

## TUGAS SISTEM OPERASI

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1. What are the three main purposes of an operating system?
2. How does the distinction between kernel mode and user mode function as a rudimentary form of protection (security)?
3. Some CPUs provide for more than two modes of operation. What are two possible uses of these multiple modes?
4. Give two reasons why caches are useful. What problems do they solve? What problems do they cause? If a cache can be made as large as the device for which it is caching (for instance, a cache as large as a disk), why not make it that large and eliminate the device?
5. Distinguish between the client–server and peer-to-peer models of distributed systems.
6. How do clustered systems differ from multiprocessor systems? What is required for two machines belonging to a cluster to cooperate to provide a highly available service?
7. Which network configuration—LAN or WAN—would best suit the following environments?
  1. A campus student union
  2. Several campus locations across a statewide university system
  3. A neighborhood
8. Describe some of the challenges of designing operating systems for mobile devices compared with designing operating systems for traditional PCs.

Answer :

1.
  - a) **Resource Management:** The operating system organises and manages computer resources such as CPU, memory, storage devices, and input/output devices.
  - b) **User Interface:** The operating system provides a user interface that allows users to interact with the computer efficiently and intuitively.
  - c) **Running Applications:** The operating system provides a stable environment for running various software applications, ensuring compatibility and good process management.

2.

a) **Kernel Mode:**

- The operating system has full control over the computer.
- Full access to hardware and resources.
- Errors in this mode can cause the entire system to fail.

b) **User Mode:**

- Used by user applications.
- Access is limited and must go through the operating system.
- Errors in this mode only disrupt the application, not the entire system.

3.

a) **User Mode:** For running applications or programmes that do not require access to sensitive hardware or memory.

b) **Supervisor Mode:** For tasks that require higher permissions such as access to critical hardware, memory, and operating system functions.

4.

a) **Two reasons why caches are useful:**

- **Speed:** Caches store frequently accessed data, making it quicker to retrieve this data instead of fetching it from the main memory or disk every time. This significantly reduces access time and improves overall system performance.
- **Efficiency:** By reducing the number of accesses to the slower main memory or disk, caches help decrease the overall load on these devices, which can improve system efficiency and lifespan.

b) **Problems solved by caches:**

- **Reduced Latency:** Quicker data access leads to faster response times and a smoother user experience.
- **Lowered Workload on Main Memory/Disk:** With fewer requests to the main memory or disk, these resources can operate more efficiently and with less wear and tear.

c) **Problems caused by caches:**

- **Cache Misses:** When data is not found in the cache, it can lead to delays as the system needs to fetch data from the main memory or disk.
- **Consistency Issues:** Ensuring that the data in the cache is up-to-date with the main memory or disk can be challenging and might require complex coherence protocols.

d) **Why not make the cache as large as the device?**

Making the cache as large as the device isn't practical because:

- **Cost:** Larger caches are much more expensive to implement due to the higher cost of faster memory technologies.
- **Complexity:** Managing a large cache is more complex and can introduce significant overhead in maintaining and accessing data.

5.

a) **Client–Server:**

- **Structure:** There are one or more servers providing services, and multiple clients requesting services.
- **Central Control:** The server controls and manages resources and services.
- **Example:** Websites where the server stores data, and the clients (users) request web pages.

b) **Peer-to-Peer (P2P):**

- **Structure:** All nodes (or "peers") have equal roles and can act as both clients and servers.
- **Decentralization:** There is no central control; each peer can share resources directly with other peers.
- **Example:** File-sharing networks like BitTorrent where each user can upload and download files.

6.

a) **Clustered Systems:**

- **Structure:** Consist of multiple independent computers (nodes) working together as a single system.
- **Cooperation:** Nodes communicate over a network to share resources and tasks.
- **Use Case:** Ideal for providing high availability and load balancing.

b) **Multiprocessor Systems:**

- **Structure:** Consist of a single computer with multiple processors (CPUs) sharing the same memory and resources.
- **Cooperation:** Processors work in tandem to execute tasks faster.
- **Use Case:** Suitable for tasks requiring parallel processing within a single machine.

c) **For two machines in a cluster to cooperate for high availability:**

- **Network Communication:** Reliable and fast communication between the nodes.
- **Redundancy:** Duplication of critical components and services to prevent downtime.
- **Synchronization:** Keeping data and processes consistent across nodes.
- **Failover Mechanism:** Automatic transfer of tasks from a failed node to an operational one to maintain service continuity.

7.

- a) **A campus student union:**
  - **LAN (Local Area Network):** Best for a single building or small area.
- b) **Several campus locations across a statewide university system:**
  - **WAN (Wide Area Network):** Best for connecting multiple buildings across a large distance.
- c) **A neighborhood:**
  - **LAN:** Suitable for connecting devices within a home.
  - **WAN:** Used by Internet Service Providers to connect multiple homes.

8.

- Designing operating systems for mobile devices has some unique challenges:
  - **Limited Power:** Mobile devices have less power and memory than PCs.
  - **Battery Management:** The OS must save battery life.
  - **Touch Interface:** Mobile OS uses touchscreens, unlike PCs which use keyboards and mice.
  - **Network Changes:** Mobile devices switch between Wi-Fi and cellular networks often.
  - **Security:** Mobile devices need strong security due to higher risk of theft.