Shell Scripting

Outline

- What is shell?
- Basic
- Syntax
  - Lists
  - Functions
  - Command Execution
  - Here Documents
  - Debug
- Regular Expression
- Find

Why Shell?

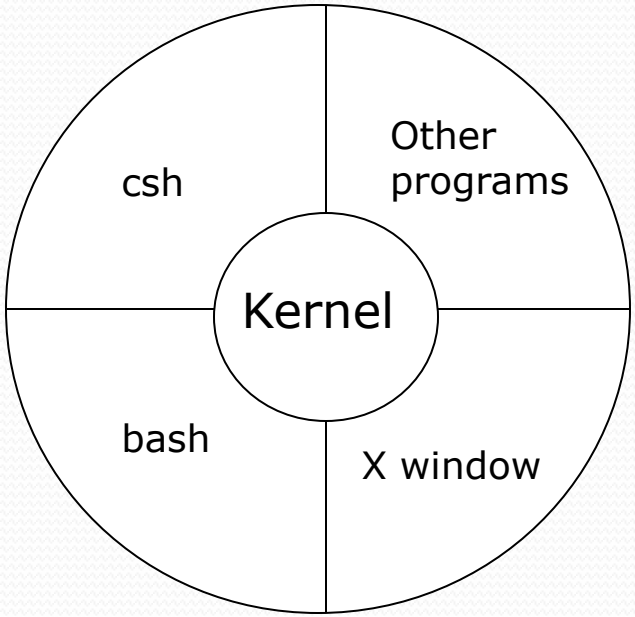
- The commercial UNIX used Korn Shell
- For Linux, the Bash is the default
- Why Shell?
  - For routing jobs, such as system administration, without writing programs
  - However, the shell script is not efficient, therefore, can be used for prototyping the ideas
- For example,

```
% ls -al | more (better format of listing directory)
% man bash | col -b | lpr (print man page of man)
```

What is Shell?

- Shell is the interface between end user and the Linux system, similar to the commands in Windows
- Bash is installed as in /bin/sh
- Check the version

```
% /bin/sh --version
```



Pipe and Redirection

- Redirection (< or >)
  - `% ls -l > lsoutput.txt` (save output to lsoutput.txt)
  - `% ps >> lsoutput.txt` (append to lsoutput.txt)
  - `% more < killout.txt` (use killout.txt as parameter to more)
  - `% kill -l 1234 > killouterr.txt 2 >&1` (redirect to the same file)
  - `% kill -l 1234 >/dev/null 2 >&1` (ignore std output)
- Pipe (|)
  - Process are executed *concurrently*
  - `% ps | sort | more`
  - `% ps -xo comm | sort | uniq | grep -v sh | more`
  - `% cat mydata.txt | sort | uniq | > mydata.txt` (generates an empty file !)

Shell as a Language

- We can write a script containing many shell commands
- Interactive Program:
  - grep files with POSIX string and print it

```
% for file in *
> do
> if grep -l POSIX $file
> then
> more $file
> fi
> done
Posix
There is a file with POSIX in it
```

  - '*' is wildcard

```
% more `grep -l POSIX *`
% more $(grep -l POSIX *)
% more -l POSIX * | more
```

Writing a Script

- Use text editor to generate the "first" file

```
#!/bin/sh
# first
# this file looks for the files containing POSIX
# and print it
for file in *
do
    if grep -q POSIX $file
    then
        echo $file
    fi
done
exit 0
```

exit code, 0 means successful

```
% /bin/sh first
% chmod +x first
%./first (make sure . is include in PATH parameter)
```

Syntax

- Variables
- Conditions
- Control
- Lists
- Functions

Variables

- Variables needed to be declared, note it is case-sensitive (e.g. foo, FOO, Foo)
- Add '$' for storing values

```
% salutation=Hello
% echo $salutation
Hello
% salutation=7+5
% echo $salutation
7+5
% salutation="yes dear"
% echo $salutation
yes dear
% read salutation
Hola!
% echo $salutation
Hola!
```

