bash Tips &> Tricks

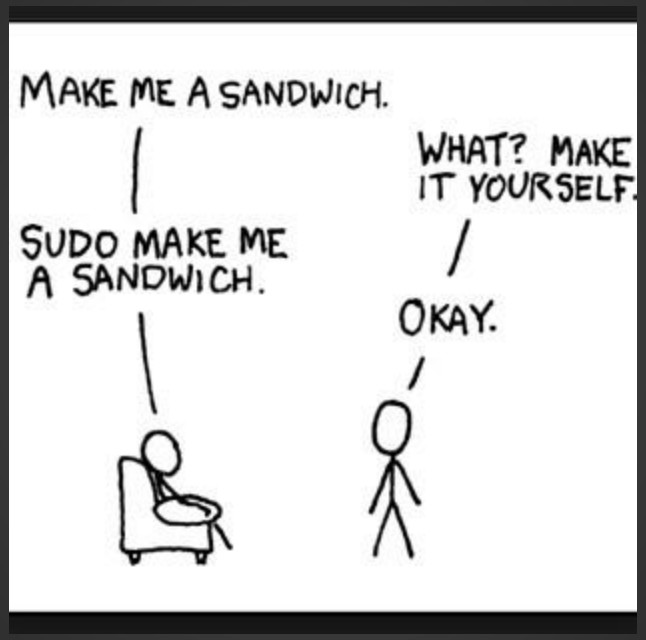
Using the shell for fun and profit!

Brian Gerard
bgerard@gmail.com
August, 2014

What We'll Talk About Today

- Some Useful Commands and Options
- History Manipulation
- Gettin Loopy
- Aliases
- Functions

Commands to Know and Love.



Useful Commands and Options: `man(1)` and `apropos(1)`

```
# Learn how to learn
bash$ man man

# Learn a heck of a lot more than you're
# going to in today's class
bash$ man bash

# See if there are any other man pages that
# would have useful info on the subject
bash$ apropos bash
```

Useful Commands and Options: `man(1)` and `apropos(1)`

```
# Q: What do those numbers up there (⬆)
# actually mean?
# A: It's the section of the manual where
# you will find the page in question.

# Find out about the user command printf(1)
bash$ man 1 printf

# Find out about the C standard library
# function named printf(3)
bash$ man 3 printf
```

Useful Commands and Options:

grep(1)

```
# Show the lines where a pattern occurs
bash$ grep pattern filename
# ...or the ones where it doesn't
bash$ grep -v pattern filename

# ...or anywhere in all the files under a
# directory; "r" == recursive
bash$ grep -r pattern directory

# Search case-insensitively
bash$ grep -i pattern filename
```

Useful Commands and Options:

grep(1)

```
# Show the lines where a pattern occurs,
# preceded by the line numbers
bash$ grep -n pattern filename

# Only report the *count* of lines on which
# a pattern occurs in the file; only counts
# lines, not instances of the pattern
bash$ grep -c pattern filename
```

Useful Commands and Options:

grep(1)

```
# The ABC's of grep...

# Show matching lines, plus two lines After
bash$ grep -A 2 pattern filename

# Show matching lines, plus two lines Before
bash$ grep -B 2 pattern filename

# Show matching lines, with two lines before
# *and* two after (C == Context)
bash$ grep -C 2 pattern filename
```

Useful Commands and Options:

grep(1)

```
# grep(1) also has siblings it's worth
# getting to know:

# Search for a fixed string (no regexes).
# Can be much faster if you don't really
# need a regex match (but -i still works)
bash$ fgrep string filename

# Search for an extended regex
bash$ egrep uberPattern filename
```

Useful Commands and Options:

find(1)

```
# All items with "something" in their names
bash$ find /somewhere -name '*something*'

# All files larger than 2 MiB in size
bash$ find /somewhere -size +2M

# Or both...
bash$ find /somewhere -size +2M \
      -a -name '*something*'
```

