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Part -1

CHAPTER

4

Software and Mobile Applications

**In this chapter, you will learn about system software which includes
Operating systems, Utilities, and Middleware
and Application software**

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Software consists of computer programs that control the workings of computer hardware. Software can be divided into two types:

- System software: Software that includes operating systems, utilities, and middleware that coordinate the activities and functions of the hardware and other programs throughout the computer system.
- Application software: Programs that help users solve particular computing problems.

Various Kinds of Software

Software Type	Personal	Workgroup	Enterprise
Systems software	Smartphone, tablet, personal computer, and workstation operating systems	Network operating systems	Server and mainframe operating systems
Application software	Word-processing, spreadsheet, database, and graphics programs	Email, group-scheduling, shared-work, and collaboration applications	General-ledger, order-entry, payroll, and human-resources applications

Systems Software

Operating Systems : Is a set of programs that controls a computer's hardware and acts as an interface with application software. An operating system can control one or more computers, or it can allow multiple users to interact with one computer .

The various combinations of OSs, computers, and users include the following:

- **Single computer with a single user.** This system is commonly used in personal computers, tablets, and smartphones that support one user at a time. Examples, Microsoft Windows, Mac OS X, and Google Android.
- **Single computer with multiple simultaneous users.** This type of system is used in larger server or mainframe computers that support hundreds or thousands of people, all using the computer at the same time. Examples, UNIX, z/OS, and HP-UX.
- **Multiple computers with multiple users.** This type of system is used in computer networks, including home networks with several computers attached as well as large computer networks with hundreds of computers attached, supporting many users, who may be located around the world. Network server OSs include Red Hat Enterprise Linux Server, Windows Server, and Mac OS X Server.
- **Special-purpose computers.** This type of system is typical of a number of computers with specialized functions, such as those that control

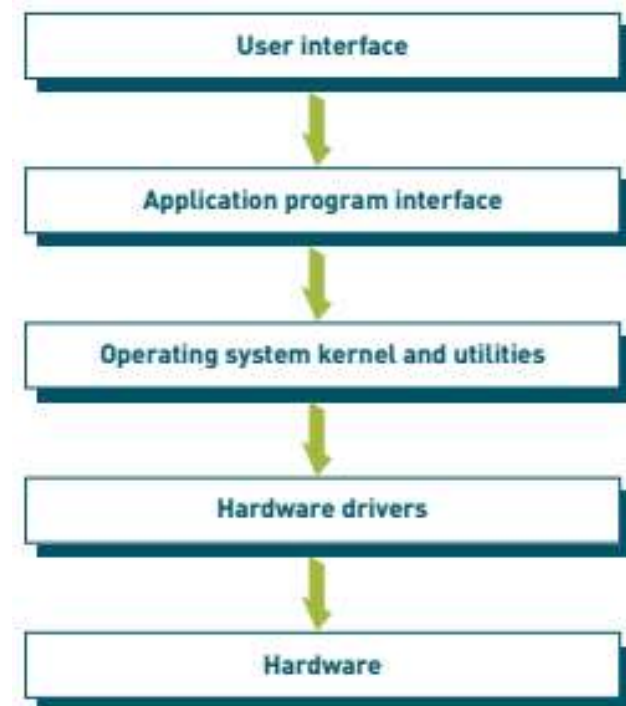
The role of the operating system is to act as an interface between application software and hardware

kernel: The heart of the operating system that controls the most critical processes of the OS

Functions Performed by the Operating System

The programs that make up the OS perform a variety of activities, including the following:

- Control common computer hardware functions.
- Provide a user interface and manage input/output management.
- Provide a degree of hardware independence.
- Manage system memory.
- Manage processing tasks.
- Provide networking capability.
- Control access to system resources.
- Manage files.



Common Hardware Functions

The OS enables applications to perform a variety of hardware-related tasks, such as the following:

- Get input from the keyboard or another input device
- Retrieve data from disks
- Store data on disks
- Display information on a monitor or printer

Each of these tasks requires a detailed set of instructions. The OS converts a basic request into instructions that the hardware can process. The OS acts as an intermediary between the application and the hardware. The OS uses special software (called hardware drivers) provided by device manufacturers to communicate with and control a device.

