Introduction to Linux Distributions

Before Learning Linux let's pay a tribute to Linus_Torvalds due to whom we are able to play with Linux today.

What Is Linux? How Linux Looks? Why to use Linux? What is the Advantage of Linux?

Many questions comes in mind of new user for Linux, so let's cover all the doubts one by one: -

First all the new user who comes to Linux platform gets confused what is Linux as they hear so many names and different versions (ubuntu, fedora, Debian, RHEL, Centos etc). Many peoples who comes to the world of Linux for the first time gets confused by various terms such as distribution, LiveCD, and GNU when looking at Linux packages. Let's understand it in easy way.

Let's divide the Linux in 4 main parts which make up a Linux Operating System: -

- The Linux kernel
- The GNU utilities
- A graphical desktop environment
- Application software
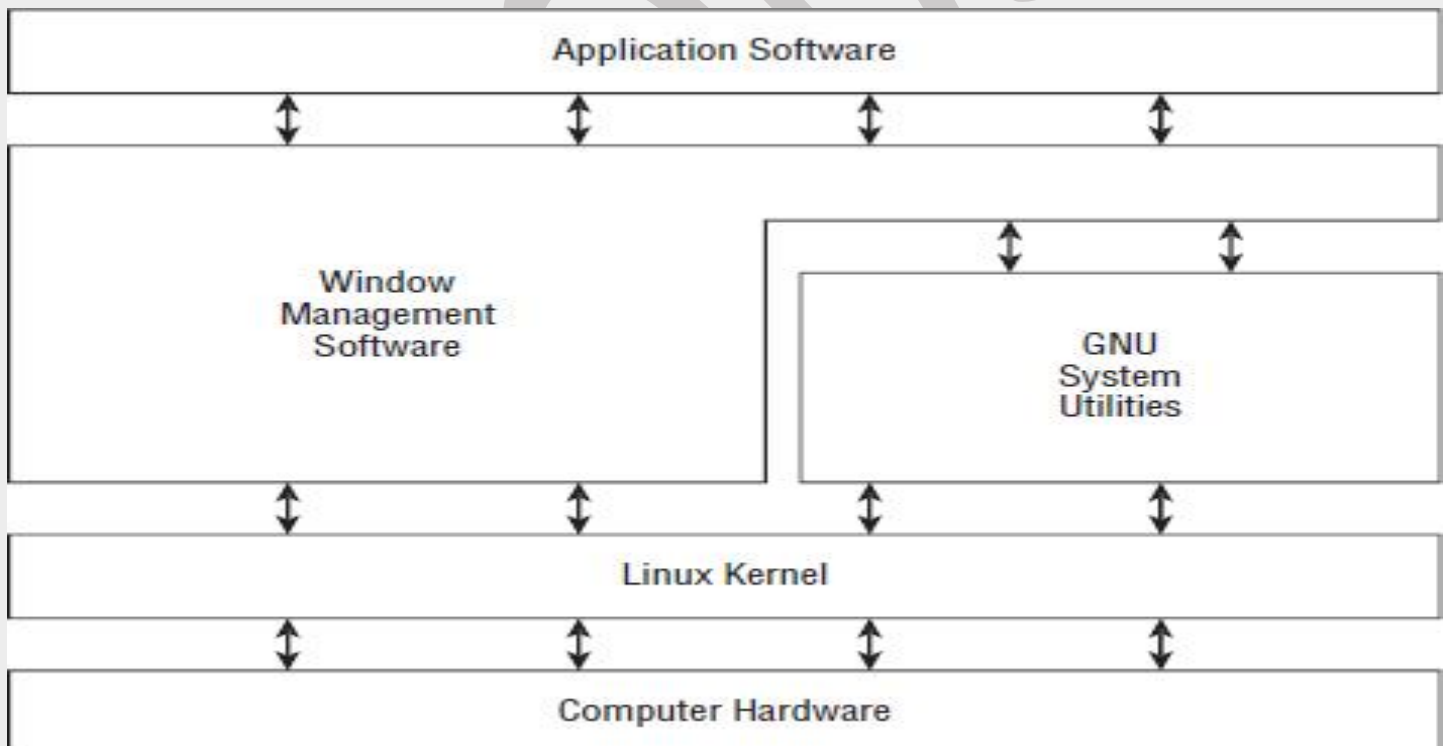
Each of the above-mentioned parts has a specific job in the Linux system. Let's understand these 4 components separately.