Useful Commands and Options:

find(1)

```
# Things modified within the past day...
bash$ find /somewhere -mtime -1
# ...or those modified *more* than a day ago
bash$ find /somewhere -mtime +0

# Stuff modified more recently than "foo"
bash$ find /somewhere -newer /path/to/foo

# Run something on each entry it finds
bash$ find /somewhere -name '*something*' \
      -exec chmod 644 '{}' \;
```

Useful Commands and Options:

find(1)

```
# Leading us inevitably to...

bash$ find /your_base -name '*' \
      -exec chgrp us '{}' \;
```

Useful Commands and Options:

xargs(1)

```
# xargs(1) takes stdin and constructs a
# command from it.

# Run grep(1) on a list of files
bash$ cat file_list | xargs grep -H pattern

# Basically the same as running
bash$ grep pattern file1 file2 file3 ...
# And more efficient than using find(1)
bash$ find . -name 'file*' \
      -exec grep -H pattern '{}' \;
```

Useful Commands and Options:

xargs(1)

```
# The -n option tells xargs to only use a
# certain number of items from stdin for
# each constructed command
bash$ cat host_list | xargs -n 1 host

# Looks up each host in DNS, one at a time.
# Without the '-n 1', host(1) would take the
# first host as the name to look up, the
# second as the DNS server to use, and would
# simply be very confused about being given
# anything more than that.
```

Useful Commands and Options:

xargs(1)

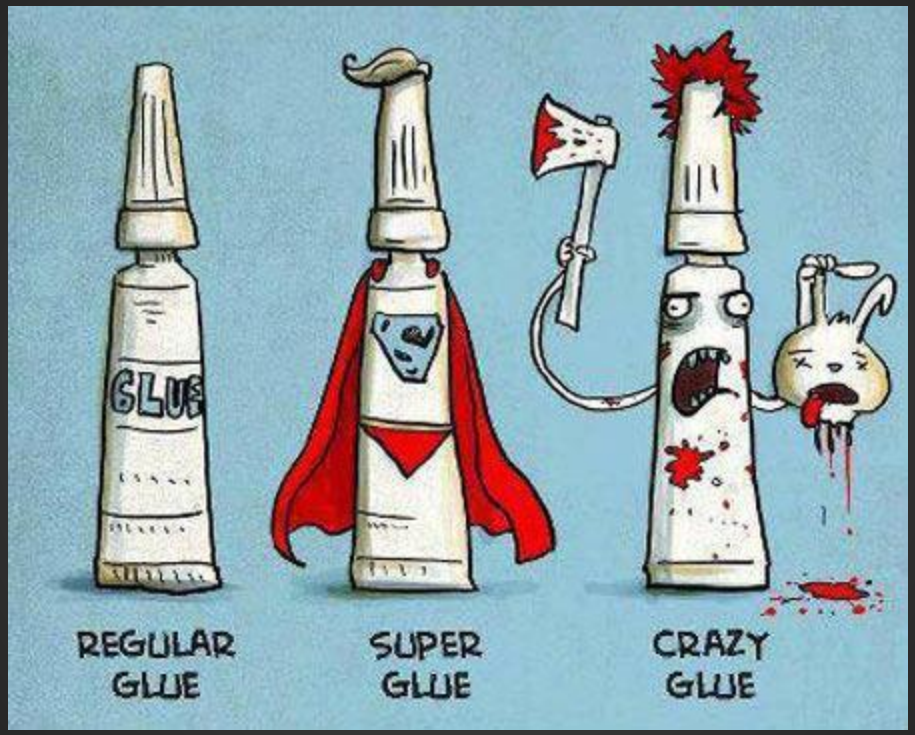
```
# The -I option allows xargs to Insert the
# values it pulls from stdin somewhere other
# than at the end of the command
bash$ cat files_to_copy | \
      xargs -I THEM /bin/cp THEM /somewhere

# Useful with find(1), for example...
bash$ find /active -mtime +30 | \
      xargs -I THEM /bin/mv THEM /archive
```

Useful Commands and Options:

xargs(1)

```
# While we're on the subject, *if* you use
# the find+xargs construct, you need two
# more options for safety's sake:
# find's -print0 (that's print<zero>)
# xargs's -0 (that's -<zero>), a.k.a. --null
bash$ find /my/logs -mtime +30 \
      -a -type f -print0 | xargs -0 /bin/rm

# Ensures that find(1) separates its results
# with NULLs, and that xargs(1) looks for a
# NULL to delimit its incoming arguments.
```

Putting the Pieces Together



Say I wanna do something cool on a buncha hosts...

```
# Ok, here we go...
bash$ ssh host1 'do_something --cool'
bash$ ssh host2 'do_something --cool'
...
bash$ ssh hostN 'do_something --cool'
```

Ugh. That really should have been a bit less... labor intensive.