User Interface and Input / Output Management

One of the most important functions of any OS is providing:

User interface: The element of the operating system that allows people to access and interact with the computer system.

Command-based user interface: A user interface that requires you to give text commands to the computer to perform basic activities , For example, ERASE, RENAME, COPY.

Graphical user interface (GUI): An interface that displays pictures (icons) and menus that people use to send commands to the computer system.

Although GUIs have traditionally been accessed using a keyboard and mouse, more recent technologies allow people to use **touch screens** and **spoken commands**. Use a touch user interface also called a natural user interface (**NUI**) or multitouch interface. Microsoft and other operating system manufacturers have developed voice-command computer control software.

Speech Application Program Interface (SAPI) to associate your voice commands with specific actions performed by the computer. Apple's OpenEars makes it simple for you to add speech recognition and text to speech to your iPhone, iPad, or iPod. Siri.

Some companies are also experimenting with sensors attached to the human brain (brain interfaces) that can detect brain waves and control a computer as a result. Sight and brain interfaces can be very helpful to disabled individuals.

Hardware Independence

Application programming interface (API) is a set of programming instructions and standards that enable one software program to access and use the services of another software program. An API provides a software-to-software interface, not a user interface. The API also provides software developers tools that allow them to build application software without needing to understand the inner workings of the OS and hardware. Software applications are designed to run on a particular OS by using the operating system's application program interface.

APIs also provide a degree of hardware independence so that the underlying hardware can change without necessarily requiring a rewrite of the software applications.

Hardware independence refers to the ability of a software program to run on any platform, without concern for the specific underlying hardware. When new hardware technologies are introduced, the operating system, not the application software, is required to adjust to enable use of those changes.

Memory Management: The OS also controls how memory is accessed, maximizing the use of available memory and storage to provide optimum efficiency. The memory-management feature of many OSs allows the computer to execute program instructions effectively and to speed processing. One way to increase the performance of an old computer is to upgrade to a newer OS and increase the amount of memory. Most OSs support virtual memory, which allocates space on the hard disk to supplement the immediate, functional memory capacity of RAM. Virtual memory works by swapping programs or parts of programs between memory and one or more disk devices a concept called paging.

Processing Tasks

Operating systems use the following five basic approaches to task management to increase the amount of processing that can be accomplished in a given amount of time:

- **Multiuser.** Allows two or more users to run programs at the same time on the same computer. Some operating systems permit hundreds or even thousands of concurrent users.
Scalability : The ability of the computer to handle an increasing number of concurrent users.
- **Multiprocessing.** Supports running a program on more than one CPU.
- **Multitasking.** Allows more than one program to run concurrently.
- **Multithreading.** Allows different threads of a single program to run concurrently.
Thread: A set of instructions within an application that is independent of other threads.
- **Real time.** Responds to input instantly. To do this, the operating system task scheduler can stop any task at any point in its execution if it determines that another higher priority task needs to run immediately. Real time operating systems are used to control the operation of jet engines, the deployment of air bags, and the operation of antilock braking systems. Not all operating systems employ all these approaches to task management.

Networking Capability Most operating systems include networking capabilities so that computers can join together in a network to send and receive data and share computing resources. Operating systems for larger server computers are designed specifically for computer networking environments.

Access to System Resources and Security Because computers often handle sensitive data that can be accessed over networks, the OS needs to provide a high level of security against unauthorized access to the users' data and programs. Typically, the OS establishes a logon procedure that requires users to enter an identification code, such as a user name, and a password.

File Management The OS manages files to ensure that files in secondary storage are available when needed and that they are protected from access by unauthorized users. Many computers support multiple users who store files on centrally located disks or tape drives. The OS keeps track of where each file is stored and who is cleared to access them.

