Computer Software and Operation System

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what is software?

Software is a collection of instructions and data that tell the computer how to work. It is a sequence of instruction written in a language understand by a computer. This is in contrast to physical hardware, from which the system is built and actually performs the work.

Category of computer software.

System software

System software is software designed to provide a platform for other software. Examples of system software include operating systems like mac OS, Linux, Android and Microsoft Windows. System software also refers to the files and programs that make up your computer's operating system. System files include libraries of functions, system services, drivers for printers and other hardware, system preferences, and other configuration files. The programs that are part of the system software include assemblers, compilers, file management tools, system utilities, and debuggers.

Types of system software

Operating system

An operating system, or "OS," is software that communicates with the hardware and allows other programs to run. Every desktop computer, tablet, and smartphone includes an operating system that provides basic functionality for the device. Common desktop operating systems include Windows, OS X, and Linux.

Device driver: A device driver is a special kind of software program that controls a specific hardware device attached to a computer. Device drivers are essential for a computer to work properly. These programs may be compact, but they provide the all-important means for a computer to interact with hardware, for everything from mouse, keyboard and display (user input/output) to working with networks, storage and graphics.

Language Translator: Any program written in a high level language is known as source code. However, computers cannot understand source code. Before it can be run, source code must first be translated into a form which a computer understands - this form is called object code. A translator is a program that converts source code into object code. Generally, there are three types of translator:

1. compilers
2. interpreters
3. assemblers

Utility software:

Utility software is system software designed to help analyze, configure, optimize or maintain a computer. Utility software usually focuses on how the computer infrastructure (including the computer hardware, operating system, software and data storage) operates. Example This software may come along with OS like windows defender, windows disk cleanup tool. Antivirus, backup software, file manager, disk compression tool all are utility software.

Application software

Application software is a type of computer program that performs a specific personal, educational, and business function. Each program is designed to assist the user with a particular process, which may be related to productivity, creativity, and/or communication. Application software is a program or group of programs designed for end-users. Examples of an application include a word processor, a spreadsheet, an accounting application, a web browser, database software. It further can be divided into two category

Customized or tailored software

Custom software development is the designing of software applications for a specific user or group of users within an organization. Custom software is typically created just for these specific users by a third-party or in-house group of developers and is not packaged for resale. Payroll, sales ledger, salary sheet are some task done by customized software.

Packaged software

Packaged software is a collection of programs that perform similar functions or have similar features. For example, Microsoft Office includes multiple applications such as Excel, Word, and PowerPoint. Video and audio editing software may also be available as packaged software, used for editing music and video files used in a movie. Some programs included in packaged software may be available for purchase individually. However, purchasing packaged software is often cheaper than purchasing each software program separately.

System software	Application software
It is the kind of software which is the interface between the application software and system.	It is the kind of software which runs according to the user.
This kind of software is written in low level language.	This kind of software is written in high level language.
It is used for operating computer hardware.	It is used by users to perform any specific task they want.
System software is hardware so they are not in interaction with the user.	Users can interact with this as this user interaction is needed at each and every point.
This is installed on the computer when the operating system is installed.	Users can install them as according to their choice.
This can run independently.	This can run independently.They need the presence of system software.
Example-bugger compiler,etc.	Example-word processor,media player,etc.

