SNS COLLEGE OF ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE NAME : 23CST207 - DATABASE MANAGEMENT SYSTEMS

II YEAR / IV SEMESTER

Unit 5- Physical Storage and MongoDB
Topic 1 : STORAGE AND FILE STRUCTURE

STORAGE AND FILE STRUCTURE

- Overview of Physical Storage Media
- Magnetic Disks
- RAID
- Tertiary Storage
- Storage Access
- File Organization
- Organization of Records in Files
- Data-Dictionary Storage
- Storage Structures for Object-Oriented Databases

Classification of Physical Storage Media

- Several types of storage medias are exist in computer system. They are classified into different types

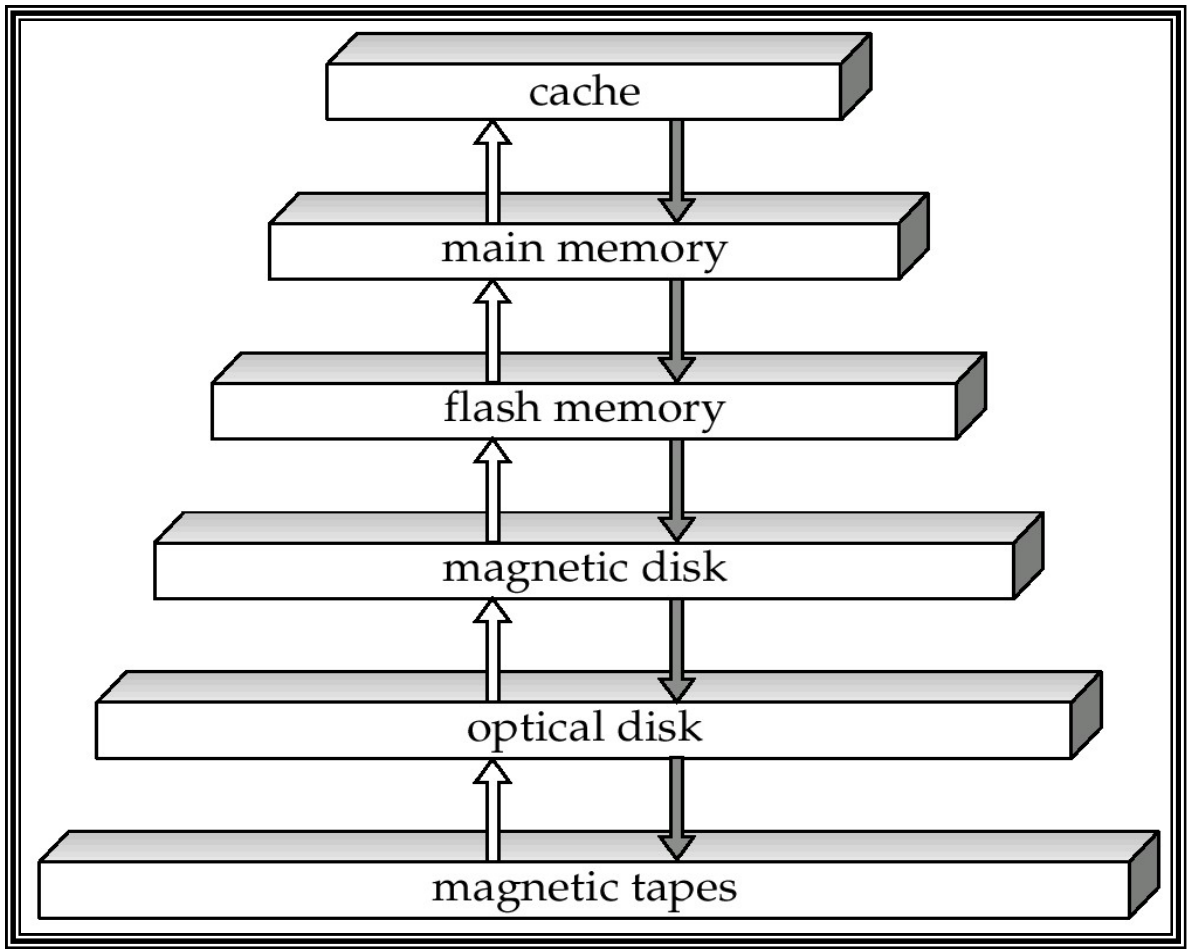
1. Accessing speed
2. Cost per unit of data
3. Reliability

- Speed with which data can be accessed
- Cost per unit of data
- Reliability
  - data loss on power failure or system crash
  - physical failure of the storage device
- Can differentiate storage into:
  - **volatile storage:** loses contents when power is switched off
  - **non-volatile storage**:
    - Contents persist even when power is switched off.
    - Includes secondary and tertiary storage, as well as batter-backed up main-memory.

