

BY BOBBY ILIEV

Introduction to Bash Scripting

FOR DEVELOPERS



Table of Contents

About the book	8
About the author	9
Sponsors	10
Ebook PDF Generation Tool	12
Ebook ePub Generation Tool	13
Book Cover	14
License	15
Introduction to Bash scripting	16
Bash Structure	17
Bash Hello World	18
Bash Variables	20
Bash User Input	24
Bash Comments	26
Bash Arguments	27
Bash Arrays	29
Array Slicing	31
String Slicing	32

Bash Conditional Expressions	34
File expressions	35
String expressions	37
Arithmetic operators	39
Exit status operators	41
Bash Conditionals	42
If statement	43
If Else statement	44
Switch case statements	47
Conclusion	49
Bash Loops	50
For loops	51
While loops	53
Until Loops	55
Continue and Break	56
Bash Functions	58
Debugging, testing and shortcuts	60
Creating custom bash commands	63
Example	64
Making the change persistent	66
Listing all of the available aliases	67
Conclusion	68
Write your first Bash script	69

Planning the script	70
Writing the script	71
Adding comments	72
Adding your first variable	73
Adding your first function	74
Adding more functions challenge	76
The sample script	77
Conclusion	79
 Creating an interactive menu in Bash	80
Planning the functionality	81
Adding some colors	83
 Adding the menu	84
Testing the script	86
Conclusion	89
 Executing BASH scripts on Multiple Remote Servers	90
Prerequisites	91
The BASH Script	92
Running the Script on all Servers	94
Conclusion	95
 Work with JSON in BASH using jq	96
Planning the script	97
Installing jq	98
Parsing JSON with jq	100
Getting the first element with jq	102
Getting a value only for specific key	103
Using jq in a BASH script	104

Conclusion	107
Working with Cloudflare API with Bash	108
Prerequisites	109
Challenge - Script requirements	110
Example script	111
Conclusion	113
BASH Script parser to Summarize Your NGINX and Apache Access Logs	114
Script requirements	115
Example script	116
Running the script	117
Understanding the output	118
Conclusion	119
Sending emails with Bash and SSMTP	120
Prerequisites	121
Installing SSMTP	122
Configuring SSMTP	123
Sending emails with SSMTP	124
Sending A File with SSMTP (optional)	125
Conclusion	126
Password Generator Bash Script	127
:warning: Security	128
Script summary	129
Prerequisites	130
Generate a random password	131
The script	133

The full script:	134
Conclusion	135
Contributed by	136
Redirection in Bash	137
Difference between Pipes and Redirections	138
Redirection in Bash	139
STDIN (Standard Input)	140
STDOUT (Standard Output)	141
STDERR (Standard Error)	143
Piping	145
HereDocument	147
HereString	149
Summary	150
Automatic WordPress on LAMP installation with BASH	151
Prerequisites	152
Planning the functionality	153
The script	155
The full script	162
Summary	166

Wrap Up	167
----------------------	------------

About the book

- **This version was published on 02 08 2024**

This is an open-source introduction to Bash scripting guide that will help you learn the basics of Bash scripting and start writing awesome Bash scripts that will help you automate your daily SysOps, DevOps, and Dev tasks. No matter if you are a DevOps/SysOps engineer, developer, or just a Linux enthusiast, you can use Bash scripts to combine different Linux commands and automate tedious and repetitive daily tasks so that you can focus on more productive and fun things.

The guide is suitable for anyone working as a developer, system administrator, or a DevOps engineer and wants to learn the basics of Bash scripting.

The first 13 chapters would be purely focused on getting some solid Bash scripting foundations, then the rest of the chapters would give you some real-life examples and scripts.

About the author

My name is Bobby Iliev, and I have been working as a Linux DevOps Engineer since 2014. I am an avid Linux lover and supporter of the open-source movement philosophy. I am always doing that which I cannot do in order that I may learn how to do it, and I believe in sharing knowledge.

I think it's essential always to keep professional and surround yourself with good people, work hard, and be nice to everyone. You have to perform at a consistently higher level than others. That's the mark of a true professional.

For more information, please visit my blog at <https://bobbyiliev.com>, follow me on Twitter [@bobbyiliev_](#) and [YouTube](#).

Sponsors

This book is made possible thanks to these fantastic companies!

Materialize

The Streaming Database for Real-time Analytics.

Materialize is a reactive database that delivers incremental view updates. Materialize helps developers easily build with streaming data using standard SQL.

DigitalOcean

DigitalOcean is a cloud services platform delivering the simplicity developers love and businesses trust to run production applications at scale.

It provides highly available, secure, and scalable compute, storage, and networking solutions that help developers build great software faster.