Web based software

Web-Based Software is software you access with just an internet connection and a web browser. There is no software or hardware to purchase, no need to download software, or ever worry about costly product upgrades. Web-based software, often referred to as "cloud-based software" is popular and widely used because it only requires an internet connection. If you use web-based email like Gmail or Yahoo Mail, then you've already been using web-based software.
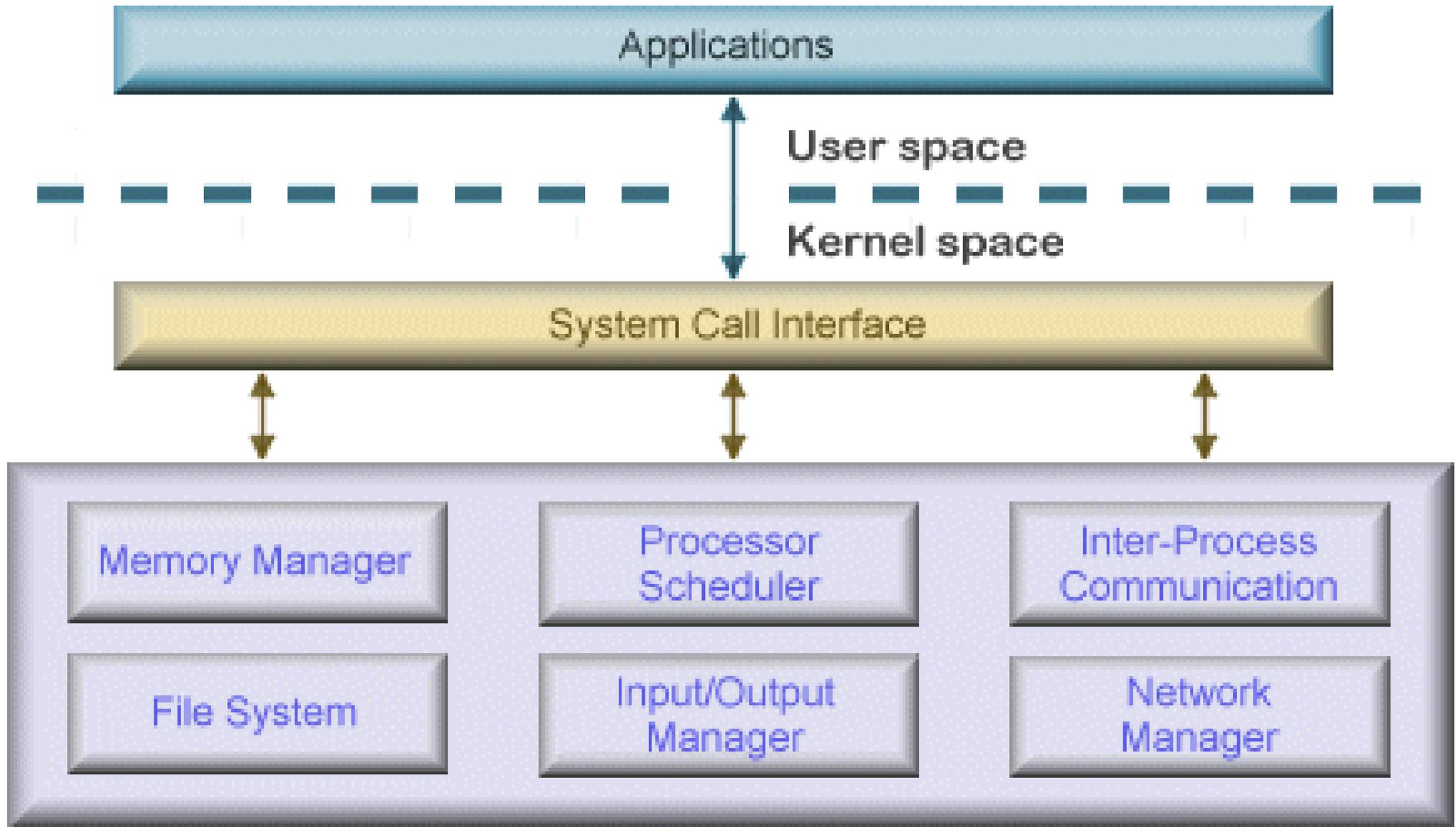
Mobile application (apps)

A mobile application, also referred to as a mobile app or simply an app, is a computer program or software application designed to run on a mobile device such as a phone, tablet, or watch. Example tiktok, angry bird, temple run.

Concept of operating system

Introduction to operating system

An operating system is an integrated set of program that controls the resources like CPU, memory I/o devices etc. of the computer system. It provides an interface to its users, which is more convenient to use than the bare machine. Making computer system more convenient to use and managing the resources of the computer system are the two primary objectives of operating system. An operating system is a collection of program that controls the overall operation of computer system. Operating system controls and coordinates the use of the hardware among various application programs for the various users. So it acts as the interface between user and computer hardware.

Operating System

Applications

↕ User space

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Kernel space

System Call Interface

↕   ↕   ↕

Memory Manager	Processor Scheduler	Inter-Process Communication
File System	Input/Output Manager	Network Manager

Importance of operating system

Operating systems perform the following important functions:

i) Processor Management: It means assigning processor to different tasks which has to be performed by the computer system.

ii) Memory Management: It means allocation of main memory and secondary storage areas to the system programs, as well as user programmers and data.

iii) Input and Output Management: It means co-ordination and assignment of the different output and input devices while one or more programs are being executed.

iv) File System Management: Operating system is also responsible for maintenance of a file system, in which the users are allowed to create, delete and move files.

v) Establishment and Enforcement of a Priority System: It means the operating system determines and maintains the order in which jobs are to be executed in the computer system.

vi) Assignment of system resources, both software and hardware to the various users of the system.