The Linux Kernel

The core of the Linux system is the *kernel*. The kernel controls all the hardware and software on the computer system, allocating hardware when necessary and executing software when required. Simply, Kernel is the framework that connects the application layer to the hardware of a computer.

The kernel is primarily responsible for four main functions: -

- System memory management
- Software program management
- Hardware management
- Filesystem management

Now let's move into these 4 components: -

System Memory Management

One of the primary functions of the operating system kernel is memory management. Not only does the kernel manage the physical memory available on the server, but it can also create and manage virtual memory, or memory that does not actually exist.

It does this by using space on the hard disk, called the *swap sp*ace. The kernel swaps the contents of virtual memory locations back and forth from the swap space to the actual physical memory. This allows the system to think there is more memory available than what physically exists
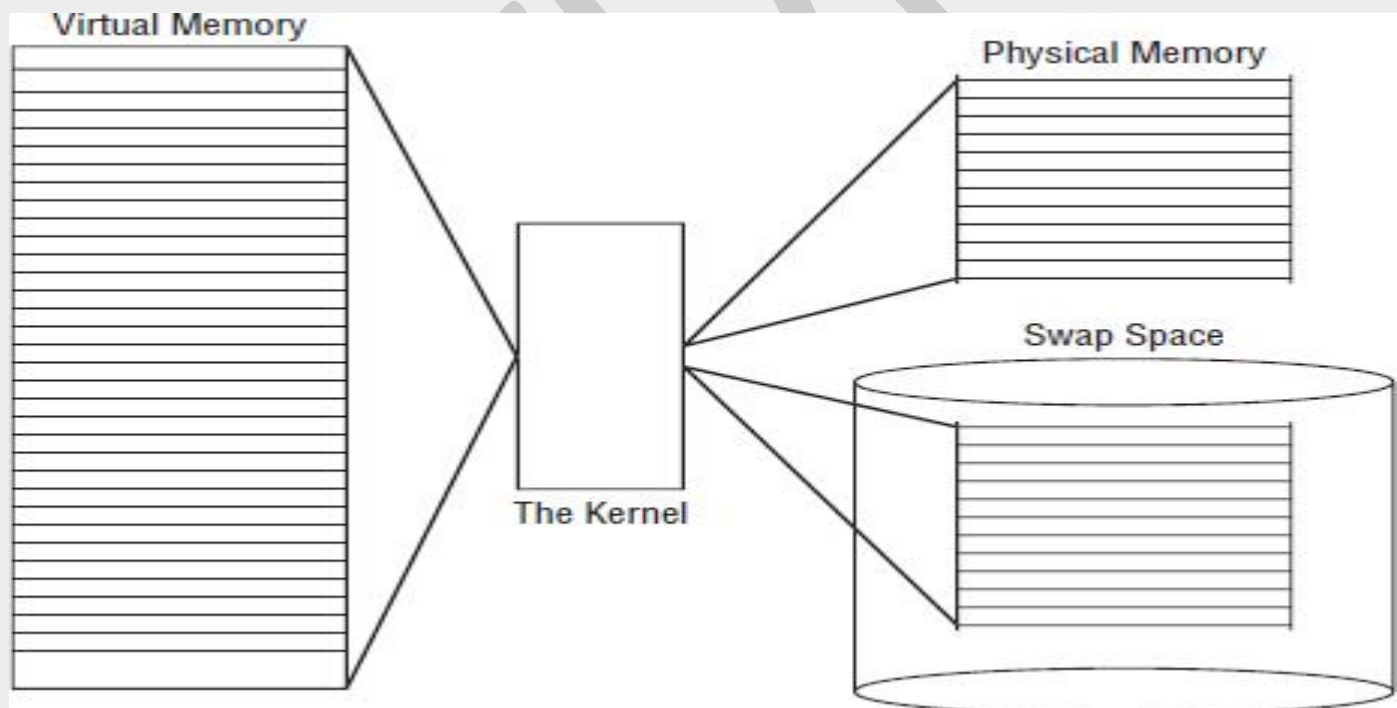
Software Program Management