Time to mess around with history!

Revisionist History, Part One: Command Line Editing

```
# Default keybindings are emacs; let's
# change that to the One True Editor™
bash$ set -o vi

# So I hit the first host...
bash$ ssh host1 'do_something --cool'
# ...and now type (minus the spaces):
# <esc> k w cw host2 <enter>
# ...which will end up running:
bash$ ssh host2 'do_something --cool'
```

Revisionist History, Part... Two ...of Part One?: Command Line Editing

```
# There's also the 'fc' (fix command)
# shell built-in.
bash$ fc

# Yep, that's all there is to it.  It will
# open your previous command in $EDITOR.
# When you exit, whatever you've changed
# that command to will then be executed.

# And I lied.  There can be more to it than
# that. 'man bash' is your friend.
```

Revisionist History, Part Two: Quick History Substitution

```
bash$ ssh host1 'do_something --cool'

# In order to re-run the previous command on
# the next host...
bash$ ^1^2^
ssh host2 'do_something --cool'

# ...or just plain ^1^2 - the end '^' is
# optional unless you want to append
# something to the resulting command.
```

How about another way...

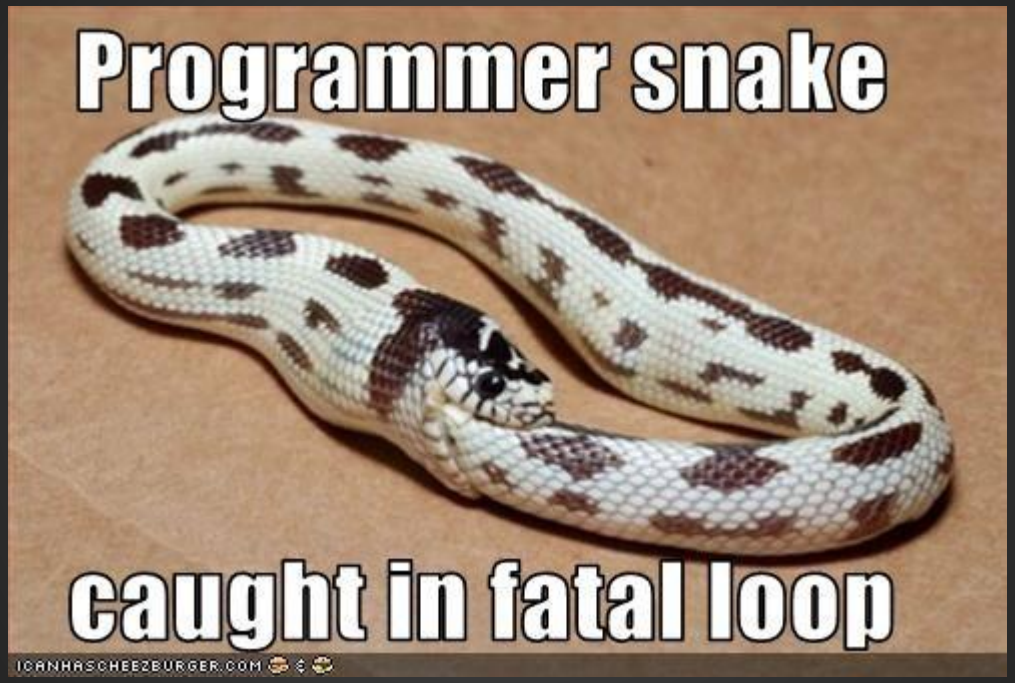
```
## Quick substitution, alternate form.
bash$ ssh host1 'do_something --cool'

# Re-run the previous command on the next
# host...
bash$ !!:s/1/2/
ssh host2 'do_something --cool'

# And again, the trailing '/' is optional if
# you don't need to append anything to the
# resulting command.
```

