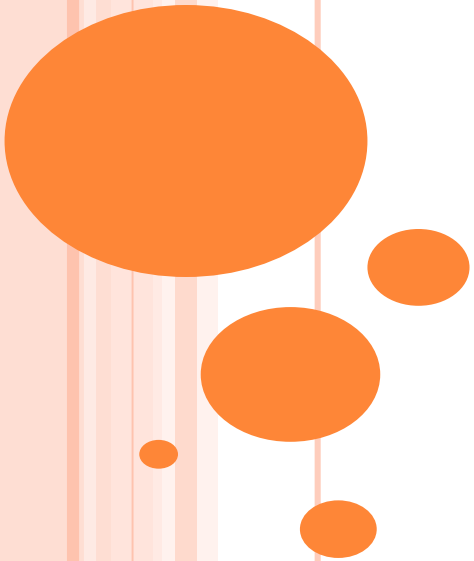

Shell Scripting

What is Shell

- A shell is special user program which provide an interface to user to use operating system services.
- Shell accept human readable commands from user and convert them into something which kernel can understand.
- It is a command language interpreter that execute commands read from input devices such as keyboards or from files.

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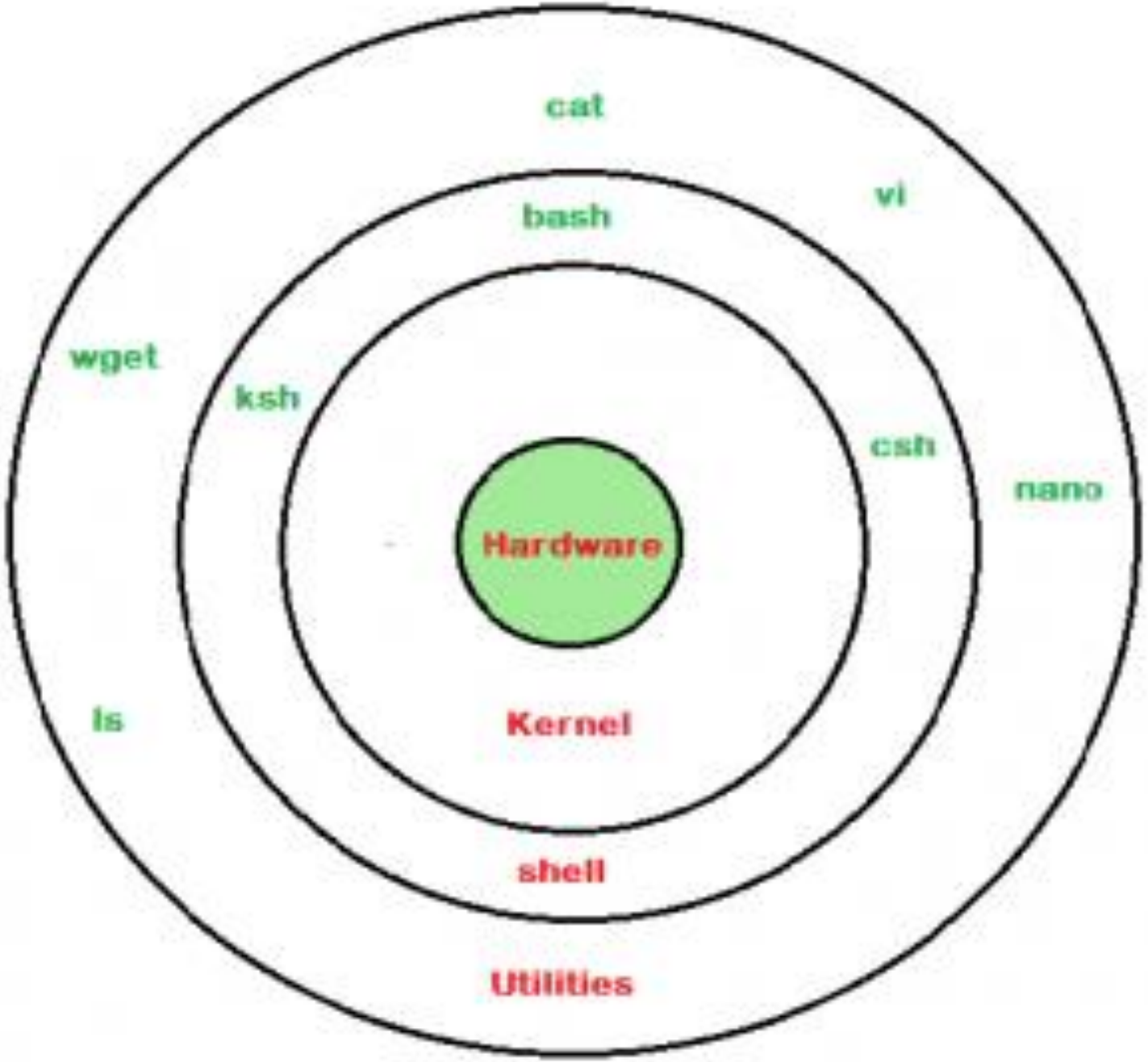
cat
vi
bash
wget
ksh
csh
nano
Hardware
ls
Kernel
shell
Utilities

Types of shells

There are four shells

- Bourne shell(sh),
- Korn shell(ksh),
- C shell(csh) and
- Bourne Again Shell (bash).

