Linux Operating System:

Linux is an open-source operating system developed in 1991 by Linus Torvalds. It was designed as an open-source alternative to Unix and quickly gained popularity due to its flexibility and high security. Over time, Linux became one of the most widely used systems in various fields, such as servers and cloud computing, thanks to its ability to handle heavy loads and maintain consistent stability.

Operating System Principles:

Linux is based on the philosophy of open-source software, which allows users to view, modify, and freely distribute the system's source code. This philosophy encourages community collaboration and contributes to the continuous development of the system. Users and developers can participate in improving the system, leading to faster identification and resolution of bugs.

Linux Distributions:

There are several Linux distributions (or "distros") that vary based on usage goals and user interfaces. Ubuntu is an ideal choice for beginners due to its ease of use and wide community support. On the other hand, Fedora is considered an experimental distribution offering the latest technologies, targeting developers. Debian is known for its stability and long-term support, serving as the base for many other distributions. There are also specialized distributions like Kali Linux, aimed at security testing and ethical hacking.

What Makes Linux Stand Out:

Linux offers several advantages that make it a preferred choice in many fields. One of its key benefits is stability, allowing the system to run for extended periods without requiring a reboot, making it ideal for servers that need continuous uptime. Additionally, Linux provides a high level of security, thanks to its strict permissions system that restricts access to system files and resources, reducing the likelihood of breaches and attacks.

Moreover, Linux is highly efficient in resource management, capable of running smoothly even on low-spec devices. This efficiency makes it a preferred choice not only for servers but also for older machines. Its ability to make the most of available resources makes Linux suitable for applications requiring high performance without consuming large amounts of resources.

Linux Usage:

Linux is widely used in various fields. In the server industry, Linux is the most common choice due to its stability and security, with over 90% of servers on the internet running on Linux. Linux also serves as the backbone of many cloud computing platforms, such as AWS and Google Cloud. Due to its flexibility and power, it is also used in supercomputing centers for scientific computing and big data processing.

1. Installing Linux:

When installing Linux, the first step is to prepare the device by partitioning the hard drive and setting up the file system. This process involves dividing the drive into multiple partitions for storing the system and data in an organized manner. Typically, three main partitions are created: the root partition (/) which contains the core system files, the home partition (/home) for personal user files, and the swap partition, which acts as virtual memory to assist the system when RAM runs low. After partitioning, the sections are formatted using a suitable file system like ext4, which is the most commonly used in modern Linux distributions.

When installing Linux distributions such as Ubuntu or CentOS, the steps vary depending on the distribution. For example, installing Ubuntu is one of the easiest processes, where users can choose to install the system alongside another OS like Windows or format the entire disk for the new system. The Ubuntu installer provides a graphical interface that simplifies the process and allows users to customize the necessary settings, such as language and time zone. In contrast, installing CentOS, which is server-focused, may require more advanced configuration, such as network settings and selecting the appropriate packages for server purposes.

2. Post-installation Setup:

After completing the installation, system setup is required to ensure it runs efficiently. One of the essential steps is managing hardware and drivers. In most Linux distributions, devices are automatically recognized during installation, but in some cases, users may need to install custom drivers for certain devices, such as NVIDIA or AMD graphics cards. Tools like "Additional Drivers" in Ubuntu can be used to easily install these drivers.

In addition to driver management, users need to configure basic system settings, such as time and network settings. To set the time, users can use the graphical settings interface or command-line tools like **timedatectl** to configure the time zone. For network settings, wired or wireless networks can be easily configured using tools like Network Manager, either through the graphical interface or by using commands like **nmcli** or **ifconfig** to set IP addresses and control network configurations.

These steps represent the primary operations for installing and configuring Linux after installation, ensuring that the system runs efficiently and is ready for use.

Command	Description	Use
timedatectl	Time date control	timedatectl set-timezone Asia/Riyadh
nmcli	Network Manager Command Line Interface	nmcli device wifi connect [SSID] password [password]
ifconfig	Interface configuration	ifconfig [interface-name] [IP-address] netmask [netmask]

Homework:

1. Briefly explain the history of Linux development and its importance in fields such as servers and cloud computing.
2. Compare the following three Linux distributions: Ubuntu, Fedora, and Debian, in terms of their intended use and key features.
3. What advantages make Linux a stable and secure system, and how is it more efficient in resource management compared to other systems?
4. Discuss the major uses of Linux in fields such as servers, cloud computing, and scientific computing. Why is it preferred in these fields?
5. Compare the installation process of Ubuntu and CentOS, focusing on the differences in setup and requirements for each distribution.
6. After installing Linux, what steps should be taken to manage hardware and install necessary drivers, and how can basic system settings like time and network be configured?