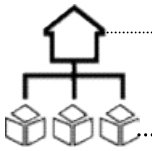


Operating system

What is an Operating System?

An Operating system (OS) is a software which acts as an interface between the end user and computer hardware. Every computer must have at least one OS to run other programs. An application like Chrome, MS Word, Games, etc needs some environment in which it will run and perform its task. The OS helps you to communicate with the computer without knowing how to speak the computer's language. It is not possible for the user to use any computer or mobile device without having an operating system.

Example of operating systems are : Windows, Linux,Android,IOSetc

History Of OS

- ✓ Operating systems were first developed in the late 1950s to manage tape storage
- ✓ The General Motors Research Lab implemented the first OS in the early 1950s for their IBM 701
- ✓ In the mid-1960s, operating systems started to use disks
- ✓ In the late 1960s, the first version of the Unix OS was developed
- ✓ The first OS built by Microsoft was DOS. It was built in 1981 by purchasing the 86-DOS software from a Seattle company
- ✓ The present-day popular OS Windows first came to existence in 1985 when a GUI was created and paired with MS-DOS.

Features of Operating System

Here is a list commonly found important features of an Operating System:

- ✓ Protected and supervisor mode
- ✓ Allows disk access and file systems Device drivers Networking Security
- ✓ Program Execution
- ✓ Memory management Virtual Memory Multitasking
- ✓ Handling I/O operations
- ✓ Manipulation of the file system
- ✓ Error Detection and handling
- ✓ Resource allocation
- ✓ Information and Resource Protection

1. What is operating system?

a) collection of programs that manages hardware resources

b) system service provider to the application programs

c) link to interface the hardware and application programs

d) all of the mentioned **Ans.:** d

Which one is the first 64 bit operating system?

a. Windows vista
b. Mac
c. Linux
d. Windows XP

Explanation: The 32-bit processor was the primary processor used in all computers until the early 1990s. Intel Pentium processors and early AMD processors were 32-bit, which means the operating system and software work with data units that are 32 bits wide. Windows 95, 98, and XP are all 32-bit operating systems. A computer with a 64-bit processor can have a 64-bit or 32-bit version of an operating system installed. However, with a 32-bit operating system, the 64-bit processor would not run at its full capability.

What is a Kernel?

The kernel is the central component of a computer operating systems. The only job performed by the kernel is to the manage the communication between the software and the hardware. A Kernel is at the nucleus of a computer. It makes the communication between the hardware and software possible. While the Kernel is the innermost part of an operating system, a shell is the outermost one.

Hardware---->Karnel/OS/Shell--->Terminal-->User

Features of Kennel

- ✓ Low-level scheduling of processes
- ✓ Inter-process communication
- ✓ Process synchronization
- ✓ Context switching

Types of Kernels

There are many types of kernels that exists, but among them, the two most popular kernels are:

1. **Monolithic:**A monolithic kernel is a single code or block of the program
2. **Microkernels:**Microkernel manages all system resources. In this type of kernel, servicesare implemented in different address space.

2. Which of the following plays an important role in modern Operating Systems(OS)?

a) Kernel b) Shell c) Fork d) None **Ans.:** a

3. Which one of the following is not true?

a) kernel is the program that constitutes the central core of the operating system

b) kernel is the first part of operating system to load into memory during booting

c) kernel is made of various modules which can not be loaded in running operating system

d) kernel remains in the memory during the entire computer session **Ans.:** c

Functions of an Operating System

- ✓ Process management:
- ✓ Memory management:
- ✓ File management:
- ✓ Device Management:
- ✓ I/O System Management:
- ✓ Secondary-Storage Management:
- ✓ Security
- ✓ Command interpretation
- ✓ Networking
- ✓ Job accounting:
- ✓ Communication management:

4. Which one of the following error will be handle by the operating system?

a) power failure b) lack of paper in printer

c) connection failure in the network d) all of the mentioned **Ans.:** d

5. ----is mainly responsible for allocating the resources as per process requirement?

a) RAM b) Operating system

c) Compiler d) Application software **Ans.:** b

6. BAT refers to

a) Executable Files b) Batch Files c) Boot Files d) None **Ans.:** b

7. ---is the program which interprets commands given by the user?

a) Kernel b) Shell c) Fork d) None **Ans.:** b

8. NTFS stands for---

a) New Technology File System b) New Transmission File System

c) Net Transmission File System d) None **Ans.:** a

Types of Operating system

- ✓ **Batch Operating System:**The user of a batch operating system never directly interacts with the computer. In this type of OS, every user prepares his or her job on an offline device like a punch card and submit it to the computer operator.
- ✓ **Multitasking/Time Sharing OS:**Time-sharing operating system enables people located at a different terminal(shell) to use a single computer system at the same time. The processor time (CPU) which is shared among multiple users is termed as time sharing.
- ✓ **Multiprocessing OS**
- ✓ **Real Time OS:**A real time operating system time interval to process and respond to inputs is very small. Examples: Military Software Systems, Space Software Systems.