Basic Shell Programming

- A script is a file that contains shell commands
  - data structure: variables
  - control structure: sequence, decision, loop
- Shebang line for bash shell script:

```
#! /bin/bash
#! /bin/sh
```

- to run:
  - make executable: `% chmod +x script`
  - invoke via: `% ./script`

Bash shell programming

- Input
  - prompting user
  - command line arguments
- Decision:
  - if-then-else
  - case
- Repetition
  - do-while, repeat-until
  - for
  - select
- Functions
- Traps

Variable

- A variable is a character string to which we assign a value.
- The value assigned could be a number, text, filename, device, or any other type of dat
- Valid variables
- _abc
- Ab_c
- Ab_1
- Invalid Variables
- 1_ab
- -ab
- Ab-cd
- Ab_c!

SPECIAL SHELL VARIABLES

Parameter	Meaning
$0	Name of the current shell script
$1-$9	Positional parameters 1 through 9
$#	The number of positional parameters
$*	All positional parameters, “$*” is one string
$?	Return status of most recently executed command
$$	Process id of current process

Examples: Command Line Arguments

```
% set tim bill ann fred
      $1  $2   $3  $4
% echo $*
tim bill ann fred
% echo $#
4
% echo $1
tim
% echo $3 $4
ann fred
```

The ‘set’ command can be used to assign values to positional parameters

User input

- shell allows to prompt for user input

Syntax:

```
read varname [more vars]
```

- or

```
read -p "prompt" varname [more vars]
```

- words entered by user are assigned to **varname** and "**more vars**"
- last variable gets rest of input line

User input example

```
#! /bin/bash
read -p "enter your name: " first last

echo "First name: $first"
echo "Last name: $last"
```

OPERATORS

- Arithmetic Operators
- Relational Operators
- Boolean Operators
- String Operators
- File Test Operators

Arithmetic Operators

- shell didn't originally have any mechanism to perform simple arithmetic operations but it uses external programs, either **awk** or **expr or bc**.
- C=`expr 1 + 1`
- There must be spaces between operators and expressions. For example, 2+2 is not correct; it should be written as 2 + 2.
- The complete expression should be enclosed between ` `, called the backtick.

Floating Point

- Bc - **bc** command is used for command line calculator.
- **Input : $ echo "12+5" | bc**
- **Output : 17**
- **Input : $ echo "10/2" | bc**
- **Output : 5**
- **Input: $ echo "5.1*2.1" | bc**
- **Output : 10.7**
- **Input: $ echo “scale=1;5/2" | bc**
- **Output : 10.7**
- **[root@localhost ~]# div=`echo "scale=1;5/2" | bc`**
- **[root@localhost ~]# echo $div**
- **[root@localhost ~]# 2.5**

- **How to store the result of complete operation in variable?**

  Example:
- **Input:**
- **$ x=`echo "12+5" | bc`**
- **$ echo $x**
- **Output:17**

USIING EXPR

```
#!/bin/bash

read -p "enter two numbers=  " a b

add=`expr $a + $b`

echo "add=$add"

dev=`expr $a / $b`

echo "dev=$dev
```

USING BC

```
#!/bin/bash

read -p "enter two numbers=  " a b

add=`echo “$a+$b” | bc`

echo "add=$add"

dev=`echo “scale=1;$a/$b” | bc`

echo "dev=$dev
```

Arithmetic Operators

Operator	Description	Example
+ (Addition)	Adds values on either side of the operator	`expr $a + $b`
- (Subtraction)	Subtracts right hand operand from left hand operand	`expr $a - $b`
* (Multiplication)	Multiplies values on either side of the operator	`expr $a \* $b`
/ (Division)	Divides left hand operand by right hand operand	`expr $b / $a`
% (Modulus)	Divides left hand operand by right hand operand and returns remainder	`expr $b % $a`
= (Assignment)	Assigns right operand in left operand	a = $b
== (Equality)	Compares two numbers, if both are same then returns true.	[$a == $b]
!= (Not Equality)	Compares two numbers, if both are different then returns true.	[$a != $b]

- all the conditional expressions should be inside square braces with spaces around them,
- for example
- **[$a == $b]** is correct
- **[$a==$b]** is incorrect.

Relational Operators

Operator	Description	Example
-eq	Checks if the value of two operands are equal or not; if yes, then the condition becomes true.	[$a -eq $b]
-ne	Checks if the value of two operands are equal or not; if values are not equal, then the condition becomes true.	[$a -ne $b]
-gt	Checks if the value of left operand is greater than the value of right operand; if yes, then the condition becomes true.	[$a -gt $b]
-lt	Checks if the value of left operand is less than the value of right operand; if yes, then the condition becomes true.	[$a -lt $b]
-ge	Checks if the value of left operand is greater than or equal to the value of right operand; if yes, then the condition becomes true.	[$a -ge $b]
-le	Checks if the value of left operand is less than or equal to the value of right operand; if yes, then the condition becomes true.	[$a -le $b]

Boolean Operators

x=5 y=10

Operator	Description	Example
!	This is logical negation. This inverts a true condition into false and vice versa.	[! false] is true.
-o	This is logical **OR**. If one of the operands is true, then the condition becomes true.	[$x -lt 10 -o $y -gt 100] is true.
-a	This is logical **AND**. If both the operands are true, then the condition becomes true otherwise false.	[$x -lt 20 -a $y -gt 100] is false.