That seems a bit clunky; what does it give us?

```
## Quick substitution, but not on the
## immediately previous command:

# ...later on in the shell session...
bash$ history | grep 'ssh host1 '
 1234  ssh host1 'do_something --cool'

# Re-execute command number 1234, going to
# a new host this time.
bash$ !1234:s/host1/a-new-host/
ssh a-new-host 'do_something --cool'
```

Cool, but isn't that *still* a bit manual?

Good News; Bash Has Loops!



Gettin All Loopy

```
# There's while...
bash$ while (true); do
> echo "hello world"
> sleep 1
> done
hello world
hello world
hello world
^C
```

Gettin All Loopy

```
# ...and also for...
bash$ for item in ...list...; do
> echo $item
> done
thing1
thing2
...
```

Ooo... that looked promising.

```
# A for loop's list can just be the contents
# of a file, broken on whitespace, and so...
bash$ for host in $(cat list_of_hosts.txt)
> do
> echo "Running on $host"
> ssh $host 'do_something --cool'
> done
Running on host1
Running on host2
...
```

...but what if I want to do that again sometime?

Aliases: They're Not Just for Gangsters Anymore!

What *Is* a Bash Alias?

```
# An alias is a string which will be
# substituted for a word when that word
# appears first in a simple command
bash$ alias sayfoo='echo $foo'
bash$ type sayfoo
sayfoo is aliased to `echo $foo'
bash$ sayfoo

bash$ foo=bar
bash$ sayfoo
bar
```

What *Is* a Bash Alias?

```
# It is worth noting that aliases are only
# expanded once, so something like this...
bash$ alias ls='ls -AFC'
# ...will not result in an infinite
# re-expansion.

# And this, given the declaration above
bash$ ls /foo
# Is exactly the same as this, without it
bash$ ls -AFC /foo
```

Putting That to Good Use

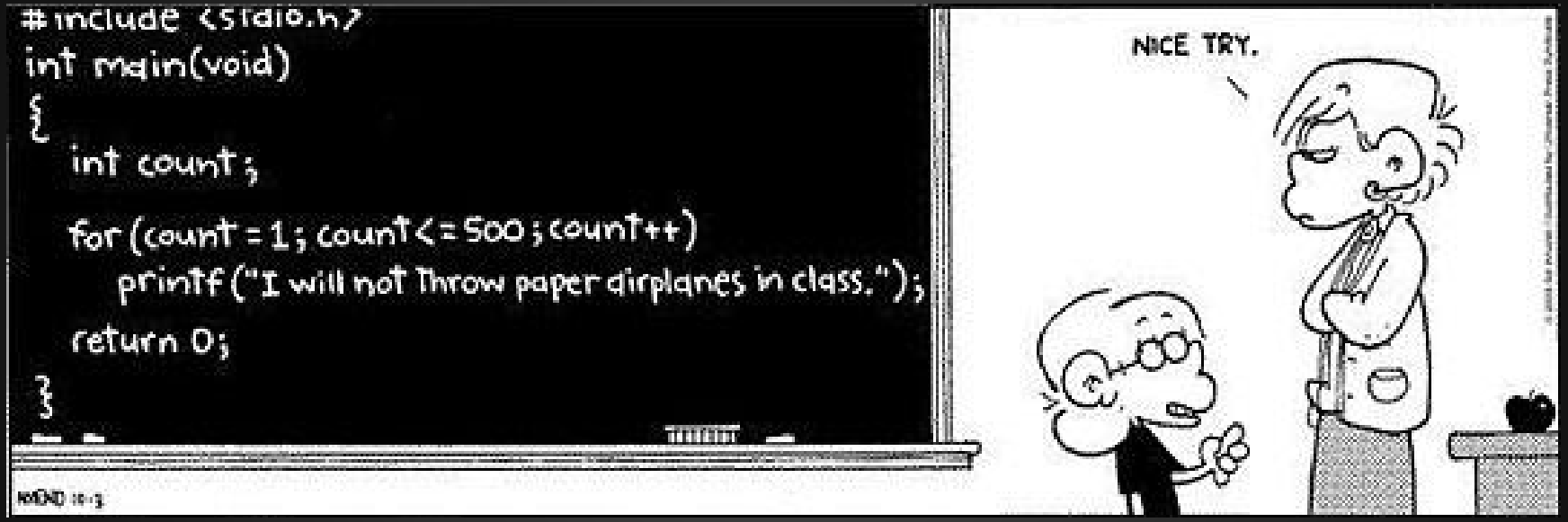
```
# So we can turn that loop into a command
# that can be used again whenever needed.
bash$ alias do_cool_stuff='for host in $(cat
list_of_hosts.txt); do echo "Running on
$host"; ssh $host "do_something --cool";
done'
bash$ type do_cool_stuff
do_cool_stuff is aliased to `for host in
$(cat list_of_hosts.txt); do echo "Running
on $host"; ssh $host "do_something --cool";
done'
```

