

# Shell Scripting 2

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## Last time

We introduced shell scripting as a tool for automating stuff

- ▶ Gave a basic overview of syntax
- ▶ Mentioned `env` and `shellcheck`

## This time

- ▶ More syntax and control flow
- ▶ Variables and techniques  
As before I'll try and keep to POSIX shell and mark where things are Bashisms...
  - ▶ but some Bash-isms are useful to know

# Variables

All programs have variables... Shell languages are no different:

## To create a variable:

```
GREETING="Hello World!"
```

(No spaces around the =)

## To use a variable

```
echo "${GREETING}"
```

If you want your variable to exist in the programs you start as an *environment variable*:

```
export GREETING
```

## To get rid of a variable

```
unset GREETING
```

## Well...

Variables in shell languages *tend* to act more like macro variables.

- ▶ There's no penalty for using one that's not defined.

```
NAME='Joe'
unset NAME
echo "Hello, '${NAME}'"
Hello, ''
```

If this bothers you:

```
set -o nounset
echo "${NAME:? variable 1 passed to program}"
```

(There are a *bunch* of these shell parameter expansion tricks beyond `:?` which can do search and replace, string length and various magic...)

# Standard variables

`${0}` Name of the script

`${1}`, `${2}`, `${3}`... Arguments passed to your script

`${#}` The number of arguments passed to your script

`${@}` and `${*}` All the arguments

## Control flow

If statements and *for* loops, with *globbing*, are available:

```
# Or [ -x myscript.sh ];  
# Or [[ -x myscript.sh ]]; if using Bash  
if test -x myscript.sh; then  
    ./myscript.sh  
fi
```

```
for file in *.py; do  
    python "${file}"  
done
```

## Other loops

Well...okay you only have for really... but you can do other things with it:

```
for n in 1 2 3 4 5; do
    echo -n "${n} "
done
```

```
1 2 3 4 5
```

```
seq 5
```

```
1 2 3 4 5
```

```
for n in $(seq 5); do
    echo -n "${n} "
done
```

```
1 2 3 4 5
```

```
seq -s, 5
```

```
1,2,3,4,5
```

```
# IFS = In Field Separator
IFS=', '
for n in $(seq -s, 5); do
    echo -n "${n} "
done
```

```
1 2 3 4 5
```

## Case statements too!

```
3 # Remove everything upto the last / from ${SHELL}
case "${SHELL##*/}" in
    bash) echo "I'm using bash!" ;;
    zsh)  echo "Ooh fancy a zsh user!" ;;
    fish) echo "Something's fishy!" ;;
    *)    echo "Ooh something else!" ;;
esac
```



## Base name and Dir name

In the previous example I used the "\${VAR##\*/}" trick to remove everything up to the last /... Which gives you the name of the file neatly...  
...but I have to look this up everytime I use it.  
Instead we can use \$(basename "\${shell}") to get the same info.

```
echo "${SHELL}"  
echo "${SHELL##*/}"  
echo "$(basename "${SHELL}")"  
echo "$(dirname "${SHELL}")"
```

You can even use it to remove *file extensions*:

```
for f in *.jpg; do  
    convert "${f}" "$(basename "${f}" .jpg).png"  
done
```

# Pipelines

As part of shell scripting, its often useful to build commands out of chains of other commands. For example I can use `ps` to list all the processes on my computer and `grep` to search.

- How many processes is *Firefox* using?

```
ps -A | grep -i firefox
```

43172	??	SpU	0:10.69	/usr/local/bin/firefox		
59551	??	Sp	0:00.06	/usr/local/lib/firefox/firefox	-contentproc	-appDir
7023	??	SpU	0:06.10	/usr/local/lib/firefox/firefox	-contentproc	{a032331
59478	??	SpU	0:00.21	/usr/local/lib/firefox/firefox	-contentproc	{3cd651d
47320	??	SpU	0:00.60	/usr/local/lib/firefox/firefox	-contentproc	{50d5261
26734	??	SpU	0:00.18	/usr/local/lib/firefox/firefox	-contentproc	{68aa722
308	??	SpU	0:00.16	/usr/local/lib/firefox/firefox	-contentproc	{bd6ff5f
42479	??	SpU	0:00.14	/usr/local/lib/firefox/firefox	-contentproc	{d874750
45572	??	Rp/2	0:00.00	grep	-i	firefox

## Too much info!

Lets use the awk command to cut it to just the first and fifth columns!

```
ps -A | grep -i firefox | awk '{print $1, $5}'
```

```
43172 /usr/local/bin/firefox
59551 /usr/local/lib/firefox/firefox
7023 /usr/local/lib/firefox/firefox
59478 /usr/local/lib/firefox/firefox
47320 /usr/local/lib/firefox/firefox
26734 /usr/local/lib/firefox/firefox
308 /usr/local/lib/firefox/firefox
42479 /usr/local/lib/firefox/firefox
5634 grep
```

## Why is grep in there?

Oh yes... when we search for *firefox* we create a new process with *firefox* in its commandline.  
Lets drop the last line

```
ps -A | grep -i firefox | awk '{print $1, $5}' | ghead -n -1
```

43172	/usr/local/bin/firefox
59551	/usr/local/lib/firefox/firefox
7023	/usr/local/lib/firefox/firefox
59478	/usr/local/lib/firefox/firefox
47320	/usr/local/lib/firefox/firefox
26734	/usr/local/lib/firefox/firefox
308	/usr/local/lib/firefox/firefox
42479	/usr/local/lib/firefox/firefox

And really I'd just like a count of the number of processes

```
ps -A | grep -i firefox | awk '{print $1, $5}' | ghead -n -1 | wc -l  
8
```

## Other piping techniques

- ▶ The `|` pipe copies *standard output* to *standard input*...
- ▶ The `>` pipe copies *standard output* to a named file... (e.g. `ps -A >processes.txt`, see also the `tee` command)
- ▶ The `>>` pipe **appends** *standard output* to a *named file*...
- ▶ The `<` pipe reads a file *into standard input*... (e.g. `grep firefox <processes.txt`)
- ▶ The `<<<` pipe takes a string and *places it on standard input*
- ▶ You can even copy and merge streams if you know their file descriptors (e.g. appending `2>&1` to a command will run it with *standard error* merged into *standard output*)

## Wrap up

Go forth and shell script!

## What we covered

- ▶ Variable expansions
- ▶ Common control flow statements
- ▶ Different pipe tricks



## Software Tools

Good Programming is not learned from  
generatives, but by seeing how significant  
programs can be made clean, easy to read,  
easy to maintain and modify, human-  
engineered, efficient, and reliable by the  
application of common sense and good  
programming practices. Careful study  
and emulation of good programs  
leads to better writing.

Kernighan  
Plauger