CS 241: Systems Programming
Lecture 7. Shell Scripting 2

Fall 2019
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Script positional parameters

`$ ./script arg1 ... argn # or bash script arg1 ... argn`

Special variables

- ‣ `$#` — Number of arguments
- ‣ `$0` — Name used to call the shell script (./script or script)
- ‣ `$1, $2, …, $9` — First nine arguments
- ‣ `${n}` — nth argument (braces needed for $n > 9$)
- ‣ `"$@"` — all arguments; expands to each argument quoted
- ‣ `"$*"` — all arguments; expands to a single quoted string

Two special builtin commands

```
set --
```
‣ Can set positional parameters (and `$#`)
```
   set -- arg1 arg2 … argn
```

```
shift
shift n
```
‣ Discard first *n* parameters and rename the remaining starting at `$1`
‣ If `n` is omitted, it's the same as `shift 1`
‣ Updates `$#`

Iterate over parameters

```
while [[ $# -gt 0 ]]; do
  arg="$1"
  # whatever you want to do with ${arg}
  shift
done
```

Functions

```bash
#!/bin/bash

num_args() {
  echo "foo called with $# arguments"
  if [[ $# -gt 0 ]]; then
    echo "  foo's first argument: $1"
  fi
}


echo "Script $0 invoked with $# arguments"
if [[ $# -gt 0 ]]; then
  echo "  $0's first argument: $1"
fi

num_args 'extra' "$@" 'args'
```

`local` creates a local variable.

What does this script print out?

A. `A`

B. `B`

C. `C`

D. The empty string

E. Nothing, it's a syntax error

```bash
#!/bin/bash

foo() {
    x="$1"
}
bar() {
    local x="$1"
}

x=A
foo B
bar C
echo "${x}"
```

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```bash
#!/bin/bash

foo() {
    x="$1"
}
bar() {
    local x="$1"
    foo "$2"
}

x=A
foo B
bar C D
echo "${x}"
```

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- ‣ `pipeline1 || pipeline2`
  `pipeline2` runs if and only if `pipeline1` doesn't return 0

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- ‣ `pipeline1 || pipeline2`
  `pipeline2` runs if and only if `pipeline1` doesn't return 0
- ‣ `pipeline &`
  runs `pipeline` in the background

When writing a script, we often want to change directories with cd. If the directory doesn't exist, the script should exit with an error.

Which construct should we use?

A. `cd "${dir}" && exit 0`

B. `cd "${dir}" || exit 0`

C. `cd "${dir}" && exit 1`

D. `cd "${dir}" || exit 1`

E. `cd "${dir}" && exit 2`

Arrays

Assign values at numeric indices
- ‣ `arr[0]=foo`
- ‣ `arr[1]=bar`

Assign multiple values at once
- ‣ `arr=(foo bar)`
- ‣ `txt_files=(*.txt) # pathname expansion/globbing`

Append (multiple values) to an array
- ‣ `arr+=(qux asdf)`

Arrays

Access an element
- ‣ `${arr[0]}`
- ‣ `${arr[1]}`
- ‣ `n=42`
  `${arr[n]}`

Access all elements
- ‣ `"${arr[@]}"` # expands to each element quoted by itself
- ‣ `"${arr[*]}"` # expands to one quoted word containing all elements

Array length
- ‣ `${#arr[@]}`

If `arr` is the two element array
`arr=('foo bar' baz)`
how should we print each element of `arr`?

```
A. for elem in ${arr}; do
      echo "${elem}"
   done


B. for elem in "${arr}"; do
      echo "${elem}"
   done


C. for elem in "${arr[*]}"; do
      echo "${elem}"
   done
```

```
D. for elem in "${arr[@]}"; do
      echo "${elem}"
   done


E. for (( n=0 ; n < ${#arr[@]}; n+=1 )); do
      echo "$arr[n]"
   done
```

In-class exercise

https://checkoway.net/teaching/cs241/2020-spring/exercises/Lecture-07.html

Grab a laptop and a partner and try to get as much of that done as you can!