

SHELL SCRIPTING AND CUSTOMIZATION

GPI F20 · Emmanuel & Sayan

PET TAX

Carole Bashkin!

Ran her program, bashed it

Can't convince her that bash isn't
awesome

Pipin', globbin', multitaskin'

What's happen?

Carole Bashkin!



WHAT IS A SHELL?

- A shell is the outermost layer that allows a user to interact with the operating system.
- For a programmer, it is the program that powers your terminal.
- We will focus on Unix shells, command-line interpreters for Unix-like operating systems.
- They come in many flavors.
 - `zsh`, `bash`, `fish`, etc.

COMMAND CENTER

- Show contents of a file `cat path`
- Show contents of a directory `ls`
- Change directories `cd path`
- Remove a file `rm src`
- Move/rename a file `mv src dst`
- Copy a file `cp src new_name`
- Execute a binary `./name`
- Print something `echo "Hello, world!"`

OVER, OVER, AND OVER AGAIN

- Sometimes, you want to run the same set of commands multiple times.
 - Compiling and testing your code
 - Renaming a bunch of files
 - Initializing your git repos with a `.gitignore`
 - Archiving your new favorite xkcd comics
 - Setting up your dev environment on a new machine
- Shell scripts allow you to run a sequence of shell commands from a file.

```
~  
> z scripts  
  
~/scripts  
> cat resume.sh  
#!/bin/bash  
cd ~/Google\ Drive  
cp ~/Documents/Resume/SayanChaudhry_CarnegieMellon_Resume.pdf .  
cp ~/Documents/Resume/SayanChaudhry_CarnegieMellon2020_Resume.pdf .  
cd ~/Documents/git/shiftsayan.github.io  
cp ~/Documents/Resume/SayanChaudhry_CarnegieMellon_Resume.pdf ./resume.pdf  
git add .  
git commit -m "update resume"  
git push -u origin master  
  
~/scripts  
> ./resume.sh
```

WRITE YOUR OWN SHELL SCRIPT

- Each script begins with a shebang followed by the commands you want to execute.
 - `#!/bin/zsh`
 - `#!/bin/bash`
 - `#!/usr/bin/env python3`
- Add executable permissions to your file.
 - `chmod +x script.sh`
 - This changes the mode of the file to an executable.
- Run the script!
 - `./script.sh`

FUNCTIONS ARE SHELL SCRIPTS

- Apart from interfacing with the operating system, they support other programming constructs as well.
 - Variables
 - Conditionals
 - Loops
 - String Manipulation
- The syntax, unfortunately, does not spark joy.
 - Variable Assignment: `VAR=value`
 - Variable Access: `echo $VAR`
 - Command Line Arguments: `$1, $2, $3, and so on`



- Python syntax, however, does spark joy.
- You can convert any of your Python scripts into executable scripts by adding a shebang.
 - `#!/usr/bin/env python3`



Globs and Ranges

Imagine that this is you....

- Carol Bashkin has successfully sued you and is trying to take all your stuff
- Option 1:



Imagine that this is you....

- Carol Bashkin has successfully sued you and is trying to take all your stuff
- Option 2: make fake financial statements to hide your assets
- Problem: it's hard to make a ton of fake financial statements quickly
 - Financial statement is an empty file that is named [year].financial_statment
- Can Joe make financial statements from 1988 to 2019 in one command line?
- Solution: ranges.

Ranges

- Patterns that the shell is able to expand
- First form:
 - `abc{def,DEF,dEf}ghi` → `abcdefghi abcDEFghi abcdEfghi`
- Second form:
 - `abc{a..d}efg` → `abcaefg abcbefg abccefg abcdefg`
- **NOTE NO SPACES** in the ranges
- Shell does the expansion before running a command
- Ex:
 - `$ echo abc{def,DEF,dEf}ghi`
 - `abcdefghi abcDEFghi abcdEfghi`

So how do we commit fraud?

- Can Joe make financial statements from 1988 to 2019 in one command line?
- Solution:
 - `$ touch {1988..2019}.financial_statement`
- Sweet we did it!!!

Darn Howard Bashkin...

