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COMPUTER SCIENCE

Grade XII

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COMPUTER SCIENCE

Grade XII

Abdul Haseeb

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Contents

UNIT 1

OPERATING SYSTEM

After the completion of Unit-1, Students will be able to:

- Define an operating system.
- Describe commonly used operating systems (DOS, Windows, Unix, Macintosh).
- Explain the following types of operating systems:
  - Batch processing operating system
  - Multiprogramming operating system
  - Multitasking operating system
  - Time-Sharing operating system
  - Real Time operating system
  - Multiprocessor operating system
  - Parallel processing operating system
  - Distributed operating system
  - Embedded operating system
- Describe features/characteristics of Single-user and Multi-user operating systems.
- Describe the following functions of operating systems:
  - Process management
  - Memory management
  - File management
  - I/O system management
  - Secondary storage management
  - Network management
  - Protection system
  - Command-interpreter
- Define a process.
- Describe the new, running, waiting/block, ready and terminated states of a process.
- Differentiate between:
  - Thread and Process
  - Multi-threading and Multi-tasking
  - Multi-tasking and Multi-programming

1.1 INTRODUCTION

This unit is focused on introduction to Operating System and its functions and services. It also describes that how an operating system is used to execute processes. At the end, a differentiation is made between thread and process, multithreading, multitasking and multiprogramming.

Operating System is an important component of a computer system and has the same relation with computer hardware as human soul has with human body. As human body is useless without human soul, similarly, a computer is useless without an operating system.

1.1.1 An Operating System

An operating System (OS) is an intermediary between users and computer hardware. It provides users an environment in which a user can execute programs conveniently and efficiently. In technical terms, it is a software which manages hardware. An operating System controls the allocation of resources and services such as memory, processors, devices and information.

An operating system is a program that acts as an interface between the user and the computer hardware and controls the execution of all kinds of programs.

Some commonly used operating systems that are used for personal computers are: Linux, Mac OS, Microsoft Windows XP, Microsoft Windows Vista, Windows 7 and UNIX.

A computer without an operating system is just an empty dump of metal. To run application programs on a computer, it must have an operating system installed on it. Operating systems perform basic operations, such as getting input from the input devices, transferring data from main memory to the processor for processing and then sending

output to the output devices. It also keeps track of files and directories on the hard disk, and controls peripheral devices.

Consider Figure 1.1 which shows that operating system is an interface between users and computer hardware.

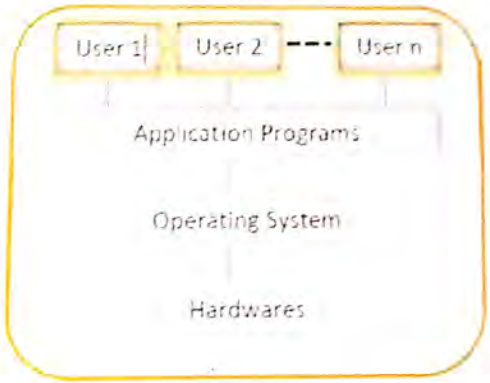

Figure 1.1: Operating System as an Interface

Operating system operates on top of hardware and acts as a virtual machine that hides the hardware level complexities from the users and provides them a convenient way of using the system.

1.1.2 Commonly used operating systems

The development of operating system has started since 1950's and different types of operating systems have been developed so far by different companies. The most commonly used operating systems are: DOS, Windows, UNIX and Macintosh.

a. DOS

DOS is the abbreviation for Disk Operating System which was the first operating system used for personal computers.

DOS operating system was developed in 1980 by Microsoft when, in July 1980, the IBM assigned a project to Microsoft for the development of a 16-bit operating system for their personal computer. Microsoft developed the first version of DOS for the personal computer and named it PC-DOS. After this, Microsoft developed a Microsoft version of the same PC-DOS operating system and named it MS-DOS. Both PC-DOS and MS-DOS are almost similar and now users refer them with only DOS.

In Figure 1.2 a snapshot of Microsoft DOS Operating System is shown with some basic commands: DIR and VER.