Step 3: Profit!

```
# And now...
bash$ do_cool_stuff
Running on host1
Running on host2
...
Running on hostN
```

Any other ways to do that?

Even Better - Functions!



Function Version of do_cool_stuff

```
# Translating...
bash$ function do_cool_stuff () {
> for host in $(cat list_of_hosts.txt); do
> echo "Functioning on $host"
> ssh $host "do_something --cool"
> done
> }
bash$
```

Function Version of do_cool_stuff

```
# Here goes...
bash$ do_cool_stuff
Running on host1
Running on host2
...
Running on hostN
```

What the wha?

Aliases are expanded before functions

```
# Meh.
bash$ type do_cool_stuff
do_cool_stuff is aliased to `for host in
$(cat list_of_hosts.txt); do echo "Running
on $host"; ssh $host "do_something --cool";
done'

# Must fix.
bash$ unalias do_cool_stuff
```

Now let's see how it looks

```
bash$ type do_cool_stuff
do_cool_stuff is a function
do_cool_stuff ()
{
    for host in $(cat list_of_hosts.txt);
    do
        echo "Functioning on $host";
        ssh $host "do_something --cool";
    done
}
```

Aaaah... much better.

```
# One mo time!
bash$ do_cool_stuff
Functioning on host1
Functioning on host2
...
Functioning on hostN
```

But why use functions rather than aliases?