Storage Device hierarchy

- The various storage media can be organized in a hierarchy according to their speed and their cost.
- Cache
- Main memory
- Flash memory
- Magnetic disk
- Optical disk
- Magnetic tapes

Storage Hierarchy



- The higher levels are expensive, but are fast. As we move down the hierarchy, the cost per bit decreases, where as the access time increases.
- The storage hierarchy includes 3 main categories.
- Primary storage
  - This category usually provides fast access to data, but has limited storage capacity, it is volatile in nature.
    - Cache and main memory

- Secondary Storage (on_line storage)
  - These device usually have a large capacity, less cost and slower access to data. It is non volatile
  - Eg. Flash memory, magnetic disks.
- Tertiary storage (Off_line storage)
  - This is in the lowest level of hierarchy, non-volatile, slow access time
  - Eg: Magnetic tape, optical storage.

Based on storage volatility they can be classified into 2 types

- Volatile storage
  - Loses the contents when the power to the device is removed.
    - Eg., Main memory and cache.
- Non-Volatile storage
  - Contents persist even when the power is switched off.
    - Eg., Secondary & Tertiary storage devices.

Primary Storage devices

- Cache memory
  - It is the fastest and most costly from of storage. It is volatile in nature. It is managed by computer system hardware.
- Main Memory
  - Fast access, generally two small to store the entire database.
  - Too expensive
  - Capacities of upto a few giga bytes widely used currently.

Flash Memory

- It is present between primary storage and secondary storage in the storage hierarchy.
- It is non volatile memory.
- Accessing speed is as fast as reading data from main memory.
- Widely used in embedded devices such as digital cameras.
- It is also known as EEPROM (Electrically Erasable Programmable Read Only Memory).
- Disadvantage is that an entire block must be erased and written over at a time.

Secondary Storage Devices

- Magnetic Disk
  - Primary Medium for long term storage of data, Typically stores entire database.
  - Data must be moved from disk to main memory for access and written back storage.
  - Much slower access than main memory.
  - Capacities ranges upto 400 Gigabytes currently
  - Much larger capacity than main and flash memory.
  - Disk storage survives power failures and system crashes.
  - Disk failure can destroy data but is very rare.

Tertiary Storage

- Optical Disks
  - CD ROM
  - DVD
  - CD –R and DVD-R
- Magnetic Tapes

- Optical Disks
  - It is non volatile in nature
  - Data is read optically from a spinning disk using a laser.
  - CD-ROM, DVD and Record once versions are most popular from of Optical storage.
- CD ROM (Compact Disk Read only Memory)
  - Disks can be loaded into or removed from a drive
  - High storage capacity (640 MB per disk)
  - Higher seed times or about 100 mseconds.
  - Higher latency (300 RPM) and lower data transfer rates (3 to 6MB/sec) compared to magnetic disks.

- DVD (Digital Video Disk)
  - DVD – 5 hold 4.7 GB and DVD- 9 holds 8.5 GB
  - DVD-10 and DVD-18 are double sided formats with capacities of 9.4 GB and 17 GB
  - Other characteristics similar to CD-ROM.
- Record once Versions (CD-R and DVD-R) are becoming popular
  - Data can only be written once, and cannot be erased.
  - High capacity and long lifetime, used for archival storage
  - Multiple write versions also available (CD_RW, DVD-RW)

- Magnetic Tapes
  - Non volatile memory used mainly for backup, for storage of infrequently used information and as an off-line medium for transferring information from one system to another.
  - Holds large volume of data and provides high transfer rates
  - Very slow access time in comparison to magnetic disks and optical
  - Tape jukeboxes used for very large capacity of storage

THANK YOU