Quoting

- Edit a "vartest.sh" file

```
#!/bin/sh

myvar="Hi there"

echo $myvar
echo "$myvar"
echo `$myvar`
echo \$myvar

echo Enter some text
read myvar

echo '$myvar' now equals $myvar
exit 0
```

Output

```
Hi there
Hi there
$myvar
$myvar
Enter some text
Hello world
$myvar now equals Hello world
```

Environment Variables

- $HOME home directory
- $PATH path
- $PS1 第一層提示符號 (normally %)
- $PS2 第二層提示符號 (normally >)
- $$ process id of the script
- $# number of input parameters
- $0 name of the script file
- $IFS separation character (white space)

- Use ‘env’ to check the value

Parameter

```
% IFS = ` `
% set foo bar bam
% echo "$@"
foo bar bam
% echo "$*"
foo bar bam
% unset IFS
% echo "$*"
foo bar bam
```

Parameter

Edit file 'try_var'

```
#!/bin/sh
salutation="Hello"
echo $salutation
echo "The program $0 is now running"
echo "The parameter list was $*"
echo "The second parameter was $2"
echo "The first parameter was $1"
echo "The user's home directory is $HOME"
echo "Please enter a new greeting"
read salutation
echo $salutation
echo "The script is now complete"
exit 0
```

```
%./try_var foo bar baz
Hello
The program ./try_var is now running
The second parameter was bar
The first parameter was foo
The parameter list was foo bar baz
The user's home directory is /home/ychuang
Please enter a new greeting
Hola
Hola
The script is now complete
```

Condition

- test or ‘ [‘

need space !

```
if test -f fred.c
then
...
fi
```

```
If [ -f fred.c ]
then
...
fi
```

```
if [ -f fred.c ];then
...
fi
```

```
expression1 -eq expression2
expression1 -ne expression2
expression1 -gt expression2
expression1 -ge expression2
expression1 -lt expression2
expression1 -le expression2
!expression
```

```
-d file   if directory
-e file   if exist
-f file   if file
-g file   if set-group-id
-r file   if readable
-s file   if size >0
-u file   if set-user-id
-w file   if writable
-x file   if executable
```

```
String1 = string2
String1 != string 2
-n string (if not empty string)
-z string (if empty string)
```

Control Structure

Syntax

```
if condition
then
  statement
else
  statement
fi
```

```
#!/bin/sh
echo "Is it morning? Please answer yes or no"
read timeofday
if [ $timeofday = "yes" ]; then
  echo "Good morning"
else
  echo "Good afternoon"
fi
exit 0
```

```
Is it morning? Please answer yes or no
yes
Good morning
```

Condition Structure

```
#!/bin/sh
echo “Is it morning? Please answer yes or no”
read timeofday
if [ $timeofday = “yes” ]; then
  echo “Good morning”
elif [ $timeofday = “no” ]; then
  echo “Good afternoon”
else
  echo “Sorry, $timeofday not recongnized. Enter yes or no”
   exit 1
fi
exit 0
```

Condition Structure

```
#!/bin/sh
echo "Is it morning? Please answer yes or no"
read timeofday
if [ "$timeofday" = "yes" ]; then
  echo "Good morning"
elif [ $timeofday = "no" ]; then
  echo "Good afternoon"
else
  echo "Sorry, $timeofday not recongnized. Enter yes or no"
   exit 1
fi
exit 0
```

If input "enter" still returns Good morning

Loop Structure

Syntax

```
for variable
do
   statement
done
```

```
#!/bin/sh

for foo in bar fud 43
do
   echo $foo
done
exit 0

bar
fud
43
```

How to output as bar fud 43?

