Bash if elif else Statement: A Comprehensive Tutorial

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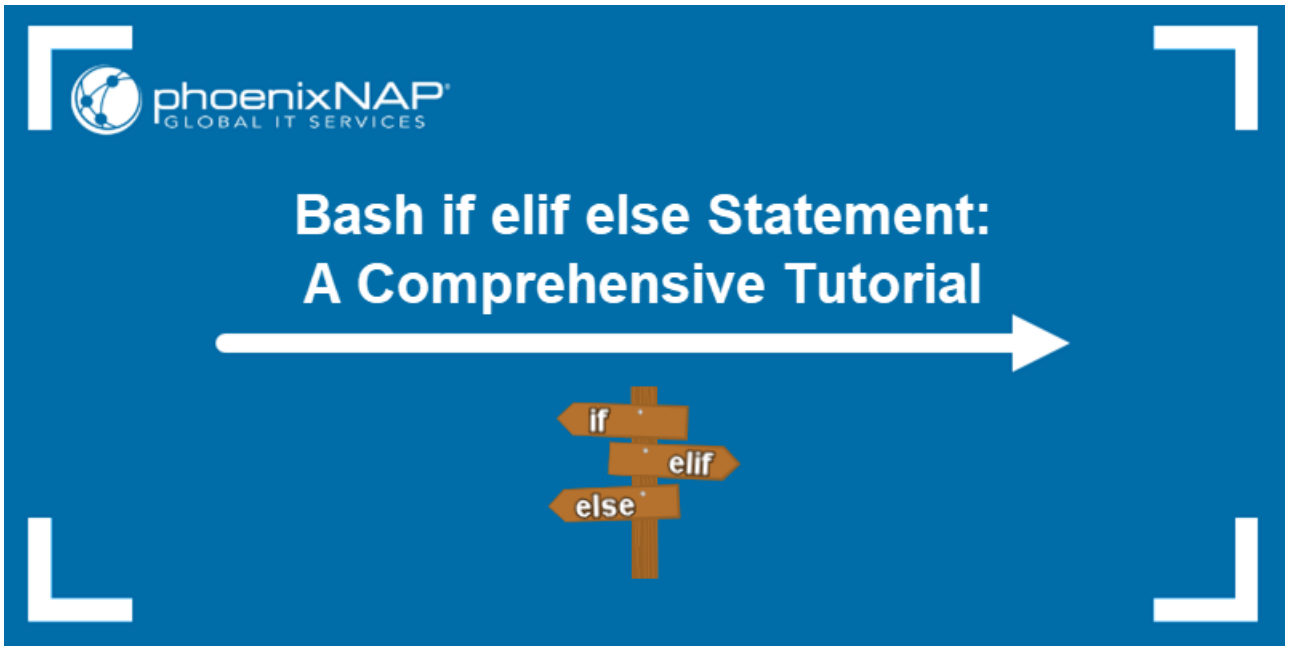
BASH LINUX

Contents

Introduction

Bash scripts help automate tasks on your machine. The **`if elif else`** statement in bash scripts allows creating conditional cases and responses to specific code results. The **`if`** conditional helps automate a decision-making process during a program.

This article explains what the `if elif else` statement is and shows the syntax through various examples.



Prerequisites

- A machine with Linux OS.
- Access to the command line/terminal.
- Access to a text editor like Vi/Vim.

What is the Bash if Statement?

In programming, the **`if`** statement is a conditional expression. However, the command tested in the **`if`** statement evaluates based on the **exit status**. Therefore:

- If the command completes **successfully**, the exit status is **0**.
- If the statement throws an **error**, the exit status is any number between **1** and **255**.

The zero for success and any non-zero value for failure seems counterintuitive. In most other programming languages, zero represents false, and one (or greater) represents true. However, in bash scripting, the UNIX convention returns the exit status instead of a truth value, and the two should not be confused.

Test a sample error command (1 greater than 100) in the terminal by running:

```
test 1 -gt 100
```

Check the exit status using the echo command:

```
echo $?
```

The test returns an exit code **1**, indicating the expression failed.

Similarly, check a sample command that evaluates successfully (1000 greater than 100) in the terminal with:

```
test 1000 -gt 100
```

Print the exit status to confirm the command was successful:

```
echo $?
```

The test returns an exit code **0**, showing the command completed without an error.

Bash if Statement Example

Follow the instructions below to create an example bash script using an **`if`** statement.

1. Open the terminal (**CTRL+ALT+T**) and create an example script to test how the bash **`if`** statement works:

```
vi test_script.sh
```

2. In the script, add the following lines:

```
echo -n "Please enter a whole number: "
read VAR
echo Your number is $VAR
if test $VAR -gt 100
then
        echo "It's greater than 100"
fi
echo Bye!
```

Each line in the script does the following:

- **Lines 1-3** provide instructions to enter a number through the console. The number is read into a variable called **`VAR`** and printed.
- **Line 4** starts the **`if`** statement and checks the exit status for the command right after (**`$VAR -gt 100`**).
- **Lines 5-6** signals the start of commands to execute only if the statement in line 4 completes successfully (with an exit status 0), meaning we entered a number greater than 100.
- **Line 7** signals the end of the **`if`** statement.
- **Line 8** is outside of the statement and runs as expected, regardless of the **`if`** outcome.