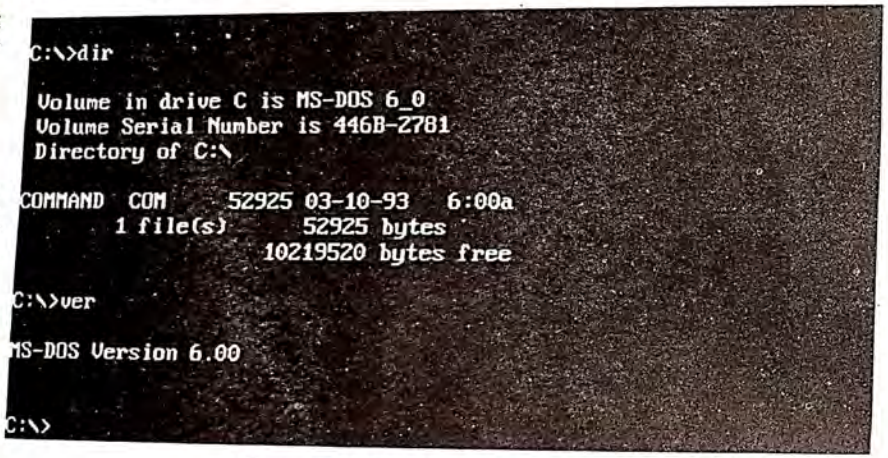

Figure 1.2 MS DOS Operating System

The most commonly used DOS commands are:

CD - changes the current directory
COPY - copies a file
DEL - deletes a file
DIR - lists directory contents
EDIT - starts an editor to create or edit plain text files
FORMAT - formats a disk to accept DOS files

HELP - displays information about a command
MKDIR - creates a new directory
RD - removes a directory
REN - renames a file
TYPE - displays contents of a file on the screen

b. Windows

Windows operating systems are the most commonly used operating systems that are based on Graphical User Interfaces (GUI).

i. Brief history of windows operating system

The history of windows operating system goes back to 1983. The first windows operating system "Windows 1.0" was launched on November 20, 1985. The graphical support with desktop icons was introduced in "windows 2.0" that was launched on December 9, 1987. On August 24, 1995, "windows 95" was launched. Windows 98, XP and Vista were released on June 25, 1998, October 25, 2001 and 2006 respectively. In October 2009 windows 7 was released and Windows 8 was released on October 2012.

ii. Features of windows operating system

- Windows operating system has improved graphical user interface that can be easily used by every type of user.
- Windows operating systems are user friendly.
- These are the best operating systems running on PCs.
- Windows series of operating systems are not very expensive for home users.
- Windows operating systems are supported by most of the software.

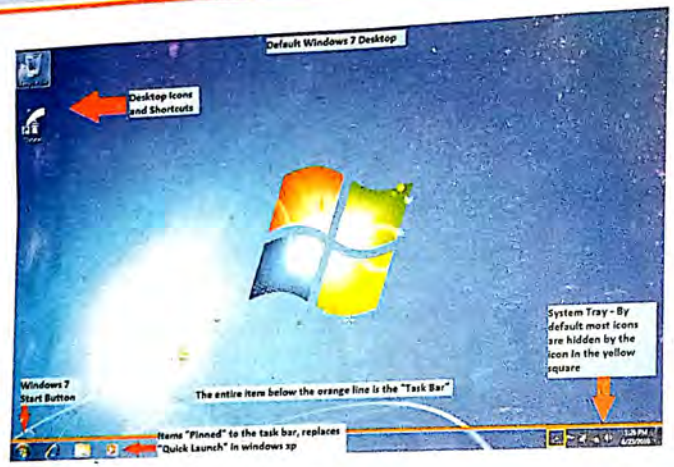

Figure 1.3: Windows 7 Desktop

c. UNIX Operating System

UNIX is a multitasking and multi-user operating system that was developed by Ken Thompson, Dennis Ritchie and their group members at Bell Labs in 1969. It was first developed in assembly language. Later on, in 1973, it was re-developed in C language. This version of UNIX has facilitated its further development and support to other hardware.

UNIX operating systems also have a graphical user interface (GUI) similar to Microsoft Windows which provides an easy to use environment for naive users.

Different versions of UNIX operating system have been developed so far which have some features in common. The most popular types of UNIX operating system are Sun Solaris, GNU/Linux and Mac OS X.

When you want to open the UNIX terminal window, click on **Application** menu and then select **Terminal** icon.

After selecting **Terminal** from the menu, the UNIX Terminal window will open having % prompt as shown in figure 1.4. The user will enter the command in this prompt to execute.

