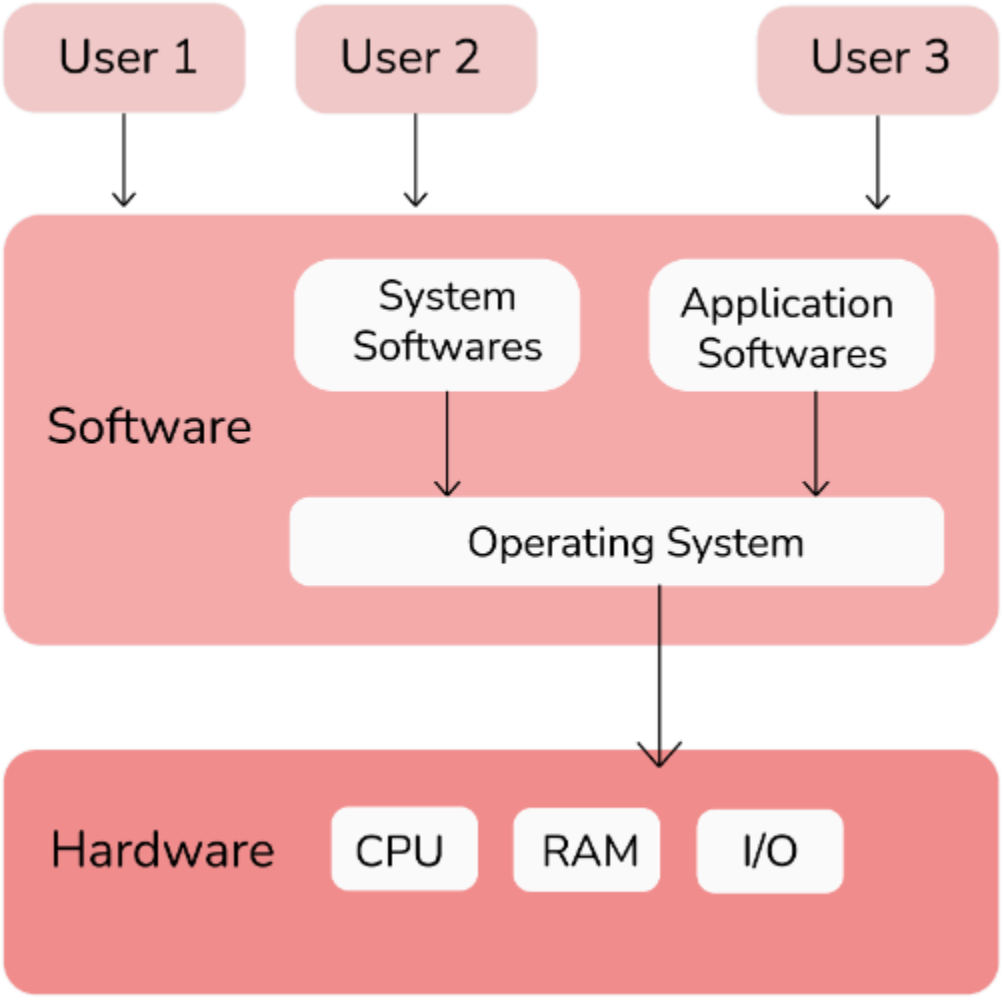
Operating Systems

@bzlearnin

Operating System (OS) is basically a software program that manages and handles all resources of a computer such as hardware and software.



Basic Questions

1. **What is an operating system?**
    - Answer: An operating system (OS) is system software that manages computer hardware and software resources, providing services for computer programs.

2. **What are the main functions of an operating system?**
    - Answer: The main functions include resource management, process management, file system management, security and access control, user interface management, and networking.

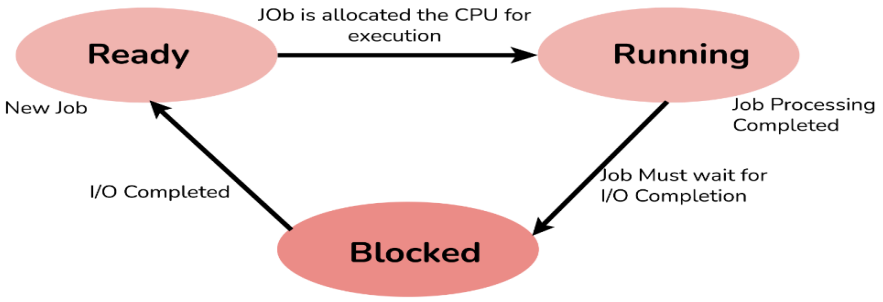
3. **What is a process?**
    - Answer: A process is a program in execution, including the program code, current activity, process stack, and data section.

4. **What is a thread?**
    - Answer: A thread is the smallest unit of a process that can be scheduled for execution, sharing resources like memory with other threads within the same process.

5. **What is the difference between a process and a thread?**
    - Answer: A process is an independent program with its own memory space, while a thread is a smaller unit within a process that shares the same memory and resources but can run independently.

6. **What is the main objective of multiprogramming?**
    - Answer:It refers to the ability to execute or perform more than one program on a single processor machine. This technique was introduced to overcome the problem of underutilization of CPU and main memory. In simple words, it is the coordination of execution of various programs simultaneously on a single processor (CPU). The main objective of multiprogramming is to have at least some processes running at all times. It simply improves the utilization of the CPU

as it organizes many jobs where the CPU always has one to execute.



Three Different Stages Of Job

Multiprogramming System

7. **What is multitasking?**
   - Answer: Multitasking is the ability of an operating system to execute multiple tasks (processes) concurrently by sharing CPU time.

