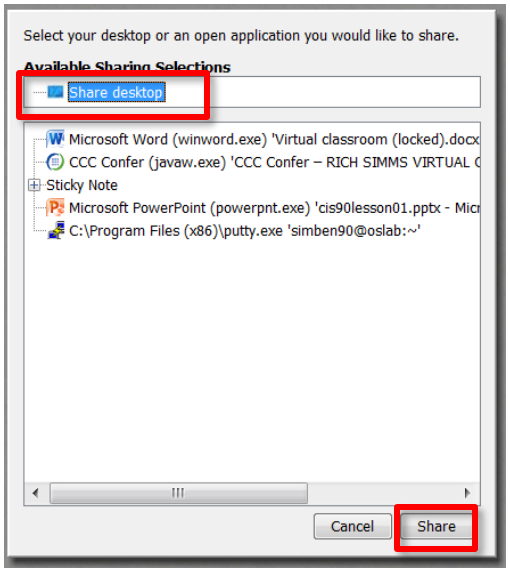
1) Instructor gives you sharing privileges



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



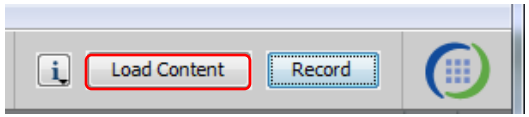
3) Click OK button.



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

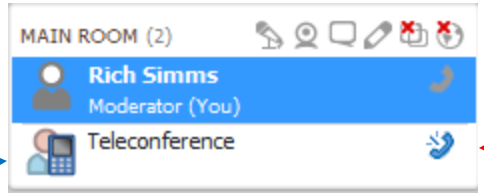
Rich's CCC Confer checklist - setup

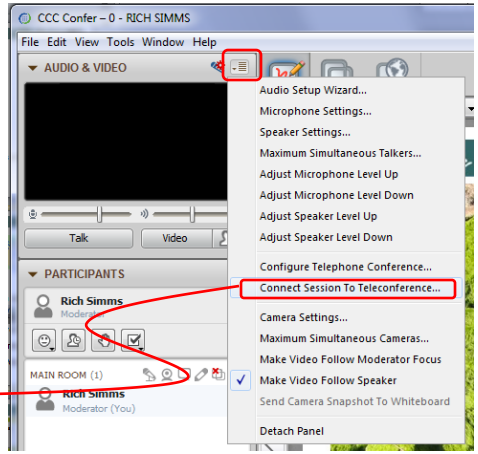
[ ] Preload White Board



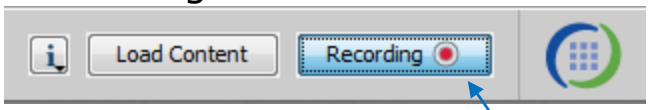
[ ] Connect session to Teleconference

Session now connected to teleconference





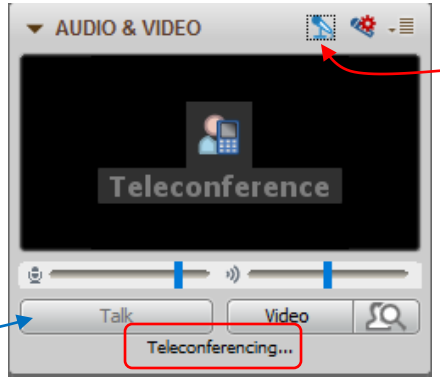
[ ] Is recording on?



Red dot means recording

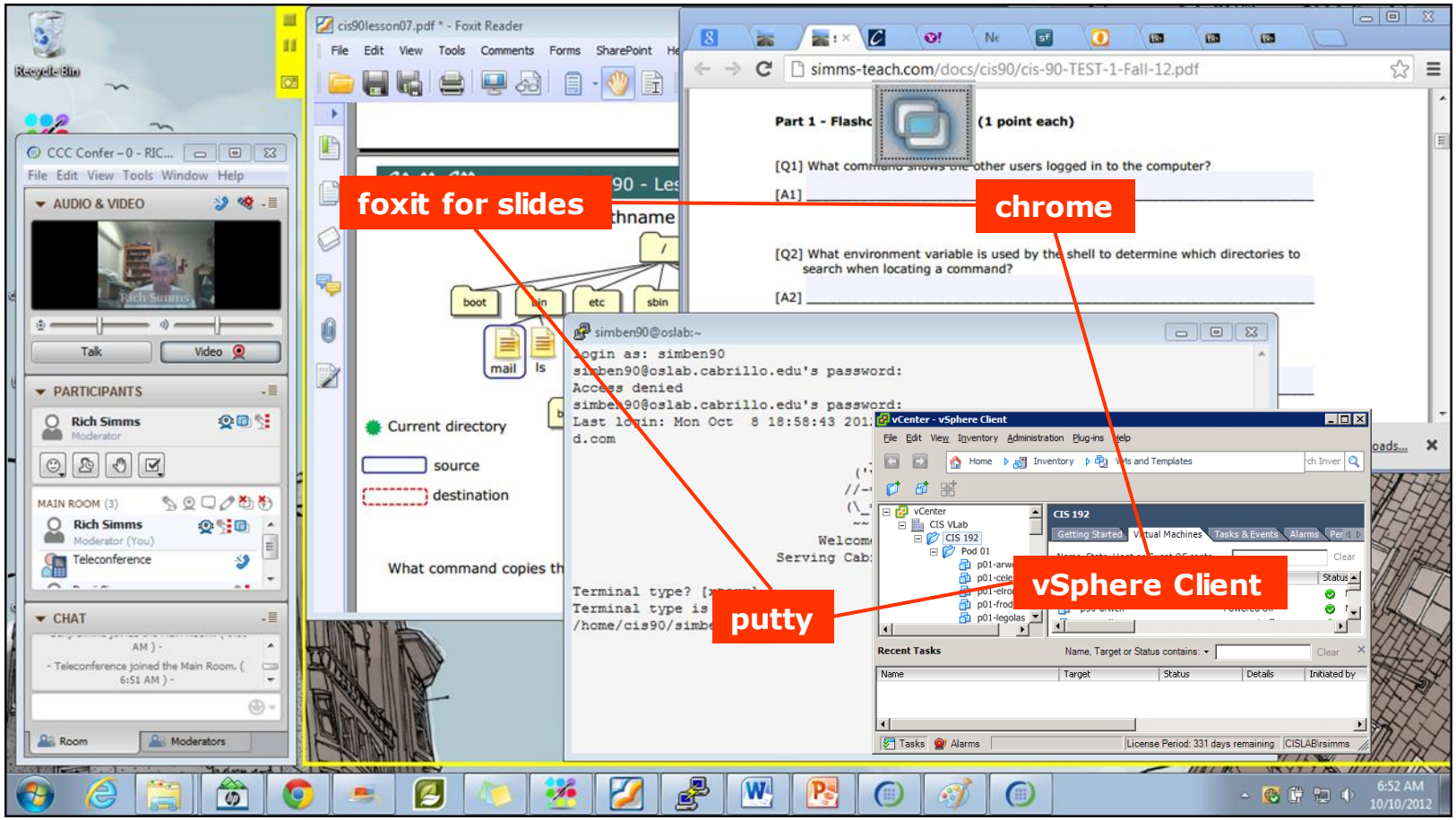
[ ] Use teleconferencing, not mic

Should be grayed out



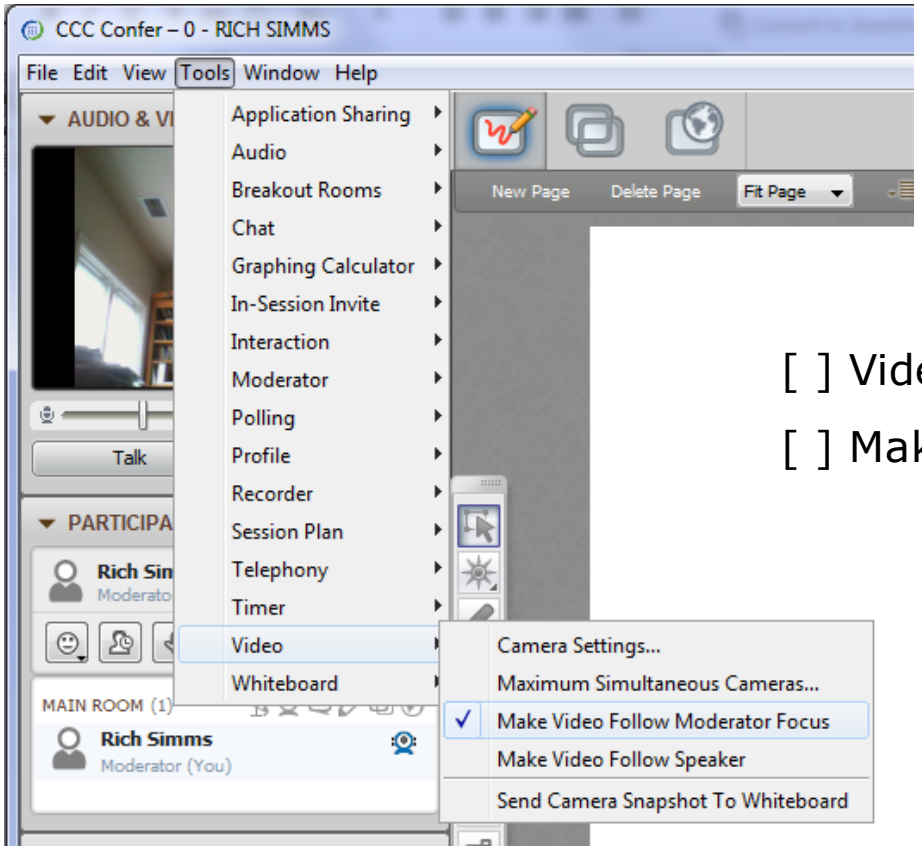
Should change from phone handset icon to little Microphone icon and the Teleconferencing ... message displayed

Rich's CCC Confer checklist - screen layout



[ ] layout and share apps

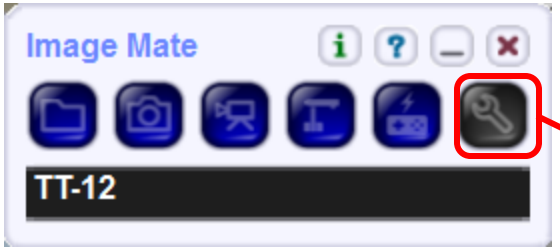
Rich's CCC Confer checklist - webcam setup

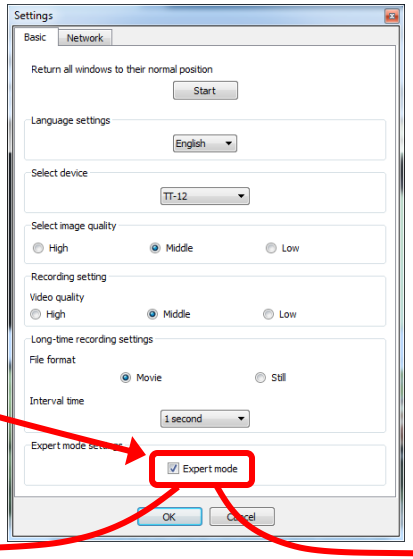


[ ] Video (webcam)