Figure 1.4 UNIX Prompt

d. Mac OS

Mac OS stands for Macintosh operating system. It is a series of operating systems having graphical user interfaces that have been developed by Apple Inc. On January 24, 1984, Apple Computer Inc. manufactured its first Macintosh personal computer and developed a system software for it which was later on renamed to Mac OS.

Mac OS can be divided into two groups which are: Mac OS Classic family and the Mac OS X family. So far, Mac OS has ten (10) versions with the names Mac OS 1, 2, 3, 4, 5, 6,7,8,9 and X. Figure 1.5 shows the desktop interface of Mac OS.

Figure 1.7: Mac OS Desktop

1.13 Types of Operating Systems

Operating system can be divided into different types which are given below.

a. Batch processing operating system

Batch processing system is that type of operating system which collects **jobs** in batches before being processed by the CPU. A job is a piece of work usually consisting of a program and the data to be run. All the Jobs are stored in **job queues** until the computer is ready to process them.

Once the CPU gets ready and fetches a job from the job queue, then there is no interaction of the user with the computer to interrupt the processing of the job until its completion.

Batches of jobs are formed by collecting jobs during working hours and then executed during the evening time or at the end of each day or whenever the computer is available. Once a batch job begins, it continues until it is completed or until an error occurs.

Payroll system and preparation of electricity, telephone and credit card bills are processed under the batch processing systems. In each of these systems, the individual wages, calls, units consumed and transactions performed are batched together and at the end of each month the total bill is calculated.

The example of batch processing system is IBM's OS 360.

b. Multiprogramming operating system

Simple batch operating system has the problem that the processor often remains idle when the process under execution is halt due to some external event. Also, Input/output devices are slow as compared to processor, therefore, most of the time the processor

remains idle. To eliminate this problem the concept of multiprogramming operating systems was introduced.

Multiprogramming operating system is that type of operating system which allows running of multiple computer programs simultaneously on a single processor. For example, you may be typing in MS Word, listening to music while in background Internet Explorer is downloading some pages from the Internet. Working in Windows 7, Vista, XP and Linux environment is multiprogramming.

In multiprogramming operating systems, several programs, called jobs, are active at the same time in the main memory (RAM) of the computer. This means that multiple jobs are loaded into RAM and executed by a single processor. Figure 1.6 shows main memory partitioned into five (05) frames holding four (04) jobs.

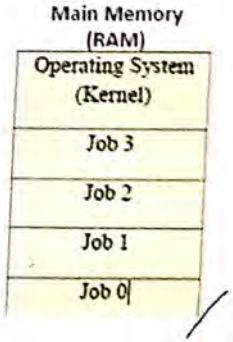

Figure 1.6 Main Memory Partitioning in Multiprogramming

Advantages of multi-programming

Multiprogramming operating systems make efficient use of the processor by interleaving multiple actives jobs that reside in main memory. It also attempts to increase CPU utilization by always having something for the CPU to execute. Main memory (RAM) is efficiently utilized to hold more jobs at a time.

Limitation of multi-programming

Multiprogramming requires context switching since several programs (processes) sequentially share the CPU. This typically introduces processing delay compared to a dedicated unshared process.

c. Multi-tasking operating system

Multitasking is the process in which the operating system performs multiple tasks simultaneously on a single processor in such a way that creates the impression of parallel executions. Practically, all modern OS has the ability of multitasking.

Multitasking does not mean that the computer has multiple processors to execute multiple processes simultaneously. It means that the operating system switches the jobs so quickly on a single processor that the user thinks all these processes are executing in parallel.

Multitasking can be either pre-emptive or cooperative. In pre-emptive version, the operating system divides the CPU time and allocates one slot to each of the programs. Operating systems that support preemptive multitasking are: Solaris, UNIX, Windows 2000, Windows XP, Mac OS X and Linux. In cooperative multitasking, processes cooperate with each other to achieve simultaneous execution. Operating system that supports cooperative multitasking is Windows 3.x.

d. Time-Sharing operating system

Time sharing operating systems are those operating systems which slice processor (CPU) time into small fixed time slices and assign the processes to the CPU for that time slice to be executed. If the process is completed in its allotted time slice, it quits the system and CPU is assigned to the new process waiting on the top of the ready queue. If the time slice expires and the process still remains incomplete, it is added at the back of the ready queue for its next turn.

This technique of sharing the CPU time is termed as time sharing, because, the time of the processor is shared among multiple jobs residing in main memory (RAM). Multiple users access the system simultaneously through their terminals and the operating system interleaves the execution of each program in a short burst of time called **time slice** or **quantum**.

