

I ❤️ #!/bin/bash



Shell Scripting - Module1

[What is Linux ?](#)

[Difference between unix & Linux](#)

[How does Linux differ from other operating system](#)

[Who uses Linux ?](#)

[Who owns Linux ?](#)

[Linux Kernel](#)

[Linux Directories](#)

[Linux Installation](#)

[Introduction to Linux shell](#)

[Kernel](#)

[Shell](#)

[Command Line shell](#)

[Graphical shell](#)

[Types of Linux shells](#)

[Introduction to shell scripting](#)

[Why do we need shell scripts ?](#)

[Advantages of shell scripts](#)

[Disadvantage of shell scripts](#)

What is Linux ?

- **Linux is the best-known and most-used open source operating system.**
- **It's a software that sits underneath of all other software on a computer.**
- **Major role of this software is to receive requests from programs & relay those to computer's hardware.**

Difference between unix & Linux

- Unix is considered as mother of most operating systems.
- Unix was invented by Bell labs back in 1965.
- Linux is nothing but the clone of Unix which is written by Linux Torvalds from scratch with help of many hackers across the globe.
- People do confuse a lot between the terms “Unix & Linux” and they tend ask questions like

“Is Unix different from Linux?” / “Are Linux & Unix the same thing?” / “Is Linux like Unix?”/ “Is Linux built on Unix?”

Here is the answer to all such questions.



“Linux & Unix are different but they do have a relationship with each other as Linux is derived from Unix”

How does Linux differ from other operating system

- In many ways, Linux is similar to other operating systems you may have used before, such as Windows, macOS etc..
- Like other operating systems, Linux also has both graphical & command line interface.
- But why Linux is different from other operating systems?
- First, and perhaps most important reason is “Linux is open source software”
- The code used to create Linux is free and available to the public to view, edit & for users with the appropriate skills to contribute to.
- There are many operating system distributions derived from Linux core source code some of them are



“Fedora, Centos, Suse(enterprise), Ubuntu, MacOS(enterprise), IOS(enterprise) & Android(enterprise)”

Who uses Linux ?

- You probably already use Linux, whether you know it or not.
- Between two-thirds of webpages on Internet are generated by servers running Linux.
- Companies & individuals choose Linux because it's secure, flexible & you can receive excellent support from large community of users. In addition to companies like SUSE & Red Hat

offers commercial support as well.

- Many devices you probably own, such as Android phones, tablets, IOS, Chromebooks, digital storage devices, cameras also run on Linux. Your car has Linux running under the hood. Hence Linux is everywhere.

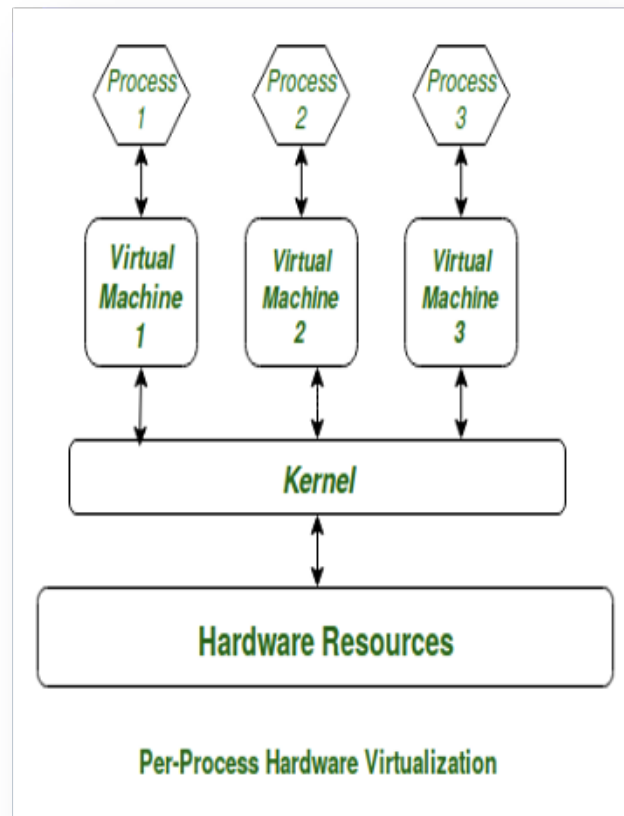
Who owns Linux ?

