Data on External Storage

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Storage System

- The storage system in a DBMS refers to the hierarchical arrangement of storage devices and media to store, manage, and retrieve data efficiently.
- The system is designed to handle different storage capacities, access speeds, volatility, and costs.

Storage System Hierarchy in DBMS

A typical hierarchy from fastest (and usually most expensive per byte) to slowest (and usually least expensive per byte) is as follows:

Registers

- Located within the CPU.
- Smallest and fastest type of storage.
- Used to hold data currently being processed.

Cache Memory (L1, L2, L3 caches)

- On or very close to the CPU.
- Extremely fast but small in size.
- Acts as a buffer for frequently used data.

Storage System Hierarchy in DBMS

Main Memory (RAM)

- Data that's actively being used or processed is loaded here.
- Faster than secondary storage.
- Volatile in nature (i.e., data is lost when power is turned off).

Flash Storage (Solid State Drives - SSD)

- No moving parts.
- Faster than traditional hard drives.
- More durable and reliable.

Magnetic Disks (Hard Disk Drives - HDD)

- Primary secondary storage medium.
- Non-volatile, persistent storage.
- Data is stored in tracks, sectors, and cylinders.
- Slower than main memory but offers a large storage capacity at a lower cost.

Storage System Hierarchy in DBMS

Optical Disks (CD, DVD, Blu-Ray)

- Data is read using lasers.
- Slower than magnetic disks and have less storage capacity.
- Portable and commonly used for media and software distribution.

Magnetic Tapes

- Sequential access storage, unlike disks(random access).
- Often used for backups and archiving due to their high capacity and low cost.
- Much slower access times compared to magnetic disks.

Remote Storage/Cloud Storage

- Data stored in remote servers and accessed over the internet.
- Provides scalability, availability, and fault-tolerance.
- Latency depends on network speed and distance to servers.

Types of Storage

Primary Storage:

- Includes registers, cache memory, and main memory (RAM).
- It's the main memory where the OS, application programs, and data in current use are kept for quick access by the processor.

Secondary Storage:

- Data storage devices like HDDs, SSDs, CDs, and USB drives.
- It is non-volatile and retains data even when the computer is turned off.

Tertiary Storage or Off-line Storage:

- Often involves magnetic tape systems or optical disk archives.
- Slower than secondary storage, used for data archiving and backup.

Quaternary Storage: cloud storage where data is stored in remote servers and is fetched over the internet or other networks.