Time sharing operating systems are needed for applications which need quick response time and users interactions such as transactions processing.

Advantages of Time sharing operating system

- Minimizes response time.
- Supports user interactivity.
- A process does not wait for a long time if it is preceded by a process of larger execution time.
- All processes get equal chances for execution.

Time Sharing Vs Multitasking Operating System

There is no universally accepted difference between time sharing and multi-tasking operating systems. Multi-tasking is used in a broad sense and thus Time-sharing operating system can be considered is a kind of multitasking operating system. Time sharing operating systems have a short time slices given to each process whereas in multitasking operating systems there is no time slice assigned to each process. The operating system (multitasking) switches among the processes residing in the main memory, RAM, in such a way that when a process needs input or output operation the operating system is switched to some other process residing in RAM.

e. Real-Time operating system

Real time operating systems are those operating systems which give quick response to users requests without delaying them. Unlike batch processing operating systems, real time operating systems produce immediate response to users requests as they are input to the system. The success rate of these operating systems is not only measured in terms of the correctness of the logically computed result, but also on the basis of time at which the results are produced. As these systems process the users input immediately, therefore, the systems supports high degree of interactivity and as a result they can be widely used in critical environments, such as, air traffic control systems, radar system, missiles systems etc.

As the results of real time operating systems are time-based, therefore, they are grouped into hard-real time operating systems and soft-real time operating systems. Hard-real time operating system guarantees the solution in the specified time constraint; otherwise, the results are catastrophic such as flight navigation, automobile, and spacecraft systems. In soft-real time operating systems, if the deadlines are missed by some amount of time still they are acceptable such as media streaming in distributed systems.

Features of real time operating system

- A real time operating system guarantees a solution or results within a specific time.
- These are multitasking operating systems.
- These operating systems are used for the execution of real-time applications, such as weather forecasting, geographical information retrieval, controlling machinery, scientific instruments and industrial systems etc.
- These systems are aimed on quick and predictable response to events.
- When these systems start execution of a task, they do not provide full control to the users to interact or interfere in that processing.

f. Multiprocessor operating system

The use of two or more central processing units (CPUs) within a single computer system is called **Multiprocessing**. A multiprocessing system can run multiple tasks in parallel on multiple CPU's and thus there should be an operating system to control such parallel executions. Multiprocessor operating systems are the operating systems that perform this task.

As multiprocessing operating systems execute multiple tasks in parallel, therefore, a single process can be divided into small independent units, called threads, and executed in parallel on multiple processors giving birth to the concept of **multithreading**.

The most commonly used multiprocessing systems are symmetric multiprocessing and asymmetric multiprocessing. In symmetric multiprocessing systems, all the CPUs are equal but in asymmetric multiprocessing systems there is one master CPU controlling other CPUs called slave CPUs.

Advantages of multiprocessing operating systems

If you have to run multiple programs at the same time, multi-processors can be very useful. Another advantage of multi-processors is that more and more programs these days are multithreaded. A multi-threaded application is a single program or application that can make use of more than one processors/cores. If one processor fails to work then the load is shared by other processors.

Limitations of multiprocessing operating system

Cost and power consumptions are the disadvantages of multiprocessing operating systems. A large main memory is required. A very sophisticated operating system is required to schedule, balance and co-ordinate the input, output and processing activities of multiple CPUs.

Multiprogramming Vs Multiprocessing

Multiprogramming is different from multiprocessing in the sense that in multiprogramming multiple programs are processed by a single processor in an interleaved passion giving the impression of being executed simultaneously while in multiprocessing operating systems multiple processors execute more than one programs simultaneously.

g. Parallel processing operating system

The operating system that is used to operate, control and manage a parallel computer system is called parallel processing operating system. A parallel computer system is a computer which has multiple processors that work co-operatively to solve a specific computational problem. The parallel execution can be achieved by executing multiple processes on different processors in parallel. Parallel operating systems are much similar to multiprocessing operating systems.

Parallel computing is used for problems which need many calculations simultaneously. This task is accomplished by dividing the computationally complex and large problems into smaller independent tasks which are executed concurrently on parallel processors.

Parallel processing can be achieved at different levels such as, bit-level, instruction level, data level and task level. The most commonly used parallel processing operating systems are UNIX and Microsoft Windows NT.