Try change for foo in “bar fud 43”

This is to have space in variable

Loop Structure

- Use wildcard '*'

```
#!/bin/sh

for file in $(ls f*.sh); do
  lpr $file
done
exit 0
```

Print all f*.sh files

Loop Structure

Syntax

```
while condition
do
  statement
done
```

Syntax

```
until condition
do
  statement
done
```

Note: condition is Reverse to while
How to re-write previous sample?

```
#!/bin/sh
for foo in 1 2 3 4 5 6 7 8 9 10
do
  echo "here we go again"
done
exit 0
```

```
#!/bin/sh
foo = 1
while [ "$foo" -le 10 ]
do
  echo "here we go again"
  foo = $foo(($foo+1))
done
exit 0
```

Case Statement

Syntax

```
case variable in\
 pattern [ | pattern ] …) statement;;
 pattern [ | pattern ] …) statement;;
 …
esac
```

```
#!/bin/sh
echo "Is it morning? Please answer yes or no"
read timeofday
case "$timeofday" in
  yes) echo "Good Morning";;
  y)   echo "Good Morning";;
  no)  echo "Good Afternoon";;
  n)   echo "Good Afternoon";;
  * )  echo "Sorry, answer not recongnized";;
esac
exit 0
```

Case Statement

- A much "cleaner" version

```
#!/bin/sh
echo "Is it morning? Please answer yes or no"
read timeofday
case "$timeofday" in
  yes | y | Yes | YES ) echo "Good Morning";;
  n* | N* )     echo "Good Afternoon";;
  * )           echo "Sorry, answer not recongnized";;
esac
exit 0
```

But this has a problem, if we enter 'never' which obeys n* case and prints "Good Afternoon"

Case Statement

```
#!/bin/sh
echo "Is it morning? Please answer yes or no"
read timeofday
case "$timeofday" in
  yes | y | Yes | YES )
                echo "Good Morning"
                echo "Up bright and early this morning"
                ;;
  [nN]*)
                echo "Good Afternoon";;
  *)
                echo "Sorry, answer not recongnized"
                echo "Please answer yes of no"
                exit 1
                ;;
esac
exit 0
```

List

- AND (&&)

  statement1 **&&** statement2 **&&** statement3 …

```
#!/bin/sh
touch file_one
rm -f file_two

if [ -f file_one ] && echo "Hello" && [-f file_two] && echo " there"
then
  echo "in if"
else
  echo "in else"
fi
exit 0
```

Check if file exist if not then create one

Remove a file

Output

```
Hello
in else
```

List

- OR (||)

statement1 || statement2 || statement3 …

```
#!/bin/sh

rm –f file_one
if [ -f file_one ] || echo “Hello” || echo “ there”
then
  echo “in if”
else
  echo “in else”
fi

exit 0
```

Output

```
Hello
in else
```

Statement Block

- Use multiple statements in the same place

```
get_comfirm && {
  grep –v “$cdcatnum” $stracks_file > $temp_file
  cat $temp_file > $tracks_file
  echo
  add_record_tracks
}
```

Function

- You can define functions for “structured” scripts

```
function_name() {
   statements
}
```

```
#!/bin/sh
foo() {
  echo “Function foo is executing”
}
echo “script starting”
foo
echo “script ended”
exit 0
```

Output

```
script starting
Function foo is executing
Script ended
```

You need to define a function before using it
The parameters $*,$@,$#,$1,$2 are replaced by local value
if function is called and return to previous after function is finished

Function

define local variable

```
#!/bin/sh
sample_text="global variable"
foo() {
  local sample_text="local variable"
  echo "Function foo is executing"
  echo $sample_text
}
echo "script starting"
echo $sample_text
foo

echo "script ended"
echo $sample_text

exit 0
```

Output?

Check the scope of the variables

Function

- Use return to pass a result

```
#!/bin/sh
yes_or_no() {
  echo "Is your name $* ?"
  while true
  do
    echo -n "Enter yes or no:"
    read x
    case "$x" in
      y | yes ) return 0;;
      n | no ) return 1;;
      * ) echo "Answer yes or
   no"
    esac
    done
}
echo "Original parameters are $*"
if yes_or_no "$1"
then
  echo "Hi $1, nice name"
else
  echo "Never mind"
fi
exit 0
```

Output

```
./my_name John Chuang
Original parameters are John Chuang
Is your name John?
Enter yes or no: yes
Hi John, nice name.
```