[ ] Make Video Follow Moderator Focus

Rich's CCC Confer checklist - Elmo



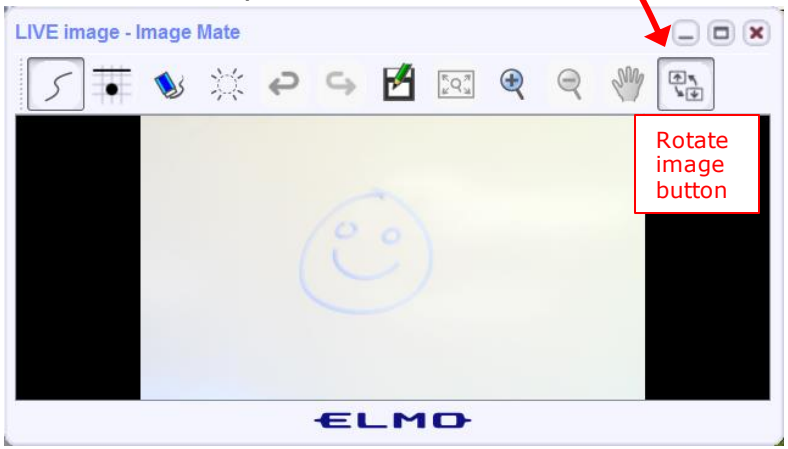


The "rotate image" button is necessary if you use both the side table and the white board.

Quite interesting that they consider you to be an "expert" in order to use this button!

Elmo rotated down to view side table

Elmo rotated up to view white board



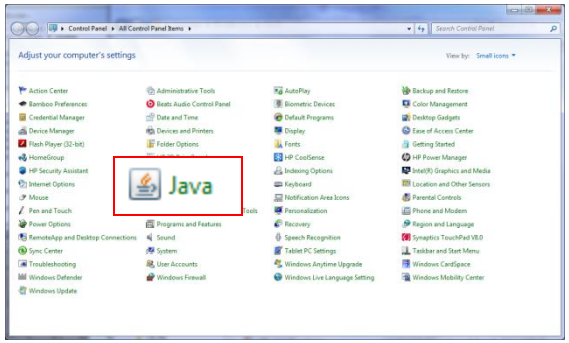
Run and share the Image Mate program just as you would any other app with CCC Confer

Rich's CCC Confer checklist - universal fixes

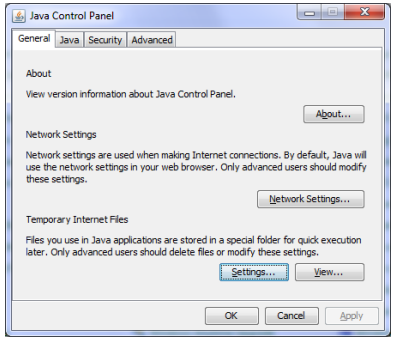
Universal Fix for CCC Confer:

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

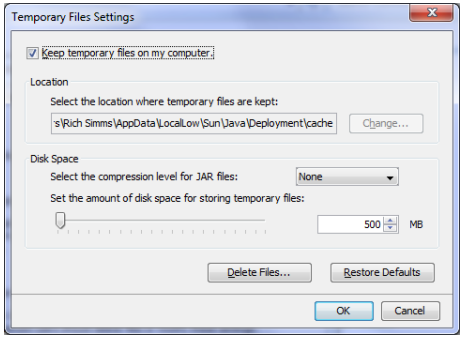
Control Panel (small icons)



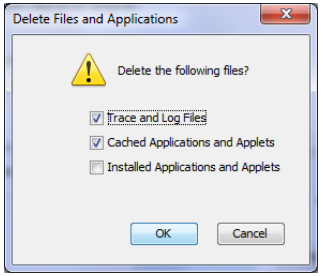
General Tab > Settings…



500MB cache size



Delete these



Google Java download

Start

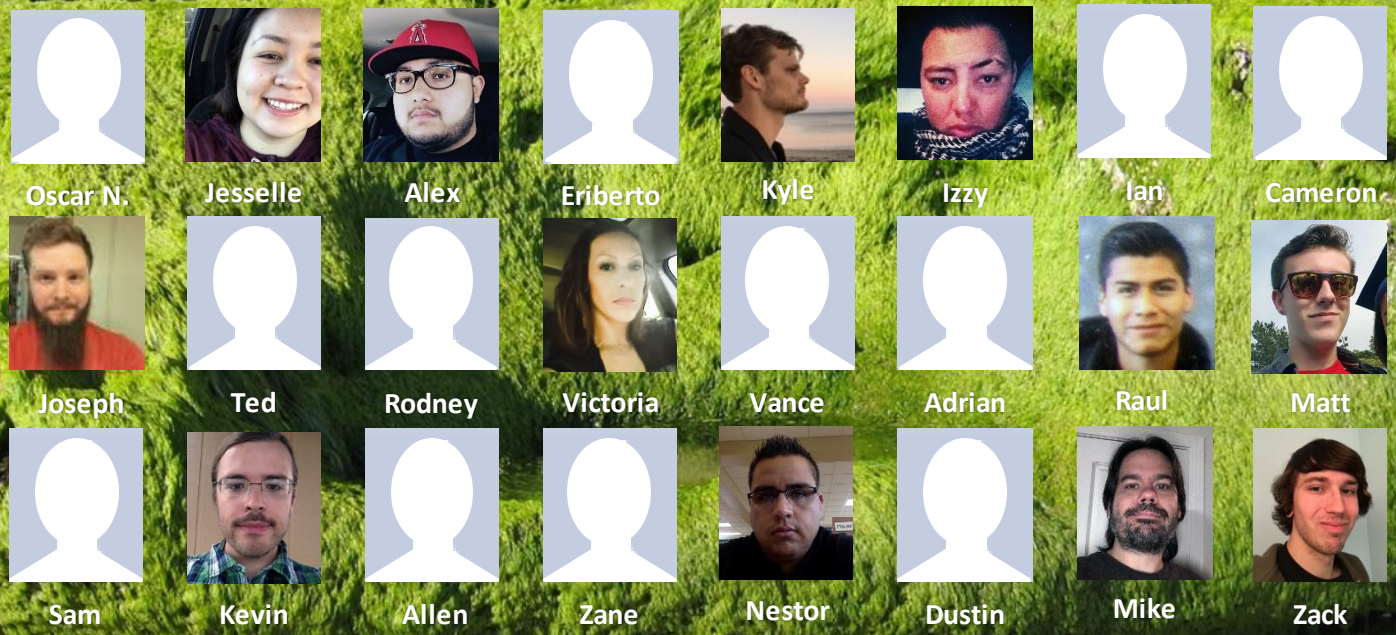
Sound Check

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

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

CIS 90 - Lesson 13

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



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

First Minute Quiz

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

Use CCC Confer White Board

email answers to: `risimms@cabrillo.edu`

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

Shell Scripting and Printing

Objectives	Agenda
• Understand how to write a script and how they run. • Learn how to print and manage print jobs waiting to print.	• Quiz • Questions • Breaking things in Lab 10 • Extra Credit Answer • Lesson 12 review • Grok that? • Housekeeping • 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 • Tips on script names • Review how scripts are run • Printers • Printer configuration via CUPS • Printing in Linux • Managing print jobs • Assignment • Wrap up

Questions

Questions?

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

Lesson material?

Labs? Tests?

How this course works?

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
/home/cis90/milhom $ echo ${LOGNAME%90}
milhom
/home/cis90/milhom $ echo ${LOGNAME:3:3}
hom
/home/cis90/milhom $ echo ${LOGNAME#mil}
hom90
```

Length of the string

Extracts "90" from end of string

Substring extraction from position 3 length 3

Extracts "mil" from front of string

For MANY MORE ways to manipulate strings Google "bash string manipulation" or browse to **http://tldp.org/LDP/abs/html/string-manipulation.html**

Breaking things in Lab 10

The path (PATH) variable … a Review

- 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 to locate commands to run.
- The PATH variable defines the directories (separated by ":"s) and the search order.
- If your path gets clobbered it is still possible to run commands. However to do that you must specify the full absolute pathname. For example you can always run the **tty** command as follows:

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

The path (PATH) variable … a Review

```
/home/cis90/simben $ echo $PATH
/usr/lib/qt-3.3/bin:/usr/local/bin:/bin:/usr/bin:/usr/local/sbin:
/usr/sbin:/sbin:/home/cis90/simben/../bin:/home/cis90/simben/bin:.
```

1. Determine the 4th 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

Clobber your path on purpose

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

Backup your current path

```
/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
```

Instead the full absolute pathname must be used

Class Activity

Backup and remove 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
```

What is your shell path now?

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

On Opus the ls command is in the /bin directory. If we know that a temporary workaround is to specify the full path to the command

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.

Making a path from scratch

Fixing the path, one directory at a time …

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

```
/home/cis90/simben $ PATH=/bin
/home/cis90/simben $ ls letter
letter
```

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

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

```
/home/cis90/simben $ PATH=$PATH:/usr/bin
/home/cis90/simben $ stat letter
  File: `letter'
  Size: 1059            Blocks: 16         IO Block: 4096
regular file
Device: fd00h/64768d    Inode: 102594      Links: 1
Access: (0644/-rw-r--r--)  Uid: ( 1000/simben90)   Gid: (
90/   cis90)
Access: 2012-04-30 15:43:28.000000000 -0700
Modify: 2012-03-20 10:31:30.000000000 -0700
Change: 2012-04-30 07:34:30.000000000 -0700
```

*The **stat** command is in /usr/bin so lets append that directory to the current path*

You try it

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

stat letter
PATH=$PATH:/usr/bin
echo $PATH
stat 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
```

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

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

        ****************************************************************
        *                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

```
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 $ tryme
-bash: tryme: command not found
```

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

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

You try it

```
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 $ 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

Easy … add the "." directory to the path

```
/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
```

You try it

```
cd
cp /home/cis90/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=/bin
/home/cis90/simben $ echo $PATH
/bin
```

Start with /bin which has all the essential UNIX/Linux commands

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

Append /usr/bin which has hundreds of additional UNIX/Linux commands

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

Append the CIS 90 class bin directory

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

Append your own student bin directory

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

Append the current directory

CIS 90 class 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 answers to **both** questions before the Lesson 13 class starts

