The Creators College of Science & Commerce Abbottabad

Lecturer Name: - Hassan Asghar

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LONG Questions

Question # 4: What is an Operating system? Explain different types of Operating Systems?

Operating Systems:

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 convenient efficiently. In technical terms, it is a software which manages hardware. An operating system controls the allocation of resources and services such as memory, processor, 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 computer are Linux, Mac OS X, Microsoft XP, Microsoft Windows / Vista, Windows 7 and UNIX.

Different Types of Operating Systems:

Below are the types of the operating systems

- **Batch-Processing Operation 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.

- **Multi-Programming 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 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 system 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 Window 7, Vista and Linux environment is multiprogramming.

- **Multi-Tasking Operating System**

  Multitasking is the process in which 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 co-operative. In pre-emptive version, the operating system divides the CPU time and allocates one slot to each of the programs. Operating systems that support pre-emptive multitasking are: Solaris, UNIX and windows. In co-operative multitasking, processes cooperate with each other to achieve simultaneous execution. E.g. Window 3.x.

- **Time-Sharing Operation System**

  Time sharing operating systems are those operating systems which slice processor 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.

- **Real-Time Operating System**

  Real time operating system are those operating systems which give quick response to users request without delaying them. Unlike batch processing operating systems. Real time operating systems produce immediate response to users request as they are input to the system. The success rate of these operating system 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.

- **Multi-Processor Operating System**

  The use of two or more central processing units 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.

  A multiprocessor operating systems execute multiple tasks in parallel. Therefore, a single process can be divided into small independent units, called thread, and executed in parallel on multiple processor giving birth to the concept of multithreading.

- **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.

- **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 or 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.

- **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 resource. By design, these operating systems are very compact in size and efficient in performance. Window CE, are the examples are embedded systems.

Question # 5: Differentiate between the following:

(a) Single-user and Multi Users 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) Thread and Process?

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.

(c) Multiprogramming and Multiprocessing?

Multi Programming:

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.

Multi-Processing:

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

As multi-processing, 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.

Question # 6: Define distributed operating system and describe its advantages and disadvantages?

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 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.

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

Question # 7: Write short notes on the following:

(a) Different states of a process?

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.

- **New State**

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

- **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 at that particular time.

- **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.

- **Ready State**

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

- **Terminated State (or exit)**

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

(b) 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. 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

(c) Real time processing systems?

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 produce. As their systems the user input immediately, therefor, the systems support high degree of interactivity and as a result they can be widely used in critical environments, such as air, traffic control systems, radar systems, missiles systems etc.

(d) Embedded operating systems?

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 resource.

Question # 8: Describe functions of an operating system?

An operating system 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, Window 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.

Question # 9: Compare DOS, Windows and UNIX operating systems?

The comparison of different types of operating systems are given below:

DOS	Windows	UNIX
○ DOS is the abbreviation for Disk Operating System which was the first operating system used for personal computers. ○ It was developed by Microsoft in 1980. ○ MS developed a Microsoft version of the same PC-DOS operating system and named it MS-DOS.	○ Windows operating systems are the most commonly used operating systems that are based on Graphical User Interfaces (GUI). ○ Window 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 PC's. ○ Windows series of operating systems are not very expensive for home users.	○ Unix is a multi-tasking and multi user operating system that was developed by Ken Thompson. ○ It was first developed in Assembly language then in re developed in C language. ○ Unix operating systems also have a graphical user interface (GUI) similar to Microsoft windows which provides an easy to use environment for naïve users. ○ The most popular types of Unix operating system are Sun, Solaris, GNU/Linux and Mac OS X. ○ Terminal can be opened via Application tab.