Organization of operating system

The organization of operating system deal with the internal structure of OS, mainly it is divided into 3 layers as shown in adjacent figure :

Application software

Utility software

Kernel

Machine
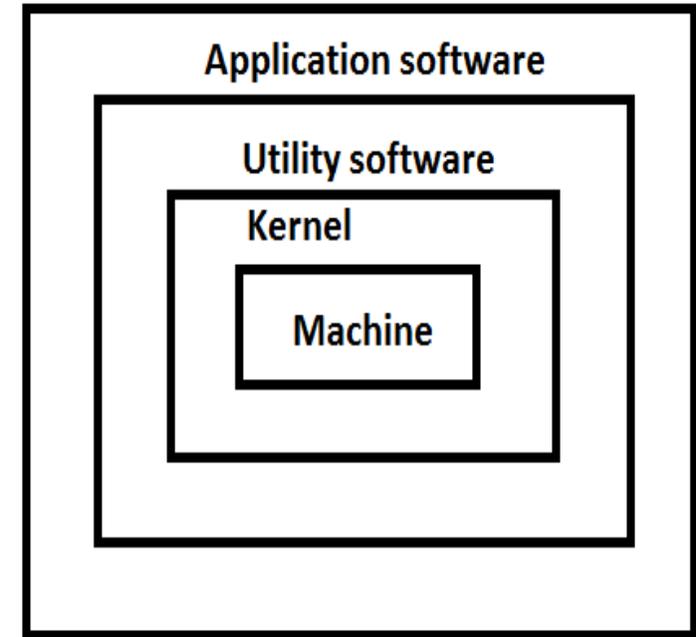
- OS Kernel: A main part of OS always remains in main memory during the running of a computer, called OS Kernel. It is main controlling part of OS which controls all running programs and the hardware resources. It can directly communicate with hardware as well as the upper layers.

- Utility Software: Outside this layer, there is a set of utility programs which are used as system management tools, also known as housekeeping works of OS. The main purpose of these tools is to make system up-to-date and efficient. Example: scandisk, disk-cleanup.

- OS Application: Application software is developed in order to fulfill the user requirements. Different application is available in the market as readymade software. Some of them are developed on the user's demand called tailored software. Example: Notepad, WordPad, Paint, etc.

Function of operating system

1. **Process management**: - Process management helps OS to create and delete processes. It also provides mechanisms for synchronization and communication among processes.
2. **Memory management**: - Memory management module performs the task of allocation and de-allocation of memory space to programs in need of this resources.
3. **File management**: - It manages all the file-related activities such as organization storage, retrieval, naming, sharing, and protection of files.
4. **Device Management**: Device management keeps tracks of all devices. This module also responsible for this task is known as the I/O controller. It also performs the task of allocation and de-allocation of the devices.
5. **I/O System Management**: One of the main objects of any OS is to hide the peculiarities of that hardware devices from the user.

1. **Secondary-Storage Management**: Systems have several levels of storage which includes primary storage, secondary storage, and cache storage. Instructions and data must be stored in primary storage or cache so that a running program can reference it.

2. **Security**: - Security module protects the data and information of a computer system against malware threat and authorized access.

3. **Command interpretation**: This module is interpreting commands given by the and acting system resources to process that commands.

4. **Networking**: A distributed system is a group of processors which do not share memory, hardware devices, or a clock. The processors communicate with one another through the network.

5. **Job accounting**: Keeping track of time & resource used by various job and users.

6. **Communication management**: Coordination and assignment of compilers, interpreters, and another software resource of the various users of the computer systems.

Types of operating system based on processing method

1. Batch Processing Operating System

Description: Jobs are collected and processed in batches without any user interaction. The system executes one job at a time until it's finished.

Example: Early mainframes like IBM OS/360.

2. Multiprogramming Operating System

Description: Multiple jobs are loaded into memory and the CPU switches between them, allowing multiple programs to run concurrently.

Example: IBM's OS/360.