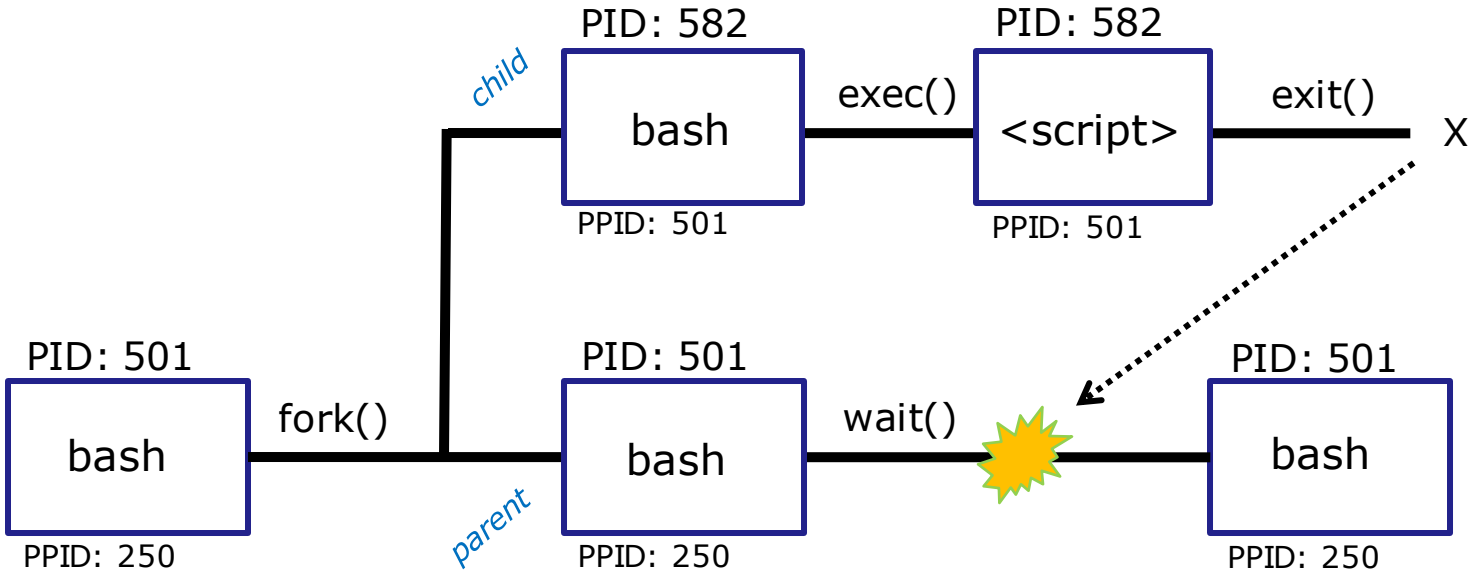
Lesson 12 Review

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.

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.

You try it

```
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`

```
echo $smartphone
```

Should be null

Method 1

```
google
echo $smartphone
```

Run google script as a child process

Method 2

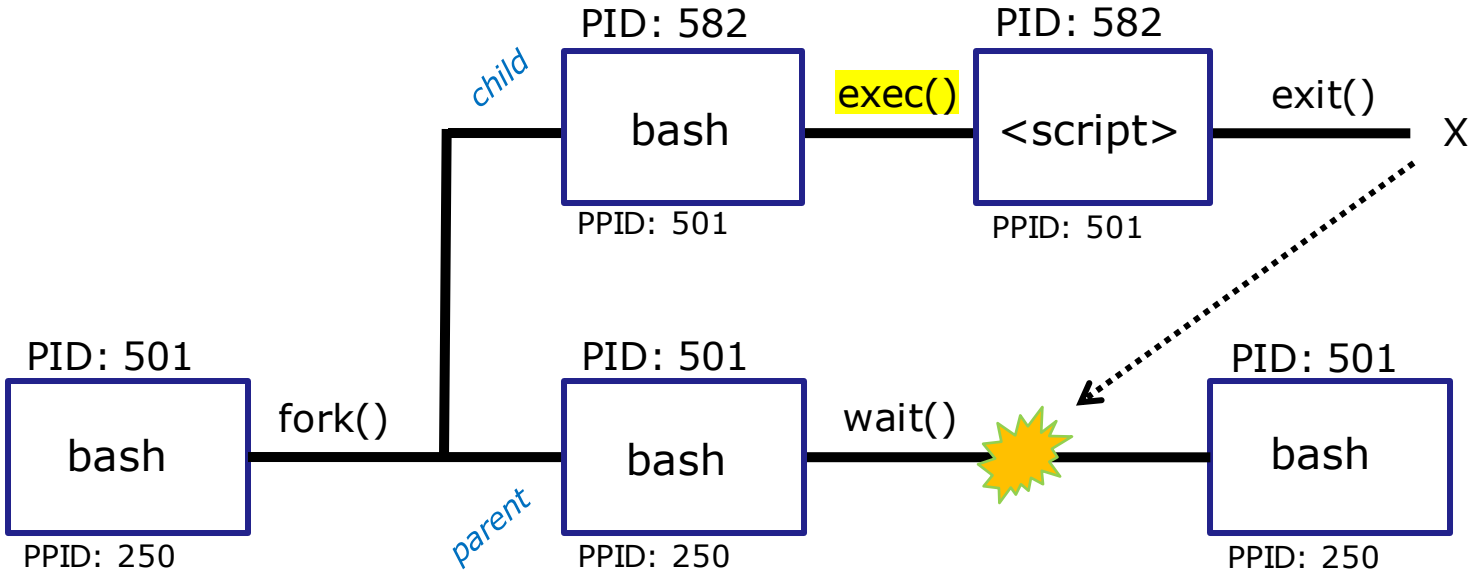
```
. google
echo $smartphone
```

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

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 code in the child process with the script commands

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.

You try it

```
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`

```
echo $smartphone
```

Should be null

Method 1

```
google
echo $smartphone
```

Run google script as a child process

Method 2

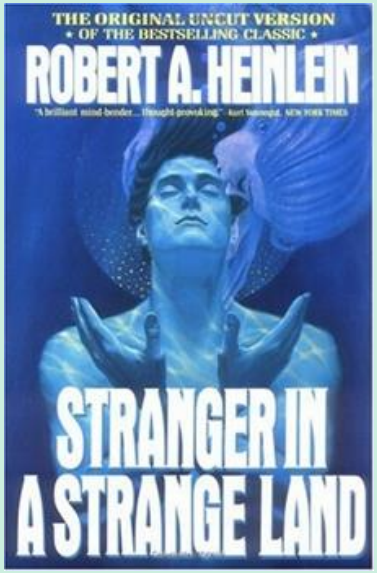
```
exec google
```

Exec the script so it replaces the code in the parent bash process

When you exec a script what happens when the script is finished?

Put your answer in the chat window

grok that?


THE ORIGINAL UNCUT VERSION
OF THE BESTSELLING CLASSIC
ROBERT A. HEINLEIN
STRANGER IN
A STRANGE LAND

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

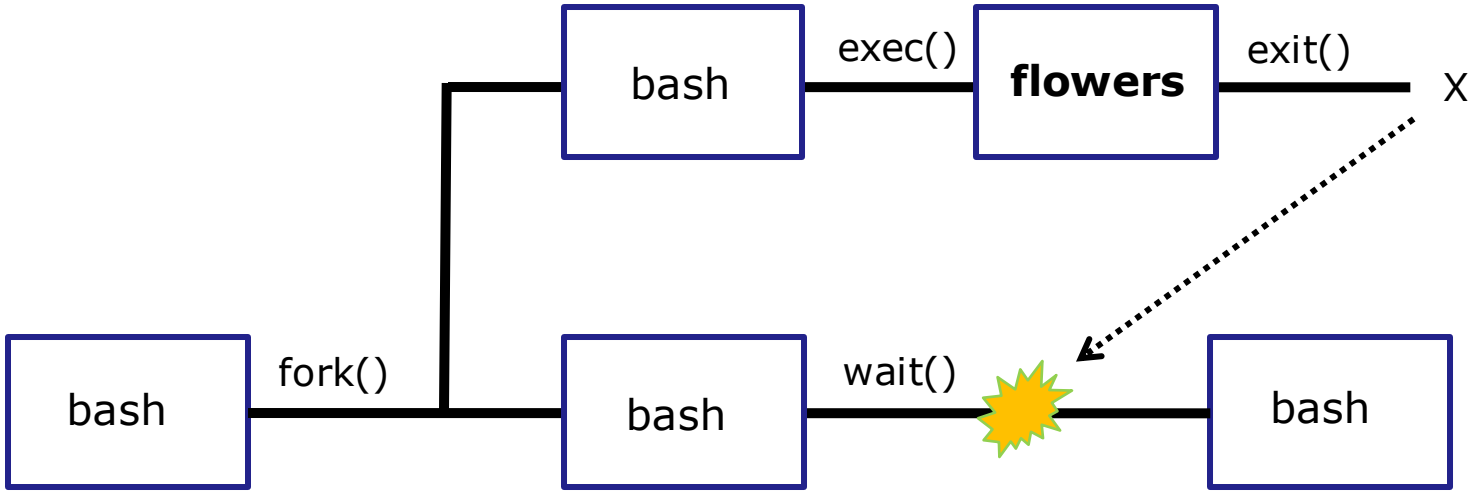
The flowers script
/home/cis90/bin/flowers

```
/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 $
```

```bash
#!/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 ""
==> setting variables in child <==
   roses are "black"
   violets are "orange"
==> Leaving child process <==

/home/cis90/simben $
```

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

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 ""
==> setting variables in child <==
   roses are "black"
   violets are "orange"
==> Leaving child process <==

