Lecture 1: Introduction to Computer Software

The term software refers to the programs that execute on the computer. A program is the step-by-step instructions that tell the computer how to do its work. The purpose of software is to convert data into information. The process of writing (or coding) programs is called programming, and individuals who perform this task are called programmers.

There are two major kinds of software: application software and system software.

1. Application Software

Application software might be described as end user software. These programs can be categorized as either basic or specialized applications.

1.1 Basic applications are widely used in nearly all career areas. They are the kinds of programs you have to know to be considered computer competent. One of these basic applications is a browser to navigate, explore, and find information on the Internet. (See **Figure 1**) The two most widely used browsers are Microsoft's Internet Explorer and Netscape's Navigator. For a summary of the basic applications, see **Table I**.

1.2 Specialized applications include thousands of other programs that are more narrowly focused on specific disciplines and occupations. Some of the best known are graphics, audio, video, multimedia, Web authoring, artificial intelligence programs, and cell phone apps.

Figure 1. Internet Explorer browser

Table I. Basic Applications

Type	Description
Browser	Connect to Web sites and display Web pages
Word processor	Word processor Prepare written documents
Spreadsheet	Analyze and summarize numerical data
Database management system	Organize and manage data and information
Presentation graphics	Communicate a message or persuade other people

2. System Software

End users use application software to accomplish specific tasks. For example, we use word processors to create letters, documents, and reports. However, end users also use system software. System software works with end users, application software, and computer hardware to handle the majority of technical details. For example, system software controls where a word processing program is stored in memory, how commands are converted so that the system unit can process them, and where a completed document or file is saved. (See **Figure 2**)
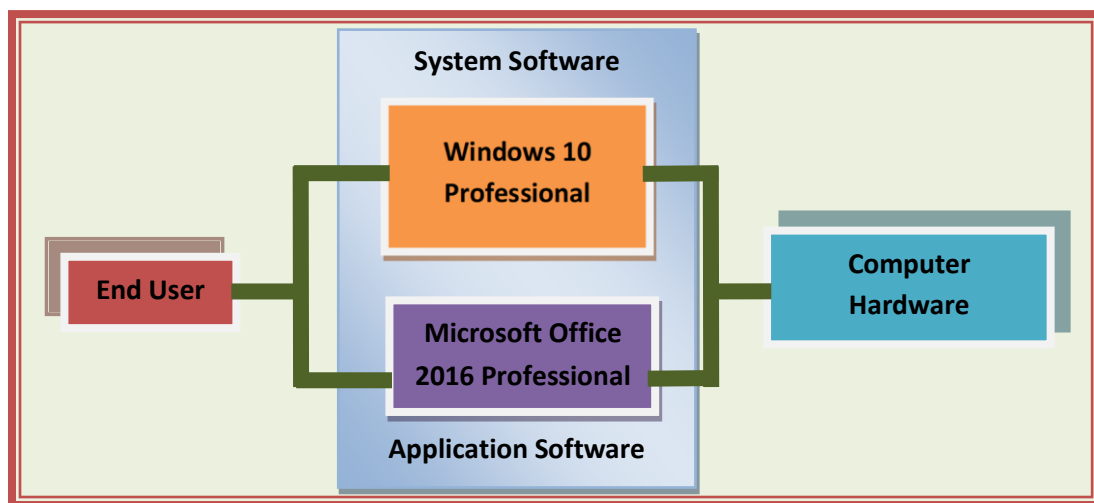

Figure 2. System software handles technical details

System software is not a single program. Rather it is a collection or a system of programs that handle hundreds of technical details with little or no user intervention. System software consists of four types of programs:

2.1 **Operating systems** coordinate computer resources, provide an interface between users and the computer, and run applications.

2.2 **Utilities** perform specific tasks related to managing computer resources.

2.3 **Device drivers** are specialized programs that allow particular input or output devices to communicate with the rest of the computer system.

2.4 Language translators convert the programming instructions written by programmers into a language that computers understand and process.

