

Discuss classifications and functions of the operating system.

1.1 INTRODUCTION

A computer operating system is a collection of programs used to manage and control computer hardware devices. Operating systems can be divided into different categories based on their functionalities and intended applications. An operating system is a computer program that manages the computer's resources. It accepts keyboard or mouse inputs from users and displays the results of those actions, as well as allowing the user to run applications and communicate with other computers via network connections. There are various types of operating systems, each with its own distinct features and functions.

1.2 FUNCTIONS

1 Memory Management

Memory management is the management of primary memory or main memory. Main memory consists of a large array of words or bytes, each with its own address. Main memory provides fast storage that the CPU can access directly. To be executed, a program must first be loaded into main memory. The operating system manages memory by performing the following activities. It tracks main memory usage. In multiprogramming, the operating system determines which processes receive memory when and how much. It allocates memory to running programs upon request from a process, de-allocates memory when a process no longer requires it or is terminated. An operating system coordinates computer applications and allocates space to the various programs installed on the computer.

2. Processor Management.

A process is a program that is being executed by the process; therefore, it requires resources such as memory space and processing time. In a multiprogramming environment, the operating system determines which processes receive processor time and for how long. This function is known as process scheduling. An operating system performs the following tasks for processor management; tracks processor and process status which is a program in charge of carrying out this task is known as the traffic controller, assigns the CPU to a process, de-allocates processors when they are no longer needed. An operating system coordinates computer applications and allocates space to the various programs installed on the computer.

3. Device Management

An operating system manages device communication through their respective drivers. It identifies the working conditions of input and output devices. It performs the following activities for device management:

- i. Tracks all devices. The I/O controller is the program that handles this task.
- ii. Determines which process receives the device and for how long.

- iii. Ensures efficient device allocation and de-allocation.

4. File Management

A file system is divided into directories or folders to facilitate navigation and use. The directories hold files and other directions. An operating system performs the following activities for file management. Tracks information, location, uses, status, assigns resources, allocates and de-allocates resources. The collective facilities are often referred to as a file system.

5. Security

The operating system protects user data with passwords and other similar techniques. It also protects against unauthorized access to programs and user data. An operating system keeps your data safe from cyber-attacks.

6. Interface

The interface connects users to hardware resources, interpreting user commands and instructions. Allows for easy communication between the computer system and the computer operator (human). It also ensures data security and integrity.

7. Error-detecting

The operating system constantly monitors the system in order to detect errors and prevent computer malfunctions. It keeps track of all the operations of the computer and generates error messages

1.3 CLASSIFICATIONS OF OPERATING SYSTEMS

Computer operating system are classified according to various ways. The classes include

1) Classification according to tasks handled concurrently

- i) Single program OS
- ii) Multitasking OS

Single-tasking operating system

It an operating system that supports the execution of only one user program in main memory at a time. The user can only run one interface program at a time. The user must exit the program before loading and running another one. Consider Ms-DOS. These operating systems are commonly found in personal computers, laptops, and other devices designed for individual users. Single-tasking operating systems process one task at a time. Advantages

- i. Simplicity
- ii. Reduced resource use
- iii. Limited efficiency.

Multitasking Operating System

A multitasking operating system allows a single CPU to run what appears to be multiple programs at the same time. The CPU switches its attention between programs as it receives requests for processing and executes instructions.

Advantages of Multi-tasking Operating System

- Multi-tasking operating increases the throughput of the System.
- It helps in reducing the response time.

Disadvantages of Multi-tasking Operating System

- There is not any facility for user interaction of system resources with the system.

2) Classification according to the number of users.

- i) Single user operating system
- ii) Multi-user operating system

Single user operating system

These operating systems are intended to meet the needs of individual users, with an emphasis on providing a user-friendly interface and managing resources for a single person's tasks.