/home/cis90/simben $
```

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

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"
==> Leaving child process <==

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

The child can only change copies of the parents variables

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 can 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 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!

Housekeeping

1. Lab 10 due by 11:59PM tonight

2. Use the **check10** script to check your work

3. After you submit your lab10 file you may comment out your riddle command in *.bash_profile*

4. The Extra Credit Labs X1 and X2 (30 points each) are available. The will be graded after the day of the final. Use **checkx2** to the second lab.

5. The Final Project is available and due in **two weeks**.

Heads up on Final Exam

Test #3 (final exam) is WEDNESDAY Dec 14 1-3:50PM

Wed	12/14	**Test #3 (the final exam)** **Time** • Wed 1:00PM - 3:50PM in Room 828 **Materials** • Test (canvas) **CCC Confer** • Enter virtual classroom • Class archives		5 posts Lab X1 Lab X2

Extra credit labs and final posts due by 11:59PM

- 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 CCC Confer 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)

STARTING CLASS TIME/DAY(S)	EXAM HOUR	EXAM DATE
Classes starting between:		
6:30 am and 8:55 am, MW/Daily	7:00 am-9:50 am	Wednesday, December 14
9:00 am and 10:15 am, MW/Daily	7:00 am-9:50 am	Monday, December 12
10:20 am and 11:35 am, MW/Daily	10:00 am-12:50 pm	Wednesday, December 14
11:40 am and 12:55 pm, MW/Daily	10:00 am-12:50 pm	Monday, December 12
1:00 pm and 2:15 pm, MW/Daily	1:00 pm-3:50 pm	Wednesday, December 14
2:20 pm and 3:35 pm, MW/Daily	1:00 pm-3:50 pm	Monday, December 12
3:40 pm and 5:30 pm, MW/Daily	4:00 pm-6:50 pm	
6:30 am and 8:55 am, TTh	7:00 am-9:50 am	
9:00 am and 10:15 am, TTh	7:00 am-9:50 am	
10:20 am and 11:35 am, TTh	10:00 am-12:50 pm	
11:40 am and 12:55 pm, TTH	10:00 am-12:50 pm	
1:00 pm and 2:15 pm, TTh	1:00 pm-3:50 pm	
2:20 pm and 3:35 pm, TTh	1:00 pm-3:50 pm	
3:40 pm and 5:30 pm, TTh	4:00 pm-6:50 pm	
Friday am	9:00 am-11:50 am	
Friday pm	1:00 pm-3:50 pm	
Saturday am	9:00 am-11:50 am	
Saturday pm	1:00 pm-3:50 pm	

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
93337	W	1:00PM-4:05PM	3.00	R.Simms	OL
&	Arr.	Arr.		R.Simms	OL

Section 93337 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 go.cabrillo.edu/online.

93338	W	1:00PM-4:05PM	3.00	R.Simms	828
&	Arr.	Arr.		R.Simms	OL

Section 93338 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 go.cabrillo.edu/online.

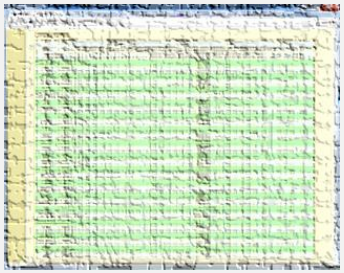
Evening Classes: For the final exam schedule, Evening Classes are those that begin at 5:35 pm or later. Also, **"M & W"** means the class meets on **BOTH** Monday and Wednesday. **"T & TH"** means the class meets on **BOTH** Tuesday and Thursday. The following schedule applies to all Evening Classes.

Where to find your grades

Send me your survey to get your LOR code name.

The CIS 90 website Grades page

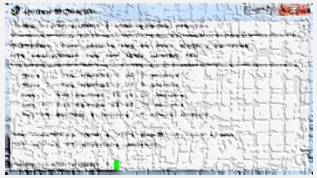
http://simms-teach.com/cis90grades.php



Or check on Opus

`checkgrades` *`codename`*

(where codename is your LOR codename)



Written by Jesse Warren a past CIS 90 Alumnus

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**

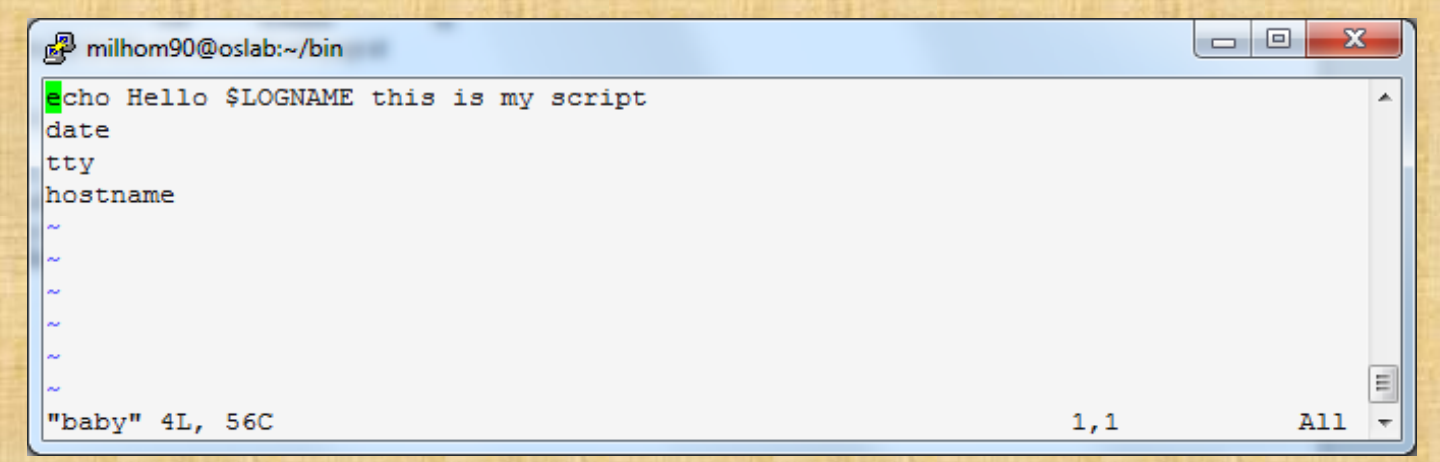
Shell Scripting 101

Shell Scripts

- In its simplest form a shell script can just be a list of commands in a file
- Execute "x" permissions must be enabled on the script file.
- The script must either be on your path or you must use an absolute 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.

Class Activity

```
/home/cis90/milhom $ cd bin
/home/cis90/milhom/bin $ cp ~/../depot/scripts/baby .
/home/cis90/milhom/bin $ vi baby
```



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

```
/home/cis90/milhom/bin $ chmod +x baby
/home/cis90/milhom/bin $ baby
Hello milhom90 this is my script
Tue Nov 24 14:10:42 PST 2015
/dev/pts/3
oslab.cis.cabrillo.edu
```

$(*some-command*)

Utilizing $(*some-command*)

The **$** metacharacter provides the "value" of both variables, e.g. $PS1 or 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

More on the date command

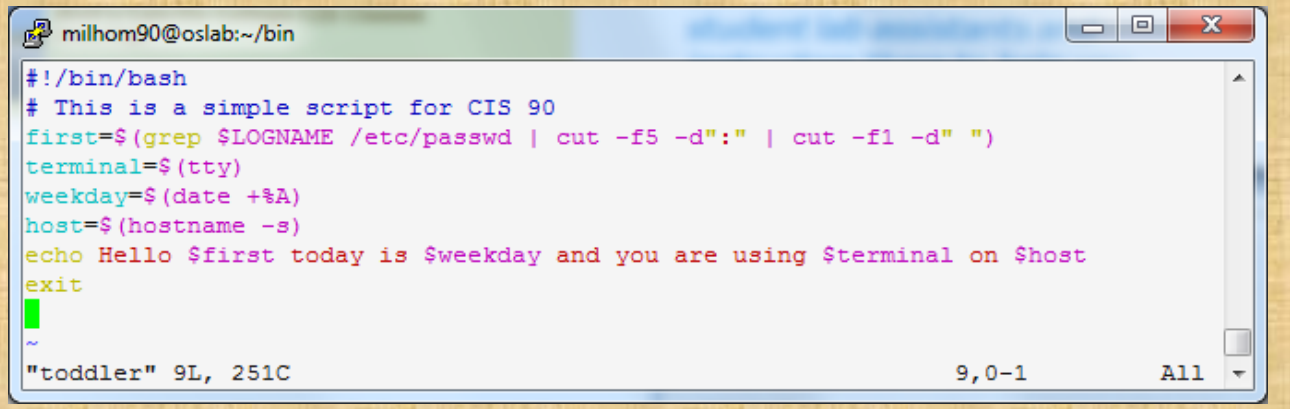
Utilizing the date command

```
/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

Class Activity

```
/home/cis90/milhom/bin $ cd ~/bin
/home/cis90/milhom/bin $ cp ~/../depot/scripts/toddler .
/home/cis90/milhom/bin $ vi toddler
```



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

```
/home/cis90/milhom/bin $ chmod +x toddler
/home/cis90/milhom/bin $ toddler
Hello Homer today is Tuesday and you are using /dev/pts/3 on oslab
```

Interactive scripts using the read command

Class Activity

```
/home/cis90/milhom/bin $ cd ~/bin
/home/cis90/milhom/bin $ cp ~/../depot/scripts/interactive .
/home/cis90/milhom/bin $ vi interactive
```

milhom90@oslab:~/bin

```
#!/bin/bash
echo Pick a number between 1 and 5
read a

echo -n "Pick a number between 1 and 5: "
read b

read -p "Pick a number between 1 and 5: " c

echo "You picked $a, $b, and $c."
exit

"interactive" 12L, 190C                                  1,1          All
```

Use echo and read to prompt then read response

Use -n option on echo to suppress the newline (carriage return)

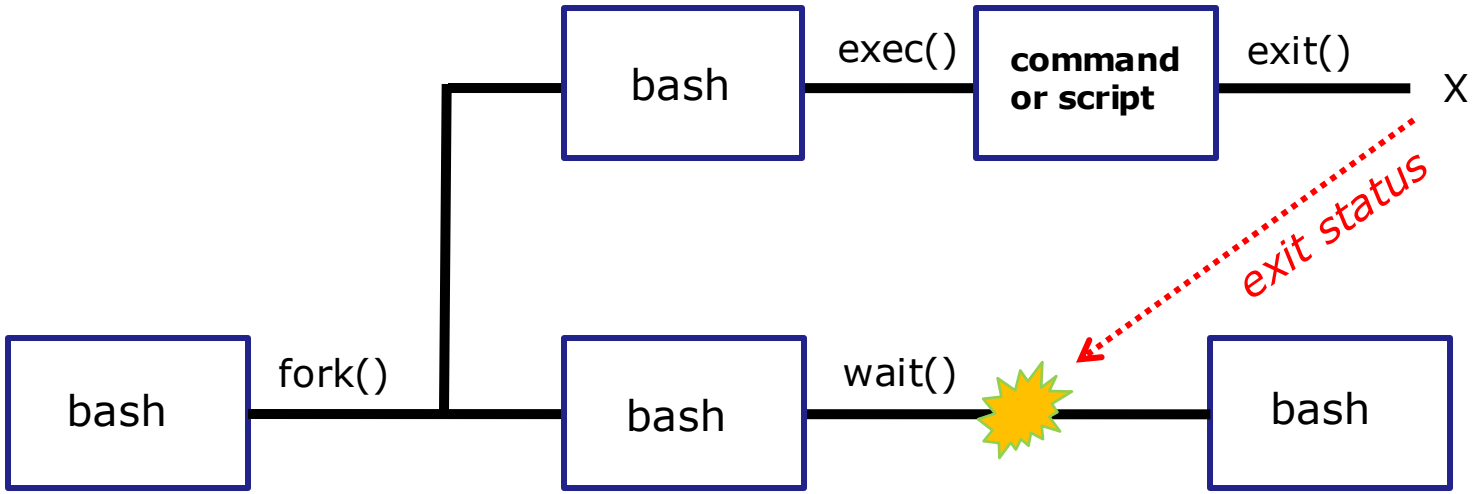
Use -p option on read to specify a prompt string without a preceding echo command

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

```
/home/cis90/milhom/bin $ chmod +x interactive
/home/cis90/milhom/bin $ interactive
Pick a number between 1 and 5
2
Pick a number between 1 and 5: 4
Pick a number between 1 and 5: 5
You picked 2, 4, and 5.
```

Communicating status back to parent

The child can communicate status back to the parent



The child process makes a 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 son-of-opus.simms-teach.com
PING son-of-opus.simms-teach.com (52.8.145.169) 56(84) bytes of data.

