1-Overview of Linux
        * What is kernel & Its function
        * Linux release & vendors
        * Fedora Project
        * Red Hat Enterprise Linux (RHEL)
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Linux :

* A name of OS kernel
* Develop by Linus Torvalds 1991
* Release and maintain under open source license.
                    [OS = Kernel + Application]

Unix-:

[Unix is a family of multitasking, multiuser computer operating systems that derive from the original AT&T Unix, development **starting in the 1970s** at the Bell Labs research center by Ken Thompson, Dennis Ritchie, and others.] (https://en.wikipedia.org/wiki/Unix)
Solaris (sun), AIX (IBM), HP-ux (hp), BSD (free available), SCO, MAC, etc..

Linux-:

[Linux is a family of **open source** Unix-like operating systems based on the Linux kernel, an operating system kernel first released on **September 17, 1991**, by Linus Torvalds.]
Mandriva,Mint, Oracle linux,SUSE,Ubuntu, Kali, Parrot, PCLinuxOS, Sabayon Linux etc
(https://en.wikipedia.org/wiki/Linux)

==> Kernel Functions

* I/o management
* Physical memory management
* Virtual memory management
* CPU scheduling
* file system management
* service drivers
→ [Physical Hardware → OS = (Kernel + Application) → User Interface]

==> **Function** :To perform useful functions, processes need access to the peripherals connected to the computer, which are controlled by the kernel through device drivers. A device driver is a computer program that enables the operating system to interact with a hardware device.
Distribution : (https://en.wikipedia.org/wiki/List_of_Linux_distributions)

RHEL (Red Hat Linux Enterprise Linux)

Red hat (1993) → GNU (2, 3, 4, 5, 6(GUI), 7, 8, **9 (2003 X) close** → Next RHEL move to enterprise

Fedora Project was founded on 22 September 2003 when Red Hat decided to split Red Hat Linux into Red Hat Enterprise Linux (RHEL) and a community-based operating system, Fedora. This option quickly fell by the wayside for non-enterprise RHEL users in favor of Fedora

RHEL 6 = (Fedora 12,13)
RHEL 7 = (Fedora 19,20)
RHEL 8 = (Fedora 28) Linux 4.18 kernel (Aug 2019)
https://en.wikipedia.org/wiki/Fedora_version_history
https://access.redhat.com/articles/3078

Kernel

→ Kernel : The kernel is the essential center of a computer operating system, the core that provides basic services for all other parts of the operating system.

A kernel is the lowest level of easily replaceable software that interfaces with the hardware in your computer. It is responsible for interfacing all of your applications that are running in "user mode" down to the physical hardware, and allowing processes, known as servers, to get information from each other using inter-process communication (IPC).

==> **Type** :
In general, most kernels fall into one of three types:
→ micro-kernel (CPU, memory, and IPC)
→ monolithic (*CPU, memory, and IPC, device drivers, file system mgmt, and system server calls.*)
→ **Hybrid** (Combine aspect of both Above kernel) https://en.wikipedia.org/wiki/Hybrid_kernel

Linux is a monolithic kernel while XNU and Windows use hybrid kernels.

Details for kernel

* Microkernel - **A microkernel takes the approach of only managing what it has : CPU, memory, and IPC.In a computer can be seen as an accessory can be handled in user mode.** Micro-kernels have a advantage of portability because they don't have to worry if you change your video card or even your operating system so long as the operating system still tries to access the hardware in the same way. Micro-kernels also have a very small footprint, for both memory and install space, and they tend to be **more secure because only specific processes run in user mode** which doesn't have the high permissions as supervisor mode.
Pros
1. Portability
2. Small install footprint
3. Small memory footprint
4. Security
Cons
1. Hardware is more abstracted through drivers
2. Hardware may react slower because drivers are in user mode
3. Processes have to wait in a queue to get information
4. Processes can't get access to other processes without waiting

* Monolithic -
Monolithic kernels are the opposite of micro-kernels because they encompass not only the CPU, memory, and IPC, but they also include things like device drivers, file system management, and system server calls.

Monolithic kernels tend to be better at accessing hardware and multitasking because if a program needs to get information from memory or another process running it has a more direct line to access it and doesn't have to wait in a queue to get things done. This however can cause problems because the more things that run in supervisor mode, the more things that can bring down your system if one doesn't behave properly.

Pros

1. More direct access to hardware for programs
2. Easier for processes to communicate between each other
3. If your device is supported, it should work with no additional installations
4. Processes react faster because there isn't a queue for processor time

Cons

1. Large install footprint
2. Large memory footprint
3. Less secure because everything runs in supervisor mode

* Hybrid -

Hybrid kernels have the ability to pick and choose what they want to run in user mode and what they want to run in supervisor mode. Often times things like device drivers and filesystem I/O will be run in user mode while IPC and server calls will be kept in the supervisor mode. This give the best of both worlds but often will require more work of the hardware manufacturer because all of the driver responsibility is up to them. It also can have some of the latency problems that is inherent with micro-kernels.

Pros
* Developer can pick and choose what runs in user mode and what runs in supervisor mode
* Smaller install footprint than monolithic kernel
* More flexible than other models

Cons
* Can suffer from same process lag as micro-kernel
* Device drivers need to be managed by user (typically)

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