- Linux is freely available to anyone.
- However, the trademark on the name “Linux” rests with its creator, Linus Torvalds.
- The term “Linux” technically refers to just the Linux kernel.
- But most people refer entire operating system as "Linux" because to most users an OS includes a bundle of programs, tools, and services (like a desktop, clock, an application menu, and so on).

Linux Kernel

What is the main purpose of inventing computer ?

- To run the sequence of instructions which is known as program.
- The program is often referred as Process.
- If you look back the history, single computer were used to run single process.
- later general purpose computers are designed to run many processes simultaneously, but how it has been achieved ?
- In general – what is required for process (it requires hardware resources such are Memory, Processor time, Storage space, etc)
- To run many processes simultaneously, we need a middle layer to manage the distribution of hardware resources of the computer efficiently & fairly among all the various processes running on the computer.
- This middle layer is referred to as the kernel.
- Basically the kernel virtualizes the common hardware resources of the computer to provide each process with its own virtual resources.
- This makes the process seem as it is the sole process running on the machine.
- The kernel is also responsible for preventing & mitigating conflicts between different processes.



Linux Directories

- **/bin:** Where Linux core commands reside like ls, mv.
- **/boot:** Where boot loader and boot files are located.
- **/dev:** Where all physical drives are mounted like USBs DVDs.
- **/etc:** Contains configurations for the installed packages.
- **/home:** Where every user will have a personal folder to put folders with name like /home/likegeeks.
- **/lib:** Where libraries of the installed packages located since libraries shared among all packages, unlike Windows, you may find duplicates in different folders.
- **/media:** Here are the external devices like DVDs and USB sticks that are mounted, and you can access their files from here.
- **/mnt:** mounted USB or DVD can be loaded in this drive.
- **/opt:** Some optional packages are located here and managed by the package manager.
- **/proc:** Because everything on Linux is a file, this folder for processes running on the system and you can access them and see much info about the current processes.

- **/root:** The home folder for the root user.
- **/sbin:** Like /bin, but binaries here are for root user only.
- **/tmp:** Contains the temporary files.
- **/usr:** Where the utilities and files shared between users on Linux.
- **/var:** Contains system logs and other variable data.

Linux Installation

There are several ways to install Linux machine.

| **Install Linux machine directly on cloud.**

| **Install Linux machine as an Docker container.**

| **Install Linux machines on Oracle virtual box.**

Let's see how to install linux machine in oracle virtual box using Vagrant.

Install Virtual box: [In laptop]

<https://www.virtualbox.org/wiki/Downloads>

Install Vagrant:[In laptop]

<https://www.vagrantup.com/downloads>

Download VSCode:[In laptop]

<https://code.visualstudio.com/download>

Open VScode: Navigate to File -> Open -> Select your shared folder (please create one folder in your machine)

Run Vagrant command:

- Click on folder data under shared.
- Run command "vagrant init"
- Note : You can find "Vagrantfile" which will be created automatically.
- Open "Vagrantfile" Delete all lines and update below code.

```
# -*- mode: ruby -*-
# vi: set ft=ruby :
Vagrant.configure("2") do |config|
  config.vm.define "TEST" do |vm1|
```

```

vm1.vm.hostname = "TEST"
vm1.vm.box = "bento/ubuntu-20.04"
vm1.vm.network "private_network", ip: "192.178.33.10"
vm1.vm.network "forwarded_port", guest: 8080, host: 9000, host_ip: "127.0.0.1", auto_correct: true
vm1.vm.network "forwarded_port", guest: 80, host: 9001, host_ip: "127.0.0.1", auto_correct: true
vm1.vm.provider "virtualbox" do |vb|
  vb.name = "TEST"
  vb.gui = false
  vb.memory = "2024"
end
end
end

```

Command to bring up the Virtual machines.