2.1 Operating Systems

An operating system is a collection of programs that handle many of the technical details related to using a computer. In many ways, an operating system is the most important type of computer program. Without a functioning operating system, your computer would be useless.

2.1.1 Functions

Every computer has an operating system and every operating system performs a variety of functions. These functions can be classified into three groups:

- **Managing resources:** Operating systems coordinate all the computer's resources including memory, processing, storage, and devices such as printers and monitors. They also monitor system performance, schedule tasks, provide security, and start up the computer.

- **Providing user interface:** Operating systems allow users to interact with application programs and computer hardware through a user interface. Many older operating systems used a character-based interface in which users communicated with the operating system through written commands such as "Copy A: assign.doc C:". Almost all newer operating systems use a graphical user interface (GUI). A graphical user interface uses graphical elements such as icons and windows.

- **Running applications:** Operating systems load and run applications such as word processors and spreadsheets. Most operating systems support multitasking, or the ability to switch between different applications stored in memory. With multitasking, you could have Word and Excel running at the same time and switch easily between the two applications. The program that you are currently working on is described as running in the foreground. The other program or programs are running in the background.

2.1.2 Features

Starting or restarting a computer is called booting the system. There are two ways to boot a computer: a warm boot and a cold boot. A warm boot occurs when the computer is already on and you restart it without turning off the power. A warm boot can be accomplished in several ways. For many computer systems, they can be restarted by simply pressing a sequence of keys. Starting a computer that has been turned off is called a cold boot. You typically interact with the operating system through the graphical user interface. Most

provide a place, called the desktop that provides access to computer resources. (See **Figure 3**) Operating systems have several features in common with application programs, including

- **Icons**—graphic representations for a program, type of file, or function.

- **Pointer**—controlled by a mouse, trackpad, or touchscreen, the pointer changes shape depending upon its current function. For example, when shaped like an arrow, the pointer can be used to select items such as an icon.

- **Windows**—rectangular areas for displaying information and running programs.

- **Menus**—provide a list of options or commands.

- **Tabs**—divide menus into major activity areas.

- **Dialog boxes**—provide information or request input.

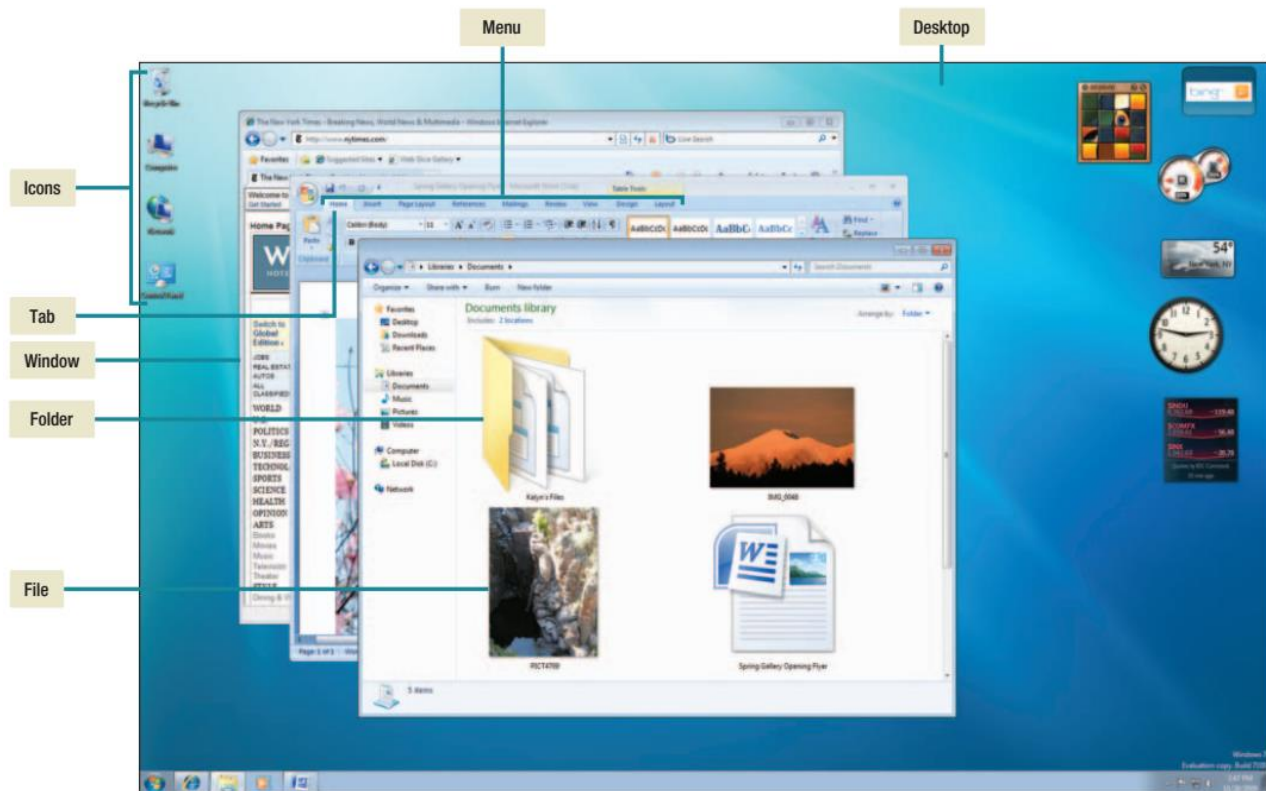- **Help**—provides online assistance for operating system functions and procedures.