Founded in 2012 with offices in New York and Cambridge, MA, DigitalOcean offers transparent and affordable pricing, an elegant user interface, and one of the largest libraries of open source resources available.

For more information, please visit <https://www.digitalocean.com> or follow [@digitalocean](#) on Twitter.

If you are new to DigitalOcean, you can get a free \$200 credit and spin up your own servers via this referral link here:

[Free \\$200 Credit For DigitalOcean](#)

DevDojo

The DevDojo is a resource to learn all things web development and web design. Learn on your lunch break or wake up and enjoy a cup of coffee with us to learn something new.

Join this developer community, and we can all learn together, build together, and grow together.

[Join DevDojo](#)

For more information, please visit <https://www.devdojo.com> or follow @thedeveloper on Twitter.

Ebook PDF Generation Tool

This ebook was generated by [Ibis](#) developed by [Mohamed Said](#).

Ibis is a PHP tool that helps you write eBooks in markdown.

Ebook ePub Generation Tool

The ePub version was generated by [Pandoc](#).

Book Cover

The cover for this ebook was created with [Canva.com](https://www.canva.com).

If you ever need to create a graphic, poster, invitation, logo, presentation - or anything that looks good — give Canva a go.

License

MIT License

Copyright (c) 2020 Bobby Iliev

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Introduction to Bash scripting

Welcome to this Bash basics training guide! In this **bash crash course**, you will learn the **Bash basics** so you could start writing your own Bash scripts and automate your daily tasks.

Bash is a Unix shell and command language. It is widely available on various operating systems, and it is also the default command interpreter on most Linux systems.

Bash stands for Bourne-Again SHell. As with other shells, you can use Bash interactively directly in your terminal, and also, you can use Bash like any other programming language to write scripts. This book will help you learn the basics of Bash scripting including Bash Variables, User Input, Comments, Arguments, Arrays, Conditional Expressions, Conditionals, Loops, Functions, Debugging, and testing.

Bash scripts are great for automating repetitive workloads and can help you save time considerably. For example, imagine working with a group of five developers on a project that requires a tedious environment setup. In order for the program to work correctly, each developer has to manually set up the environment. That's the same and very long task (setting up the environment) repeated five times at least. This is where you and Bash scripts come to the rescue! So instead, you create a simple text file containing all the necessary instructions and share it with your teammates. And now, all they have to do is execute the Bash script and everything will be created for them.

In order to write Bash scripts, you just need a UNIX terminal and a text editor like Sublime Text, VS Code, or a terminal-based editor like vim or nano.

Bash Structure

Let's start by creating a new file with a `.sh` extension. As an example, we could create a file called `devdojo.sh`.

To create that file, you can use the `touch` command:

```
touch devdojo.sh
```

Or you can use your text editor instead:

```
nano devdojo.sh
```

In order to execute/run a bash script file with the bash shell interpreter, the first line of a script file must indicate the absolute path to the bash executable:

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

This is also called a Shebang.

All that the shebang does is to instruct the operating system to run the script with the `/bin/bash` executable.

However, bash is not always in `/bin/bash` directory, particularly on non-Linux systems or due to installation as an optional package. Thus, you may want to use:

```
#!/usr/bin/env bash
```

It searches for bash executable in directories, listed in PATH environmental variable.

Bash Hello World

Once we have our `devdojo.sh` file created and we've specified the bash shebang on the very first line, we are ready to create our first **Hello World** bash script.

To do that, open the `devdojo.sh` file again and add the following after the `#!/bin/bash` line:

```
#!/bin/bash  
  
echo "Hello World!"
```

Save the file and exit.

After that make the script executable by running:

```
chmod +x devdojo.sh
```

After that execute the file:

```
./devdojo.sh
```

You will see a "Hello World" message on the screen.

Another way to run the script would be:

```
bash devdojo.sh
```

As bash can be used interactively, you could run the following command directly in your terminal and you would get the same result:

```
echo "Hello DevDojo!"
```

Putting a script together is useful once you have to combine multiple commands together.

Bash Variables

As in any other programming language, you can use variables in Bash Scripting as well. However, there are no data types, and a variable in Bash can contain numbers as well as characters.

To assign a value to a variable, all you need to do is use the `=` sign:

```
name="DevDojo"
```

Notice: as an important note, you can not have spaces before and after the `=` sign.

After that, to access the variable, you have to use the `$` and reference it as shown below:

```
echo $name
```

Wrapping the variable name between curly brackets is not required, but is considered a good practice, and I would advise you to use them whenever you can:

```
echo ${name}
```

The above code would output: `DevDojo` as this is the value of our `name` variable.

