

When a system call is invoked by an application, the operating system switches operation from **user** mode to **kernel** mode to execute the call.

Process management allows multiple programs to run “together”.
Memory management allows secondary storage to be used as extension of RAM
File management allows hard disks to be used efficiently.

Types of cache mapping

- Direct-Mapped: each memory block is mapped to exactly one cache block using a specific index derived from the block number (Cache index=Block number%Number of cache blocks)
- Fully Associative: any memory block can be loaded into any cache block , has Replacement policy : either FIFO (First-In-First-Out) OR LRU (Least Recently Used)
- Set-Associative: Balanced approach, reducing conflicts while managing complexity

LRU
To replace memory block in cache size 4 of [1, 5, 6, 4] if incoming is 2 , since 1 is LRU , remove 1 , [5, 6, 4] , add 2 in so [5, 6, 4, 2]

Cache is used to make slow main memory appear fast. It is managed by the **hardware** and is transparent to the programmer
Virtual memory is used to make small main memory appear bigger. It is managed by the **Operating System** and is transparent to the programmer.

ACID:

Atomicity: Either all or none are executed (eg. Bank transaction)

Consistency: Ensure consistent data type , Transactions should maintain the integrity of the database by adhering to all defined rules, constraints, and relationships

Isolation: Ensures that transactions happening at the same time do not affect each other(eg. 2 bank transactions at the same time on same account)

Durability: Guarantees that once a transaction is committed, its changes are permanent even in cases of power loss, crashes, or errors.

Consider a set-associative cache, with two cache sets containing two cache blocks each. Memory blocks in the form $2n + k$ are mapped to cache set k , and the least recently used block within the set is replaced.

Basically means there are two sets [] [] ,each set 2 cache block space eg.[0, 6] [5, 3] one stores even another stores odd