Figure 3. Windows 7 Desktop

Most operating systems store data and programs in a system of files and folders. Unlike the traditional filing cabinet, computer files and folders are stored on a storage device such as your hard disk. Files are used to store data and programs. Related files are stored within a folder, and for organizational purposes, a folder can contain other folders. For example, you might organize your electronic files in the My Documents folder on your hard disk. This

folder could contain other folders, each named to indicate its contents. One might be "Computers" and could contain all the files you have created (or will create) for this course.

2.1.3 Categories

While there are hundreds of different operating systems, there are only three basic categories: embedded, network, or stand-alone. (See **Figure 4**)

- **Embedded operating systems** are used for handheld devices such as smartphones, cable and satellite television tuner boxes, video game systems, and other small electronics. The entire operating system is stored within or embedded in the device. The operating system programs are permanently stored on ROM, or read-only memory, chips.
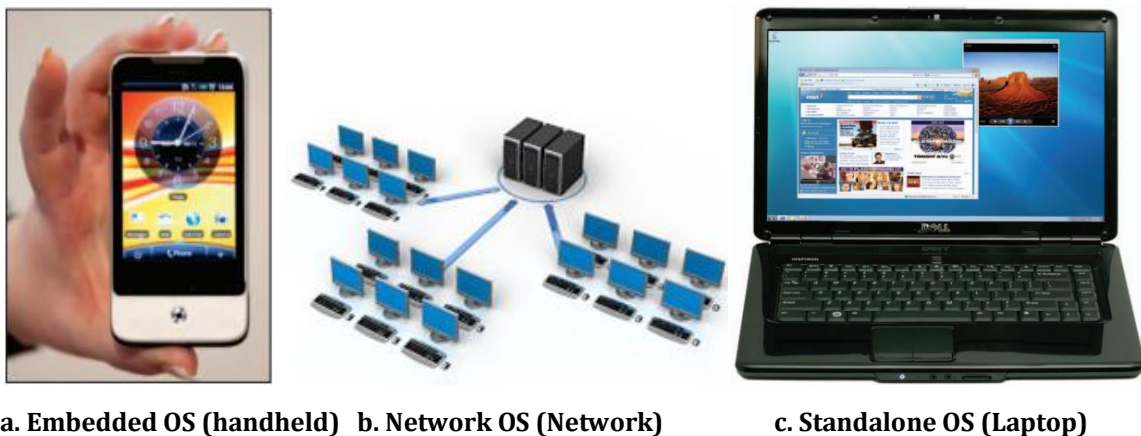

a. Embedded OS (handheld)   b. Network OS (Network)   c. Standalone OS (Laptop)

