




PRESENTATION ON MEMORY HIERARCHY

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MEMORY HIERARCHY IN COMPUTER APPLICATION

AN OVERVIEW OF MEMORY HIERARCHY IN COMPUTER SYSTEMS

INTRODUCTION



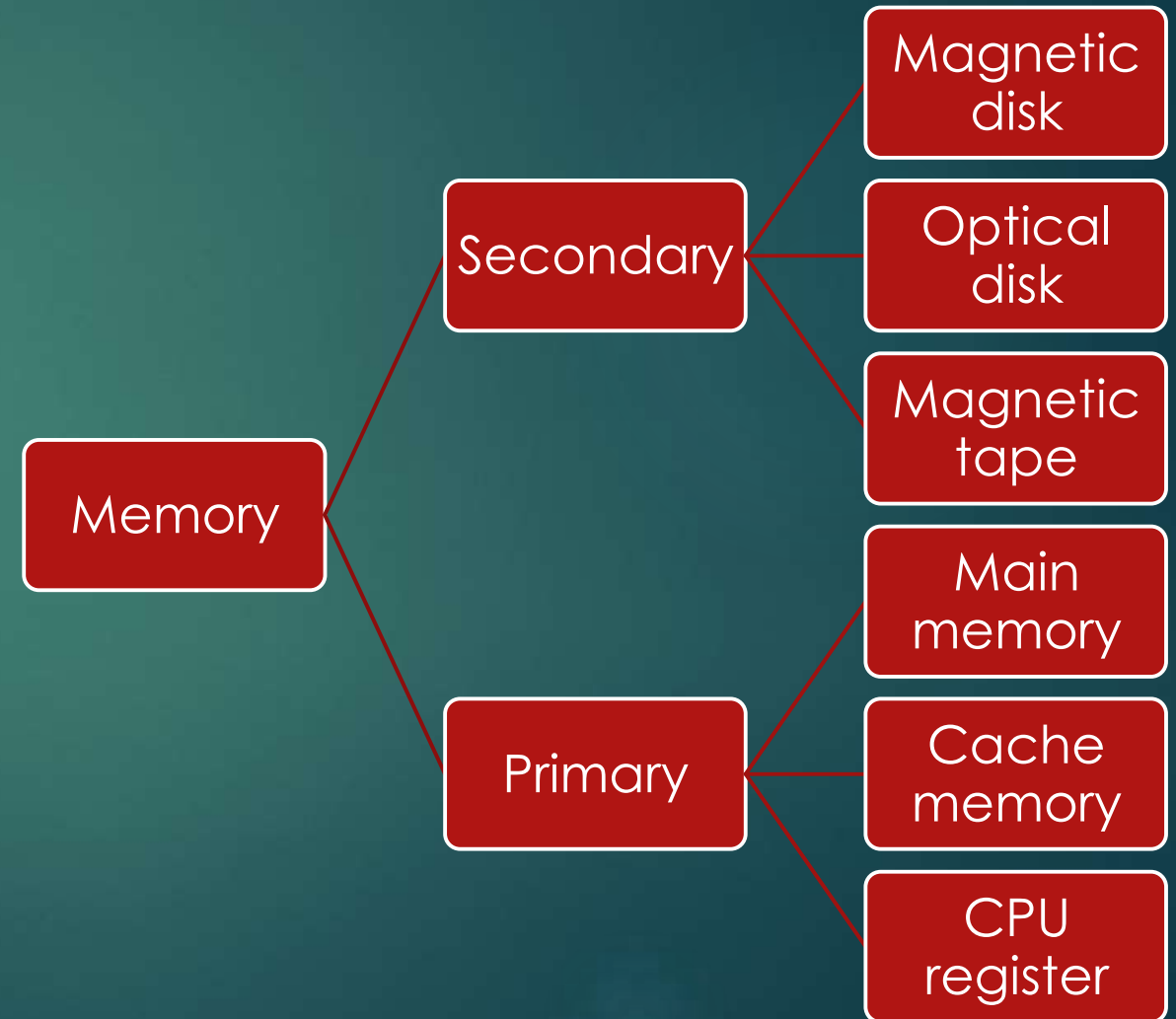
MEMORY HIERARCHY REFERS TO THE ARRANGEMENT OF DIFFERENT TYPES OF MEMORY IN A COMPUTER SYSTEM, ORGANIZED IN A HIERARCHY BASED ON SPEED AND COST.

