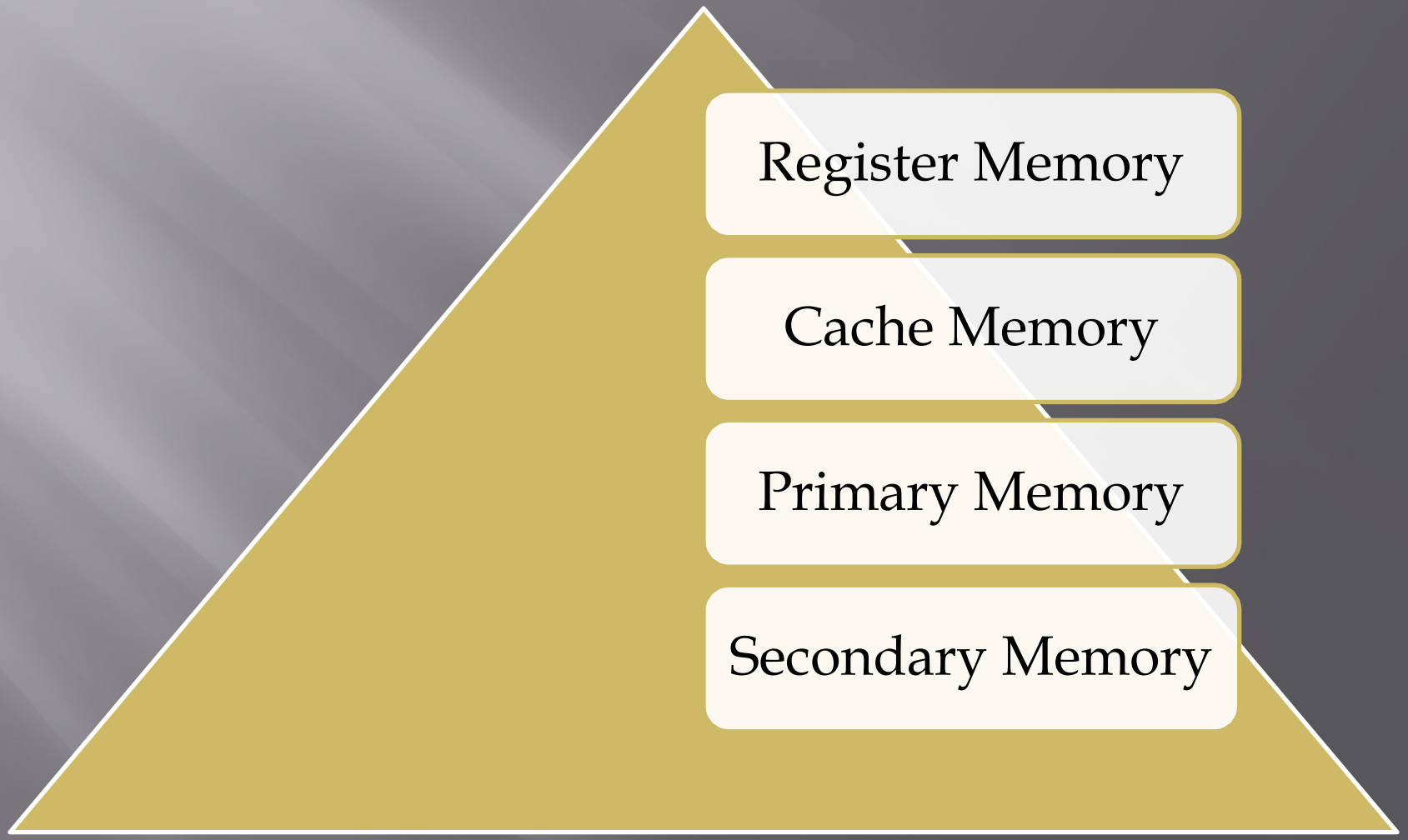
CLASSIFICATION OF MEMORY

Memory Hierarchy



PROCESSOR REGISTERS

- Processor registers are located inside the processor.
- Each register stores a word of data (32/64 bit).
- Registers are fastest among all types of computer data storage

CACHE MEMORY

- It is intermediate form of storage between registers and RAM.
- The recent instructions and data are stored in cache memory.
- If a data or instruction is to be loaded into control unit, it is checked whether it is available in cache memory.
- If it is not available there, then the data or instruction is read from primary memory and the instruction or data read is copied to cache memory.
- When the same piece of data/instruction is needed again, the CPU reads it from the cache memory instead of main memory

PRIMARY MEMORY

- It may be ROM(Read Only Memory) or
- RAM(Random Access Memory).

