
CSE 390a

Lecture 6

bash scripting continued; remote X windows; unix tidbits

slides created by Marty Stepp, modified by Jessica Miller

<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 [ test ]; then          # basic if
    commands
fi
```

```
if [ test ]; then          # if / else if / else
    commands1
elif [ test ]; then
    commands2
else
    commands3
fi
```

- there **MUST** be a space between `if` and `[` and between `[` and ***test***
 - `[` is actually a shell command, not just a character
 - also be careful to include the semi-colon between `]` and `then`

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 | wc -l`
if [ $LOGINS -gt 10 ]; then
    echo 'attu is very busy right now!'
fi
```



More if testing

compound comparison operators	description
<code>if [<i>expr1</i> -a <i>expr2</i>]; then ...</code> <code>if [<i>test1</i>] && [<i>test2</i>]; then ...</code>	and
<code>if [<i>expr1</i> -o <i>expr2</i>]; then ...</code> <code>if [<i>test1</i>] [<i>test2</i>]; then ...</code>	or
<code>if [! <i>expr</i>]; then ...</code>	not

```
# alert user if running >= 10 processes when
# attu is busy (>= 5 users logged in)
LOGINS=`w | 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
```

```
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.
```

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

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
```

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

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
```

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
```

Exercise

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

Exercise Solution

```
PS3="What is your favorite kind of music? "  
select CHOICE in "rock" "pop" "dance" "raggae"; 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!";;  
    "raggae") echo "Takin' it easy...";;  
    * ) echo "come on...you gotta like something!";;  
  esac  
  break  
done
```

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

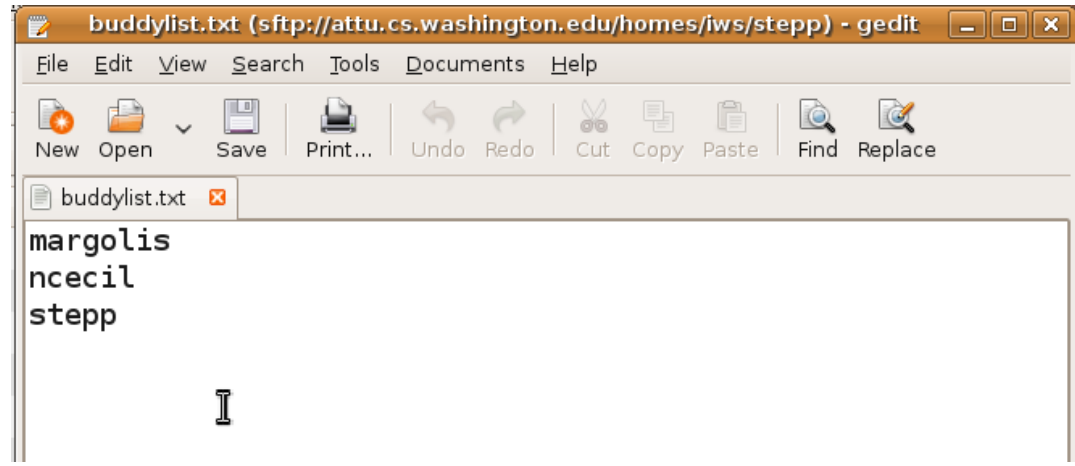
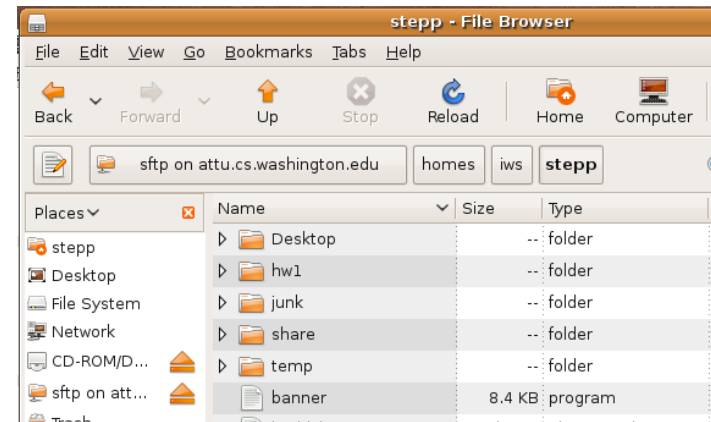
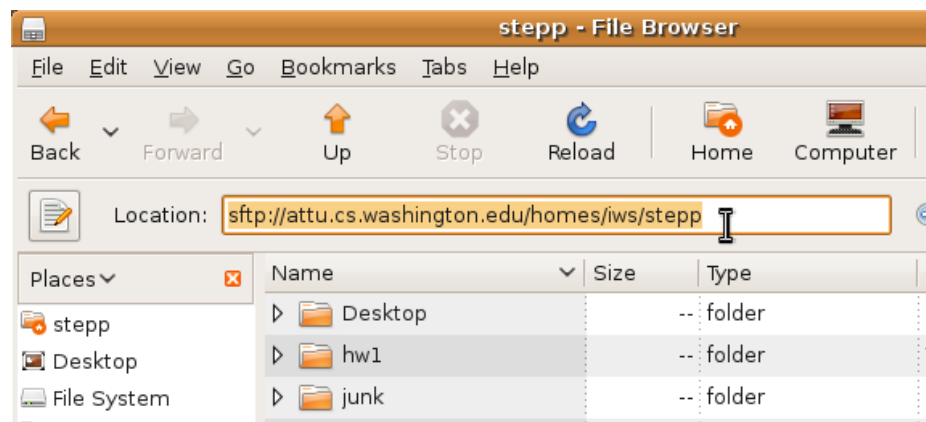
```
function name() {           # declaration  
    commands                # ()'s are optional  
}
```

```
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

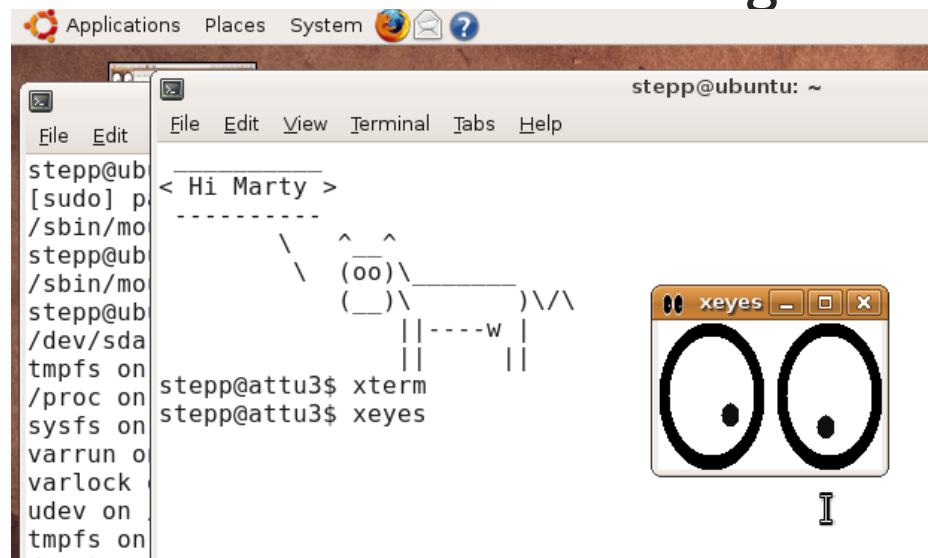
- Gnome's file browser and `gedit` text editor are capable of opening files on a remote server and editing them from your computer
 - press `Ctrl-L` to type in a network location to open



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
```



- 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