--- son-of-opus.simms-teach.com ping statistics ---
1 packets transmitted, 0 received, 100% packet loss, time 10000ms
/home/cis90/milhom/bin $ echo $?
1
```

status=1 (Son-of-Opus system at AWS is down right now to save $)

```
/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)

Class Activity

```
/home/cis90/milhom/bin $ cd ~/bin
/home/cis90/milhom/bin $ cp ~/../depot/scripts/kid .
/home/cis90/milhom/bin $ vi kid
```

```
#!/bin/bash
echo "This is the $0 script running as a child process"
read -p "Enter a status number (0-255) to return to the parent process: " status
echo "You entered $status, use: echo \$? to view from the parent"
exit $status
```

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

```
/home/cis90/milhom/bin $ ./kid
This is the ./kid script running as a child process
Enter a status number (0-255) to return to the parent process: 25
You entered 25, use: echo $? to view from the parent
/home/cis90/milhom/bin $ echo $?
25
```

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
~
                                                        1,1           All
```

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, 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

rsimms@oslab:/home/cis90/bin

```
*********************************************************
*          Spring 2016 CIS 90 Online Projects           *
*********************************************************
1) Adrian
2) Alex
3) Allen
4) Benji
5) Cameron
6) Duke
7) Dustin
8) Eriberto
9) Homer
10) Ian
11) Izzy
12) Jesselle
13) Joseph
14) Kevin
15) Kyle
16) Luis
17) Matt
18) Mike
19) Nestor
20) Oscar
21) Raul
22) Rodney
23) Sam
24) Ted
25) Vance
26) Victoria
27) Zack
28) Zane

99) Exit

Enter Your Choice:
```

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

Final Project Grading Rubric

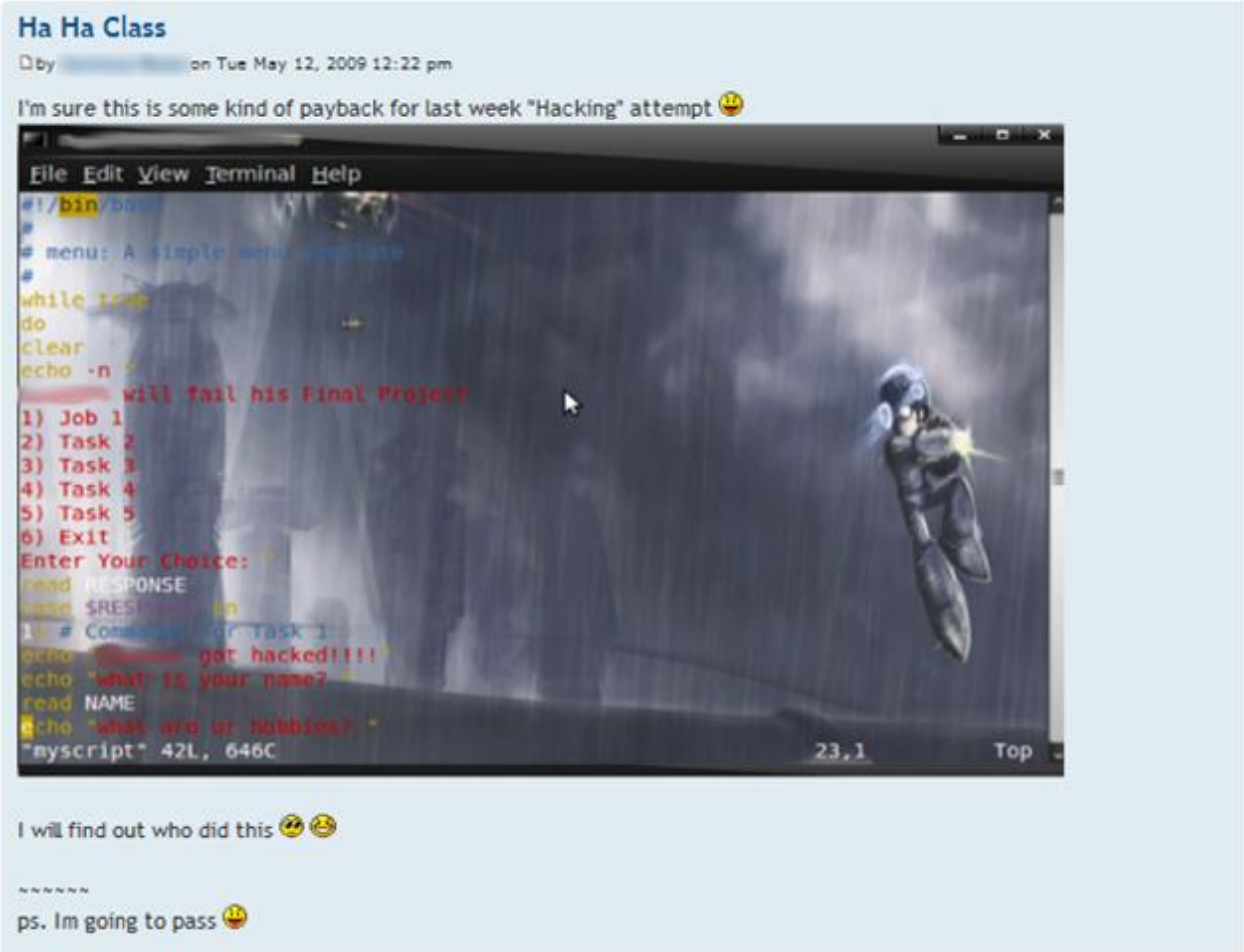
Grading rubric (60 points maximum)

Possible Points	Requirements
30	Implementing all five tasks (6 points each): • Requirements for each task: – Minimum of 10 "original" script command lines – Has comments to explain what it does – Has user interaction
25	You don't have to do all of these but do at least five: • Redirecting stdin (5 points) • Redirecting stdout (5 points) • Redirecting stderr (5 points) • Use of permissions (5 points) • Use of filename expansion characters (5 points) • Use of absolute path (5 points) • Use of relative path (5 points) • Use of a PID (5 points) • Use of inodes (5 points) • Use of links (5 points) • Use of a GID or group (5 points) • Use of a UID or user (5 points) • Use of a signal (5 points) • Use of piping (5 points) • Use of an environment variable (5 points) • Use of /bin/mail (5 points) • Use of a conditional (5 points) The maximum for this section are 25 points.
5	Present your script in front of the class
Points lost	
-15	Fails to run from **allscripts**
-15	Other students in the class are unable to read and execute your script.
-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: • Doesn't give full credit to the original author • Doesn't indicate where the code was obtained from • Doesn't include licensing terms • Violates copyright or licensing terms
Extra credit	
30	Up to three additional tasks (10 points each)

Final Project permissions

Permissions

A past forum post …



Uh, oh … someone got hacked!

Group Write Permissions

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

rsimms@oslab:/home/cis90/bin

```
[rsimms@oslab bin]$ ls -l /home/cis90/*/bin/myscript
-rwxrwxr-x. 1 brocam90 cis90   702 Nov 16 13:50 /home/cis90/brocam/bin/myscript
-rwxrwxr-x. 1 brukyl90 cis90   855 Nov 16 14:57 /home/cis90/brukyl/bin/myscript
-rwxrwxr-x. 2 camkev90 cis90   614 Nov 21 18:00 /home/cis90/camkev/bin/myscript
-rwxrwxr-x. 1 cuines90 cis90   995 Nov 21 17:34 /home/cis90/cuines/bin/myscript
-rwxrwxr-x. 1 elirau90 cis90   714 Nov 20 19:05 /home/cis90/elirau/bin/myscript
-rwxrwxr-x. 1 greall90 cis90   734 Nov 16 14:44 /home/cis90/greall/bin/myscript
-rwxrwxr-x. 1 horthe90 cis90   715 Nov 16 14:37 /home/cis90/horthe/bin/myscript
-rwxrwxr-x. 1 kelvan90 cis90   803 Nov 16 14:36 /home/cis90/kelvan/bin/myscript
-rwxr-xr-x. 1 lafjos90 cis90  1353 Nov 16 17:14 /home/cis90/lafjos/bin/myscript
-rwxrwxr-x. 1 milhom90 cis90  4533 Nov 16 09:21 /home/cis90/milhom/bin/myscript
-rwxrwxr-x. 1 pruale90 cis90   546 Nov 16 14:48 /home/cis90/pruale/bin/myscript
-rwxrwxr-x. 1 ramisr90 cis90   725 Nov 16 14:35 /home/cis90/ramisr/bin/myscript
-rwxrwxr-x. 1 saimat90 cis90   719 Nov 16 13:58 /home/cis90/saimat/bin/myscript
-rwxrwxr-x. 1 sedmic90 cis90   717 Nov 16 14:25 /home/cis90/sedmic/bin/myscript
-rwxrwxr-x. 1 simben90 cis90 10512 Nov 16 09:19 /home/cis90/simben/bin/myscript
[rsimms@oslab bin]$
```

*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?

Group Read and Execute Permissions

rsimms@oslab:/home/cis90/bin

```
[rsimms@oslab bin]$ ./checkmyscripts
-rwxrwxr-x. 1 simben90 cis90 10512 Nov 16 09:19 /home/cis90/simben/bin/myscript
-rwxrwxr-x. 1 milhom90 cis90 4533 Nov 16 09:21 /home/cis90/milhom/bin/myscript
ls: cannot access /home/cis90/rodduk/bin/myscript: No such file or directory
-rwxrwxr-x. 1 brocam90 cis90 702 Nov 16 13:50 /home/cis90/brocam/bin/myscript
-rwxrwxr-x. 1 brukyl90 cis90 855 Nov 16 14:57 /home/cis90/brukyl/bin/myscript
-rwxrwxr-x. 2 camkev90 cis90 614 Nov 21 18:00 /home/cis90/camkev/bin/myscript
-rwxrwxr-x. 1 cuines90 cis90 995 Nov 21 17:34 /home/cis90/cuines/bin/myscript
ls: cannot access /home/cis90/zuneri/bin/myscript: No such file or directory
ls: cannot access /home/cis90/elszac/bin/myscript: No such file or directory
ls: cannot access /home/cis90/estjes/bin/myscript: No such file or directory
-rwxrwxr-x. 1 greall90 cis90 734 Nov 16 14:44 /home/cis90/greall/bin/myscript
-rwxrwxr-x. 1 kelvan90 cis90 803 Nov 16 14:36 /home/cis90/kelvan/bin/myscript
ls: cannot access /home/cis90/kerian/bin/myscript: No such file or directory
-rwxr-xr-x. 1 lafjos90 cis90 1353 Nov 16 17:14 /home/cis90/lafjos/bin/myscript
ls: cannot access /home/cis90/lindus/bin/myscript: Permission denied
ls: cannot access /home/cis90/nieosc/bin/myscript: No such file or directory
ls: cannot access /home/cis90/persam/bin/myscript: No such file or directory
-rwxrwxr-x. 1 pruale90 cis90 546 Nov 16 14:48 /home/cis90/pruale/bin/myscript
-rwxrwxr-x. 1 ramisr90 cis90 725 Nov 16 14:35 /home/cis90/ramisr/bin/myscript
ls: cannot access /home/cis90/roszak/bin/myscript: No such file or directory
-rwxrwxr-x. 1 saimat90 cis90 719 Nov 16 13:58 /home/cis90/saimat/bin/myscript
ls: cannot access /home/cis90/soladr/bin/myscript: No such file or directory
ls: cannot access /home/cis90/brevic/bin/myscript: No such file or directory
ls: cannot access /home/cis90/ebarod/bin/myscript: No such file or directory
-rwxrwxr-x. 1 elirau90 cis90 714 Nov 20 19:05 /home/cis90/elirau/bin/myscript
-rwxrwxr-x. 1 sedmic90 cis90 717 Nov 16 14:25 /home/cis90/sedmic/bin/myscript
ls: cannot access /home/cis90/corlui/bin/myscript: No such file or directory
-rwxrwxr-x. 1 horthe90 cis90 715 Nov 16 14:37 /home/cis90/horthe/bin/myscript
[rsimms@oslab bin]$
```

Which myscript files cannot by 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 - cis90
```
(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 write to 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 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?