- ✓ **Distributed OS:**Distributed systems use many processors located in different machines to provide very fast computation to its users.
- ✓ **Network OS:**Network Operating System runs on a server.
- ✓ **Mobile OS**

Firmware: Firmware is one kind of programming that is embedded on a chip in the device which controls that specific device.

Difference between 32-Bit vs. 64 Bit Operating System

Parameters	**32. Bit**	**64. Bit**
Architecture and Software	Allow 32 bit of data processing simultaneously	Allow 64 bit of data processing simultaneously
Compatibility	32-bit applications require 32-bit OS and CPUs.	64-bit applications require a 64-bit OS and CPU.
Systems Available	All versions of Windows 8, Windows 7, Windows Vista, and Windows XP, Linux, etc.	Windows XP Professional, Vista, 7, Mac OS X and Linux.
Memory Limits	32-bit systems are limited to 3.2 GB of RAM.	64-bit systems allow a maximum 17 Billion GB of RAM.

Key Note

- ✓ An operating system is a software which acts as an interface between the end user and computer hardware
- ✓ Operating systems were first developed in the late 1950s to manage tape storage
- ✓ The kernel is the central component of a computer operating systems. The only job performed by the kernel is to the manage the communication between the software and the hardware
- ✓ Two most popular kernels are Monolithic and MicroKernels
- ✓ Process, Device, File, I/O, Secondary-Storage, Memory management are various functions of an Operating System
- ✓ Batch, Multitasking/Time Sharing, Multiprocessing, Real Time, Distributed, Network, Mobile are various types of Operating Systems

Which one is the 7 th generation's intel processor?

a. Intel Core i7-9850HL
b. Intel Core i5 -7200U
c. Intel Core i5-9400H
d. Intel Core i9-10900K

Ans.: b

FAT stands for

a) File Allocation Table b) File Application Table
c) First Allocation Table d) First Application Table **Ans.:** a

What is a Process?

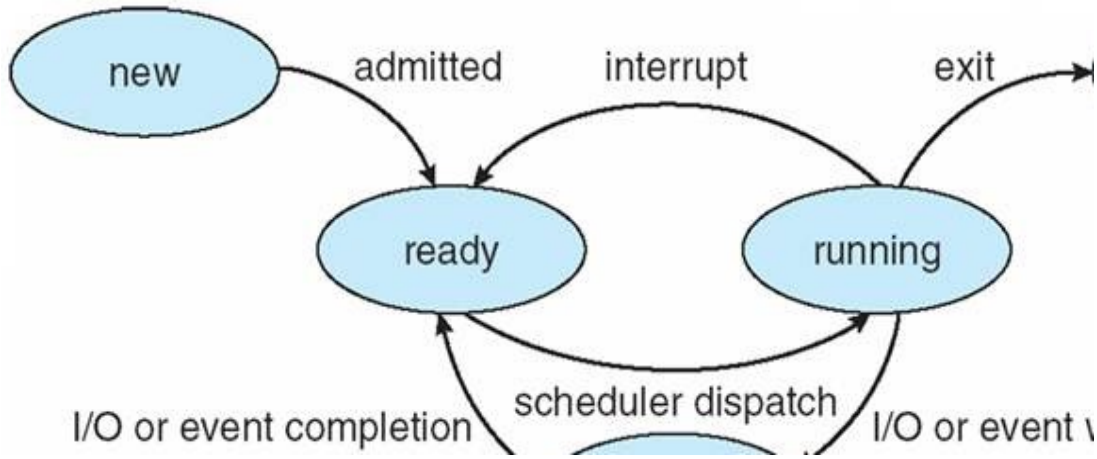
A process is the execution of a program that allows you to perform the appropriate actions specified in a program. It can be defined as an execution unit where a program runs. The OS helps you to create, schedule, and terminates the processes which is used by CPU. The other processes created by the main process are called child process.