3. Save and close Vim:

```
:wq
```

4. Next, make the file executable:

```
chmod +x test_script.sh
```

5. Lastly, run the script with:

```
./test_script.sh
```

The script outputs a different message based on the entered number. Run the script multiple times and test for other numbers to confirm the behavior.

Bash if Statement Syntax

The basic syntax for a bash **`if`** statement is:

```
if <commands>
then
        <commands>
fi
```

Each keyword has a specific function:

- **`if`** signals the statement's beginning. The command right after is the one in which the exit status check applies.
- **`then`** executes the commands only if the previous review completes successfully.
- **`fi`** closes the if statement.

Enclosing the test command in different brackets results in different execution methods for the **`if`** statement. The table below provides a short description as well as a use case for each bracket type.

Syntax	What it is	When to use
`if ( <commands> )`	Subshell executed in a	When the commands affect

Syntax	What it is	When to use
	subprocess.	the current shell or environment. The changes do not remain when the subshell completes.
`if (( <commands> ))`	Bash extension.	Use for arithmetic operations and C-style variable manipulation.
`if [ <commands> ]`	POSIX builtin, alias for **`test <commands>`**.	Comparing numbers and testing whether a file exists.
`if [[ <commands> ]]`	Bash extension, an advanced version of single square brackets.	String matching a wildcard pattern.

Below are example bash scripts that use each bracket type with a more in-depth explanation.

Single-Parentheses Syntax

Using single parentheses in bash scripting creates a subshell. When combined with the **`if`** statement, the subprocess finishes before continuing the program. The **`if`** analyzes the exit status and acts accordingly.

The bash **`if`** statement with single parentheses syntax looks like the following:

```
if ( <commands> )
then
        <commands>
fi
```

Try the example below to see how the sub-process behaves together with the **`if`** statement:

1. Create the script using Vim:

```
vi single_parentheses.sh
```

2. Add the following lines of code to the script:

```
outer_variable=Defined
echo Before if:
echo inner_variable = $inner_variable
echo outer_variable = $outer_variable
if (
        echo Inside subshell:
        inner_variable=Defined
        echo inner_variable = $inner_variable
        outer_variable=Changed
        echo outer_variable = $outer_variable
)
then
        echo After then:
        echo inner_variable = $iner_variable
        echo outer_variable = $outer_variable
fi
echo After fi:
echo inner_variable = $inner_variable
echo outer_variable = $outer_variable
```

The program does the following:

- **Line 1** creates a variable called **`outer_variable`** in which we store a string **`Defined`**.
- **Lines 2-4** print the variables to the console. At this moment, **`outer_variable`** has a string stored in it, while **`inner_variable`** is blank.
- **Line 5** starts the **`if`** statement and a sub-process, delimited by single parentheses.
- **Line 6-11** store a string inside the **`inner_variable`** and change the **`outer_variable`** to a different string. Both values print to the console, and the sub-process ends with an exit code. In this case, the sub-process ends successfully with an exit code **`0`**.
- **Line 12-16** execute after the sub-process and print the variable values. However, the values change back to what they were before the **`if`** statement. The sub-process only stores the values locally and not globally.
- **Lines 16-19** run after the commands in the **`then`** clause. The values remain unchanged outside the statement.

3. Save the script and close the editor:

```
:wq
```

4. Make the script executable:

```
chmod +x single_parentheses.sh
```

5. Lastly, run the example to test the results:

```
./single_parentheses.sh
```

The output prints the variable states as the program progresses.

Double-Parentheses Syntax

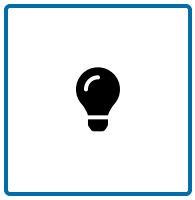
The double-parentheses syntax for a bash **`if`** statement is:

```
if (( <commands> ))
then
        <commands>
fi
```

The double parentheses construct in bash allows:

- **Arithmetic evaluation**. Defining a variable as **`a=$(( 1+1 ))`** calculates the equation and sets **`a`** to 2.
- **C-style variable manipulation.** For example, incrementing variables with **`(( a++ ))`**.

When using double-parentheses syntax in an **`if`** statement, the evaluation behaves differently. Suppose the expression evaluates to **`0`**, then the **`if`** test does not pass.



Note: Double parentheses are analogous to most other programming languages, where zero is false and one is true.