Current Operating systems

Personal	Workgroup	Enterprise
Microsoft Windows	Microsoft Windows Server	Microsoft Windows Server
Mac OS X, iOS	Mac OS X Server	
Linux	Linux	Linux
Google Android, Chrome OS	UNIX	UNIX
HP webOS	IBM i and z/OS	IBM i and z/OS
	HP-UX	HP-UX

Personal Computing Operating Systems

- Microsoft PC Operating Systems (DOS, Windows
- Apple Computer Operating Systems
- Linux , called an open source operating system.
- Google: Android and Chrome

Workgroup Operating Systems

- Windows Server
- UNIX
- Red Hat Linux
- Mac OS X Server

Enterprise Operating Systems : Mainframe computers

Mobile Operating Systems

Embedded Operating Systems (TV set-top boxes, automated industrial machines, media players, medical devices, digital cameras, PDAs, GPS receivers, ATMs, gaming devices, and business devices such as cash registers.

Utility Programs

Utility program: A program that helps to perform maintenance or correct problems with a computer system

Hardware Utilities

Hardware utilities can be used to check the status of all parts of the PC, including hard disks, memory, modems, speakers, and printers. Disk utilities check the hard disk's boot sector, file allocation tables, and directories and analyze them to ensure that the hard disk is not damaged

Security Utilities

Computer viruses and malware from the Internet and other sources can be a nuisance and worse sometimes completely disabling a computer. Antivirus and anti-malware utilities can be used to constantly monitor and protect a computer. Firewall software is another important security utility for protecting a computer system. Firewall software filters incoming and outgoing packets, making sure that neither hackers nor their tools are attacking the system.

File-Compression Utilities

File-compression programs can reduce the amount of disk space required to store a file or reduce the time it takes to transfer a file over the Internet.

Spam-Filtering Utilities

Receiving unwanted email (spam) can be a frustrating waste of time. Email software and services include spam-filtering utilities to assist users with these annoyances.

Network and Internet Utilities

A broad range of network- and systems-management utility software is available to monitor hardware and network performance and trigger an alert when a server is crashing or a network problem occurs

Server and Mainframe Utilities

Some utilities enhance the performance of servers and mainframe computers.

Other Utilities

Utility programs are available for almost every conceivable task or function.

Application Software

The primary function of application software is to apply the power of a computer system to enable people, workgroups, and entire enterprises to solve problems and perform specific tasks

Personal Application Software

- Word Processing
- Spreadsheet Analysis
- Database Applications
- Presentation Graphics Program
- Personal Information Managers
- Other Personal Application Software

