Computer Architecture

Lab 1 (Starting with Linux)

Linux is a computer operating system. An operating system consists of the software that manages your computer and lets you run applications on it.

The features that make up Linux and similar computer operating systems include the following:

- **Detecting and preparing hardware components.** When the Linux system boots up, it looks at the components on your computer (CPU, hard drive, network cards, and so on) and loads the software (drivers and modules) needed to access those particular hardware devices.
- **Managing processes.** The operating system must keep track of multiple processes running at the same time and decide which have access to the CPU and when.
- **Managing memory.** RAM and swap space (extended memory) must be allocated to applications as they need memory.
- **Providing user interfaces.** An operating system must provide ways of accessing the system.
- **Controlling filesystems.** Filesystem structures are built into the operating system. The operating system controls ownership of and access to the files and directories.
- **Providing user access and authentication.** Creating user accounts and allowing boundaries to be set between users.

- **Offering administrative utilities.** In Linux, hundreds (perhaps thousands) of commands and graphical windows are available to do such things as add users, manage disks, monitor the network, install software, and generally secure and manage your computer.
- **Programming tools.** A wide variety of programming utilities for creating applications and libraries for implementing specialty interfaces are available with Linux.

Understanding How Linux Differs from Other Operating Systems

If you are new to Linux, chances are good that you have used a Microsoft Windows or Apple Mac OS operating system. Operating systems from both Microsoft and Apple are considered proprietary operating systems. What that means is:

- You cannot see the code used to create the operating system.
- You, therefore, cannot change the operating system at its most basic levels if it doesn't suit your needs.
- You can't use the operating system to build your own operating system from source code.
- You cannot check the code to find bugs, explore security vulnerabilities, or simply learn what that code is doing.
- You may not be able to easily plug your own software into the operating system if the creators of that system don't want to expose the programming interfaces you need to the outside world.

Brief History of Linux

In 1991, a computer science student at the University of Helsinki in Finland named Linus Torvalds created the Linux operating system. While Linux shares much of the core concepts of Unix, it contains no Unix code. The first commercial Linux distributions hit the market in the mid-1990s. Since then hundreds of Linux variants have been developed. The open nature of the Linux operating system has contributed to its success and helped make it one of the most popular server operating systems in use today.

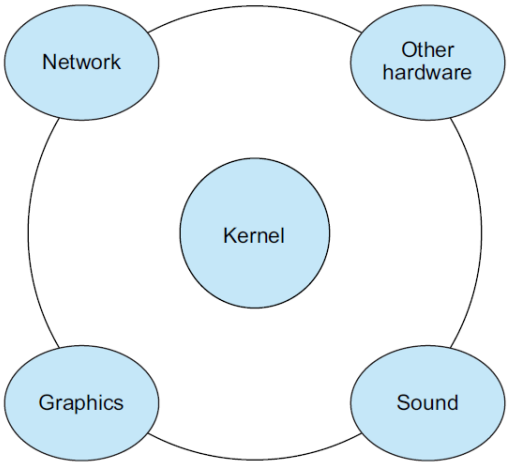
Popular Versions of Linux

There are many different Linux distributions. The tables below list the most popular systems in use today.

OS	Description
Red Hat Enterprise Linux	Popular commercial Linux distribution created by Red Hat, Inc.
Fedora	Free community-based distribution that serves as a test bed for new technologies that feed into Red Hat Enterprise Linux
CentOS	Free binary-compatible clone of Red Hat Enterprise Linux
Debian	Popular non-commercial Linux distribution
Ubuntu	User-friendly Linux distribution based on Debian
SuSE Enterprise Linux	Commercial Linux distribution created by Novell, Inc.
openSUSE	Free community-based distribution based on SUSE Enterprise Linux

The Linux kernel

At the heart of every Unix, Linux, and BSD system is the kernel. The kernel provides a layer between the computer hardware and user applications. When applications need to display output to a screen or write files to the disk, the kernel facilitates these actions. The Linux kernel is coordinating how the operating system looks, sounds, operates hardware, and communicates with other devices over a network and the internet.



The Shell

The command line interpreter, also known as the **shell**, is a program that accepts input from a user (typically a command of some sort) and performs the requested task. Once that task has completed, the program will terminate and return the user to the shell.

The shell's prompt identifies the type of shell being used. There are two basic types of shell prompts:

$ Normal user shell (may also be % or > on some systems)

Root user shell