A process operations can be easily controlled with the help of PCB(Process Control Block). You can consider it as the brain of the process, which contains all the crucial information related to processing like process id, priority, state,

10. he number of processes completed per unit time is known as _____

a) Output b) Throughput c) Efficiency d) Capacity **Ans.:** b

Process control block state



Which of the following is not the state of a process in Process Control Block (PCB)? [JBL-AEO(IT)-2015]

a) Old b)New c) Waiting d) Running **Ans.:** a

11. A Process Control Block(PCB) does not contain which of the following?

a) Code b) Stack c) Bootstrap program d) Data **Ans.: c**

12. Which of the following is not the state of a process?

a) New b) Old c) Waiting d) Running **Ans.:** b

13. What is Thread?

Thread is an execution unit that is part of a process. A process can have multiple threads, all executing at the same time. It is a unit of execution in concurrent programming. A thread is lightweight and can be managed independently by a scheduler. It helps you to improve the application performance using parallelism.

Multiple threads share information like data, code, files, etc. We can implement threads in three different ways:

1. Kernel-level threads
2. User-level threads
3. Hybrid threads

KEY DIFFERENCE

- ✓ Process means a program is in execution, whereas thread means a segment of a process.
- ✓ A Process is not Lightweight, whereas Threads are Lightweight.
- ✓ A Process takes more time to terminate, and the thread takes less time to terminate.
- ✓ Process takes more time for creation, whereas Thread takes less time for creation.
- ✓ Process likely takes more time for context switching whereas as Threads takes less time for context switching.
- ✓ A Process is mostly isolated, whereas Threads share memory.
- ✓ Process does not share data, and Threads share data with each other.

Multiprogramming:

A multiprogramming is a parallel processing in which the multiple programs can run simultaneously.

- Multiprogramming is the allocation of more than one concurrent program on a computer system and its resources.
- Multiprogramming allows using the CPU effectively by allowing various users to use the CPU and I/O devices effectively.
- Multiprogramming makes sure that the CPU always has something to execute, thus increases the CPU utilization.

14. What is the degree of multiprogramming?

a) the number of processes executed per unit time

b) the number of processes in the ready queue

c) the number of processes in the I/O queue
d) the number of processes in memory
Ans.: d

Multiprocessing

Multiprocessing is an ability of a computer to use two or more processors for computer operations. With multiple processors, the computer performance can be significantly increased.

Multithreading

Multithreading is a program execution technique that allows a single process to have multiple code segments (like threads). It also runs concurrently within the "context" of that process. Multi-threaded applications are applications that have two or more threads that run concurrently. Therefore, it is also known as concurrency.

- ✓ A multiprocessing system has more than two processors whereas Multithreading is a program execution technique that allows a single process to have multiple code segments
- ✓ Multiprocessing improves the reliability of the system while in the multithreading process, each thread runs parallel to each other.

OS Components

An operating system is a large and complex system that can only be created by partitioning into small pieces. These pieces should be a well-defined portion of the system, which carefully defined inputs, outputs, and functions.

File Management : File creation and deletion,Mapping files onto secondary storage.

Process Management: The process management component is a procedure for managing the many processes that are running simultaneously. Like when you open vlc player in the same time working with Ms word. Its work is precesscreation , deletion, Suspension and resumption,Synchronization process

Network Management: Network management is the process of administering and managing computer networks. It includes performance management, fault analysis, provisioning of networks, and maintaining the quality of service.

Main Memory management: Main Memory is a large array of storage or bytes, which has an address. The memory management process is conducted by using a sequence of reads or writes of specific memory addresses.

Secondary-Storage Management: The computer system offers secondary storage to back up the main Memory. Today modern computers use hard drives/SSD as the primary storage of both programs and data. However, the secondary storage management also works with storage devices, like a USB flash drive, and CD/DVD drives.

Security Management: The various processes in an operating system need to be secured from each other's activities. For that purpose, various mechanisms can be used to ensure that those processes which want to operate files, memory CPU, and other hardware resources should have proper authorization from the operating system.

- ✓ An operating system is a large and complex system that can only be created by partitioning into small pieces.
- ✓ Operating system shares the various OS system components like File, Process Memory, I/O device management, etc.
- ✓ A file is a collection of related information which is should define by its creator.
- ✓ The operating system checks the capability of the program to read, write, create, and delete files.

Memory Management

Memory management is the functionality of an operating system which handles or manages primary memory and moves processes back and forth between main memory and disk during execution. Memory management keeps track of each and every memory location, regardless of either it is allocated to some process or it is free.

Process Address Space

The process address space is the set of logical addresses that a process references in its code. For example, when 32-bit addressing is in use, addresses can range from 0 to 0x7fffffff; that is, 2^31 possible numbers, for a total theoretical size of 2 gigabytes.