ROM

- We cannot change content of ROM.
- It is non-Volatile.
- It contain BIOS (Basic Input Output system).
- It also contains instructions to load OS into RAM.
- PROM(Programmable ROM): Programmable once with high voltage.
- EPROM(Erasable PROM): Content can be erased by ultraviolet ray.
- EEPROM(Electrically Erasable PROM):Content can be erased by electric Current.

RAM

- Access time for any word from RAM is same, so it is called Random Access Memory.
- It is also called read write memory, because we can perform both read write operation into RAM.
- RAM is two types

  1. Static Ram
  2. Dynamic Ram

Dynamic RAM

- To store a bit the circuit contains a transistor and capacitor.
- To read a bit the transistor checks for a charge in capacitor. If a charge is present then reading is 1 otherwise reading is 0.
- However the problem with DRAM is that the capacitor leaks energy very quickly and can hold charge for only fraction of second.
- Therefore a refresh process is required to maintain the charge in the capacitor so that it can retain the information.
- It can store more data per chip and it is cheap. It generates less heat

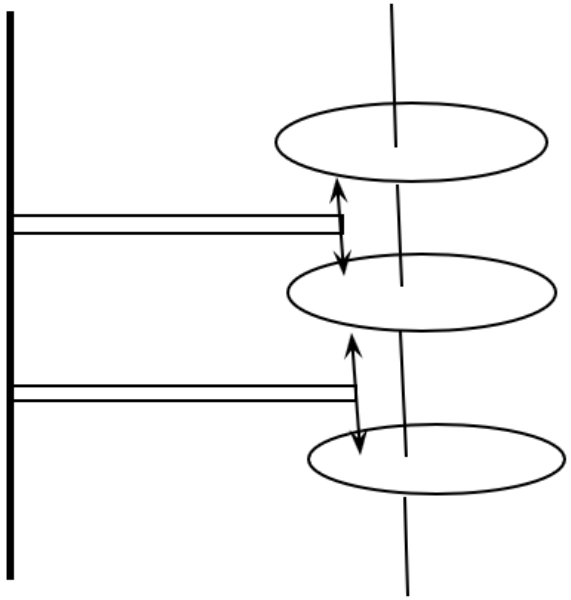
Static Ram

- Capacitor is not used in Static Ram.
- It does not need refresh.
- It is made of D-flip-flops.
- It occupies more space than Dynamic RAM, and is expensive.
- It is faster and more reliable.

SECONDARY STORAGE DEVICES

- HARD DISK
- DVD (Digital Versatile Disk) ROM

Hard Disk



- It stores all programs and files.
- It contains set of disks.
- Information is recorded in concentric circles called tracks. The track is divided into segments called sectors.
- Set of tracks of same radius forms a cylinder.
- The read write head can move from one cylinder to another cylinder.
- Time to position read write head on required cylinder is called seek time(10- 100ms).
- Time to bring the read write head over the target sector is called latency time(4ms).
- Time to transfer data is called transfer time

Calculating Hard disk Capacity

- Given
- No of Disks = 9 => No of surfaces = 16 = 2^4
- No of tracks per surface = 2048 = 2^11
- No of sectors per track = 1024 = 2^10
- Size of sector = 16 KB = 2^4 KB
- => Disk Capacity = 2^(4+11+10+4) KB
  = 2^(29) KB = 2^9 GB
  = 512 GB

DVD (Digital Versatile Disk) ROM

- An optical storage media consists of a flat, round portable metal disk.
- The disk is coated with highly reflective material.
- It stores data in the form of pits and lands.
- Pits are tiny reflective bumps created with a laser beam and lands are flat areas.
- Land reflects the laser light and reads 1 while a pit absorbs the light it is red as 0.

Reading of data from DVD