- Unfortunately, Howard Bashkin (Carol's (for the moment still living) husband) is a lawyer and notices that real financial statements have 3 parts.
- The statute of limitations is 10 years for this type of fraud.
- Howard needs to collect all records from 2010 onwards and zip them into one zip file. Can he do this in 1 line?
- Solution: globs

Globs

- Patterns that expand to all files in the local directory that match the pattern
- **? glob**
 - Matches any single character
 - Ex:
 - `abc?efg` matches `abcdefg`, `abccefg`, `abc0efg`, and more!!
- *** glob**
 - Matches any character 0 or more times
 - Ex:
 - `abc*efg` matches `abcccccccccefg`, `abcefg`, `abc_literally_anything_efg`
- Again matching is done by the shell before it is passed into any command

Catching Financial Fraud

- Howard needs to collect all records from 2010 onwards and zip them into one zip file. Can he do this in 1 line?
 - Hint: the zip command zips files by:
 - `$ zip <output file> <input files ...?>`
- We can use glob: ?
- Solution:
 - `$ zip joe_exotic_financial_statements.zip 201?.financial_statement`

Why was this better than using a range?

- Wait doesn't this work as well?
 - `$ zip joe_exotic_financial_statements.zip {2010..2019}.financial_statement`
- Yes...but what if Joe didn't have one of his financial statement
 - Say he was missing 2018 since he made a lot of money from his Oklahoma governor's campaign
- What if the statute of limitations was 20 years instead?
 - `$ zip joe_exotic_financial_statements.zip 20??.financial_statement`
- What if we want all the financial statements regardless of year?
- We want any file ending in `.financial_statement`

Rick Kirkham sees this and is like....

- Rick needs to develop 10 seasons each of 10 episodes of both Joe Exotic TV and his new reality show, big cat country
- Is there a way where rick can generate all these different mp4 files in 1 command line? (they can just be empty files)
- Solution: nested ranges:
 - `$ touch {joe_exotic_tv,big_cat_country}_s{1..10}e{1..10}.mp4`
 - This expands to:
 - `$ touch joe_exotic_tv_s{1..10}e{1..10}.mp4 big_cat_country_s{1..10}e{1..10}.mp4`
 - So on...
 - This will generate every combination of tv show, season, and episode and create 200 files!!

Oh no!!! The alligator enclosure!!



Oh no!!! The alligator enclosure!!

- An unknown person set the alligator enclosure on fire!!!
- It destroyed all of Rick's tv show's footage!!!
- Is there a 1 line command to delete all of rick's footage, but none of JoeExoticTV?
 - `$ rm big_cat_country*.mp4`

Summary (of Charges filed by US Attorney in Tulsa)

- Ranges:
 - {start..end} or {thing1,thing2,thing3} ← note no spaces in range
- Globs expand to match all files in given folder that match the form:
 - ? ← wild card matches any single character
 - * ← expands to match zero or more characters
- Lol im trying to somehow make this slide Tiger King themed



Shell Configuration

.rc files

- Depending on your OS/shell you might have:
 - .bashrc, .zshrc, .bash_profile, etc. in your home folder
- These are shell scripts that are run when a new terminal window is created
- You can initialize a bunch of different things in your .rc file
- Unlike bash scripts they're run in the same shell as your default shell
 - Could be run in ZSH, not bash, if you use ZSH

Environment Variables

- Create variables that you can use in your terminal
 - API Keys
 - Paths to things
 - What Joe Exotic's real name is
- Setting environment variables:
 - `$ export joe_exotic="Joseph Allen Maldonado-Passage"`
- Aliases
 - Let you make your own terminal commands
- Setting Aliases:
 - Maybe you want `gs` to alias to `git status`
 - `$ alias gs="git status"`

Resourcing your .rc file

- Your .rc file is ran when the shell starts
- If you modify it, those changes aren't reflected in your current shell windows
- So you need to re-source the .rc file:
 - `$ source .zshrc` ← or whatever your .rc file is

You need to hide the body that's under the septic tank

- Carol is hiding the body of her husband under the septic_tank folder
- She wants to make sure that every time she opens her terminal it deletes the file body_of_husband in of the septic tank folders
- How can she do this?

Solution: the `**` glob

- Recursive glob
- Matches any file at any depth in folders in current directory
- Ex:
 - `**/abc.xyz` matches `abc.xyz`, `folder/abc.xyz`, `folder2/abc.xyz`, `folder/subfolder/abc.xyz`

How can

1. Open our
2. Add rm *s
3. Re-sourc
4. Start you



Hints for the lab

- “When it all goes down you want to be on the side of the feds”