15. CPU fetches the instruction from memory according to the value of _____

a) program counter b) status register

c) instruction register d) program status word **Ans.:** a

S.N.	Memory Addresses & Description
1	Symbolic addresses The addresses used in a source code. The variable names, constants, and instruction labels are the basic elements of the symbolic address space.
2	Relative addresses At the time of compilation, a compiler converts symbolic addresses into relative addresses.
3	Physical addresses The loader generates these addresses at the time when a program is loaded into main memory.

4	logical address space The set of all logical addresses generated by a program is referred to as a logical address space. The set of all physical addresses corresponding to these logical addresses is referred to as a physical address space.

16. When there is a large logical address space, the best way of paging would be---------

[Com bank- AP-2018]

a)Not to page b) a two level paging algorithm
c) not all prone to deadlock d) all of the above **Ans:.** b

17. Which one of the following is the address generated by CPU?

a) physical address b) absolute address
c) logical address d) none of the mentioned **Ans.:** c

18. Program always deals with _____

a) logical address b) absolute address
c) physical address d) relative address **Ans.:** a

19. Physical memory is broken into fixed-sized blocks called _____

a) frames b) pages
c) backing store d) none of the mentioned **Ans.:** a

20. Logical memory is broken into blocks of the same size called _____

a) frames b) pages
c) backing store d) none of the mentioned **Ans.:** b

21. Every address generated by the CPU is divided into two parts. They are _____

a) frame bit & page number b) page number & page offset
c) page offset & frame bit d) frame offset & page offset **Ans.:**b

22. The operating system maintains a _____ table that keeps track of how many frames have been allocated, how many are there, and how many are available.

a) page b) mapping c) frame d) memory **Ans.:** c

23. Run time mapping from virtual to physical address is done by _____

a) Memory management unit b) CPU
c) PCI d) None of the mentioned **Ans.:** a

24. For every process there is a _____

a) page table b) copy of page table
c) pointer to page table d) all of the mentioned **Ans.: a**

Fragmentation

As processes are loaded and removed from memory, the free memory space is broken into little pieces. It happens after sometimes that processes cannot be allocated to memory blocks

considering their small size and memory blocks remains unused. This problem is known as Fragmentation.

Paging

A computer can address more memory than the amount physically installed on the system. This extra memory is actually called virtual memory and it is a section of a hard that's set up to emulate the computer's RAM. Paging technique plays an important role in implementing virtual memory.

- ✓ Page Replacement Algorithm
- ✓ First In First Out (FIFO) algorithm
- ✓ Optimal Page algorithm
- ✓ Least Recently Used (LRU) algorithm
- ✓ Page Buffering algorithm
- ✓ Least frequently Used(LFU) algorithm
- ✓ Most frequently Used(MFU) algorithm

25. Which module gives control of the CPU to the process selected by the short-term scheduler?

a) dispatcher b) interrupt
c) scheduler d) none of the mentioned **Ans.:** a

26. Which scheduling algorithm allocates the CPU first to the process that requests the CPU first?

a) first-come, first-served scheduling b) shortest job scheduling
c) priority scheduling d) none of the mentioned **Ans.:** a

27. In priority scheduling algorithm _____

a) CPU is allocated to the process with highest priority
b) CPU is allocated to the process with lowest priority
c) Equal priority processes can not be scheduled
d) None of the mentioned **Ans.:** a

28. Which algorithm is defined in Time quantum?

a) shortest job scheduling algorithm b) round robin scheduling algorithm
c) priority scheduling algorithm d) multilevel queue scheduling algorithm **Ans.:** b

29. Which one of the following can not be scheduled by the kernel?

a) kernel level thread b) user level thread
c) process d) none of the mentioned **Ans.:** b

30. Memory management scheme by which a computer stores and retrieves data from secondary storage for use in main memory is ------ *[Com bank- SO(IT/ICT)-2018]*

a)Paging b)Scheduling c)Batch processin d)Virtual storage **Ans.:** a

31. Deadlock in Operating System

A process in operating systems uses different resources and uses resources in following way.

1) Requests a resource
2) Use the resource
2) Releases the resource

Deadlock is a situation where a set of processes are blocked because each process is holding a resource and waiting for another resource acquired by some other process.

Deadlock can arise if following four conditions hold simultaneously (Necessary Conditions)

Mutual Exclusion: One or more than one resource are non-sharable (Only one process can use at a time)

Hold and Wait:A process is holding at least one resource and waiting for resources.

No Preemption: A resource cannot be taken from a process unless the process releases the resource.

Circular Wait:A set of processes are waiting for each other in circular form.