1) Output Redirection

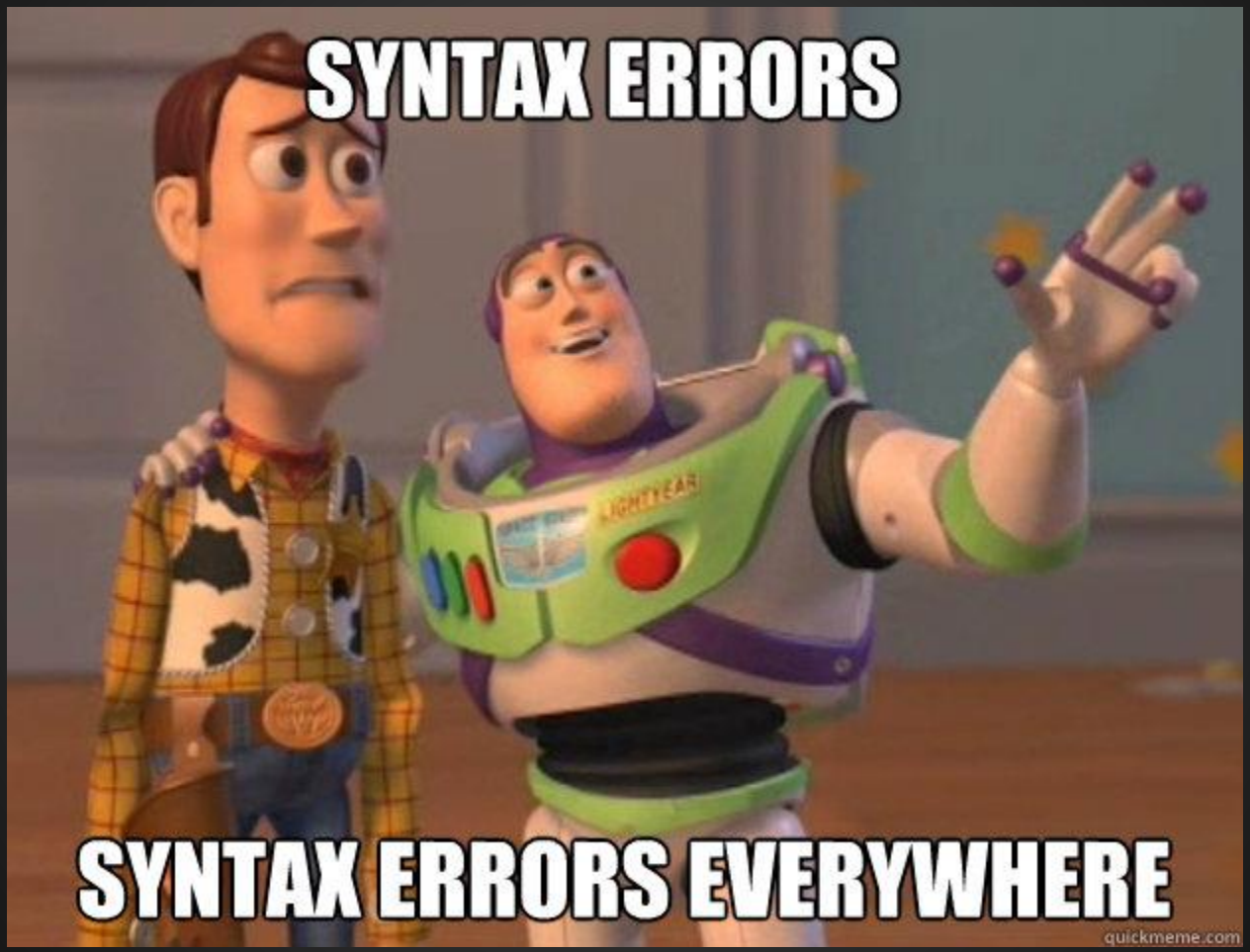
Bash Redirection

```
# bash makes it easy to redirect stdout...
bash$ ls -1 /var/log > list_of_logfiles

# ...stderr...
bash$ grep -r foo /etc 2> /dev/null

# ...or both...
bash$ my.script &> ~/output.and.errors
# (same thing)
bash$ my.script > ~/output.and.errors 2&>1
```

Redirections can be part of the function definition

```
bash$ function here_n_there () {
> echo "This goes to stdout"
> ls /no/such/file
> } > ~/herethere.out 2> ~/herethere.err
bash$ here_n_there
bash$ cat ~/herethere.out
This goes to stdout
bash$ cat ~/herethere.err
ls: cannot access /no/such/file: No such
file or directory
```

2) Syntax Checked While You Wait



bash will catch some errors when you define your function

```
# such as a missing semicolon
bash$ function bad_syntax_yo () {
> echo "This is okay"
> for i in 1 2 3 4; do
> echo "Not ok - no semicolon here ->" done
> }
bash: syntax error near unexpected token `}'
bash$ type bad_syntax_yo
bash: type: bad_syntax_yo: not found
```

Some stuff still slips through

```
# Missing command?  Runtime error.
bash$ function good_syntax_bad_command () {
> echo "This is okay"
> this is not a command
> }
bash$ good_syntax_bad_command
This is okay
-bash: this: command not found
bash$
```

3) Arguments!


THIS Guy is an IDIOT!
NO, HE's the IDIOT!!
AM NOT!
ARE TOO!
Leave me alone, or I will taunt you with another sign!