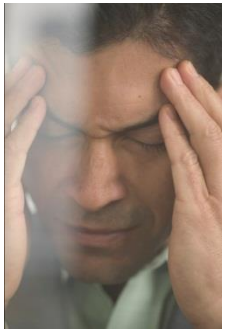
Write your answer in the chat window

Final Project Getting Started

What takes longer?

Writing the script?

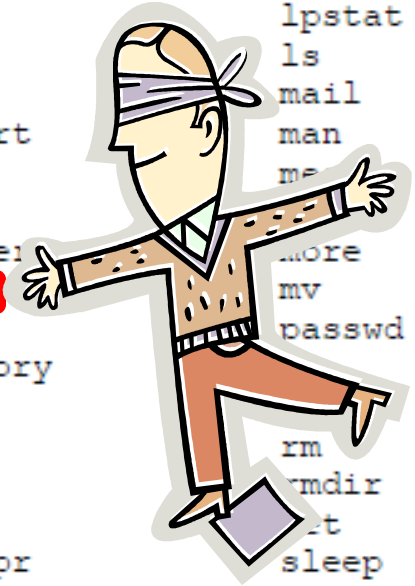
Or deciding what to script?



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

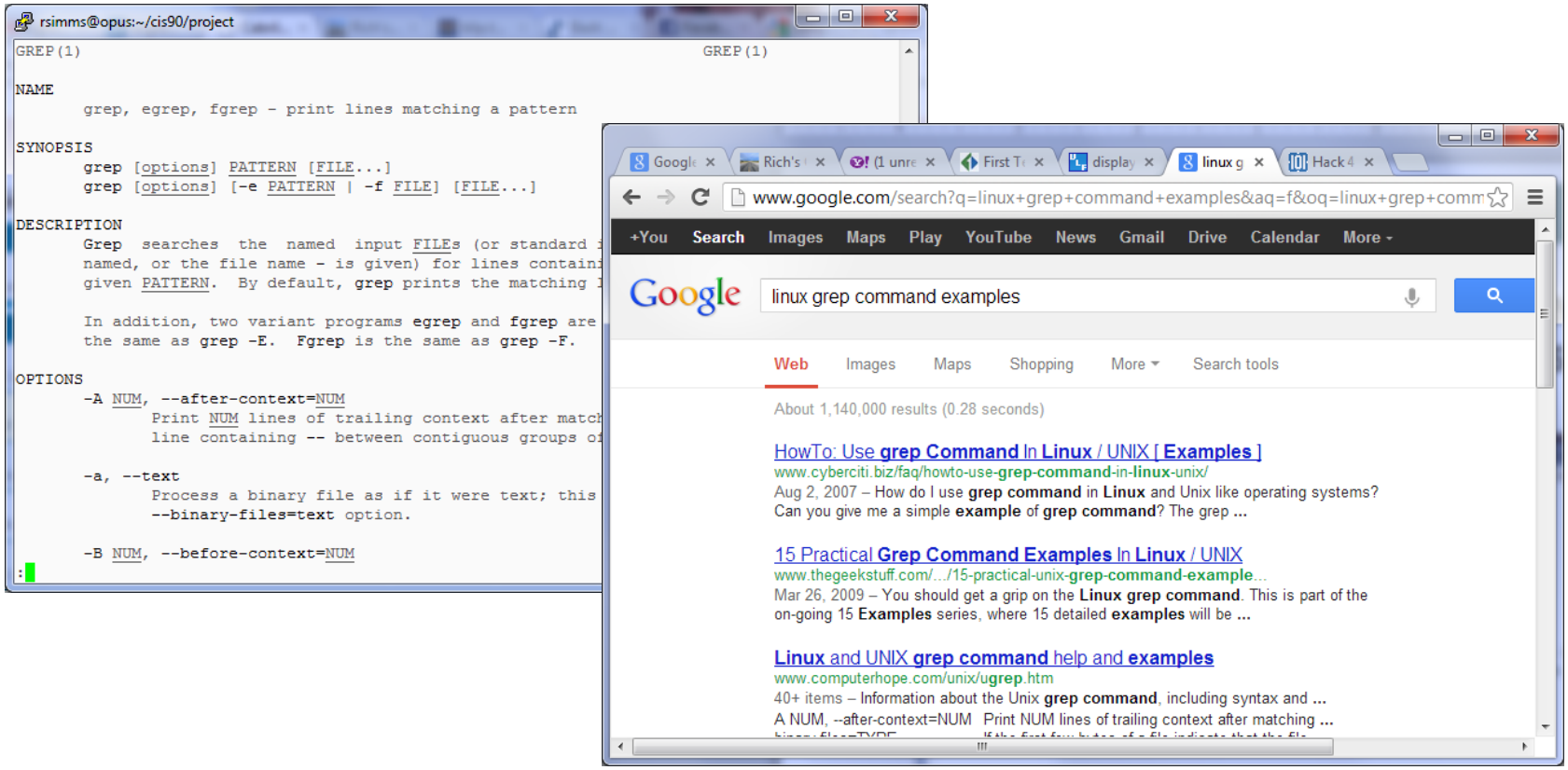
Commands

.	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



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

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
                ;;
          2)    # Commands for Task
                ;;
"myscript" 37L, 546C
```

Before

After

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
                ;;
-- INSERT --                                    10,5-12       Top
```

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)                                                    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 1st for vi,*
- *the 2nd for testing **myscript**,*
- *and a 3rd 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 2nd 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
                ;;
          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" 38L, 593C written                          21,15-29      All
```

*Experiment with a **grep** command in 3rd window*

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

*Run **myscript** in the 2nd second window to test change.*

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 $
```

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
                ;;
          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" 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!

```
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 $
```

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

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

Add some interaction

rodduk90@oslab:~/bin

```
#!/bin/bash
#
# menu: A simple menu template
#
while true
do
        clear
        echo -n "
                CIS 90 Fin
        1) Hacking with th
        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
                read dummy
                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 dummy
   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 wit
        2) Task 2
        3) Task 3
        4) Task 4
        5) Task 5
        6) Exit

        Enter Your Cho
        read RESPONSE
        case $RESPONSE in
          1)    # Commands for Task 1
                echo "Are you ready to search
                read dummy
                grep -h beauty /home/cis90/ro
                ;;
          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 b
                ;;
        esac
        echo -n "Hit the Enter key to return
        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 dummy
    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 add a count of the strings found now

```
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
    ;;
```

rodduk90@c

```
#!/bin/bash
#
# menu: A s
#
while true
do
        cle
        ech

        1)
        2)
        3)
        4)
        5)
        6)

        Ent
        rea
        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/*/*
                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                                  26,53-67
```

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?

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,
Ready to count them?

14
Hit the Enter key to return to menu
```

How many points so far?

Let's score our mini-script so far

```
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/po
   ;;
```

Implementing all five tasks (6 points each):

- Requirements for each task:
  - NO –Minimum of 10 "original" script command lines
  - NO –Has one or more non-generic comments to explain what it is doing
  - ✔ –Has user interaction

You don't have to do all of these but do at least five:

- Redirecting stdin (5 points)
- Redirecting stdout (5 points)
- Redirecting stderr (5 points)
- Use of permissions (5 points)
- ✔ Use of filename expansion characters (5 points)
- ✔ Use of absolute path (5 points)
- Use of relative path (5 points)
- Use of a PID (5 points)
- Use of inodes (5 points)
- Use of links (5 points)
- Use of scheduling (5 points)
- Use of a GID or group (5 points)
- Use of a UID or user (5 points)
- Use of a /dev/tty device (5 points)
- Use of a signal (5 points)
- ✔ Use of piping (5 points)
- Use of an environment variable (5 points)
- Use of /bin/mail (5 points)
- Use of a conditional (5 points)

The maximum for this section is 25 points.

Make another enhancement

Enhance script to let user specify search string and use color

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

```
rodduk90@
#!/bin/bas
#
# menu: A
#
while true
do
        cl
        ec

        1)
        2)
        3)
        4)
        5)
        6)

        En
        re
        ca
```

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

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

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

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
Ready to count them?

