Unix Development Environment

Shell programming

Shell programming

- **As well as using the shell to run commands you can use its built-in programming language to write your own commands or programs.**
- **Creating and executing the shell script:**
  - Use a text editor to create a file:

    ```
    emacs filename
    ```

  - Define execute permission:

    ```
    chmod u=rwx filename
    ```

  - Execute the script

    ```
    filename
    ```

Shell programming - example

```
$ cat > lh
#list home directory
cd
pwd
ls
^D

$ chmod u+x lh
$ lh
/usr/home/icc
courses
file.txt
dir1
dir2
$
```

What is with current directory? Will the home directory become the current directory when the script lh finishes?

Different shells for programming

- **Possibility of using different shells:**
  - Bourne shell - common for all Unix systems - most often used
- **First line in the script defines the shell:**
  - #!/bin/sh Bourne shell
  - #!/bin/csh C-shell
  - #!/bin/tcsh TC-shell
  - #!/bin/bash BASH shell

Shell programming - Example 1

```
#!/bin/bash
# This script displays the date, time,
# username and current directory.

echo "Date and time is:"
date
echo
echo "Your username is: $(whoami) \n"
echo "Your current directory is: \c"
pwd
```

- **Output:**

```
Date and time is:
Mon Feb 27 17:21

Your username is: icc
Your current directory is: /home/icc/course/doc
```

Shell programming - Example 2

- **Read commands from the terminal and process them in a sub-directory:**

```
#!/bin/sh
# usage: process sub-directory
   dir=$(pwd)
   for i in *
   do
       if  [ -d $dir/$i  ]
          then
          cd $dir/$i
          while echo "$i:"
              read x
          do
              eval $x
          done
       fi
   done
```

The user types the command:

process dir

The user is prompted to supply the name of the command to be read in. This command is executed using the built-in eval function

Shell programming - Passing arguments

- **Passing command arguments to the script: *comm par1 par2***
  - $0 - command name
  - $1 - $9 - parameters
  - Each parameter corresponds to the position of the argument on the command line.
  - $* - all parameters

Passing parameters - examples

```
$showpar The first five command line
   ----------------------------------------

echo "First and third parameters are: $1 $3"
----------------------------------------
   First and third parameters are: The five
```

script printps:

```
#!/bin/sh
# printps  - Convert ASCII files to PostScript # and
send them to the PostScript printer
# Use a local utility "a2ps"

a2ps $* | lpr -Pps1
```

Executing printps script:

```
$ printps elm.txt vi.ref msg
```

Shell programming - handling variables

❑ Special shell variables

Name	Description
$1 - $9	these variables are the positional parameters.
$0	the name of the command
$#	the number of positional arguments
$?	the exit status of the last command executed
$$	the process number of this shell
$!	the process id of the command run in the background.
$*	a string containing all the arguments
$@	the same as $* , except when quoted.

Managing more than 9 parameters

- **shift - shifts arguments: $n+1 becomes $n**
- **Example:**

shift_demo script:

```
echo "arg1=$1 arg2=$2 arg3=$3"
shift
echo "arg1=$1 arg2=$2 arg3=$3"
```

```
$ shift_demo one two three four
arg1=one arg2=two arg3=three
arg1=two arg2=three arg3=four
```

Shell programming - handling variables (cont.)

Definition	Description
`$var`	expand value of the variable var
`${var}`	the same as above except the braces enclose the name of the variable to be substituted.
`${var-val}`	value of var if var is defined; otherwise val. $var is not set to val.
`${var=val}`	value of var if var is defined; otherwise val. If undefined $var is set to val.
`${var?mess}`	if defined, $var; otherwise print message and exit the shell. If the message is empty, print a standard message
`${var+val}`	val if $var is defined, otherwise nothing.