Time-sharing Vs parallel processing operating system

Time-sharing operating systems allows users to share a single processor simultaneously. Each user is allocated resources, CPU, for a particular time slot called **time slice**. In parallel processing operating systems, various processes are executed simultaneously on multiple processors. In parallel processing operating systems, there is no such scheme used for the allocation of resources (e.g. processor) in which it is shared among multiple processes.

h. Distributed operating system

A distributed operating system is an operating system that manages a group of independent computers and makes them appear to the users as a single computer.

When independent computers are networked together in such a way to work in a co-operative manner then they give rise to a distributed system. In a distributed environment, for performing a task, the computers communicate with each other and perform operations in such a way that the users do not feel that the computations are taking place on more than one machine. In a distributed environment, the resources should be shared; the processes should be scheduled on different machines, and the communication and synchronization mechanisms should be defined clearly. All these are the duties of a distributed operating system. The distributed operating system hides from the users that where a particular resource is, how the data is accessed, how a resource was moved to a new location and how the error was recovered.

Advantages of distributed system

- Communication and resource sharing is possible which eliminates the need of dedicated resources with each computer system.
- The distributed systems are economical in the sense that expensive resources are shared.
- The system is reliable because of the availability of multiple machines for performing the task of a failed system.
- The system has the potential for incremental growth.

Disadvantages of distributed system

- Network connectivity is an essential part of a distributed system which is a difficult and expensive task.
- Security and privacy is an issue.

i. Embedded operating system

Embedded operating systems are those operating systems which are designed for use in embedded computer systems. An embedded computer system is a computer which is a part of another system such as robot, missile etc.

These operating systems are designed for the operations of small machines like Personal Digital Assistant (PDA) with less autonomy. They can operate with limited number of resources. By design, these operating systems are very compact in size and efficient in performance. Windows CE, Embedded Linux and Android are the examples of embedded operating systems.

1.1.4 Single-user and Multi-user Operating Systems

Operating systems can be divided into two categories as for as number of users are concerned.

a. Single-user operating systems

Single-user operating systems are those operating systems which are usable by a single user at a time. These operating systems execute a single process at a time on a single processor. Batch processing operating systems are the examples of single user operating systems.

b. Multi-user operating systems

Multi-user operating systems are those operating systems which allow multiple users to access a computer system at the same time. Time-sharing operating system is an example of multi-user operating systems as they enable multiple users to access a single computer by sharing of time. UNIX is an example of multi user operating system.

1.2 OPERATING SYSTEM FUNCTIONS

As operating system is the main controller of a computer system, therefore, it provides a variety of services and functions to the computer and its users which are listed below:

- Process Management
- Memory Management
- File Management
- Input/output System Management
- Secondary Storage Management
- Network Management
- Protection System
- Command-interpreter

Process management

A program under execution is called process. Early computer systems were able to run only one process on a single processor, but, now the concepts of multitasking and multiprogramming have enabled computers to run multiple programs on a single processor. **Process management** is that function of operating system in which it deals with running multiple processes on a single computer. Since, most of the computer systems contain one processor with one core, multitasking is done by simply switching processes quickly. If there are more processes to run on a processor, then the operating system decides whether to shorten the time slice for each process or to make the processes wait long for their next turns of execution.

Memory management

Computer memory is a vital hardware resource of the computer system and it should be properly managed. It is grouped into Registers, CPU cache, Random Access Memory (RAM) and Disk Storage. A module of operating system called memory manager is responsible for the coordination of these types of memory by tracking which memory is

available, which is to be allocated or de-allocated and how to move data among them. This overall function of operating system is called **memory management**.

File management

The data is stored in computer memory in **files** which are further arranged and organized in sub directories and root directory resulting in a **hierarchical file system**. A module of operating system that organizes and keeps track of all the files in computers is called **file manager** and the process of managing these files is called **file management**. For example, a *hierarchical file system*, shown in figure 1.7 and 1.8 depict that how files are arranged into root directory and sub-directories. This hierarchical file system is also called **files system.**

