THE UNIVERSITY OF WESTERN AUSTRALIA

Shell Arithmetic, Find

Lecture 9

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Shell Arithmetic (is not that great)

- Shell arithmetic is not very efficient, so if you have any substantial computing to do you can use Awk (coming soon!), or a stand-alone Python, etc program.
- `$((` *<expression>* `))` evaluates the expression and returns the result on stdout.

Example:

```
a=1
a=$((a + 1))
echo $a
```

```
2
```

- Often seen in `while` loops

Only integer arithmetic

+	plus
-	minus
*	multiplication
/	integer division
%	remainder
>>	right shift ($/2^N$)
<<	left shift ($*2^N$)
&	bitwise AND
|	bitwise OR
~	bitwise NOT
^	bitwise exclusive OR
&&	logical AND
| |	logical OR
!	logical NOT

Demo – Code in Action

There was time when programmer productivity was measured in lines of code written.

I want to create a Shell program, `countlines`, to count and report the number of files and the total number of lines across Python files in the named directory.

`countlines` Outline

- Check that argument is a directory
- For each Python (.py) file in the directory:
  - *Add 1 to the count of .py files*
  - *Get the file length in lines (wc –l) and add that to the total of lines*

Counted for loops

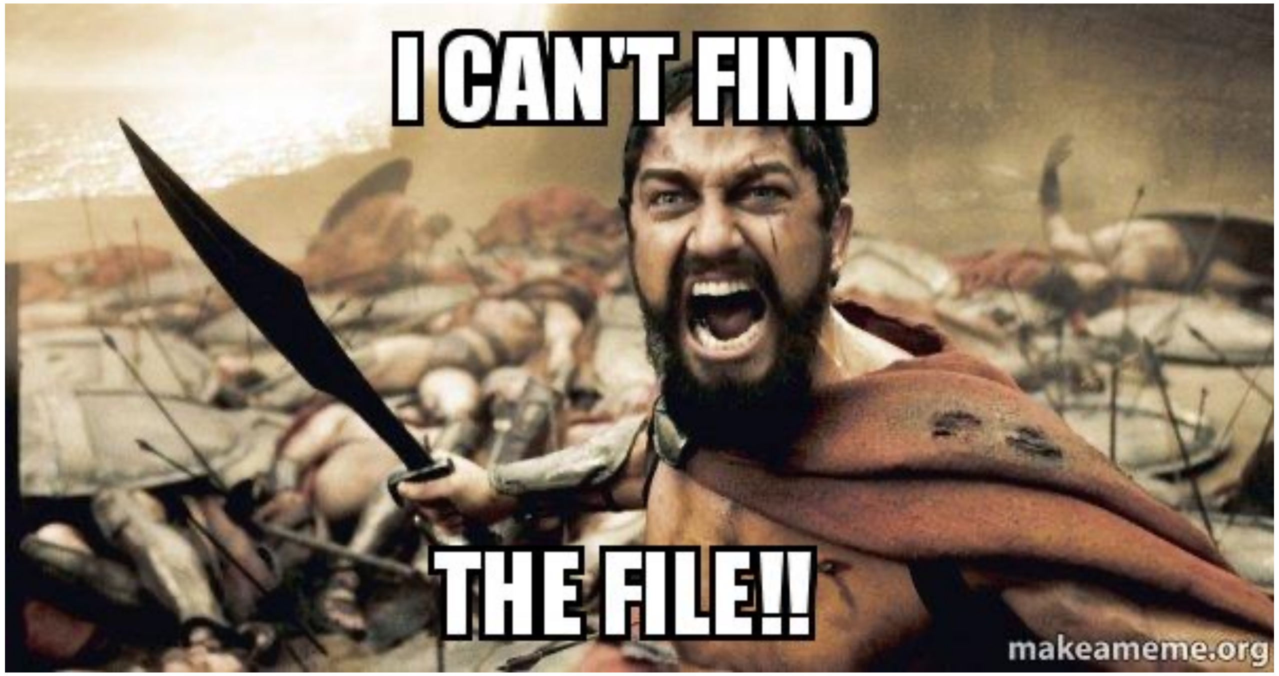
- Bash has a for-loop format that mirrors the one seen in C and Java

```
for (( <initialize loop> ; <test loop exit>; <update> ))
do
    <statements>
done
```

- Example

```
for (( i=0, sum=0; i<10; i++))
do
  sum=$(( sum + i ))
done
```

find



- Find is an incredibly useful command
- The task of recursing through nested directories searching for files with specific properties is VERY common

Find

`find` *[<options>] <path> [<expression>]*

- `find` is given:
  - *one or more directories to search*
  - *an expression specifying the properties of the sought files and/or what actions to perform when the sought files are found (default* `-print` *assumed).*
  - *options, which can be used to modify the search, e.g. to limit the depth of the search.*

Find tests

- Some of the more important tests are:

`-name` *<file pattern>* Can use * [ ] ? etc

The test file matches <file pattern>.

`-type` *<c>*

The type of the file is as specified by <c>, e.g. `d` for a directory, `f` for a regular file, `l` for a symbolic link.

`-newer` *<file>*

The test file has been accessed more recently than <file> was modified.

Find actions

- Some of the more important actions are:

`-print`

Prints the full path-name of the file.

`-exec` <*command*>

Execute <*command*> on each file that survives previous tests. All command-line arguments to find after this are assumed to pertain to the <*command*>, up to a `\;`

- `{}` refers to the file to which the command is being applied.

Find actions

# list all the files in . And subdirectories

```
find . -print
```

# find every Makefile and call make

```
find . -name "[Mm]akefile" -exec make \; -print
```

# find every file (not directory) and list it

```
find . -type f -exec ls -l ’{}’ \;
```

# find every rw------- file and make it rw-r--r--

```
find . -perm 600 -exec chmod 644 ’{}’ \;
```

Demo

- We'll write `countlinesR`, generalising the `countlines` program from the earlier demo, so that it counts lines from all sub-directories of given directory

Successfully found

Demo

I have a *very* large csv file.

- How can I find out how many columns are there are based on just the first line?
- From the header I can see there are N columns. I want to find out if there are columns where many items are the same.
  - *For each column print the column number and the number of unique strings in that column*