- **vagrant up**
- **vagrant ssh Master**

Introduction to Linux shell

- If you are using any major operating system which means you are indirectly interacting to shell.
- If you are running Ubuntu, RHEL, Centos, Linux Mint or any other Linux distribution, you are interacting to shell every time you use terminal.
- We might need to understand 3 major components here.

Kernel

The kernel is a computer program that is the core of a computer's operating system, with actually has complete control over everything in the system.

It manages following resources of the Linux system.

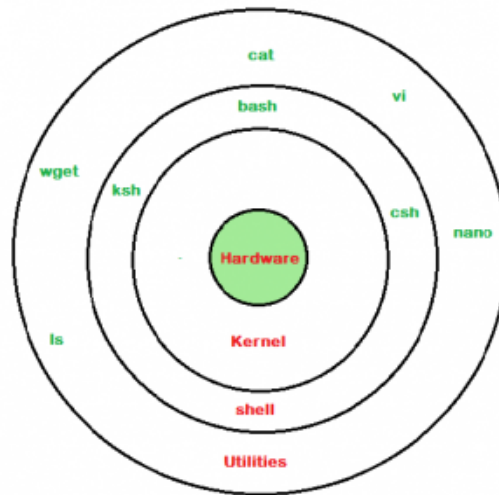
- File management
- Process management
- I/O management
- Memory management
- Device management etc.

It is often mistaken that Linus Torvalds has developed Linux OS, but actually he is only responsible for development of Linux kernel.

Shell

- A shell is special program which provide an interface to user to use operating system services.
- Shell accept human readable commands from user and convert them into something which kernel can understand.

- It is a command language interpreter that execute commands read from input devices such as keyboards or from files.
- The shell gets started when the user logs in or start the terminal.



Shell is broadly classified into two categories

- Command Line Shell
- Graphical shell

Command Line shell

- Shell can be accessed by user using a command line interface.
- A special program called Terminal in linux/macOS or Command Prompt in Windows OS is provided to type in the human readable commands such as “cat”, “ls” etc and then it is being execute.
- The result is then displayed on the terminal to the user. A terminal in Ubuntu 16.4 system looks like this

```
override@Atul-HP: ~  
override@Atul-HP:~$ ls -l  
total 212  
drwxrwxr-x  5 override override 4096 May 19 03:45 acadenv  
drwxrwxr-x  4 override override 4096 May 27 18:20 acadview_demo  
drwxrwxr-x 12 override override 4096 May  3 15:14 anaconda3  
drwxr-xr-x  6 override override 4096 May 31 16:49 Desktop  
drwxr-xr-x  2 override override 4096 Oct 21  2016 Documents  
drwxr-xr-x  7 override override 40960 Jun  1 13:09 Downloads  
-rw-r--r--  1 override override 8980 Aug  8  2016 examples.desktop  
-rw-rw-r--  1 override override 45005 May 28 01:40 hs_err_pid1971.log  
-rw-rw-r--  1 override override 45147 Jun  1 03:24 hs_err_pid2006.log  
drwxr-xr-x  2 override override 4096 Mar  2 18:22 Music  
drwxrwxr-x 21 override override 4096 Dec 25 00:13 Mydata  
drwxrwxr-x  2 override override 4096 Sep 20  2016 newbin  
drwxrwxr-x  5 override override 4096 Dec 20 22:44 nltk_data  
drwxr-xr-x  4 override override 4096 May 31 20:46 Pictures  
drwxr-xr-x  2 override override 4096 Aug  8  2016 Public  
drwxrwxr-x  2 override override 4096 May 31 19:49 scripts  
drwxr-xr-x  2 override override 4096 Aug  8  2016 Templates  
drwxrwxr-x  2 override override 4096 Feb 14 11:22 test  
drwxr-xr-x  2 override override 4096 Mar 11 13:27 Videos  
drwxrwxr-x  2 override override 4096 Sep  1  2016 xdm-helper  
override@Atul-HP:~$
```