14
Enter a new string to search for
sweet
searching for "sweet"
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.
Hit the Enter key to return to menu
```

And it works!

Check the score again

Let's re-score modified script

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

Implementing all five tasks (6 points each):

- Requirements for each task:
  - ✔ –Minimum of 10 "original" script command lines
  - NO –Has one or more non-generic comments to explain what it is doing
  - ✔ –Has user interaction

You don't have to do all of these but do at least five:

- Redirecting stdin (5 points)
- Redirecting stdout (5 points)
- Redirecting stderr (5 points)
- Use of permissions (5 points)
- ✔ Use of filename expansion characters (5 points)
- ✔ Use of absolute path (5 points)
- Use of relative path (5 points)
- Use of a PID (5 points)
- Use of inodes (5 points)
- Use of links (5 points)
- Use of scheduling (5 points)
- Use of a GID or group (5 points)
- Use of a UID or user (5 points)
- Use of a /dev/tty device (5 points)
- Use of a signal (5 points)
- ✔ Use of piping (5 points)
- Use of an environment variable (5 points)
- Use of /bin/mail (5 points)
- Use of a conditional (5 points)

The maximum for this section is 25 points.

Bing - one task done that meets minimum requirements!

Add some comments to help others understand what you are doing

```
1)      # Task 1 - grep command explored

        # Simple grep for "beauty"
        echo "Are you ready to search for beauty in the poems?"
        read dummy
        grep -h beauty /home/cis90/rodduk/poem

        # Same as before but counts matches to
        echo "Ready to count them?"
        read dummy
        grep -h beauty /home/cis90/rodduk/poem

        # Prompt user to supply search string
        echo "Enter a new string to search for
        read string
        echo searching for '"'$string'"'
        grep -h $string /home/cis90/rodduk/poe
        ;;
```

Implementing all five tasks (6 points each):
- Requirements for each task:
  - ✔ –Minimum of 10 "original" script command lines
  - ✔ –Has one or more non-generic comments to explain what it is doing
  - ✔ –Has user interaction

You don't have to do all of these but do at least five:
- Redirecting stdin (5 points)
- Redirecting stdout (5 points)
- Redirecting stderr (5 points)
- Use of permissions (5 points)
- ✔ Use of filename expansion characters (5 points)
- ✔ Use of absolute path (5 points)
- Use of relative path (5 points)
- Use of a PID (5 points)
- Use of inodes (5 points)
- Use of links (5 points)
- Use of scheduling (5 points)
- Use of a GID or group (5 points)
- Use of a UID or user (5 points)
- Use of a /dev/tty device (5 points)
- Use of a signal (5 points)
- ✔ Use of piping (5 points)
- Use of an environment variable (5 points)
- Use of /bin/mail (5 points)
- Use of a conditional (5 points)

The maximum for this section is 25 points.

And has fulfilled three of the five requirements for the overall project!

Backup your work!

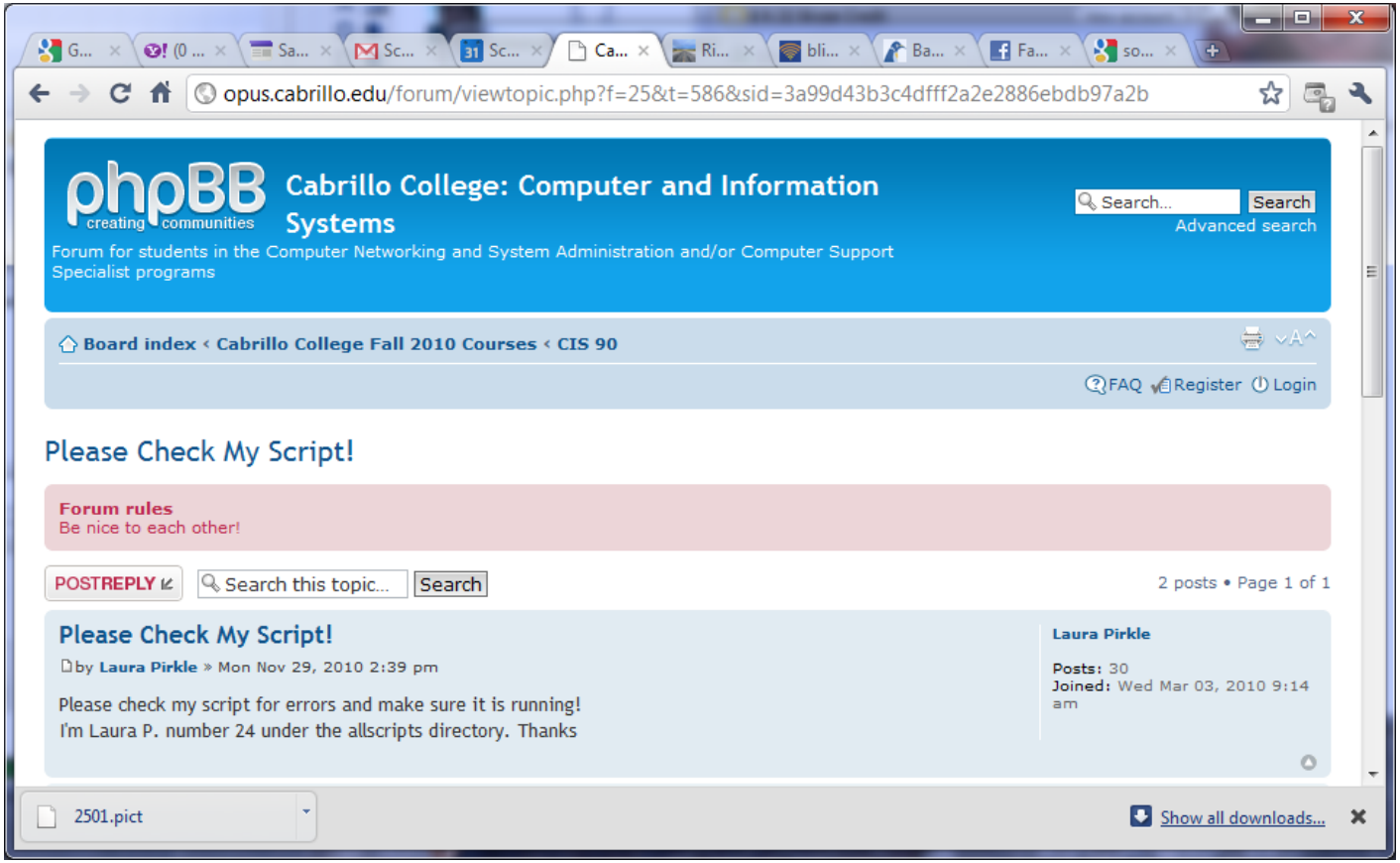
`cp myscript myscript.v1` *after first day of work*

```
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!

Testing your script



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

Plan extra time for:

- Figuring our 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 scripting help

Not so good …

Preview:

Help!

My script is getting weird error

- Homer

Not enough information has been provided on this post for others to help

Use the forum effectively to get scripting help

Better … but requires viewer to log into Opus 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

B | i | u | Quote | Code | List | List= | [*] | Img | URL | Flash | Normal | Font colour

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 script and the error using code tags which enables others to help you find and fix the problem.

Scripting Tips echo

Silence is golden … but not always

Many UNIX commands that run successfully produce no output

```
[simben90@opus bin]$ alias probe=file
[simben90@opus bin]$ cp quiet quiet.bak
[simben90@opus bin]$ value=002
[simben90@opus bin]$ umask $value
[simben90@opus bin]$ cat quiet > /dev/null
[simben90@opus bin]$ > important_file$$
```

Note there is a variable named $ which gets set to the PID of your process.

Silence is golden … but not always

Running or sourcing a script full of UNIX commands that produce no output …. still produces no output!

```
[simben90@opus bin]$ cat quiet
alias probe=file
cp quiet quiet.bak
value=002
umask $value
cat quiet > /dev/null
> important_file$$

[simben90@opus bin]$ quiet
[simben90@opus bin]$


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

Silence is golden … but not always

```
[simben90@opus bin]$ cat not-so-quiet
echo TRACE: Entering not-so-quiet script
echo Press Enter to create probe alias
read dummy
alias probe=file
echo probe alias created, try: probe letter
cp quiet quiet.bak
value=002
umask $value
echo TRACE value=$value
cat quiet > /dev/null
> important_file$$
echo Warning: the file named important_file$$ was just created or emptied
echo TRACE: Exiting not-so-quiet script
```

You can use the echo command in your scripts to provide:

- *Interaction*
- *User feedback*
- *Tracing for debugging*

```
[simben90@opus bin]$ not-so-quiet
TRACE: Entering not-so-quiet script   Debugging
Press Enter to create probe alias   Interaction

probe alias created, try: probe letter   User feedback
TRACE value=002   Debugging
Warning: the file named important_file29538 was just created or emptied   User feedback
TRACE: Exiting not-so-quiet script   Debugging
```

tips on script names

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 your 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]$
```

roddyduk@opus:~/bin

```
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

Scripting Tips

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[0**n;nn**m"** to turn on color and **\e[00m** to turn it off.*

(the -e option enables interpretation of backslash escapes)

Source: http://hacktux.com/bash/colors

Using Color

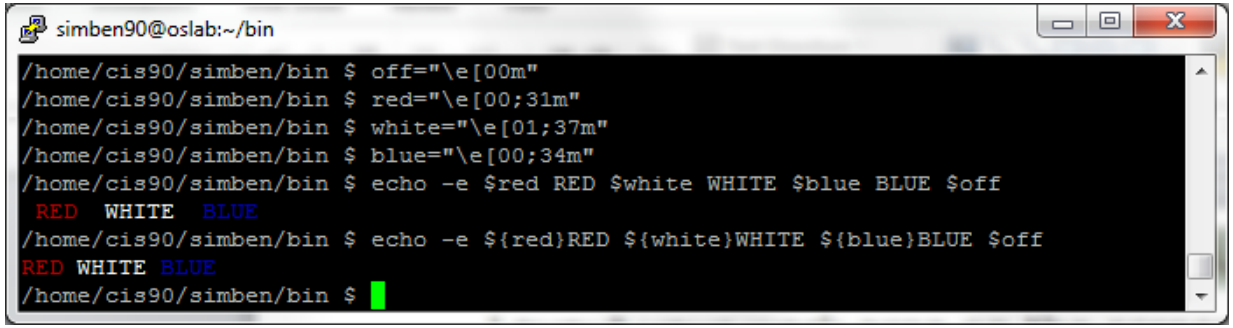
```
/home/cis90/simben/bin $ echo -e "\e[00;32m"

/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'

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

Change to color green

Revert color back to normal

Source: http://hacktux.com/bash/colors

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
 RED  WHITE  BLUE
echo -e ${red}RED ${white}WHITE ${blue}BLUE $off
RED WHITE BLUE
```

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"

Class Exercise

Make a new script in your bin directory

```
cd bin
vi example4271
```

In vi add these lines to your script then save:

```
off="\e[00m"
green="\e[00;32m"
echo -e Hi there, you look a little ${green}GREEN${off} today!
```

Prepare and run your script