Mobile Application Software

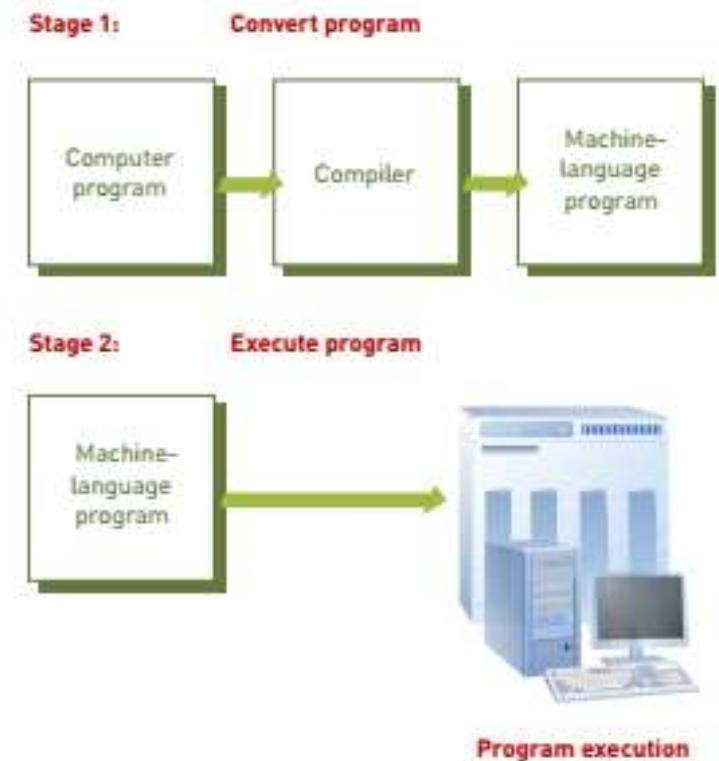
Workgroup Application Software

Enterprise Application Software

Programming Languages

Both system and application software are written in coding schemes called programming languages programming languages: Sets of keywords, commands, symbols, and rules for constructing statements by which humans can communicate instructions to a computer. Syntax: A set of rules associated with a programming language

Compiler: A special software program that converts the programmer's source code into the machine-language instructions, which consist of binary digits.



Language	Description
COBOL	An English language-like programming language designed for business use, COBOL has been in use since 1959. Billions of lines of COBOL code are still in use in systems around the world, including credit card systems, ATMs, retail/POS systems, banking and payroll systems, healthcare systems, government systems, reservation systems, and traffic signal systems. Due to its declining popularity and the retirement of experienced COBOL programmers, COBOL programs are gradually being migrated to new platforms, rewritten in modern languages, or replaced with software packages.
C	Developed in the early 1970s, C is the base for other popular languages, such as C#, Java, JavaScript, and Python. C is mostly used for implementing operating systems and embedded applications. Because it provides the foundation for many other languages, it is advisable to learn C (and C++) before moving onto other languages.
C ++	Originally designed to enhance the C language, C++ is used to develop systems software, application software, high-performance server and client applications, and video games.
Java	Java is a programming language developed by Sun Microsystems in the 1990s, and it is still widely used in the development of enterprise software, Web-based content, and games. Java is also used for mobile apps that run on the Android operating system.
JavaScript	A scripting language developed by Netscape, JavaScript derives much of its syntax from C. JavaScript can be used across multiple Web browsers and is considered essential for developing interactive or animated Web functions. It is also used in game development and for writing desktop applications.
PHP (Hypertext Preprocessor)	A popular programming language for Web developers, PHP is used to create dynamic Web sites and to develop apps. PHP is used in more than 200 million Web sites, including WordPress, Digg, and Facebook.
Python	Python is another scripting language used to develop Web sites and mobile apps. Python is considered a fairly easy language for beginners to learn due to its readability and compact syntax, and it is used in Web apps for Google, Instagram, NASA, Pinterest, and Yahoo!
Ruby	Ruby is a scripting language designed to be simple and easy to use for developing Web sites and mobile apps. It powers the Ruby on Rails (or Rails) framework, which is used on Scribd, GitHub, Groupon, and Shopify.
SQL	A language for accessing data in relational database management systems, SQL is most commonly used for its "Query" function, which searches relational databases. SQL was standardized in the 1980s by the American National Standards Institute (ANSI) and the International Organization for Standardization (ISO).

Copyrights and Licenses

single-user license: A software license that permits you to install the software on one or more computers, used by one person.

Freeware simply implies that the software is distributed for free.

Open-source software is distributed, typically for free, with the source code also available so that it can be studied, changed, and improved by its users.

Examples of freeware

Software	Description
Adobe Reader	Software for viewing Adobe PDF documents
AVG Anti-Virus	Antivirus security software
IrfanView	Photo-editing software
Pidgin	Instant messaging software
Thunderbird	Email, news, and chat software
WinPatrol	Anti-malware software

Examples of open-source software

Software	Category
Drupal	Web publishing
Gimp	Photo editing
Grisbi	Personal accounting
Linux	Operating system
Mozilla Firefox	Internet browser
MySQL	Database software
Apache OpenOffice	Application software
ProjectLibre Open Project	Project management

Software upgrades, which are an important source of increased revenue for software manufacturers, vary widely in the benefits that they provide, and what some people call a benefit, others might call a drawback. Deciding whether to upgrade to a new version of software can be a challenge for corporations and people with a large investment in software