8. **What is a kernel?**
   - Answer: The kernel is the core part of an operating system that manages system resources, handles system calls, interrupts, and hardware communication.

9. **What is virtual memory?**
   - Answer: Virtual memory is a memory management technique that creates an illusion of a large, continuous memory space by using disk storage to extend physical memory.

10. **What is a deadlock?**
    - Answer: A deadlock is a situation where two or more processes are unable to proceed because each is waiting for the other to release a resource.

11. **What are the necessary conditions for a deadlock to occur?**
    - Answer: Mutual exclusion, hold and wait, no preemption, and circular wait.

Intermediate Questions

11. How can deadlocks be prevented or avoided?

- Answer: By ensuring one of the necessary conditions does not hold, using deadlock prevention techniques, deadlock avoidance algorithms, or detecting and recovering from deadlocks.

12. What is paging?

- Answer: Paging is a memory management scheme that eliminates the need for contiguous allocation of physical memory by dividing it into fixed-sized blocks called pages.

13. What is a file system?

- Answer: A file system is a method and data structure used by an operating system to manage files on a disk or partition.

14. What is a context switch?

- Answer: A context switch is the process of saving the state of a currently running process or thread and restoring the state of a different process or thread.

15. What are system calls?

- Answer: System calls are the interface between a process and the operating system, providing the means by which a process can request services from the kernel.

16. What is a monolithic kernel?

- Answer: A monolithic kernel is a type of kernel where all operating system services run in kernel space, including device drivers, file system management, and network stacks.

17. What is a microkernel?

- Answer: A microkernel is a minimalistic kernel design where core functionalities run in kernel space, while other services run in user space, aiming to improve modularity and stability.

18. What is swapping?

- Answer: Swapping is a memory management technique where processes are moved between main memory and disk storage to manage limited physical memory.

19. What is the difference between a logical address and a physical address?

- Answer: A logical address is a reference generated by the CPU, while a physical address is the actual location in memory, translated by the memory management unit (MMU).

20. What is segmentation?

- Answer: Segmentation is a memory management technique dividing memory into variable-sized segments based on logical divisions of a program, like functions or data structures.

Advanced Questions

21. What is a real-time operating system (RTOS)?

- Answer: An RTOS is designed to handle real-time applications that process data as it comes in, typically without buffer delays.

22. What is a distributed operating system?

- Answer: A distributed operating system manages a group of distinct computers and makes them appear to be a single computer.

23. What is the purpose of the page replacement algorithm?

- Answer: Page replacement algorithms decide which memory pages to swap out when a new page needs to be brought into memory, ensuring efficient use of physical memory.

24. What is thrashing in operating systems?

- Answer: Thrashing occurs when a system spends more time swapping pages in and out of memory than executing processes, severely degrading performance.

25. What is demand paging?

- Answer: Demand paging is a memory management scheme where pages are loaded into memory only when they are needed, rather than in advance.

26. What are interrupts and how do they work?

- Answer: Interrupts are signals to the processor indicating that it should stop its current activities and execute the corresponding interrupt service routine. They handle events like hardware actions or software exceptions.

27. What is the difference between preemptive and non-preemptive scheduling?

- Answer: Preemptive scheduling allows the operating system to interrupt and switch processes, while non-preemptive scheduling lets a process run until it completes or voluntarily yields control.

28. What is the purpose of the bootloader?

- Answer: A bootloader is a small program that loads the operating system into memory when the computer starts, initializing the system and handing control over to the OS.

29. What is a hypervisor?

- Answer: A hypervisor, or virtual machine monitor (VMM), allows multiple operating systems to share a single hardware host by providing each OS with its own virtual machine environment.

30. What is the difference between a hard link and a soft link in file systems?

- Answer: A hard link is a directory entry that associates a name with a file on a file system, while a soft link (symbolic link) is a pointer to another file name, creating a link at the file system level.

Expert Questions

31. What is the difference between a daemon and a service?

- Answer: A daemon is a background process running on Unix-like systems, while a service typically refers to background processes on Windows systems.

32. What is process synchronization?

- Answer: Process synchronization is a mechanism to control the sequence of process execution to ensure correct data sharing and consistency in concurrent processing environments.

33. What is the critical section problem?

- Answer: The critical section problem involves ensuring that multiple processes or threads do not access shared resources simultaneously in a way that leads to conflicts or inconsistencies.

34. What is an inode in a file system?

- Answer: An inode is a data structure on a filesystem that stores information about a file or a directory, such as its size, ownership, permissions, and pointers to its data blocks.

35. What is the difference between synchronous and asynchronous I/O?

- Answer: Synchronous I/O operations wait for data transfer to complete before proceeding, while asynchronous I/O operations allow the program to continue executing while the data transfer occurs.

36. What is the difference between a compiler and an interpreter?

- Answer: A compiler translates an entire program into machine code before execution, while an interpreter translates and executes code line-by-line at runtime.

37. What is an orphan process?

- Answer: An orphan process is a process whose parent process has terminated, causing it to be adopted by the init process in Unix-like operating systems.

38. What is a zombie process?

- Answer: A zombie process is a process that has completed execution but still has an entry in the process table, allowing the parent process to read its exit status.

39. What is the difference between segmentation fault and page fault?

- Answer: A segmentation fault occurs when a process tries to access memory that it is not allowed to, while a page fault occurs when a process accesses a page that is not currently in memory, triggering a page-in operation.

40. What is the purpose of load balancing in operating systems?

- Answer: Load balancing distributes workloads across multiple resources (like CPUs, disks) to ensure optimal resource use, maximize throughput, and avoid overloading any single resource.