3. Multitasking Operating System

Description: Allows multiple tasks or processes to run simultaneously by allocating each a "slice" of time on the CPU. This makes it possible for the system to handle multiple operations at once.

Example: Modern Windows, macOS, and Linux.

4. Multiprocessing Operating System

Description: Utilizes more than one processor to perform tasks. This increases the system's performance by dividing tasks across multiple CPUs.

Example: Unix, Linux, and modern versions of Windows (like Windows 10).

5. Time-Sharing Operating System

Description: The CPU switches between multiple jobs so quickly that users can interact with each job while it's running, giving the impression that they are the only user. **Example:** Unix systems with multiple users.

6. Real-Time Operating System (RTOS)

Description: Designed to process data and respond to inputs immediately. It's used where timing is crucial, such as in embedded systems.

Example: RTLinux, QNX.

7. Network and Distributed Operating System

Description: Manages a group of independent computers and makes them appear as a single coherent system to users.

Example: Distributed systems like Google's infrastructure, and network operating systems like Novell NetWare.

8. Online Processing Operating System

Description: Processes data immediately as it's input, ensuring fast and continuous operations.

Example: ATMs, online reservation systems for airlines and buses.

Introduction to GUI based operating system and its features

GUI is the acronym for graphical user interface—the interface through which users interact with electronic devices, such as computers, laptops, smartphones and tablets through visual indicator representations. GUI offers visual representations of the available commands and functions of an operating system or software program using graphical elements such as tabs, buttons, scroll bars, menus, icons, pointers and windows.

GUI allows users to easily access and manipulate available functions. To select functions, users can either use a keyboard or pointing device, such as a mouse or a touchpad. In addition, devices with touchscreens also allow for user input by touching the screen.

Structural elements of a GUI

A GUI consists of structural elements that together define the appearance of the interface. Here are a few examples of such structural elements:

I.   Windows

II.   Menus

III. Icons

IV. Widgets

V.   Tabs

Windows

A window is a rectangular area of the GUI interface that displays information independently from the rest of the screen. For instance, when you click on an icon and open up an application or a file, it will open up in its own window. Even users who are not experienced with GUI interfaces can easily manipulate windows. For example, one can show or hide a window by clicking on an icon or a function button and can move a window by clicking on it and dragging it to a new position.

You can also adjust the size of a window and can easily navigate inside the window through the use of scrollbars and other functions. There are different kinds of windows. A good example of such a window is a web browser. Other examples of windows are child windows, which open as a result of user activity in a parent window, a pop-up window and a message window, or dialog box, that provides information or asks input from a user.

Menus

Menus are graphical representations of available software commands. Whereas users need to type in an application command at a command prompt to call up a function when using a command-line interface, menus provide a graphical list of commands so that users can simply click on the appropriate function.

A menu bar, which is a horizontal bar that contains all the available menus in an application, normally appears at the top of an application screen. When a user selects a menu option, a pull-down menu will appear that contains all the functions within a selected menu. A context menu is a menu that is invisible until a user right-clicks the mouse button, after which the menu appears where the cursor is positioned.

Icons

An icon is the visual representation of an application, folder, file or web browser through a picture. All files that you create in the same application will have the icon of the application, as well as the same extension.

Widgets

Widgets, also known as controls, are the graphical control elements through which the user interacts with a GUI. These control elements require direct manipulation from users so they can read or edit information in the application. Examples of such controls include buttons, scroll bars and checkboxes.

Tabs

A tab is a little rectangular box that displays the name or graphical icon associated with a specific window. When a user selects a tab, they will view the specific controls and information presented in that window. For instance, when you open up multiple pages in a web browser, you will see the different tabs displayed at the top of the browser window.

Interaction elements of a GUI

Apart from structural elements, a GUI also features interaction elements, such as:

i. **Cursor**: A cursor indicates the place where the system will accept input next. It can either be a pointer, which follows the movements of a pointing device—such as a mouse—or a text cursor, which indicates the point of focus in a current text box.

ii. **Selection:** A selection refers to a list of items to which a user will apply an operation. A user will select a portion of text for cut, copy and paste operations. Image editing applications allow users to select and modify certain areas of an image by using the magic wand selection or lasso selection tools.

iii. **Adjustment handle**: A handle serves as the indicator of a drag and drop operation. When a user places the pointer on the handle to initiate the drag process, its shape changes to an icon that represents the drag function.

concept of open source operating system

The operating system which is free to use and source code can be modified as per requirements is called open source operating system

the open source does not mean access the source code only. It has the following characteristics

free redistribution of software and code: the licenses shall not restrict for selling or giving the software as a component of aggregate software distribution containing programs from several different sources. The license should not require any royalty or other fee for such distribution.