Figure 4. Three basic categories of OS

- **Network operating systems (NOS)** are used to control and coordinate computers that are networked or linked together. Many networks are small and connect only a limited number of microcomputers. Other networks, like those at colleges and universities, are very large and complex. These networks may include other smaller networks and typically connect a variety of different types of computers. Network operating systems are typically located on one of the connected computers' hard disks. Called the network server, this computer coordinates all communication between the other computers. Popular network operating systems include NetWare, Windows Server, and UNIX.

- **Stand-alone operating systems,** also called desktop operating systems, control a single desktop or notebook computer. These operating systems are located on the computer's hard disk. Often desktop computers and notebooks are part of a network. In these cases, the desktop operating system works with the network's NOS to share and coordinate resources. In these situations, the desktop operating system is referred to as the client operating system.

The operating system is often referred to as the software environment or platform. Almost all application programs are designed to run with a specific platform. For example, Apple's iMovie software is designed to run with the Mac OS environment. Many applications, however, have different versions, each designed to operate with a particular platform. For example, one version of Microsoft Office is designed to operate with Windows. Another version is designed to operate with Mac OS.

2.1.4 Desktop operating systems

Every microcomputer has an operating system controlling its operations. The most widely used operating systems are Windows, Mac OS, Unix, and Linux.

2.1.4.1   Windows

Microsoft's Windows is by far the most popular microcomputer operating system today with nearly 90 percent of the market. Because its market share is so large, more application programs are developed to run under Windows than any other operating system. Windows comes in a variety of different versions and is designed to run with Intel and Intel-compatible microprocessors such as the Core 2 Quad and Atom series. For a summary of Microsoft's desktop operating systems, see Table II.

Table II. Summary of different windows OS

Name	Description
Windows 98	Stand-alone Operating System
Windows 2000 Professional	Upgrade to Windows 98 specifically designed for home users
Windows XP	Upgrade to Windows 2000 with improved interface, Stability, and Reliability
Windows Vista	Upgrade to Windows XP with improved security, three-dimensional workspace, and filtering capabilities
Windows 7	Improved user experience, speed and stability
Windows 8	Upgraded to Windows 7 with Quick boots up, faster and less resource intensive, improved transfer Speed, and more security features

There are many versions of Windows. The latest, Windows 10, was released in 2015. (See Figure 5) To see to the new features of windows 10 go to URL given below.

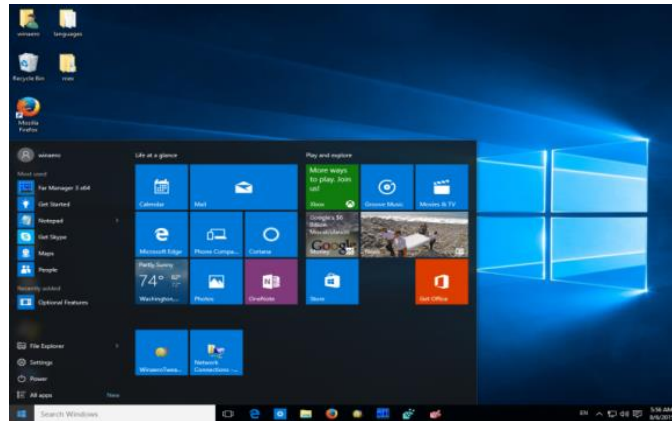https://support.microsoft.com/en-us/help/17219/windows-10-whats-new-in-this-update

Figure 5. Windows 10

2.1.4.2   MAC OS

Apple introduced its Macintosh microcomputer and operating system in 1984. It provided one of the first GUIs, making it easy even for novice computer users to move and delete files. Designed to run with Apple computers, Mac OS is not as widely used as the Windows operating system. As a result, fewer application programs have been written for it. Nonetheless, Mac OS is considered to be one of the most innovative operating systems. It is a powerful, easy-to-use operating system that is popular with professional graphic designers, desktop publishers, and many home users.