Next, let's update our `devdojo.sh` script and include a variable in it.

Again, you can open the file `devdojo.sh` with your favorite text editor, I'm using nano here to open the file:

```
nano devdojo.sh
```

Adding our `name` variable here in the file, with a welcome message. Our file now looks like this:

```
#!/bin/bash  
  
name="DevDojo"  
  
echo "Hi there $name"
```

Save it and run the file using the command below:

```
./devdojo.sh
```

You would see the following output on your screen:

```
Hi there DevDojo
```

Here is a rundown of the script written in the file:

- `#!/bin/bash` - At first, we specified our shebang.
- `name=DevDojo` - Then, we defined a variable called `name` and assigned a value to it.
- `echo "Hi there $name"` - Finally, we output the content of the variable on the screen as a welcome message by using `echo`

You can also add multiple variables in the file as shown below:

```
#!/bin/bash  
  
name="DevDojo"  
greeting="Hello"  
  
echo "$greeting $name"
```

Save the file and run it again:

```
./devdojo.sh
```

You would see the following output on your screen:

```
Hello DevDojo
```

Note that you don't necessarily need to add semicolon `;` at the end of each line. It works both ways, a bit like other programming language such as JavaScript!

You can also add variables in the Command Line outside the Bash script and they can be read as parameters:

```
./devdojo.sh Bobby buddy!
```

This script takes in two parameters **Bobby** and **buddy!** separated by space. In the **devdojo.sh** file we have the following:

```
#!/bin/bash  
  
echo "Hello there" $1
```

\$1 is the first input (**Bobby**) in the Command Line. Similarly, there could be more inputs and they are all referenced to by the **\$** sign and their respective order of input. This means that **buddy!** is referenced to using **\$2**. Another useful method for reading variables is the **\$@** which reads all inputs.

So now let's change the **devdojo.sh** file to better understand:

```
#!/bin/bash

echo "Hello there" $1

# $1 : first parameter

echo "Hello there" $2

# $2 : second parameter

echo "Hello there" $@

# $@ : all
```

The output for:

```
./devdojo.sh Bobby buddy!
```

Would be the following:

```
Hello there Bobby
Hello there buddy!
Hello there Bobby buddy!
```

Bash User Input

With the previous script, we defined a variable, and we output the value of the variable on the screen with the `echo $name`.

Now let's go ahead and ask the user for input instead. To do that again, open the file with your favorite text editor and update the script as follows:

```
#!/bin/bash

echo "What is your name?"
read name

echo "Hi there $name"
echo "Welcome to DevDojo!"
```

The above will prompt the user for input and then store that input as a string/text in a variable.

We can then use the variable and print a message back to them.

The output of the above script would be:

- First run the script:

```
./devdojo.sh
```

- Then, you would be prompted to enter your name:

```
What is your name?
Bobby
```

- Once you've typed your name, just hit enter, and you will get the following output:


```
Hi there Bobby  
Welcome to DevDojo!
```

To reduce the code, we could change the first `echo` statement with the `read -p`, the `read` command used with `-p` flag will print a message before prompting the user for their input:

```
#!/bin/bash  
  
read -p "What is your name? " name  
  
echo "Hi there $name"  
echo "Welcome to DevDojo!"
```

Make sure to test this out yourself as well!

Bash Comments

As with any other programming language, you can add comments to your script. Comments are used to leave yourself notes through your code.

To do that in Bash, you need to add the `#` symbol at the beginning of the line. Comments will never be rendered on the screen.

Here is an example of a comment:

```
# This is a comment and will not be rendered on the screen
```

Let's go ahead and add some comments to our script:

```
#!/bin/bash

# Ask the user for their name

read -p "What is your name? " name

# Greet the user
echo "Hi there $name"
echo "Welcome to DevDojo!"
```

Comments are a great way to describe some of the more complex functionality directly in your scripts so that other people could find their way around your code with ease.

Bash Arguments

You can pass arguments to your shell script when you execute it. To pass an argument, you just need to write it right after the name of your script. For example:

```
./devdojo.com your_argument
```

In the script, we can then use **\$1** in order to reference the first argument that we specified.

If we pass a second argument, it would be available as **\$2** and so on.

Let's create a short script called **arguments.sh** as an example:

```
#!/bin/bash  
  
echo "Argument one is $1"  
echo "Argument two is $2"  
echo "Argument three is $3"
```

Save the file and make it executable:

```
chmod +x arguments.sh
```

Then run the file and pass **3** arguments:

```
./arguments.sh dog cat bird
```

The output that you would get would be:

```
Argument one is dog
Argument two is cat
Argument three is bird
```

To reference all arguments, you can use `$@`:

```
#!/bin/bash

echo "All arguments: $@"
```

If you run the script again:

```
./arguments.sh dog cat bird
```

You will get the following output:

```
All arguments: dog cat bird
```

Another thing that you need to keep in mind is that `$0` is used to reference the script itself.