Try the following example to see how double parentheses work:

1. Create a bash script in the terminal:

```
vi double_parentheses.sh
```

2. Add the following code to *double_parentheses.sh*:

```
variable=-2
echo Before first if: $variable
if (( variable++ ))
then
        echo Incremented ++ style: $variable
fi
echo After first if: $variable
if (( variable=variable+1 ))
then
        echo Incremented arithmetically $variable
fi
echo After second if: $variable
```

Each line number in the script does the following:

- **Line 1** defines a variable and sets the value to **-2**.
- **Lines 3-5** increments the value C-style inside double parentheses and checks the value. If the variable is not zero, the if prints a message to the console.
- **Lines 8-10** increments the variable by one using regular arithmetic notation and prints a message if the variable is not zero.

3. Save the script and close Vim:

```
:wq
```

4. Change script permissions to executable:

```
chmod +x double_parentheses.sh
```

5. Run the script to see the results:

```
./double_parentheses.sh
```

Single-Bracket Syntax

The single bracket is another name for the **test** command and a standard POSIX utility available for all shells. The basic syntax is:

```
if [ <commands> ]
then
        <commands>
fi
```

The first bash **if** example provided in this tutorial (*test_script.sh*) works equally well with the alternative syntax:

```
echo -n "Please enter a whole number: "
read VAR
echo Your number is $VAR
if [ $VAR -gt 100 ]
then
        echo "It's greater than 100"
fi
echo Bye!
```

Run the script to confirm the output is equivalent. For the complete documentation and details on using bracket syntax, run the man command on the **test** utility:

```
man test
```

Double-Bracket Syntax

The double-bracket syntax in bash **if** scripts is the best option if portability is not necessary. The double-brackets are superior to single-brackets and include many advanced options. The syntax is:

```
if [[ <commands> ]]
then
        <commands>
fi
```

Try the example below to see how wildcard string matching works in an **`if`** command:

1. Create a shell script file called *double_brackets*:

```
vi double_brackets.sh
```

2. Add the following code:

```
if [[ $USER == k* ]]
then
        echo Hello $USER
fi
echo Bye!
```

3. The script checks if the starting letter of the username is **k** and sends a hello message if it is. Save and close the script:

```
:wq
```

4. Make the file executable with chmod:

```
chmod +x double_brackets.sh
```

5. Run the program with:

```
./double_brackets.sh
```

Other Types of Bash Conditional Statements

The **`if`** statement only performs one conditional check. Modify the **`if`** with other types of bash conditionals to create complex assessments.

if else Statement

The **`if else`** statement provides one method to define different actions based on the output of the checked conditional. The basic syntax is:

```
if <command>
then
        <commands>
else
        <commands>
fi
```

The following example demonstrates how the **`if else`** conditional works:

1. Create a new script using Vim:

```
vi if_else.sh
```

2. Insert the following code into the script:

```
echo -n "Please enter a whole number: "
read VAR
echo Your number is $VAR
if [ $VAR -gt 100 ]
then
```

```
        echo "It's greater than 100"
else
        echo "It's less than 100"
fi
echo Bye!
```

The statement checks the command output in **line 4** and prints a descriptive message based on the result:

- If the entered number is **greater than 100**, the program enters **line 6** and prints the message.
- If the number is **less than 100**, the message in the **`else`** clause (**line 8**) prints to the console.

3. Save the script and close Vim:

```
:wq
```

4. Make the script executable:

```
chmod +x if_else.sh
```

5. Lastly, run the script multiple times and test for various values:

```
./if_else.sh
```

if elif Statement

The **elif** clause combined with the **if else** statement creates multiple conditional checks. The **if elif** creates a series of checks with different results. The syntax is:

```
if <command>
then
        <commands>
elif <command>
then
        <commands>
else
        <commands>
fi
```

To create a script using **elif**:

1. Create a shell file named *elif*:

```
vi elif.sh
```

2. In the *elif.sh* file, add the following example code:

```
echo -n "Please enter a whole number: "
read VAR
echo Your number is $VAR
if [ $VAR -gt 100 ]
then
```

```
        echo "It's greater than 100"
elif [ $VAR -lt 100 ]
then
        echo "It's less than 100"
else
        echo "It's exactly 100"
fi
echo Bye!
```

The example adds an **`elif`** check on **line 7** to see if the entered number is less than 100. If the statements in lines 4 and 7 both fail, the program jumps to the else clause.

3. Save and close the file:

```
:wq
```

4. Make the *elif.sh* file executable:

```
chmod +x elif.sh
```

5. Run the script multiple times and check the behavior for different numbers:

```
./elif.sh
```

Add multiple **elif** clauses to branch out the statement for further detailed checks. For instances where the **if** and **elif** pattern series grows, the better option is to use a **case** statement.

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Nested if Statement

Nested **if** statements add a branch inside the **if**. Specifically, when a command passes the first if check, it goes through a new check to filter the result further. The syntax is:

```
if <commands>
then
        if <commands>
        then
                <commands>
        fi
fi
```

T used to search through multi-dimensional arrays. However, try t wo or three nested **if** statements to reduce program c le's logic when the nested **if** keeps growing in depth.

Examples

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