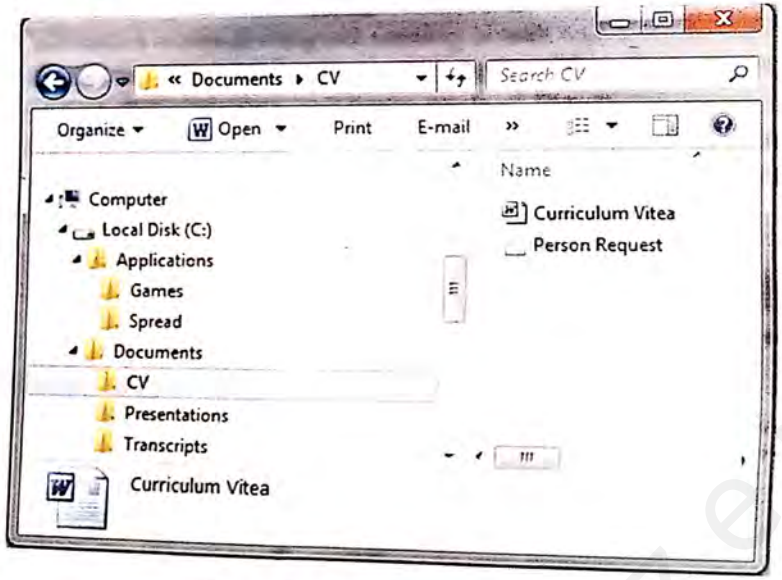

Figure 1.7: File Structure in Computer

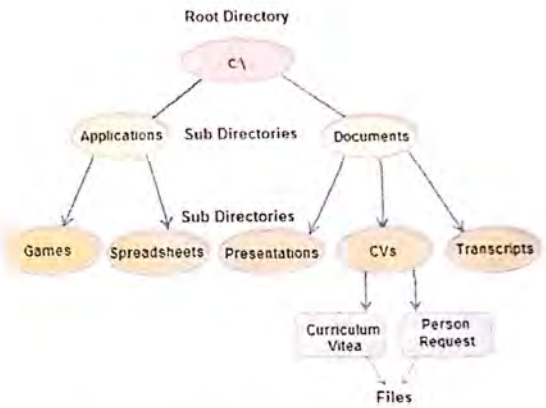

Figure 1.8: Hierarchical File System

Input/Output System Management

Every computer system has input/output devices such as keyboard, mouse, disk drives, printers, displays etc. All these devices need significant amount of management. The module of operating system used to manage input/output devices is called **Input/Output manager** or **device manager** and the process is called Input/Output management. I/O manager allocates resources on requests to applications to perform I/O operation. Device manager provides a convenient way for the use of input/output hardware and hides the hardware level complexities from the users.

The input/output hardware of computer cannot be accessed or used directly by the users. To make them useable, device drivers software must be installed on the computer. It is the device manager module of the operating system that make use of device driver software to access and manage Input/output devices. The relationship of operating system with drivers and hardware is shown in Figure 1.9.

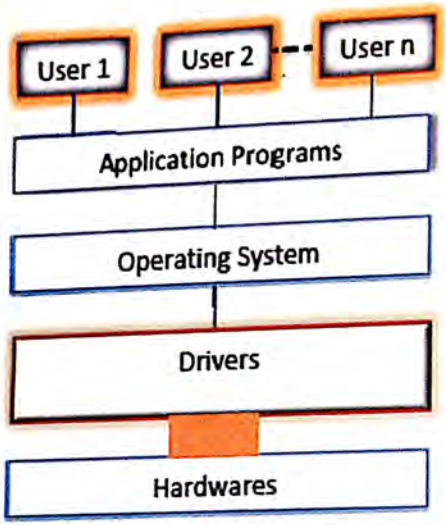

Figure 1.9 Device Drivers and Operating System

Secondary Storage Management

Secondary storage consists of those devices which stores data permanently for a long time. These devices includes tape drives, hard disks, CD and DVD disks, flash memory and other media designed to hold information for long life. The data stored in the secondary storage is accessed in primary storage and then into cache and CPU registers. The data loaded from secondary storage is ordinarily divided into fixed number of bytes or words. The function of operating system is to manage secondary storage devices and handle proper flow of data among primary and secondary storage devices is called **secondary storage management**.

In storage, each location has an address. The set of all addresses available to a program is called an address space which is managed by the secondary storage management module of the operating system.

Network management

Network management is not a core part of operating system but in modern operating systems **network manager** has become essential component to efficiently manage network related issues. Almost, all modern operating systems are capable of using transmission control protocol (TCP) and internet protocol (IP) for the network supporting services. The module of operating system that is responsible for sharing resources such as files, printers, and scanners using either wired or wireless connections is called **network manager** and the process is called **network management**.