The Linux operating system calls a running program a *process*. A process can run in the foreground, displaying output on a display, or it can run in the background, behind the scenes. The kernel controls how the Linux system manages all the processes running on the system.

Hardware Management

Still another responsibility for the kernel is hardware management. Any device that the Linux system must communicate with needs driver code inserted inside the kernel code. The driver code allows the kernel to pass data back and forth to the device, acting as a middleman between applications and the hardware.

Filesystem Management

Unlike some other operating systems, the Linux kernel can support different types of filesystems to read and write data to and from hard drives. Besides having over a dozen filesystems of its own, Linux can read and write to and from filesystems used by other operating systems, such as Microsoft Windows. The kernel must be compiled with support for all types of filesystems that the system will use. Below diagram lists the standard filesystems that a Linux system can use to read and write data.

Filesystem	Description
ext	Linux Extended filesystem — the original Linux filesystem
ext2	Second extended filesystem, provided advanced features over ext
ext3	Third extended filesystem, supports journaling
ext4	Fourth extended filesystem, supports advanced journaling
hpfs	OS/2 high-performance filesystem
jfs	IBM's journaling filesystem
iso9660	ISO 9660 filesystem (CD-ROMs)
minix	MINIX filesystem
msdos	Microsoft FAT16
ncp	Netware filesystem
nfs	Network File System
ntfs	Support for Microsoft NT filesystem
proc	Access to system information
ReiserFS	Advanced Linux filesystem for better performance and disk recovery
smb	Samba SMB filesystem for network access
sysv	Older Unix filesystem
ufs	BSD filesystem
umsdos	Unix-like filesystem that resides on top of msdos
vfat	Windows 95 filesystem (FAT32)
XFS	High-performance 64-bit journaling filesystem

Any hard drive that a Linux server accesses must be formatted using one of the filesystem types listed above.

The Linux kernel interfaces with each filesystem using the Virtual File System (VFS). This provides a standard interface for the kernel to communicate with any type of filesystem. VFS caches information in memory as each filesystem is mounted and used.

The GNU Utilities

Besides having a kernel to control hardware devices, a computer operating system needs utilities to perform standard functions, such as controlling files and programs. Above we can see Process can be run, memory can be assigned, but we needed a approach to manage or handle it as per user requirement.

The GNU organization developed a complete set of Unix utilities, but had no kernel system to run them on. These utilities were developed under a software philosophy called open source software (OSS).

The concept of OSS allows programmers to develop software and then release it to the world with no licensing fees attached. Anyone can use the software, modify it, or incorporate it into his or her own system without having to pay a license fee. **Uniting Linus's Linux kernel with the GNU operating system utilities created a complete, functional, free operating system.**