String Operators

x="ab" y="fg"

Operator	Description	Example
=	Checks if the value of two operands are equal or not; if yes, then the condition becomes true.	[$x = $y] is not true.
!=	Checks if the value of two operands are equal or not; if values are not equal then the condition becomes true.	[$x != $y] is true.
-z	Checks if the given string operand size is zero; if it is zero length, then it returns true.	[-z $x] is not true.
-n	Checks if the given string operand size is non-zero; if it is nonzero length, then it returns true.	[-n $x] is true

BASH CONTROL STRUCTURES

- if-then-else
- case
- loops
  - for
  - while

IF STATEMENT

```
if command
then
  statements
fi
```

- statements are executed only if **command** succeeds, i.e. has return status “0”

TEST COMMAND

Syntax:

```
test expression
[ expression ]
```

- evaluates ‘expression’ and returns true or false

Example:

read –p “Enter your password= “ pass

```
if test “$pass“ == “admin”
    then
    echo “Password Verfied"
fi
```

The simple if statement

```
if [ condition ]
then
  statements
fi
```

- executes the statements only if **`condition`** is true

The if-then-else statement

```
if [ condition ]
then
   statements-1
else
  statements-2
fi
```

- executes statements-1 if condition is true
- executes statements-2 if condition is false

The if…statement

```
if [ condition ]
then
    statements
elif [ condition ]
then
    statement
else
    statements
fi
```

- The word **elif** stands for “else if”
- It is part of the if statement and cannot be used by itself

Relational Operators

Meaning	Numeric	String
Greater than	-gt	
Greater than or equal	-ge	
Less than	-lt	
Less than or equal	-le	
Equal	-eg	= or ==
Not equal	-ne	!=
str1 is less than str2		str1 < str2
str1 is greater str2		str1 > str2
String length is greater than zero		-n str
String length is zero		-z str

Compound logical expressions

!	not
&&	and
||	or

and, or
must be enclosed within

[[ ]]

Example: Using the ! Operator

```
#!/bin/bash

read -p "Enter years of work: " Years
if [ "$Years" -lt 20 ]; then
   echo "You can work."
else
   echo "retire"
fi
```

Example: Using the && Operator

```
#!/bin/bash

Bonus=500
read -p "Enter Status: " Status
read -p "Enter Shift: " Shift
if [[ "$Status" = "H" && "$Shift" = 3 ]]
then
   echo "shift $Shift gets \$$Bonus bonus"
else
   echo "only hourly workers in"
   echo "shift 3 get a bonus"
fi
```

Example: Using the || Operator

```
#!/bin/bash

read -p "Enter calls handled:" CHandle
read -p "Enter calls closed: " CClose
if [[ "$CHandle" -gt 150 || "$CClose" -gt 50 ]]
   then
   echo "You are entitled to a bonus"
else
   echo "You get a bonus if the calls"
   echo "handled exceeds 150 or"
   echo "calls closed exceeds 50"
fi
```

File Testing

	Meaning
-d file	True if ‘file’ is a directory
-f file	True if ‘file’ is an ord. file
-r file	True if ‘file’ is readable
-w file	True if ‘file’ is writable
-x file	True if ‘file’ is executable
-s file	True if length of ‘file’ is nonzero

Example: File Testing

```
#!/bin/bash
echo "Enter a filename: "
read file
if [ -r $file ]
 then
   echo "File is read-able"

fi
```

```
#!/bin/bash

read -p "marks= " m

if [ $m -gt 60 ]
then
        echo "first class"

elif [[ $m -ge 50 && $m -lt 60 ]]
        then
                echo "second class"

elif [[ $m -lt 50 && $m -ge 40 ]]
        then
                echo "Third class"
        else
                echo "Fail"
fi
```

Example: if… Statement

```
# The following THREE if-conditions produce the same result

* DOUBLE SQUARE BRACKETS
read -p "Do you want to continue?" reply
if [[ $reply = "y" ]]; then
   echo "You entered " $reply
fi

* SINGLE SQUARE BRACKETS
read -p "Do you want to continue?" reply
if [ $reply = "y" ]; then
   echo "You entered " $reply
fi

* "TEST" COMMAND
read -p "Do you want to continue?" reply
if test $reply = "y"; then
   echo "You entered " $reply
fi
```

The case Statement

- use the case statement for a decision that is based on multiple choices

Syntax:

```
case word in
    pattern1) command-list1
    ;;
    pattern2) command-list2
    ;;
    patternN) command-listN
    ;;
esac
```

CASE PATTERN

- checked against word for match
- may also contain:

  `*`

  `?`

  `[ … ]`

  `[:class:]`
- multiple patterns can be listed via:

  `|`