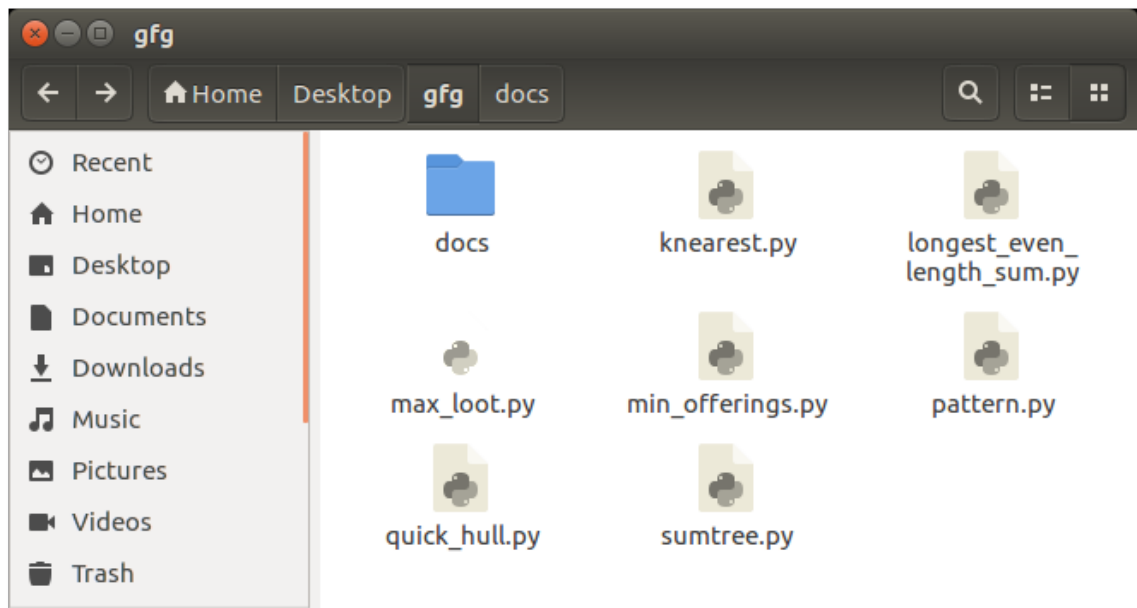
- In above screenshot “ls” command with “-l” option is executed.
- It will list all the files in current working directory in long listing format.
- Working with command line shell is bit difficult for the beginners because it’s hard to memorize so many commands.
- But it allows user to store commands in a file and execute them together. This way any repetitive task can be easily automated.



These files are usually called batch files in Windows and Shell Scripts in Linux/macOS systems.

Graphical shell

- Graphical shells provides, graphical user interface (GUI), by allowing for operations such as opening, closing, moving and resizing windows, as well as switching focus between windows.
- Window OS or Ubuntu OS can be considered as good example which provide GUI to user for interacting with program.
- User do not need to type in command for every actions.



Types of Linux shells

- **BASH (Bourne Again SHell)**
 - It is most widely used shell in Linux systems.
 - It is used as default login shell in Linux systems and in macOS. It can also be installed on Windows OS.
- **CSH (C SHell)**
 - The C shell's syntax and usage are very similar to the C programming language.
- **KSH (Korn SHell)**
 - The Korn Shell also was the base for the POSIX Shell standard specifications etc.



Each shell does the same job but understand different commands and provide different built in functions.

Introduction to shell scripting

- Usually shells are interactive that mean, they accept command as input from users and execute them.
- However some time we want to execute a bunch of commands routinely, so we have type in all commands each time in terminal.

- As shell can also take commands as input from file we can write these commands in a file and can execute them in shell to avoid this repetitive work.

These files are called Shell Scripts or Shell Programs

- Shell scripts are similar to the batch file in Windows.
- Each shell script is saved with .sh file extension eg. **myscript.sh**

Why do we need shell scripts ?

There are many reasons to write shell scri

- To avoid repetitive work and automation
- System admins use shell scripting for routine backups
- System monitoring.

Advantages of shell scripts

- The command and syntax are exactly the same as those directly entered in command line, so programmer do not need to switch to entirely different syntax
- Writing shell scripts are much quicker

Disadvantage of shell scripts

- Prone to costly errors, a single mistake can change the command which might be harmful
- Slow execution speed
- Not well suited for large and complex tasks.