Operating Systems

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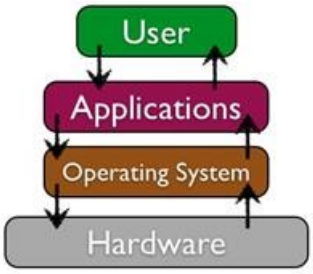
WHAT'S COVERED

Recall that the technological core of an information system is the computer. All computers consist of hardware and software working together to provide users with the ability to manipulate data. As computer hardware is categorized based on function, computer software can also be divided into categories based on function: operating systems and application software. In this section we will take a closer look at computer operating systems.

Our discussion will break down as follows:

1. What Is An Operating System

An **operating system (OS)** is software that performs the task required to keep the system running, and provides the main interface for the user. In essence, the operating system enables the computer's hardware to communicate with and control the computer's software, while providing the user with a way to interact with both. All computing devices (desktop PCs, notebook PCs, tablet PCs, smartphones, etc.) run an operating system. Without the operating system, a computer would not be operational. The operating system orchestrates several essential functions, including managing the hardware resources of the computer, providing the **user-interface** components, and providing a platform for software developers to write applications. The user-interface is what allows a user to interact with the files and software on a computer. Typically, when a computer is in operation, multiple programs are running concurrently. All software running must have access to the computer's resources, such as CPU, memory, and storage, in order to function properly. The operating system is what coordinates access to the hardware (CPU, memory, and storage) to ensure that each software application gets the resources it needs.



Operating systems facilitate communication between the user and the computer's resources. When a user interacts with applications, the operating system manages access to the computer's resources, such as CPU, memory and storage, and peripheral devices.

DID YOU KNOW

Non-computer devices, such as a car or an ATM machine, have operating systems installed on them. For instance, if your car can display your average miles per gallon or tire pressure, that display has an OS running behind it.

TERMS TO KNOW

Operating System
Software that manages the hardware and creates the interface between the hardware and the user.

User-Interface
Operating interface that allows a user to interact with the files and software on a computer.

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2. Types of Operating Systems

In most cases, when you purchase a computer, it will come loaded with an operating system on it. Most people use the operating system that comes with the computer. For personal computers, the most popular operating systems are Microsoft's Windows, Apple's OS X, and different versions of Linux. These standard operating systems are typically only found on desktop or laptop computers. Mobile operating systems such as Apple's iOS, Google's Android, Microsoft's Windows Mobile, and Blackberry are run on smartphones and tablets.

Operating systems can be differentiated from one another by characteristics such as: if it offers a graphical user interface (GUI), if it can multitask, if it is multi-user, and if it is commercial or open-source. We will examine these characteristics in more detail below.

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3. User Interface, Multitask, and Multi-user

Early personal-computer operating systems were simple by today's standards. For example, they did not provide multitasking and required the user to type commands to initiate an action. However, as computers have evolved, so have the characteristics of their operating systems.

- **User-Interface**: The way an operating system allows a user to communicate with the computer, enter commands, access software, input data, and receive output or feedback, is defined by its user-interface. A user-interface can be either graphical or command line. A **command line interface** provides users with a prompt to type text commands. Examples of operating systems that fall into this category are Linux and UNIX.

  Most operating systems today, however, provide a **graphical user interface (GUI)**. A GUI provides a graphical interface that allows the user to issue commands, run programs, and manage files by using a mouse and/or keyboard input. Linux and UNIX also offer GUI capability. MS Windows and Mac OS are the most common GUI-based operating systems.
- **Multitask**: Early operating systems could only run one program at a time. Today, all operating systems can multitask. Multitasking refers to whether an operating system is capable of allowing multiple software processes to run at the same time. Examples of operating systems that would fall into this category are: Linux, Windows, UNIX, and Mac OS.

- **Multi-user**: Operating systems tend to be designed for single users. Since there is only one keyboard, one mouse, and one monitor, there is no need to allow multiple people to control the computer at once. Multi-user refers to the operating system's ability to allow more than one user to use the same computer at the same time and at different times. Examples of operating systems that fall into this category are Linux and UNIX.

TERMS TO KNOW

Command Line Interface

A user-interface that provides users with a prompt to type text commands.

Graphical User Interface (GUI)

Contains graphics and icons and is navigated with a mouse.

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4. Open-Source vs. Commercial Operating Systems

Early computers were difficult to program and required great attention to detail. However, many personal-computer enthusiasts immediately banded together to build applications and solve problems. These computer enthusiasts were happy to share any programs they built, as well as any solutions to problems they found. This collaboration enabled them to more quickly innovate and fix problems. **Open-source** software is free software that makes the source code available for anyone to copy and use. This encourages others to contribute to the future development and improvement of the software. The open-source movement has led to the development of some of the most-used software in the world, including the Firefox browser, the Linux operating system, the Apache web server, FreeBSD, and GNU.

However, as software began to become a business, this idea of sharing everything fell out of favor, at least with some. This led to a new business model of restrictive software licensing, which required payment for software, a model that is still dominant today. This model is sometimes referred to as **commercial (closed-source)**, as the source code is not made available to others. Examples of commercial operating systems are Microsoft Windows and Apple OSX.

There are many arguments on both sides of the aisle for the commercial or open-source software. The table below explains some benefits for open-source and closed-source operating systems.

Operating System	Benefits
Open-Source	The software is available for free. The software source-code is available; it can be examined and reviewed before it is installed. The large community of programmers who work on open-source projects leads to quick bug-fixing and feature additions.
Commercial (Closed-Source)	By providing financial incentive for software development, some of the brightest minds have chosen software development as a career.

	Technical support from the company that developed the software.

TERMS TO KNOW

Open-Source

Used to describe software that is free to users, and for which the source code is made available; users are encouraged to modify.

Commercial (Closed-Source)

Used to describe software that is not free to users nor is the source code made available for users to modify.

5. Summary of Characteristics

The table below lists today's common operating systems, and summarizes their user interface, multitasking, and multi-user characteristics.

Operating System	User Interface	Multitasking	Multi-user	Open-Source Or Commercial
MS Windows	GUI/Command Line	Yes	No	Commercial
Linux	GUI/Command Line	Yes	Yes	Open-Source
UNIX	GUI/Command Line	Yes	Yes	Commercial
Mac OS	GUI	Yes	No	Commercial
MS DOS	Command Line	No	No	Commercial
Windows Mobile	GUI	No	No	Commercial
Apple iOS	GUI	No	No	Commercial
Android	GUI	Yes (up to two applications at once)	No	Commercial

SUMMARY

The two major categories of computer software are application software and **operating system** software. **Operating system** software is required of all computers, as it manages the hardware and provides the main **interface** for the user to interact with the computer. In this tutorial, we discussed **operating system** types and the main **characteristics of operating systems**.

Source: Derived from Chapter 3 of "Information Systems for Business and Beyond" by David T. Bourgeois. Some sections removed for brevity.

https://www.saylor.org/site/textbooks/Information%20Systems%20for%20Business%20and%20Beyond/Textbook.html

TERMS TO KNOW

Graphical User Interface (GUI)
Contains graphics and icons and is navigated with a mouse.

Multitask
Ability to allow multiple software processes to run at the same time.

Multiuser
Operating system's ability to allow more than one user to use the same computer at the same time and at different times.

Operating System
Software that performs the task required to keep the system running and provides the main interface for the user.

User Interface
Operating interface that allows a user to interact with the files and software on a computer.