CSE 390a
Lecture 6

bash scripting continued; remote X windows; unix tidbits

slides created by Marty Stepp, modified by Jessica Miller and Ruth Anderson
http://www.cs.washington.edu/390a/

Lecture summary

- more shell scripting
  - if/else
  - while/until
  - select/case
  - advanced: arrays and functions
- Remote editing/GUI
- various new Unix/Linux commands
  - file archiving and compression
  - shell history
  - newlines in Unix vs Windows

if/else

```
if [ cond ]; then              # basic if
    commands
fi
if [ cond ]; then              # if / else if / else
    commands1
elif [ cond ]; then
    commands2
else
    commands3
fi
```

- [is actually a shell command called "*test*", not just a character
- there ***MUST*** be spaces as shown:
  if space [space ***cond*** space]
- include the semi-colon after] (or put "then" on the next line)

Testing operators

comparison operator	description
`=, !=, <, >`	compares two string variables
`-z, -n`	tests whether a string is or is not empty (null)
`-lt, -le, -eq, -gt, -ge, -ne`	compares numbers; equivalent to Java's `<, <=, ==, >, >=, !=`
`-e, -d`	tests whether a given file or directory exists
`-r, -w`	tests whether a file exists and is read/writable

```
if [ $USER = "daisy" ]; then
    echo 'Hello there, beautiful!'
fi
LOGINS=`w -h | wc -l`
if [ $LOGINS -gt 10 ]; then
    echo 'attu is very busy right now!'
fi
```

*Note: `man test` will show other operators.

More if testing

compound comparison operators	description

`if [ expr1 -a expr2 ]; then ...`
`if [ test1 ] && [ test2 ]; then ...`
	and

`if [ expr1 -o expr2 ]; then ...`
`if [ test1 ] || [ test2 ]; then ...`
	or

`if [ ! expr ]; then ...`	not

```
# alert user if running >= 10 processes when
# attu is busy (>= 5 users logged in)
LOGINS=`w -h | wc -l`
PROCESSES=`ps -u $USER | wc -l`
if [ $LOGINS -gt 5 -a $PROCESSES -gt 10 ]; then
    echo "Quit hogging the server!"
fi
```

Exercise

- Write a program that computes the user's body mass index (BMI) to the nearest integer, as well as the user's weight class:

$$BMI = \frac{weight}{height^2} \times 703$$

BMI	Weight class
≤ 18	underweight
18 - 24	normal
25 - 29	overweight
≥ 30	obese

```
$ ./bmi
Usage: ./bmi weight height

$ ./bmi 112 72
Your Body Mass Index (BMI) is 15
Here is a sandwich; please eat.

$ ./bmi 208 67
Your Body Mass Index (BMI) is 32
There is more of you to love.
```

Exercise solution

```
#!/bin/bash
# Body Mass Index (BMI) calculator
if [ $# -lt 2 ]; then
    echo "Usage: $0 weight height"
    exit 1
fi

let H2="$2 * $2"
let BMI="703 * $1 / $H2"
echo "Your Body Mass Index (BMI) is $BMI"
if [ $BMI -le 18 ]; then
    echo "Here is a sandwich; please eat."
elif [ $BMI -le 24 ]; then
    echo "You're in normal weight range."
elif [ $BMI -le 29 ]; then
    echo "You could stand to lose a few."
else
    echo "There is more of you to love."
fi
```

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Common errors

- `[: -eq: unary operator expected`
  - you used an undefined variable in an `if` test
- `[: too many arguments`
  - you tried to use a variable with a large, complex value (such as multi-line output from a program) as though it were a simple int or string
- `let: syntax error: operand expected (error token is " ")`
  - you used an undefined variable in a `let` mathematical expression

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while and until loops

```
while [ test ]; do          # go while test is true
      commands
done


until [ test ]; do          # go while test is false
    commands
done

while [ "$ACTION" = "open the pod bay doors" ]; do
    echo "I'm sorry Dave, I'm afraid I can't do that."
    read –p "What would you like me to do?" ACTION
done
```

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select and case

- Bash Select

```
PS3=prompt  # Special variable for the select prompt
select choice in choices; do
        commands
        # Break, otherwise endless loop
        break
 done
```

- Bash Case

```
case EXPRESSION in
    CASE1) COMMAND-LIST;;
    CASE2) COMMAND-LIST;;
    ...
    CASEN) COMMAND-LIST;;
esac
```

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Exercise

- Have the user select their favorite kind of music, and output a message based on their choice

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Exercise Solution

```
PS3="What is your favorite kind of music? "
select CHOICE in "rock" "pop" "dance" "reggae"; do
    case "$CHOICE" in
        "rock") echo "Rock on, dude.";;
        "pop") echo "Top 100 is called that for a reason.";;
        "dance") echo "Let's lay down the Persian!";;
        "reggae") echo "Takin' it easy...";;
        * ) echo "come on...you  gotta like something!";;
    esac
    break
done
```

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Arrays

```
name=(element1 element2 ... elementN)

name[index]=value          # set an element
$name                      # get first element
${name[index]}             # get an element
${name[*]}                 # elements sep.by spaces
${#name[*]}                # array's length
```

- arrays don't have a fixed length; they can grow as necessary
- if you go out of bounds, shell will silently give you an empty string
  - you don't need to use arrays in assignments in this course