Methods for handling deadlock

There are three ways to handle deadlock

- ✓ Deadlock prevention or avoidance:
- ✓ Deadlock detection and recovery:
- ✓ Ignore the problem all together:

Banker's algorithm is the deadlock avoidance algorithm

32. ...occur commonly in multi-tasking when two or more threads waiting for each other.

a) Kernel b) Shell c) Fork d) Deadlock **Ans.: d**

33. Multi Threaded programs are----------[Com bank- AP-2018]

a)Lesser prone to deadlocks b) more porn to deadlocks
c) not at all prone to deadlock d) always results in deadlocks **Ans.:** b

34. A system is in the safe state if _____

a) the system can allocate resources to each process in some order and still avoid a deadlock
b) there exist a safe sequence
c) all of the mentioned
d) none of the mentioned **Ans.:** a

35. The circular wait condition can be prevented by _____

a) defining a linear ordering of resource types
b) using thread
c) using pipes
d) all of the mentioned **Ans.:** a

36. Which one of the following is the deadlock avoidance algorithm?

a) banker's algorithm b) round-robin algorithm

c) elevator algorithm d) karn's algorithm **Ans.:** a

37. What is the drawback of banker's algorithm?

a) in advance processes rarely know how much resource they will need

b) the number of processes changes as time progresses

c) resource once available can disappear

d) all of the mentioned

Ans.: d

38. To avoid deadlock _____

a) there must be a fixed number of resources to allocate

b) resource allocation must be done only once

c) all deadlocked processes must be aborted

d) inversion technique can be used

Ans.: a

Some important Questions:

☞ **What are the different operating systems?**

- ✓ Batched operating systems
- ✓ Distributed operating systems
- ✓ Timesharing operating systems
- ✓ Multi-programmed operating systems
- ✓ Real-time operating systems

☞ **What is a socket?**

A socket is used to make connection between two applications. Endpoints of the connection are called socket.

☞ **What do you mean by a process?**

An executing program is known as process. There are two types of processes:

- ✓ Operating System Processes
- ✓ User Processes

☞ **What are the different states of a process?**

A list of different states of process:

- ✓ New Process
- ✓ Running Process
- ✓ Waiting Process
- ✓ Ready Process
- ✓ Terminated Process

- ☞ **What is the difference between micro kernel and macro kernel?**
- ✓ **Micro kernel:** micro kernel is the kernel which runs minimal performance affecting services for operating system. In micro kernel operating system all other operations are performed by processor.
- ✓ **Macro Kernel:** Macro Kernel is a combination of micro and monolithic kernel.
- ☞ **What is the advantage of a multiprocessor system?**

As many as processors are increased, you will get the considerable increment in throughput. It is cost effective also because they can share resources. So, the overall reliability increases.

- ☞ **What is virtual memory?**

Virtual memory is a very useful memory management technique which enables processes to execute outside of memory. This technique is especially used when an executing program cannot fit in the physical memory.

- ☞ **What is RAID? What are the different RAID levels?**

RAID stands for Redundant Array of Independent Disks. It is used to store the same data redundantly to improve the overall performance.
Following are the different RAID levels:

- ✓ RAID 0 - Stripped Disk Array without fault tolerance
- ✓ RAID 1 - Mirroring and duplexing
- ✓ RAID 2 - Memory-style error-correcting codes
- ✓ RAID 3 - Bit-interleaved Parity
- ✓ RAID 4 - Block-interleaved Parity
- ✓ RAID 5 - Block-interleaved distributed Parity
- ✓ RAID 6 - P+Q Redundancy

Previous Year Questions

39. The maximum number of processes that can be in ready state in computer system with n CPU's is— *[Com. bank(officer)-2019]*

a) n b) n^2 c) 2n d) indepent of n **Ans.:** d

40. In UNIX, processes that have finished execution but have not yet had their status collected are known as- *[Com. bank(officer)-2019]*

a) Sleeping processes b) Stopped processes
c) Zombie processes d) Orphan processes **Ans.:** c

41. In UNIX. the login prompt can be changed by changing the content of the file - *[Com. bank(officer)-2019]*

a) getydefs b) contrab c) initab d) init **Ans.: b**

42. Which of the following UNIX commands allows scheduling a program to be executed at specifies time?

a) nice b) cron c) date and time d) schedule **Ans.: b**

43. Which of the following is major part of time taken when accessing data on the disk?

[Com. bank(officer)-2019]

a) Settle time b) Rotational delay c) Waiting time d) Seek time **Ans.: d**

44. Which O/S is recommended for real time system? *[Com bank- AME-2018]*

a) Windows b) Unix c) Oracle d) C/OS **Ans.: a**

45. Which one of the following is not a real time operating system?

a) VxWorks b) Windows CE c) RTLinux d) Palm OS ` **Ans.:**d