Shell Control Structures

EECS 2031

Control Structures

- if then else
- for
- while
- case (which)
- until

if Statement and test Command

- Syntax:

```
if condition
then
    command(s)
elif condition_2
then
    command(s)
else
    command(s)
fi
```

- Command **test** is often used in ***condition***.

3

if – then – else Example

```
% cat if_else
#!/bin/sh
echo -n 'Enter string 1: '
read string1
echo -n 'Enter string 2: '
read string2
if test $string1 = $string2
then
        echo 'They match!'
else
        echo 'No match!'
fi
```

```
% if_else
Enter string 1: acd
Enter string 2: 123
No match!

% if_else
Enter string 1: 123
Enter string 2: 123
They match!
```

4

`test` Command

Argument	Test is true if . . .
`-d` *file*	*file* is a directory
`-f` *file*	*file* is an ordinary file
`-r` *file*	*file* is readable
`-s` *file*	*file* size is greater than zero
`-w` *file*	*file* is writable
`-x` *file*	*file* is executable
`! -d` *file*	*file* is not a directory
`! -f` *file*	*file* is not an ordinary file
`! -r` *file*	*file* is not readable
`! -s` *file*	*file* size is not greater than zero
`! -w` *file*	*file* is not writable
`! -x` *file*	*file* is not executable
`-e` *file*	*file* or directory exists

also returns *false* if file or directory does not exist

also returns *true* if file or directory does not exist

⇒ empty file

There must be a space between ! and minus sign.

5

`test` Command (2)

n1 `-eq` *n2*	integer *n1* equals integer *n2*
n1 `-ge` *n2*	integer *n1* is greater than or equal to integer *n2*
n1 `-gt` *n2*	integer *n1* is greater than integer *n2*
n1 `-le` *n2*	integer *n1* is less than or equal to integer *n2*
n1 `-ne` *n2*	integer *n1* is not equal to integer *n2*
n1 `-lt` *n2*	integer *n1* is less than integer *n2*
s1 `=` *s2*	string *s1* equals string *s2*
s1 `!=` *s2*	string *s1* is not equal to string *s2*

- Parentheses can be used for grouping test conditions.

6

test Example 1

```
% cat check_file
#!/bin/sh
if test ! -s $1
then
   echo "File $1 is empty."
   exit 1
else
   ls -l $1
fi
```

```
% touch z.txt

% check_file z.txt
File z.txt is empty.
```

7

test Example 2

```
% cat check_file
#!/bin/sh
if test $# -eq 0
then
   echo Usage: check_file file_name
   exit 1
fi
if test ! -s $1
then
   echo "File $1 is empty."
   exit 1
else
   ls -l $1
fi
```

8

`test` Example 3

- What is wrong with the following script?

```
% cat chkex2
#!/bin/sh
# Check if a file is executable.
if test -x $1
then
   echo File $1 is executable.
else
   echo File $1 is not executable.
fi
```

9

`test` and Logical Operators

- `!`, `||` and `&&` as in C
- Following is better version of `test` Example 3

```
%cat chkex
#!/bin/sh
if test -e $1 && test -x $1
then
   echo File $1 is executable.
elif test ! -e $1
then
   echo File $1 does not exist.
else
   echo File $1 is not executable.
fi
```

10

`for` Loops

```
for variable in list
do
    command(s)
done
```

- ***`variable`*** is a user-defined variable.
- ***`list`*** is a sequence of strings separated by spaces.

11

`for` Loop Example 1

```
% cat fingr
#!/bin/sh
for name in $*
do
    finger $name
done
```

- Recall that **`$*`** stands for all command line arguments the user enters.

12

for Loop Example 2

```
% cat fsize
#!/bin/sh
for i in $*
do
 echo "File $i: size `cat $i | wc -c` bytes"
done

% fsize chex chfile chfile2
File chex: size 86 bytes
File chfile: size 90 bytes
File chfile2: size 163 bytes
```

13

for Loop Example 3

```
% cat rmread
#!/bin/sh
# Remove the read permission for "others"
# from all files in the working directory.
for i in *
do
  chmod o-r $i
  ls -l $i
done
```

`for` Loop Example 4

```
% cat prdir
#!/bin/sh
# Display all c files in a directory
# specified by argument 1.
for i in $1/*.c
do
   echo "======= $i ======"
   more $i
done
```

15

Arithmetic Operations Using `expr`

- The shell is not intended for numerical work (use Java, C, or Perl instead).
- However, **`expr`** utility may be used for *simple* arithmetic operations on integers.
- **`expr`** is not a shell command but rather a UNIX utility.
- To use **`expr`** in a shell script, enclose the expression with backquotes.
- Example:

```
#!/bin/sh
sum=`expr $1 + $2`
echo $sum
```

- Note: spaces are required around the operator **+** (but not allowed around the equal sign).