This is an excellent way to create self destruct the file if you need to or just get the name of the script.

For example, let's create a script that prints out the name of the file and deletes the file after that:

```
#!/bin/bash

echo "The name of the file is: $0 and it is going to be self-
deleted."

rm -f $0
```

You need to be careful with the self deletion and ensure that you have your script backed up before you self-delete it.

Bash Arrays

If you have ever done any programming, you are probably already familiar with arrays.

But just in case you are not a developer, the main thing that you need to know is that unlike variables, arrays can hold several values under one name.

You can initialize an array by assigning values divided by space and enclosed in `()`.
Example:

```
my_array=("value 1" "value 2" "value 3" "value 4")
```

To access the elements in the array, you need to reference them by their numeric index.

Notice: keep in mind that you need to use curly brackets.

- Access a single element, this would output: `value 2`

```
echo ${my_array[1]}
```

- This would return the last element: `value 4`

```
echo ${my_array[-1]}
```

- As with command line arguments using `@` will return all elements in the array, as follows: `value 1 value 2 value 3 value 4`

```
echo ${my_array[@]}
```

- Prepending the array with a hash sign (#) would output the total number of elements in the array, in our case it is 4:

```
echo ${#my_array[@]}
```

Make sure to test this and practice it at your end with different values.

Array Slicing

While Bash doesn't support true array slicing, you can achieve similar results using a combination of array indexing and string slicing:

```
#!/bin/bash

array=("A" "B" "C" "D" "E")

# Print entire array
echo "${array[@]}" # Output: A B C D E

# Access a single element
echo "${array[1]}" # Output: B

# Print a range of elements (requires Bash 4.0+)
echo "${array[@]:1:3}" # Output: B C D

# Print from an index to the end
echo "${array[@]:3}" # Output: D E
```

When working with arrays, always use `[@]` to refer to all elements, and enclose the parameter expansion in quotes to preserve spaces in array elements.

String Slicing

In Bash, you can extract portions of a string using slicing. The basic syntax is:

```
${string:start:length}
```

Where:

- **start** is the starting index (0-based)
- **length** is the maximum number of characters to extract

Let's look at some examples:

```
#!/bin/bash

text="ABCDE"

# Extract from index 0, maximum 2 characters
echo "${text:0:2}" # Output: AB

# Extract from index 3 to the end
echo "${text:3}"   # Output: DE

# Extract 3 characters starting from index 1
echo "${text:1:3}" # Output: BCD

# If length exceeds remaining characters, it stops at the end
echo "${text:3:3}" # Output: DE (only 2 characters available)
```

Note that the second number in the slice notation represents the maximum length of the extracted substring, not the ending index. This is different from some other programming languages like Python. In Bash, if you specify a length that would extend beyond the end of the string, it will simply stop at the end of the string without raising an error.

For example:


```
text="Hello, World!"

# Extract 5 characters starting from index 7
echo "${text:7:5}" # Output: World

# Attempt to extract 10 characters starting from index 7
# (even though only 6 characters remain)
echo "${text:7:10}" # Output: World!
```

In the second example, even though we asked for 10 characters, Bash only returns the 6 available characters from index 7 to the end of the string. This behavior can be particularly useful when you're not sure of the exact length of the string you're working with.

Bash Conditional Expressions

In computer science, conditional statements, conditional expressions, and conditional constructs are features of a programming language, which perform different computations or actions depending on whether a programmer-specified boolean condition evaluates to true or false.

In Bash, conditional expressions are used by the `[[` compound command and the `[]` built-in commands to test file attributes and perform string and arithmetic comparisons.

Here is a list of the most popular Bash conditional expressions. You do not have to memorize them by heart. You can simply refer back to this list whenever you need it!

File expressions

- True if file exists.

```
[[ -a ${file} ]]
```

- True if file exists and is a block special file.

```
[[ -b ${file} ]]
```

- True if file exists and is a character special file.

```
[[ -c ${file} ]]
```

- True if file exists and is a directory.

```
[[ -d ${file} ]]
```

- True if file exists.

```
[[ -e ${file} ]]
```

- True if file exists and is a regular file.

```
[[ -f ${file} ]]
```

- True if file exists and is a symbolic link.

```
[[ -h ${file} ]]
```

This is a sample from "Introduction to Bash Scripting" by Bobby Iliev.

For more information, [Click here](#).