MEMORY HIERARCHY IS AN ENHANCEMENT TO ORGANIZE THE MEMORY SUCH THAT IT CAN MINIMIZE THE ACCESS TIME. THE MEMORY HIERARCHY WAS DEVELOPED BASED ON A PROGRAM BEHAVIOR KNOWN AS LOCALITY OF REFERENCES.

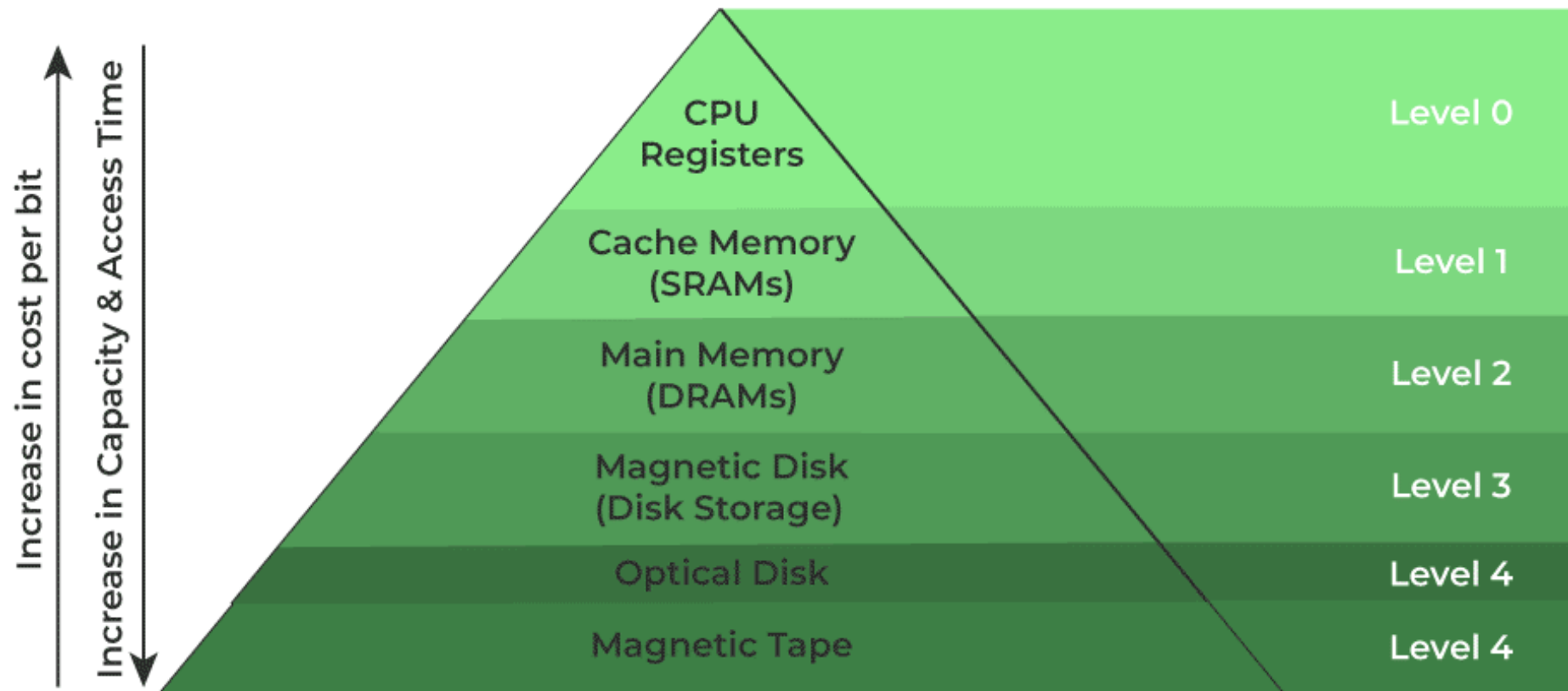
TYPES OF MEMORY

This Memory Hierarchy Design is divided into 2 main types:

- Primary - directly accessible by the processor
- Secondary - accessible by the processor via an I/O Module



The figure below clearly demonstrates the different levels of the memory hierarchy.