Derived works. The license must allow modification and derived works. The license must allow user to distribute under the same term as the license of the original software.

Integrity of the author's source code: the license may restrict source code being distributed in modified form. The licenses allow the distribution of patch files with the source code for purpose of modifying the program at build time.

Distribution of licenses: the right attached to the program must apply to all the users. If the program is redistributed, the license agreement should not restrict on it as well as this distribution should be valid to those parties too. The rights attached to the program must not depend on the program's being part of a particular software distribution.

Open source operating system examples are

i.   GNU/Linux (various versions or distributions include Debian, Fedora, Gentoo, Ubuntu and Red Hat) - operating system

ii.   FreeBSD - operating system

iii.   Android - mobile phone platform

Concept of mobile operating system

A mobile operating system (mobile OS) is an OS built exclusively for a mobile device, such as a smartphone, personal digital assistant (PDA), tablet or other embedded mobile OS. Popular mobile operating systems are Android, Symbian, iOS, BlackBerry OS and Windows Mobile.

A mobile OS is responsible for identifying and defining mobile device features and functions, including keypads, application synchronization, email, thumbwheel and text messaging. A mobile OS is similar to a standard OS (like Windows, Linux, and Mac) but is relatively simple and light and primarily manages the wireless variations of local and broadband connections, mobile multimedia and various input methods.

- **1. Android OS**: The Android operating system is the most popular operating system today. It is a mobile OS based on the Linux Kernel and open-source software. The android operating system was developed by Google. The first Android device was launched in 2008.

- **2. Bada (Samsung Electronics):** Bada is a Samsung mobile operating system that was launched in 2010. The Samsung wave was the first mobile to use the bada operating system. The bada operating system offers many mobile features, such as 3-D graphics, application installation, and multipoint-touch.

- 3**. BlackBerry OS**: The BlackBerry operating system is a mobile operating system developed by Research In Motion (RIM). This operating system was designed specifically for BlackBerry handheld devices. This operating system is beneficial for the corporate users because it provides synchronization with Microsoft Exchange, Novell GroupWise email, Lotus Domino, and other business software when used with the BlackBerry Enterprise Server.

- 4**. iPhone OS / iOS**: The iOS was developed by the Apple Inc. for the use on its device. The iOS operating system is the most popular operating system today. It is a very secure operating system. The iOS operating system is not available for any other mobiles.

5. **Symbian OS**: Symbian operating system is a mobile operating system that provides a high-level of integration with communication. The Symbian operating system is based on the java language. It combines middleware of wireless communications and personal information management (PIM) functionality. The Symbian operating system was developed by Symbian Ltd in 1998 for the use of mobile phones. Nokia was the first company to release Symbian OS on its mobile phone at that time.

6. **Windows Mobile OS**: The window mobile OS is a mobile operating system that was developed by Microsoft. It was designed for the pocket PCs and smart mobiles.

7. **Harmony OS:** The harmony operating system is the latest mobile operating system that was developed by Huawei for the use of its devices. It is designed primarily for IoT devices.

8**. Palm OS:** The palm operating system is a mobile operating system that was developed by Palm Ltd for use on personal digital assistants (PADs). It was introduced in 1996. Palm OS is also known as the Garnet OS.

9. **Web OS (Palm/HP)**: The Web OS is a mobile operating system that was developed by Palm. It based on the Linux Kernel. The HP uses this operating system in its mobile and touchpads.

Assignments

1. What is software?
2. Explain system software.
3. Explain types of system software.
4. What is utility software?
5. What is application software?
6. Describe tailored and packaged software
7. List out differences between system software and application software.
8. Explain web based software and mobile applications.
9. What is operating system? Explain.
10. List out importance of operating system.
11. What is OS kernel? Explain in details.
12. Describe functions of operating system.
13. Describe types of operating system based on processing method.
14. What is GUI? what are its features?
15. Describe the concept of open source operating system.
16. What is mobile operating system? Explain with examples.