One of the latest versions of the Macintosh operating system is Mac OS X. (See **Figure 6**) This operating system provides a wide array of powerful features including Spotlight and Dashboard Widgets. Spotlight is an advanced search tool that can rapidly locate files, folders, e-mail messages, addresses, and much more. Dashboard Widgets are a collection of specialized programs that will constantly update and display information. Some versions of Mac OS X also include Boot Camp, which allows Macintosh computers to run both Mac OS and the Windows operating system.
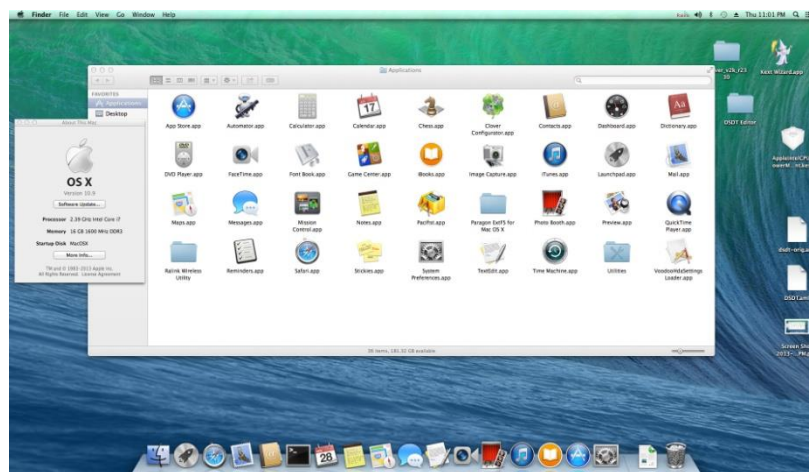

Figure 6. MAC OS X

2.1.4.3 UNIX and Linux

The UNIX operating system was originally designed to run on minicomputers in network environments. Now, it is also used by powerful microcomputers and by servers on the Web. There are a large number of different versions of UNIX. One receiving a great deal of attention today is Linux. Linux was originally developed by a graduate student at the University of Helsinki, Linus Torvalds, in 1991. He allowed free distribution of the operating system code and encouraged others to modify and further develop the code. Programs released in this way are called open source. Linux is a popular and powerful alternative to the Windows operating system. (See Figure 7) Linux has been the basis of several other operating systems. For example, Google's Chrome OS is based on Linux. This operating system is designed for netbook computers and focuses on Internet connectivity through cloud computing.

Figure 7. Linux

As we have discussed, application programs are designed to run with particular operating systems. What if you wanted to run two or more applications each requiring a different operating system? One solution would be to install each of the operating systems on a different computer. There is, however, a way in which a single physical computer can support multiple operating systems that operate independently. This approach is called virtualization.

With virtualization software, the physical machine can be logically separated into separate and independent virtual computers known as virtual machines. Each virtual machine appears to the user as a separate independent computer with its own operating system. The operating system of the physical machine is known as the host operating system. The operating system for each virtual machine is known as the guest operating system. Users can readily switch between virtual computers and programs running on them. (See **Figure 8**)

Figure 8. Windows 10 running within a window on the Mac OS X operating system

2.1.5 Mobile phone operating Systems

Mobile phone operating systems, also known as mobile OS, are a type of embedded operating system. Every smartphone has a mobile phone operating system. Although less complicated and more specialized for wireless communication, these operating systems control smartphones just as Windows or Mac OS controls desktop computer operations. While there are numerous mobilephone operating systems, some of the best known are Symbian, BlackBerry OS, iPhone OS, Android, and Windows Phone 7.

- **Symbian** has its origins in Japan with Nokia, Sony, and others. Introduced in 2009, it controls more smartphones worldwide than any other mobile operating system.