This bundling of the Linux kernel and GNU utilities is often just called Linux.
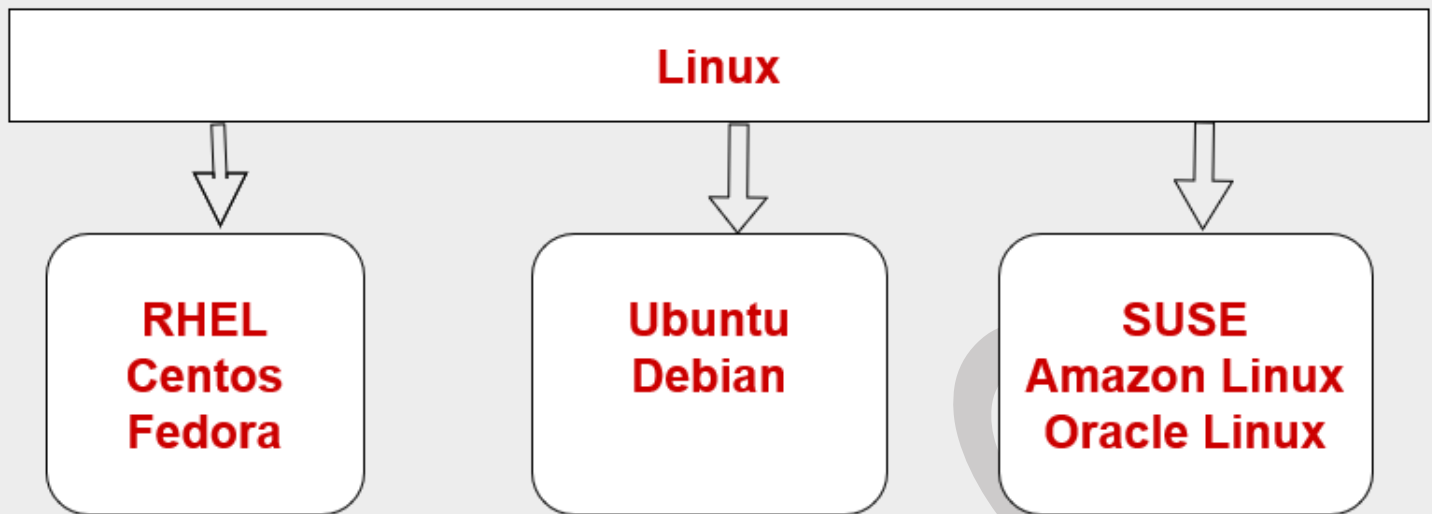
In Above pic we can see that RHEL, Centos, Fedora belongs to same family whereas Ubuntu, Debian belongs to different family while there are many other Linux distribution as well such as Oracle Linux, Amazon Linux and we can call it belonging from different Linux family because in each of those Linux we can observe few of the package would be different like in RHEL family we can observe it uses **rpm** packages whereas for Debian family all Linux uses **deb** packages.

So we can say RHEL, Centos, Fedora belongs to same family of Linux but are different flavor of Linux as RHEL is used for commercial purpose where the support is required from Redhat team, whereas centos is free version of RHEL without support from Redhat team while fedora is development server of RHEL (Means in fedora Redhat teams use to do all the testing of any new release and if everything works fine then they implements it in RHEL).

Similarly, Ubuntu, Debian, Linux Mint belongs from same family but are different flavor of Linux. Similar is the case with another Linux as well like Oracle Linux, Amazon Linux.

So now its time to answer the questions which we had seen in beginning of this video: -

What Is Linux?

Linux is an opensource operating system similar to Windows and other OS.

How Linux Looks?

We can install Linux with Minimal installation (Only command line tools will be accessible) where it will be accessible in terminal or with full installation where gnome will be available, and we can access it in GUI mode.

What is the Advantage of Linux?

It is opensource so it offers free Operating System.

It is also highly secured then Windows, so we don't require to maintain Antivirus for it.

Linux server has much high stability, it could run non-stop without a single reboot even for multiple years.

Why to use Linux?

Today as we can see most of the company is running behind open source tools to get their solution done without paying huge amount for licensing. Linux provides us this flexibility, as in Linux we can install multiple opensource tools like Ansible, Docker, Kubernetes, Jenkins, terraform etc which primarily focuses on Linux OS. In data-science, machine learning as well Linux gives better output hence today Linux is the need of the hour.

Summary

Here we discussed on Linux system and the basics of how it works. The Linux kernel is the core of the system, controlling how memory, programs, and hardware all interact with one another. The GNU utilities are also an important piece in the Linux system.