Many operating systems support networking protocols. The most popular network operating systems are Microsoft Windows Server 2003, Microsoft Windows Server 2008, UNIX, Linux, Mac OS X, and Novell NetWare.

Protection System

Nowadays, computer systems have multiple users connected through clients to the server computers. These users concurrently access and execute multiple processes which must be protected against each other so that the processes may not interfere each other data. The module of operating system responsible for this task is called **protection system**. Protection refers to mechanism for controlling the access of programs, processes, or users to the resources defined by a computer system.

Command interpreter

All operating systems need to provide an interface to the users for the communication with the computer. The two commonly used methods, provided by the operating systems, for interfacing are Command Line Interface (CLI) and Graphical User Interface (GUI).

A **command line interface** or **CLI** is a method of interacting with an operating system or software using a command line interpreter. This command line interpreter may be a text terminal, terminal emulator, or remote shell client.

1.3 PROCESS MANAGEMENT

As discussed earlier, process management is one of the important functions of operating system. The following sections describe process in detail with a comparison to threads.

1.3.1 Process

Following are some definitions of process:

- A program under execution by the processor (CPU) is called process.
- An instance of a program running on a computer is called process.
- The entity that can be assigned to and executed on a processor is termed as process.

1.3.2 Process States

A process can be in one of the different states: new, ready, running, block, and exit. These states are usually represented in the form of models called process models.

a. New State

When a new process is created then it is said to be in new state.

b. Running State

A process is said to be in running state if it is under execution by the CPU. This means that the process actually using the CPU at that particular time.

c. Blocked (or waiting) State

A process is said to be in blocked state if it is waiting for some event to happen such as an Input/Output completion before it can proceed.

d. Ready State

A process is said to be in ready state if it is ready to be assigned to the CPU for processing.

e. Terminated state (or exit)

A process is said to be in terminated state if the CPU has finished its execution.

An example of a five state process model is given below:

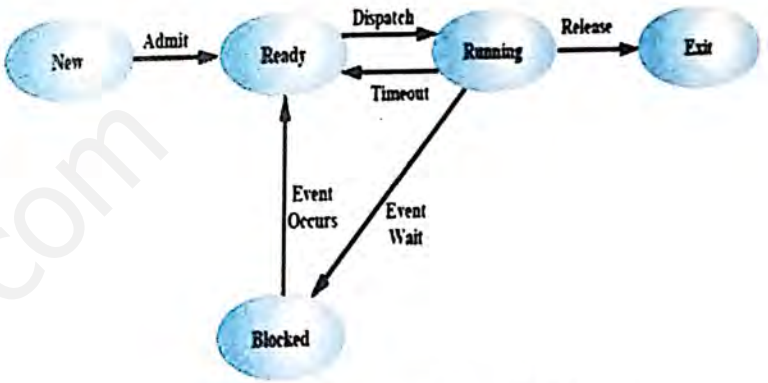

Figure 1.10: Five-State Process Model

1.3.3 Threads and processes

A **thread** can be defined as a dispatchable unit of a process that can be executed sequentially and is interruptible. It can also be defined as a single sequence stream within a process.

As threads are small independently executable units of processes, therefore, they have some of the properties of processes because of which they are sometimes called **lightweight processes**. In a process, threads allow multiple executions of streams.

Processes vs. Threads

- Processes are independent of one another while threads are not independent of one another.
- Unlike processes, all threads can access every address in the task.
- Processes might or might not assist one another because processes may originate from different users while threads are designed to assist one another.

1.3. 4 Multitasking and Multithreading

- The features of a multitasking operating system is to execute more than one **programs** simultaneously while the multithreading feature executes **different parts of the program**, called **threads**, simultaneously.
- As multitasking executes individual program, therefore, the multitasking operating systems use separate memory and data, while the multithreaded operating systems share the same memory and data variables for all threads of the same process.
- Implementation of multitasking is relatively easier in operating systems than the implementation of multithreading.

1.3. 5 Multitasking and Multiprogramming

Multiprogramming is the concept in which more than one user's programs are active at the same time in the main memory (RAM) of the computer and the operating system selects one job at a time from the ready queue and assigns it to the CPU for execution. The ready queue is always placed in the main memory of the computer. To understand this concept, consider the scenario of having the application programs such as MS Word, MS Excel, and MS Access opened with a user typing in MS Word document and leaving the others just in main memory without performing any task.