Note: All variables are of text type

Shell programming - program statements

Reading user input

- To read standard input into a shell script use the read command.

```
echo "Please enter your name:"
read name
echo "Welcome to MDH $name"
```

Conditional statements

```
if [ condition ]
then
    commands    # if condition is true
elif [ condition ]

    commands    # else if
else
    commands    # else
fi
```

IF statement - example

```
# test if user in logged in
# input: getuser username

user=$1    # input parameter
if who | grep -s $user > /dev/null
then
    echo $user is logged in
else
    echo $user not available
fi
```

```
#Testing for files and variables:
if [ ! -f $FILE ]; then
    if [ "$WARN" = "yes" ]; then
          echo "$FILE does not exist"
    fi
fi
```

Test conditions:

-e file	**true if the file exists**
-d file	**true if file is a directory**
-f file	**true if the file is an ordinary file**
-L file	**true if file is a symbolic link**
-r[wx] file	**true if the file is readable (writable, executable)**
-z str	**true if the length of the str is zero**
-n str	**true if str is not a null str**
str1 = str2	**true if str1 and str2 are identical**
str1 != str2	**true if str1 and str2 are not identical**
n1 -eq n2	**true if numbers n1 and n2 are equal**

Other keywords: -ge, -gt -le, -lt, -ne

Shell programming - program statements

The case statement

```
case word in
    pattern1)   command(s)
                ;;
    pattern2)   command(s)
                ;;
    patternN)   command(s)
                ;;
    esac
```

The for statement

```
for var in list-of-words
do
    commands
done
```

Example

```
#!/bin/bash
# compare files in two directories
# input cmpfile dir1 dir2

dir1=$1
dir2=$2

for i in $(ls $dir1)
do
    echo $i:
    cmp $dir1/$i $dir2/$i
    echo
done
```

while and until statements

```
while command-list1
do
    command-list2
done


until command-list1
do
    command-list2
done
```

Other statements

- Including text in a shell script

```
# this script outputs the given text before it
# runs

cat << EOF
This shell script is currently under
development, please report any problems to
me(icc@mdh.se)
EOF
```

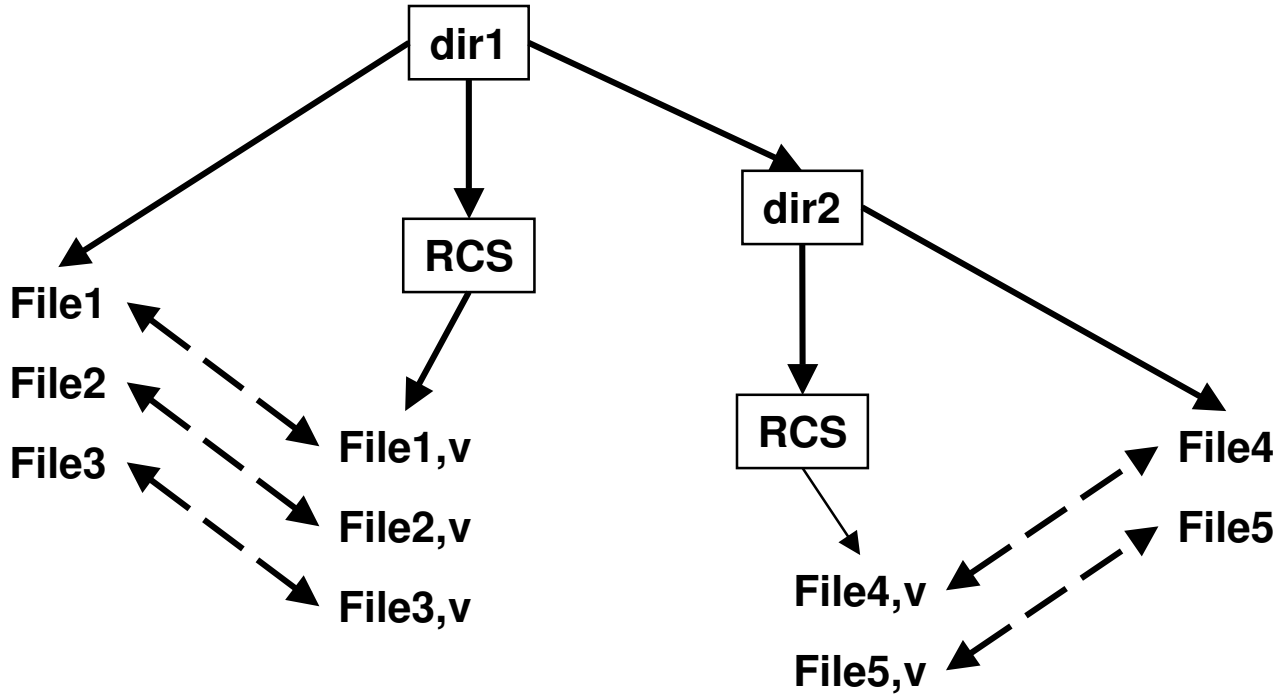
- exec command - executing without creating a new process

```
exec /usr/local/test/bin/test_version
```

Shell programming - A more complex example

❑ `lsver` program

- list files in a directory tree and compare date of files with the dates of the corresponding files in the underlying RCS directories



lsver man page

NAME

lsver - list files and show which are versioned

SYNOPSIS

lsver [-r] [name ...]