```
chmod +x example4271
example4271
```

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

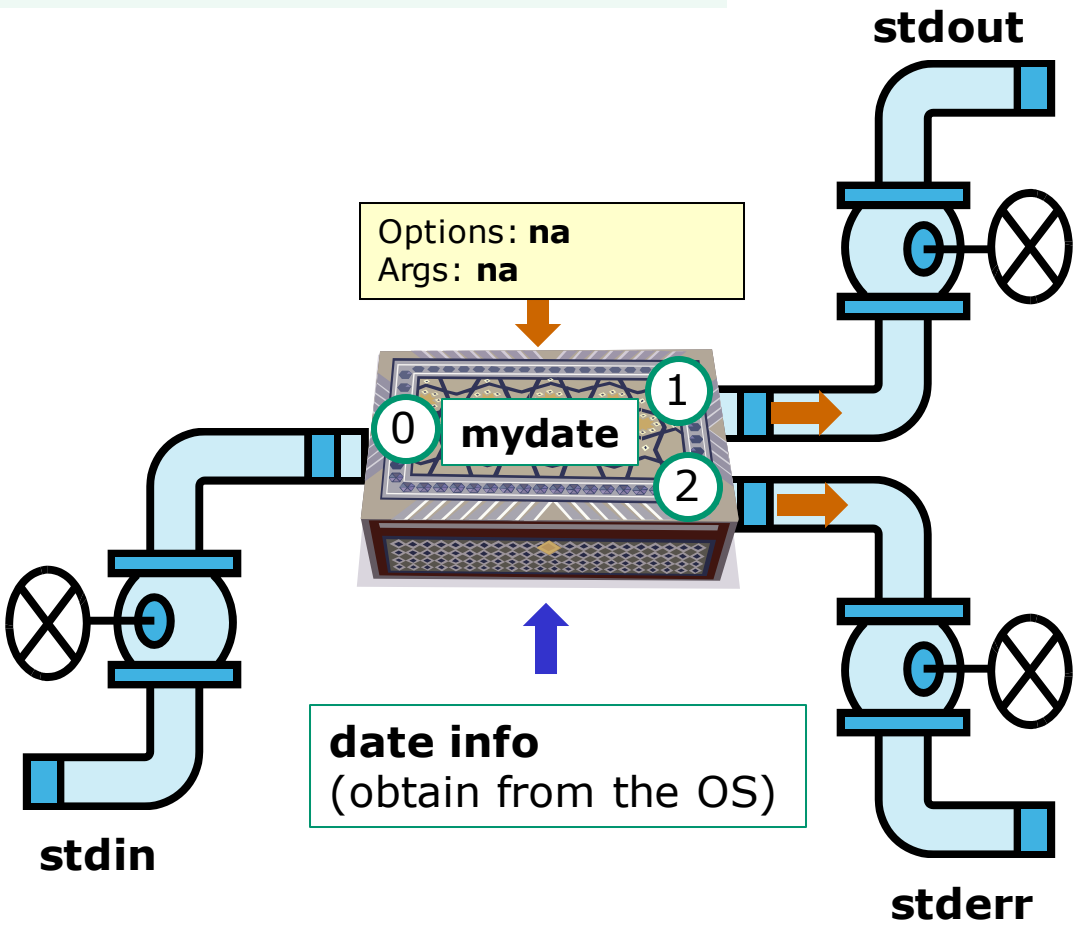
Don't initialize them yet

```
/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



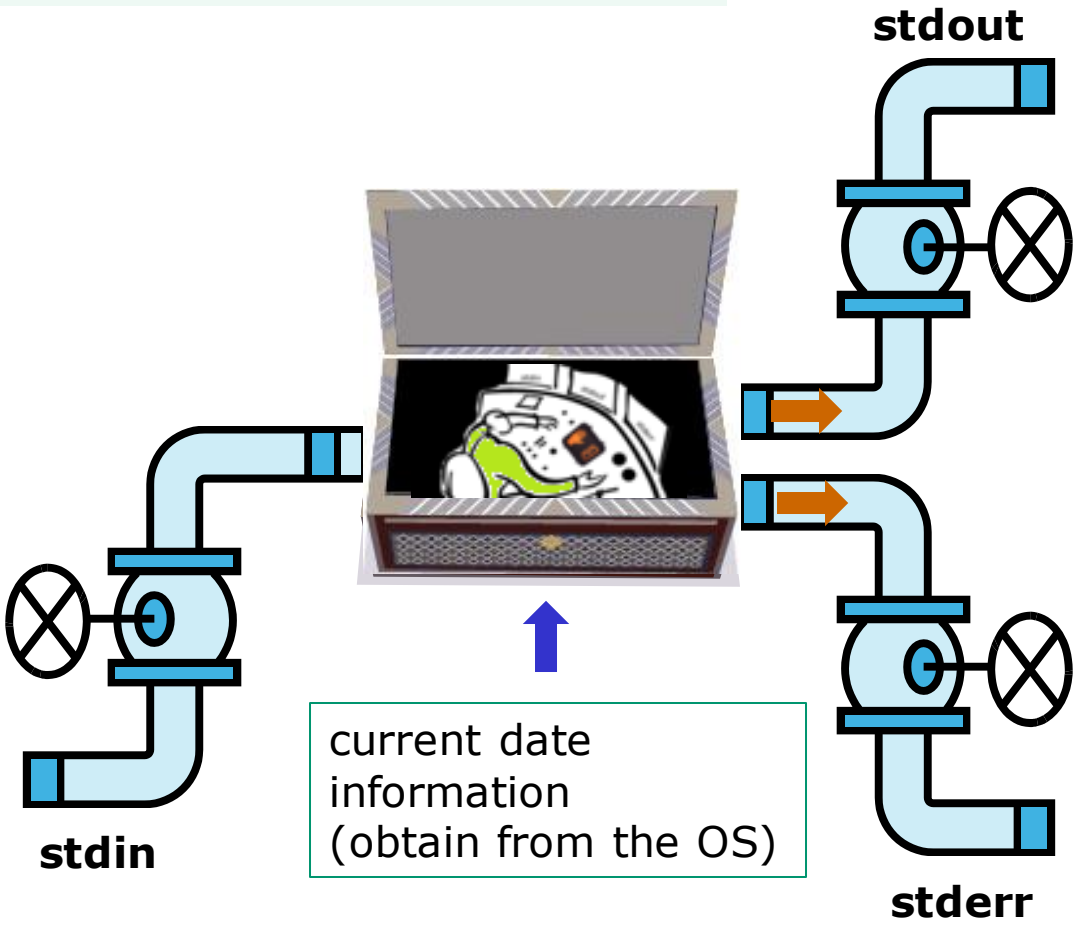

```
Hola simben90
05/09/2013
```

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

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

Running a Script

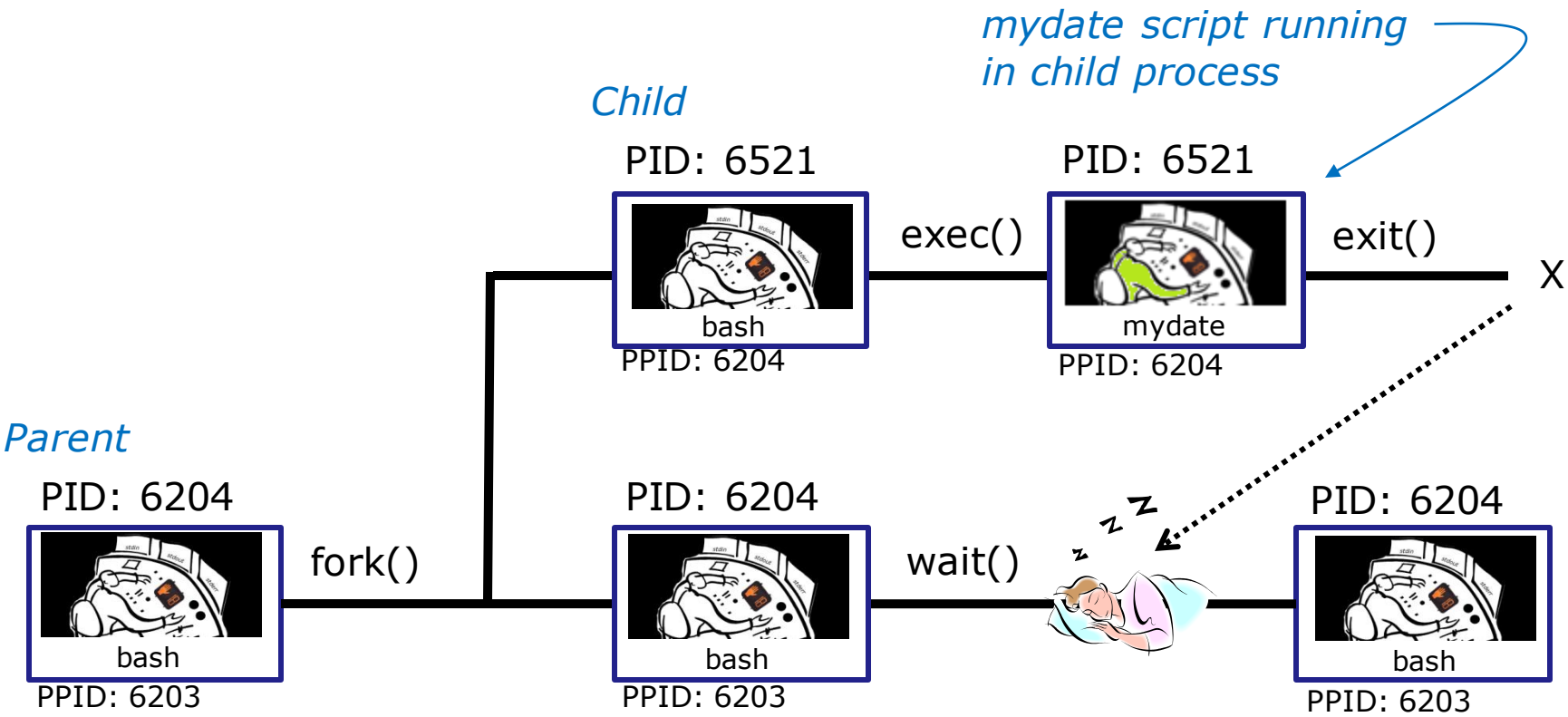
$ mydate




```
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

/home/cis90/simben $
```

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

Why no Tic Tac Toe output?

Running a Script

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

/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
```

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

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

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

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

Add these new lines

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

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

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

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

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

Printers

Two predominate types of printers

- Thermal inkjet technology
- Laser, drum, toner technology

So many ways to hook them up …

Now:
- Network
- USB
- Wireless (Bluetooth, IR)

Back then:
- Serial cable
- Parallel printer cable

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*]

```
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

What printers are available on Opus?

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

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

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

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

CUPS

Practice Printing

On Opus

```
lpq
lpstat

cancel <print job number>
lpq

lprm <print job number>
lpq
```

When finished type "done" in the chat window


Assignment

Start your project!

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	mesg	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	- Linux print command
cancel, lprm	- cancel print job
lpq, lpstat	- Show print queue

Web:

http://hostname:631	- CUPS web based management utility
http://hostname:9100	- 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 10 "original" script command lines
  - Has one or more non-generic comments to explain what it is doing
  - Has user interaction

You don't have to do all of these but do at least five:
- Redirecting stdin (5 points)
- Redirecting stdout (5 points)
- Redirecting stderr (5 points)
- Use of permissions (5 points)
- Use of filename expansion characters (5 points)
- Use of absolute path (5 points)
- Use of relative path (5 points)
- Use of a PID (5 points)
- Use of inodes (5 points)
- Use of links (5 points)
- Use of scheduling (5 points)
- Use of a GID or group (5 points)
- Use of a UID or user (5 points)
- Use of a /dev/tty device (5 points)
- Use of a signal (5 points)
- Use of piping (5 points)
- Use of an environment variable (5 points)
- Use of /bin/mail (5 points)
- Use of a conditional (5 points)

The maximum for this section is 25 points.

Backup