The concept of multitasking means performing multiple tasks in parallel. Always, a single CPU processes one task at a time but the switching of CPU between the processes is so fast that it gives the impression of simultaneous execution of multiple processes. While listening to music, we can browse Internet and print some document at the same time. In a broad sense, both the multiprogramming and multitasking are the same things with two different names.

Summary

- An operating system is a program that acts as an interface between the user and the computer hardware and controls the execution of all kinds of programs.
- The history of operating system goes back to 1950s and different types of operating system have been developed so far. DOS, Windows, Macintosh and UNIX are the examples of operating systems.
- Modern operating systems have been passed through a long evolutionary period starting from batch processing system, multiprogramming and then to distributed, parallel and embedded operating systems.
- Operating system acts like a controller and thus performs a wide range of functions and services such as process management, memory management, file management, I/O management, network management and ensuring security.
- A job under execution is called process. A process can be in one of ready, running or waiting state. It is the responsibility of the operating system to decide which process to be assigned to the CPU for execution and which to be suspended and placed back either in waiting or ready state.

- Multitasking, multiprogramming and multithreading are the features of nearly all modern operating systems which enable them to process multiple users jobs simultaneously in a parallel fashion.

Activities

ACTIVITY 1

The instructor should apply a few internal and external commands of MS-DOS to the students in computer lab and then provide a list of most commonly used MS-DOS commands and asks them to practice on these commands.

ACTIVITY 2

The instructor should practice the installation steps of Windows XP and Windows 7 Operating System in the class and then should, briefly, describe the main features of these operating systems to the students.

ACTIVITY 3

Utility programs are the programs that are considered as a component of operating system. They are installed automatically with the installation of operating systems. A few examples of utility programs are Notepad, WordPad, Calculator, Image Viewer and Antivirus. The instructor should briefly practice the students on these programs.

ACTIVITY 4

Drivers are the software that are used to interface computer hardware with the operating system and make them available to the users. The instructor should practice the installations of LAN card, Sound card and VGA card to the students.

Exercise

Q.1 Fill in the Blanks.

i. The concept of executing multiple programs simultaneously on multiple possessors is known as_____.

ii. Multitasking operating systems execute _____ simultaneously.

iii. The central theme of modern operating systems, based on the concept of switching among multiple programs in memory, is called _____.

iv. A process consists of five states i.e. new, ready, running, block and _____.

v. _____ is a multitasking, multi-user operating system for servers, desktops and laptops, originally developed in 1969 by a group of AT&T employees at Bell Labs.

Q.2 Select the correct choice for the following Multiple Choice Questions.

i. Operating system is an:
   a. Application software
   b. System software
   c. Driver
   d. None of the above

ii. DOS stands for:
   a. Doctor of system
   b. Document of system
   c. Disk operating system
   d. None of the above

iii. Which one of the following is correct for multiprocessing operating systems?

a. Used on systems having only one processor

b. Cannot execute more than one processes at a time

c. Run on systems which having more than one processors

d. None of the above

iv. Multiprogramming refers to:

a. Having several programs in RAM at the same time

b. Multiprocessing

c. Writing programs in multiple languages

d. None of the above

v. The most recently launched operating system of Microsoft is:

a. Windows 98

b. Windows 8

c. DOS

d. Windows NT

vi. Which of the following is not an operating system?

a. Linux

b. MS Word

c. UNIX

d. Windows XP Professional

vii. Which type of software enables you to solve specific problems or perform specific tasks?

a. System software

b. Operating system

c. Utility software

d. Application software

viii. Which type of software controls your application software and manages how your hardware devices work together?

a. System software

b. Operating system

c. Utility software

d. Application software

ix. A technique in which a process, executing an application, is divided into threads that can run concurrently is called:

a. Multithreading

b. Multiprocessing

c. Batch processing

d. None of the above

Q.3 Write TRUE/FALSE against the following statements.

i. The operating system acts as an interface between the computer hardware and the human user.

ii. Multiprogramming allows the processor to make use of idle time caused by I/O wait.

iii. An operating system controls the execution of applications and acts as an interface between applications and the computer hardware.

iv. In the early computers, the operating systems did not exist.

v. Multi-programming do not provide better utilization of system resources than multiprogramming.

vi. In a time sharing system, when a process is assigned to the CPU for execution, it remains there till its completion.

vii. A process is a dispatchable unit of thread.

viii. A process is directly assigned to the CPU for processing from a block state when the event for which it is waiting happens.