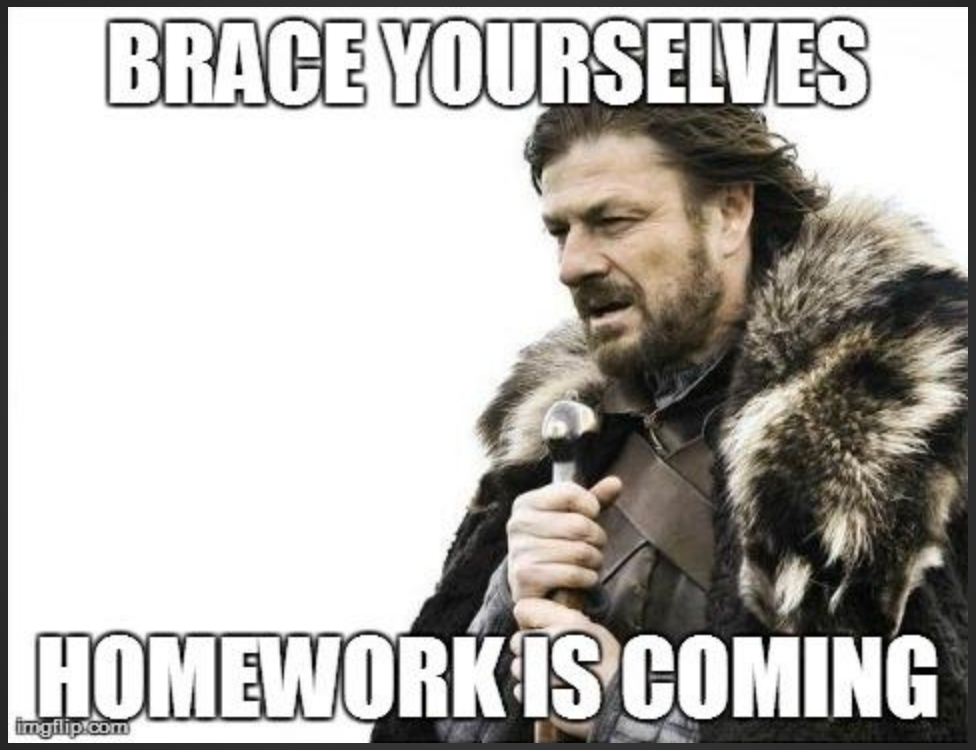
Positional Parameters

```
# We can modify the function to pick a host
bash$ function do_cool_stuff () {
> if [[ $# -gt 0 ]]
> then the_hosts=($@)
> else the_hosts=($(cat list_of_hosts.txt))
> fi
> for host in ${the_hosts[*]}; do
> echo "Functioning on $host"
> ssh $host "do_something --cool"
> done
> }
```

Positional Parameters

```
# And that means we can do this...
bash$ do_cool_stuff host1 host4
Functioning on host1
Functioning on host4
# While this still does the default...
bash$ do_cool_stuff
Functioning on host1
Functioning on host2
...
Functioning on hostN
```

Stuff What Was Skipped



Left As an Exercise to the Reader: Arrays

```
bash$ my_list=(first second third)
bash$ echo ${my_list[1]}
second
bash$ hosts=($(cat my.host.list))
bash$ echo ${hosts[3]}
host4
bash$ echo ${hosts[${#hosts}]}
hostN
```

Left As an Exercise to the Reader: Conditionals

```
bash$ if [[ ${my_list[1]} = "second" ]]
> then echo "yep, it is second"
> else echo "no, it is not"
> fi
yep, it is second
bash$ if [[ ${#my_list} -ge 42 ]]
> then echo "big list"
> else echo "leetle list"
> fi
leetle list
```

Your Mission, Should You Choose to Accept It...

Look through your own history (by running 'history') and see what kinds of things you repeat regularly.

What would make a good alias or function?

Pick one, turn it into one or the other, test it, tweak it until you're happy. Then add it to your .bashrc so you have it handy when you log in.

Lather, rinse, repeat.

References

The bash(1) man page, natch.

Read through these sections for more:

- ALIASES
- FUNCTIONS
- REDIRECTION
- CONDITIONAL EXPRESSIONS

Also feel free to peruse `~bgerard/.bashrc` on pilot.

Cheat sheets, sample code, etc:

https://github.com/briangerard/bash_examples

https://github.com/briangerard/my_env

Thank You!


Thank you, blah,
blah...something clever
and hilarious, blah.
yourecards
someecards.com