Multi-user operating system

It allows more than one user to interact with the computer. It can be installed on a computer used by multiple people at the same time. Multi-user operating systems are designed to allow multiple users to access resources simultaneously, thereby supporting collaborative work environments. Multi-user operating systems are widely used in business, enterprise, and server environments, allowing multiple users to interact simultaneously. Simultaneous User Support: Allows multiple users to access the system simultaneously. Resource Sharing: The efficient distribution of resources among users. Examples of multi-user operating systems include UNIX and Linux.

3) Classification according to the interface

- i) Command line user interface (CLUI)
- ii) Graphical User Interface
- iii) Menu-driven

Command-line interface

A command-line interface allows the user to communicate with the computer by typing commands using a typing device. The computer displays a prompt; the user enters the command and presses enter or return. MS-DOS is a common command-driven interface. The MS-DOS command to display all files on c:\ is: `dir c:\`.

Menu-driven interface.

This type of interface allows a user to interact with a computer by navigating a series of screens or menus. A menu consist of a list of options which a user can choose from to perform a given task. Examples of menus include popup menus and drop down menus.

Graphical user interface (GUI)

It is a user interface that includes graphical elements, such as windows, icons and buttons. GUI allows a user to interact with a computer using an environment that consist of graphical objects called WIMP

1.4 Other classes of operating system

1) Network operating systems

An operating system specifically created to oversee and control the different parts of a computer network is called a network operating system (NOS). NOS provides shared access to files, printers, security, applications, and other networking functions via a small private network. NOS are installed on servers to allow users manage data, user groups, and applications. Examples include Microsoft Windows, Linux.

Advantages of Network Operating system

- i. Reliable centralized servers.
- ii. Security concerns are handled by servers.
- iii. Remote access to servers is possible from various locations and systems.

Disadvantages of network operating systems

- i. Users rely on a central location for most operations.
- ii. Regular maintenance and updates are required.

2) Batch operating system

Batch operating system is an operating system that can process data in batches since it can collect data into groups and process it all at once. The batch operating system is ideal for lengthy and time-consuming tasks. The operating system does not interact with the computer directly. There is an operator who collects similar jobs with the same requirements and groups them into batches. It is the operator's responsibility to sort jobs with similar requirements. These systems are used to manage payroll systems, enter data, and generate bank statements.

Advantages of Batch Operating System:

- i. Difficulty in estimating job completion times.
- ii. Multiple users can share batch systems.
- iii. Batch Systems has very little idle time

Disadvantages of Batch Operating System:

- i. Computer operators should be familiar with batch systems.
- ii. It can be costly.
- iii. If one of the jobs fails, the remaining jobs will have to wait for an unknown time. Payroll systems, bank statements, and other similar applications are examples of batch operating systems.

3. Time-sharing operating system

Real-time operating systems allow multiple users to access a computer simultaneously; hence they are intended to process data or control systems in real-time with low latency. A time-sharing operating system, also known as a multitasking OS, works by allocating time to specific tasks and switching between them frequently.

4. Distributed Operating System:

This operating system manages a collection of independent computers while making them appear to be a single computer. This system is built on autonomous and interconnected computers that communicate with each other using communication channels. A distributed operating system supports multiple applications and users in real time.

Advantages of Distributed Operating Systems:

- i. All systems are independent, so failure of one does not affect the other's network communication.
- ii. Sharing resources allows for faster and more durable computations.
- iii. Delays in data processing decrease.

Disadvantages of Distributed Operating Systems:

- i. The main network can fail, causing the entire system to stop.
- ii. Language used to establish distributed systems is not well defined.
- iii. These systems are not widely available because they are extremely expensive.

5. Real-time Operating System

Real-time operating systems process data immediately after it is entered. They are used in industrial systems, such as manufacturing control systems, as well as embedded systems like medical devices. Real-time operating systems support real-time systems that must adhere to strict time requirements. They are used in scientific research, medical imaging, robotics, and air traffic control operations.

1.4 REFERENCES

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