16

`expr` Example

```
% cat cntx
#!/bin/sh
# Count the number of executable files in
# the current working directory
count=0
for i in *          # what if we replace * with $* ?
do
   if test -x $i
   then
      count=`expr $count  + 1`
      ls -l $i
   fi
done
echo "There are $count executable files."
```

17

`while` Loops

```
while condition
do
    command(s)
done
```

- Command `test` is often used in ***`condition`***.
- Execute ***`command(s)`*** when ***`condition`*** is met.

18

`while` Loop Example (1)

```
% cat dargs
#!/bin/sh
# Display the command line arguments, one per line.
count=1
argc=$#
while test $count -le $argc
do
   echo "Argument $count is: $1"
   count=`expr $count  + 1`
   shift          # shift arg 2 into arg 1 position
done

# What happens if the while statement is as follows?
# while test $count -le $#
```

19

Homework

- What happens if in the above program we do not use variable `argc`, but write the `while` statement as follows?

```
while test $count -le $#
```

- Rewrite the script using a `for` loop instead of a `while` loop.

20

`while` Loop Example (2)

```
% cat myecho
#!/bin/sh
# Read lines from standard input until EOF (Ctrl-D)
while read myline
do
   echo "$myline"
done
```

21

I/O Redirection of Control Structures

- Control structures can be treated as any other command with respect to I/O redirection.

Note: This script

- trims leading/trailing whitespace
- ignores backlash characters '\'
- ignores the last line if it does not end with a '\n'

```
% cat weakcat
#!/bin/sh
# My (weaker) version of
"cat"
while read myline
do
   echo "$myline"
done < $1
# read lines from file $1
```

22

I/O Redirection: Example

```
% cat weakcat
#!/bin/sh
# My (weaker) version of "cat"
while read myline
do
   echo "$myline"
done < $1 > $1.out

# read lines from file $1
# write lines to file $1.out
```

23

`until` Loops

```
until condition
do
   command(s)
done
```

- Command `test` is often used in ***`condition`***.
- Exit loop when ***`condition`*** is met.

24

`until` Loop Example

```
% cat grocery
#!/bin/sh
# Enter a grocery list and
# store in a file indicated by $1
#
echo To end list, enter \"all\".
item=nothing
until test $item = "all"
do
        echo -n "Enter grocery item: "
        read item
        echo $item >> $1
done
```

25

`until` Loop Example Output

```
% grocery glist
To end list, enter "all".
Enter grocery item: milk
Enter grocery item: eggs
Enter grocery item: lettuce
Enter grocery item: all
```

```
% cat glist
milk
eggs
lettuce
all
```

26

`case` Statement

```
case variable in
pattern1) command(s);;
pattern2) command(s);;
. . .
patternN) command(s);;
*)        command(s);;  # all other cases
esac
```

- Why the double semicolons?

27

`case` Statement Example

```
% cat mysched
#!/bin/sh
echo -n "Enter the day (mon, tue, wed, thu, fri): "
read day
case $day in
   mon)     echo 'CSE2031 2:30-4:30 CLH-H'
            echo 'CSE2021 17:30-19:00 TEL-0016';;
   tue | thu)
            echo 'CSE2011 17:30-19:00 SLH-E';;
   wed)     echo 'No class today.  Hooray!';;
   fri)     echo 'CSE2031 2:30-4:30 LAB 1006';;
   *)       echo 'Day off. Hooray!';;
esac
```

28

Process-Related Variables

- Variable **$$** is PID of the shell.

```
% cat showpid
#!/bin/sh
ps
echo PID of shell is $$

% showpid
```

```
indigo 775 % showpid
  PID TTY          TIME CMD
 4637 pts/5    00:00:00 tcsh
 5064 pts/5    00:00:00 showpid
 5065 pts/5    00:00:00 ps
PID of shell is 5064.
```

29

Process Exit Status

- All processes return exit status (return code).
- Exit status tells us whether the last command was successful or not.
- Stored in variable **$?**
- 0 (zero) means command executed successfully.
- 0 is good; non-zero is bad.
- Good practice: Specify your own exit status in a shell script using **exit** command.
  - default value is 0 (if no exit code is given).

30

Process Exit Status: Example

- An improved version of grep.

```
% cat igrep
#!/bin/sh
# Arg 1: search pattern
# Arg 2: file to search
#
grep $1 $2
if test  $? -ne 0
then
  echo Pattern not found.
fi
```

```
% igrep 'bin' grocery
#!/bin/sh

% igrep 'bin2' grocery
Pattern not found.
```

31

Next lecture

- Shell scripting – part 3
- Reading for this lecture:
  - Posted notes (chapter 33)

32