DESCRIPTION

The command lsver shows files in the same way as ls command and in addition it gives information about if files are writable or readonly, and if there exist corresponding RCS files in the RCS directory. If for a file a RCS file is found, then the text Ver denotes it. Date of the file with the date of the RCS file is compared. If the exported file is older then the RCS file, then the text old is displayed, otherwise the texts up-to-date or new are shown.

PARAMETERS

name

denotes a directory or a file. If no name is specified then the current directory is listed.

OPTIONS

-r

lists all subdirectories (corresponding to the ls -R option).

man lsver (cont.)

EXAMPLES

```
lsver
RCS                 dir
get_param           -       Ver     up-to-date
ipa_structure       -       Ver      up-to-date
lsver               w       Ver     new
project             w       Ver     up-to-date
project.help        -       Ver     old
```

SEE ALSO

ls(1), rcs(1)

Shell programming - lsver program

```
#!/bin/bash
#-------------------------------------------------------------
# lsver - list versioned files
# $Id 1.2  1993/03/23  13:43:05  icrnkovi
# List files and shows which are versioned
# command: lsver [-r] file ....
#-------------------------------------------------------------
function list {                          # define function list
  ls_arg=$*                              # take all input parameters
  for arg in $ls_arg; do                 # process all parameters
  if [ -d $arg ]; then                   # if directory
    dir=$arg                             # put its name in dir var
  else
    dir=$(dirname $arg)                  # take dir part into dir var.
```

Shell programming - lsver program - cont.

```
        #process files for each parameter
        for fl in $(ls $arg); do
          file=$(basename $fl)                          # for each file get name
          if [ -d $dir/$file ]; then                    # if it is a directory
            rd=dir                                      # specify it
          elif [ -w $dir/$file ]; then                  # if it is writable file
            rd="w"                                      # specify w
          else                                          # no writable file
           rd="-"                                       # specify read-only
          fi
          # we shall now compare file with the possible RCS/file,v
          ver=                                          # initialize ver
          age=                                          # initialize time comp.
          rcs_file=$dir/RCS/${file},v                   # specify RCS file
          if [ -f $rcs_file ]; then                     # if there is RCS file
            ver="Ver"                                   # specify "Ver"
            age=up-to-date                              # assume - up-to date
            if [ $dir/$file -ot $rcs_file ]; then       # file older
              age=old
            elif [ $dir/$file -nt $rcs_file ; then      # file newer
              age=new
            fi
          fi
          echo "$file $rd $ver $age"                    # print info about item
        done
    done                                                # process all params
} #function list
```

Shell programming - lsver program - cont.

```
#-------------------------------------------------------------
# main program
#-------------------------------------------------------------
usage="Usage: lsver [-r] [names ...]"
r_flag=false                              # default option no -r
for arg in $* ; do                        # process input arguments
     case $arg in
       -r*) r_flag=true                   # recursive flag
            shift ;;                      # skip to next argument
       -*)  echo -u2 $usage               # illegal option
            exit 1 ;;                     # exit
     esac
done


if [ $r_flag = false ]; then              # if no recursive search
  list "$*" | awk '{printf("%-25s %-3s %-4s %s\n",$1,$2,$3,$4) }'
```

Shell programming - lsver program - cont.

```
 else                                                  # recursive search
   names="$@"                                          # save all parameters
   if [ -z "$names" ]; then                            # if no parameter def.
     names=.                                           # take default directory
   fi


   # find tree and pipe to read loop

   find $names -print| while read x; do
     if [ -d  $x ]; then                               # x is directory
       if [ $(basename $x) != RCS ]; then              # skip RCS dir
         echo
         echo "Directory $x"                           # show directory name
         echo

         # invoke list function and do format output

         list $x | \
                   awk '{ printf("%-25s %-3s %-4s %s\n",$1,$2,$3,$4) }'

       fi

     fi

   done
fi
```