Functions

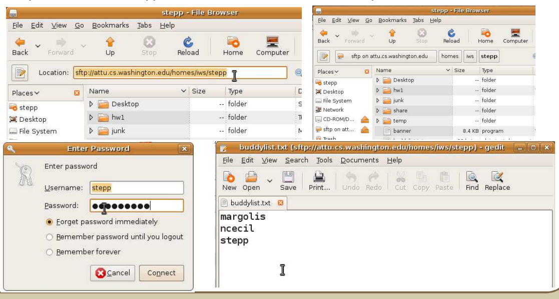
```
function name() {          # declaration
    commands               # ()’s are optional
}

name                       # call
```

- functions are called simply by writing their name (no parens)
- parameters can be passed and accessed as $1, $2, etc. (icky)
  - you don't need to use functions in assignments in this course

Remote editing

- Gnome's file browser and `gedit` text editor are capable of opening files on a remote server and editing them from your computer
  - press Ctrl-L to type in a network location to open



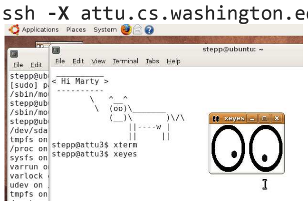
stepp - File Browser
File Edit View Go Bookmarks Tabs Help
Back Forward Up Stop Reload Home Computer
Location: sftp://attu.cs.washington.edu/homes/iws/stepp
Places
stepp
Desktop
File System
Name Size Type
Desktop -- folder
hw1 -- folder
junk -- folder
stepp - File Browser
sftp on attu.cs.washington.edu homes iws stepp
Network
CD-ROM/D...
sftp on att...
Trash
share -- folder
temp -- folder
banner 8.4 KB program
Enter Password
Enter password
Username: stepp
Password:
Forget password immediately
Remember password until you logout
Remember forever
Cancel
Connect
buddylist.txt (sftp://attu.cs.washington.edu/homes/iws/stepp) - gedit
File Edit View Search Tools Documents Help
New Open Save Print... Undo Redo Cut Copy Paste Find Replace
buddylist.txt

```
margolis
ncecil
stepp
```

Remote X display

- normally, you cannot run graphical programs on a remote server
- however, if you connect your SSH with the -X parameter, you can!
  - the X-Windows protocol is capable of displaying programs remotely

```
ssh -X attu.cs.washington.edu
```



```
 __________
< Hi Marty >
 ----------
        \   ^__^
         \  (oo)\_______
            (__)\       )\/\
                ||----w |
                ||     ||
stepp@attu3$ xterm
stepp@attu3$ xeyes
```

```
stepp@ub
[sudo] p
/sbin/mo
stepp@ub
/sbin/mo
stepp@ub
/dev/sda
tmpfs on
/proc on
sysfs on
varrun o
varlock
udev on
tmpfs on
```

- Other options (-Y for “Trusted” mode, -C for compressed, see online)

Compressed files

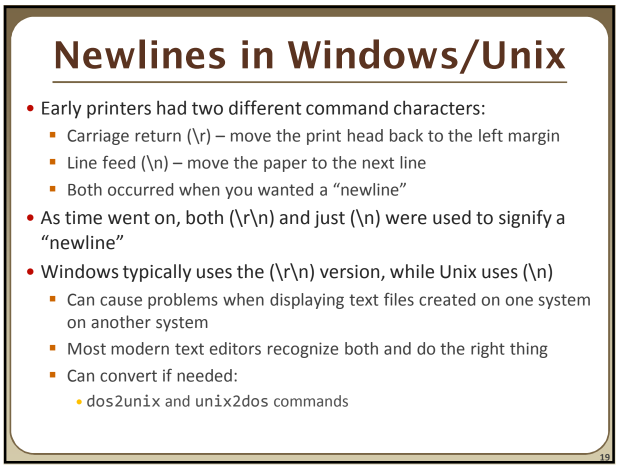
command	description
`zip, unzip`	create or extract .zip compressed archives
`tar`	create or extract .tar archives (combine multiple files)
`gzip, gunzip`	GNU free compression programs (single-file)
`bzip2, bunzip2`	slower, optimized compression program (single-file)

- many Linux programs are distributed as `.tar.gz` archives
  - first, multiple files are grouped into a `.tar` file (not compressed)
  - next, the `.tar` is compressed via `gzip` into a `.tar.gz` or `.tgz`
- to decompress a `.tar.gz` archive:

```
$ tar -xzf filename.tar.gz
```

Other useful tidbits

- Single quotes vs double quotes
  - Quotes tell the shell to treat the enclosed characters as a string
  - Variable names are not expanded in single quotes
    - STAR=*
      - echo $STAR
      - echo “$STAR”
      - echo ‘$STAR’
- Shell History
  - The shell remembers all the commands you’ve entered
  - Can access them with the `history` command
  - Can execute the most recent matching command with !
    - Ex: `!less` will search backwards until it finds a command that starts with `less`, and re-execute the entire command line



Newlines in Windows/Unix

- Early printers had two different command characters:
  - Carriage return (\r) – move the print head back to the left margin
  - Line feed (\n) – move the paper to the next line
  - Both occurred when you wanted a “newline”
- As time went on, both (\r\n) and just (\n) were used to signify a “newline”
- Windows typically uses the (\r\n) version, while Unix uses (\n)
  - Can cause problems when displaying text files created on one system on another system
  - Most modern text editors recognize both and do the right thing
  - Can convert if needed:
    - `dos2unix` and `unix2dos` commands

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