- **BlackBerry OS,** also known as RIM OS, was first introduced in 1999 by a small Canadian firm called Research In Motion. Originally designed as the platform for the BlackBerry handheld computer, it has evolved into a powerful mobile phone operating system that is challenging Symbian.

- **iPhone OS** was originally developed in 2007 by Apple. It is based on Mac OS and is used as the platform for Apple's iPhone, iPod Touch, and iPad. iPhone OS is one of the fastest growing mobile operating systems.

- **Android** was originally introduced in 2007. It was originally developed by Android Inc. and later purchased by Google. Like the iPhone OS, Android is one of the fastest growing mobile operating systems.

- **Windows Phone 7** was introduced in 2010. It followed two other mobile operating systems from Microsoft: Windows CE and Windows Mobile. Windows Phone 7 was designed for users actively involved in social networking and instant messaging.

2.2 Utilities

Ideally, microcomputers would continuously run without problems. However, that simply is not the case. All kinds of things can happen—internal hard disks can crash, computers can freeze up, operations can slow down, and so on. These events can make computing very frustrating. That's where utilities come in. Utilities are specialized programs designed to make computing easier. There are hundreds of different utility programs. The most essential are:

- **Troubleshooting** or **diagnostic programs** that recognize and correct problems, ideally before they become serious.
- **Antivirus programs** that guard your computer system against viruses or other damaging programs that can invade your computer system.
- **Uninstall programs** that allow you to safely and completely remove unneeded programs and related files from your hard disk.
- **Backup programs** that make copies of files to be used in case the originals are lost or damaged.
- **File compression programs** that reduce the size of files so they require less storage space and can be sent more efficiently over the Internet. Most operating systems provide some utility programs. Even more powerful utility programs can be purchased separately or in utility suites.

2.2.1 Windows Utilities

The Windows operating systems are accompanied by several utility programs, including Backup and Restore, Disk Cleanup, and Disk Defragmenter.

- **Backup and Restore** is a utility program included with the many versions of Windows that makes a copy of all files or selected files that have been saved onto a disk. It helps to protect you from the effects of a disk failure. For example, you can select Backup and Restore from the Windows 7 Maintenance menu to create a backup for your hard disk. When you surf the Web, a variety of programs and files are saved on your hard disk. Many of these and other files are not essential.

- **Disk Cleanup** is a troubleshooting utility that identifies and eliminates nonessential files. This frees up valuable disk space and improves system performance. For example, by selecting Disk Cleanup from the Windows 7 System Tools menu, you can eliminate unneeded files on your hard disk.

- **Disk Defragmenter** is a utility program that locates and eliminates unnecessary fragments and rearranges files and unused disk space to optimize operations. For example, by selecting Disk Defragmenter from the Windows 7 System Tools menu, you can defrag your hard disk.

2.2.2 Utility Suites

Like application software suites, utility suites combine several programs into one package. Buying the package is less expensive than buying the programs separately. The three best-known utility suites are McAfee Office, Norton 360, and V Communications SystemSuite. These suites provide a variety of utilities, including programs that will protect your system from dangerous programs called computer viruses. A computer can be affected by virus in many ways, including by opening attachments to e-mail messages and downloading software from the Internet.

2.3 Device drivers

Every device, such as a mouse or printer that is connected to a computer system has a special program associated with it. This program, called a device driver or simply a driver, works with the operating system to allow communication between the device and the rest of the computer system. Each time the computer system is started, the operating system loads all of the device drivers into memory.

Whenever a new device is added to a computer system, a new device driver must be installed before the device can be used. Windows supplies hundreds of different device drivers with its system software. For many devices, the appropriate drivers are automatically selected and installed when the device is first connected to the computer system. For others, the device driver must be manually installed. Fortunately, Windows provides wizards to assist in this process. For example, Windows' Add a Device Wizard provides step-by-step guidance for selecting the appropriate hardware driver and installing that driver. If a particular device driver is not included with the Windows system software, the product's manufacturer will supply one. Many times these drivers are available directly from the manufacturer's Web site.