Memory Hierarchy Design

MAGNETIC DISK

Magnetic Disk are simply circular plates that are fabricated with either a metal or a plastic or a magnetized material. The Magnetic disks work at a high speed inside the computer and these are frequently used.



MAGNETIC TAPE



Magnetic tape is simply a magnetic recording device that is covered with a plastic film. It is generally used for the backup of data. In the case of a magnetic tape, the access time for a computer is a little slower and therefore, it requires some amount of time for accessing the strip.

In magnetic tape only one side of the ribbon is used for storing data. It is sequential memory which contains thin plastic ribbon to store data and coated by magnetic oxide. Data read/write speed is slower because of sequential access. It is highly reliable which requires magnetic tape drive writing and reading data.

MAIN MEMORY (RAM)

MAIN MEMORY ALSO KNOWN AS RAM (RANDOM ACCESS MEMORY), IS THE PRIMARY MEMORY OF A COMPUTER SYSTEM. IT HAS A LARGER STORAGE CAPACITY THAN CACHE MEMORY, BUT IT IS SLOWER. MAIN MEMORY IS USED TO STORE DATA AND INSTRUCTIONS THAT ARE CURRENTLY IN USE BY THE CPU.

TWO TYPES OF MAIN MEMORY ARE THERE

- ▶ **Static RAM:** Static Ram stores the binary information in flip flops and information remains valid until power is supplied. It has a faster access time and is used in implementing cache memory. It is generally large in size.
- ▶ **Dynamic RAM:** It stores the binary information as a charge on the capacitor. It requires refreshing circuitry to maintain the charge on the capacitors after a few milliseconds. It contains more memory cells per unit area as compared to SRAM. It is generally smaller in size.

CACHE MEMORY

CACHE MEMORY IS A SMALL, FAST MEMORY UNIT LOCATED CLOSE TO THE CPU. IT STORES FREQUENTLY USED DATA AND INSTRUCTIONS THAT HAVE BEEN RECENTLY ACCESSED FROM THE MAIN MEMORY. CACHE MEMORY IS DESIGNED TO MINIMIZE THE TIME IT TAKES TO ACCESS DATA BY PROVIDING THE CPU WITH QUICK ACCESS TO FREQUENTLY USED DATA.

REGISTERS

REGISTERS ARE SMALL, HIGH-SPEED MEMORY UNITS LOCATED IN THE CPU. THEY ARE USED TO STORE THE MOST FREQUENTLY USED DATA AND INSTRUCTIONS. REGISTERS HAVE THE FASTEST ACCESS TIME AND THE SMALLEST STORAGE CAPACITY, TYPICALLY RANGING FROM 16 TO 64 BITS.

SECONDARY STORAGE

SECONDARY STORAGE IS A NON-VOLATILE MEMORY UNIT THAT HAS A LARGER STORAGE CAPACITY THAN MAIN MEMORY. IT IS USED TO STORE DATA AND INSTRUCTIONS THAT ARE NOT CURRENTLY IN USE BY THE CPU. SECONDARY STORAGE HAS THE SLOWEST ACCESS TIME AND IS TYPICALLY THE LEAST EXPENSIVE TYPE OF MEMORY IN THE MEMORY HIERARCHY.

Characteristics of Memory Hierarchy

1. **Capacity:** It is the global volume of information the memory can store. As we move from top to bottom in the Hierarchy, the capacity increases.
2. **Access Time:** It is the time interval between the read/write request and the availability of the data. As we move from top to bottom in the Hierarchy, the access time increases.
3. **Performance:** Earlier when the computer system was designed without a Memory Hierarchy design, the speed gap increased between the CPU registers and Main Memory due to a large difference in access time. This results in lower performance of the system and thus, enhancement was required. This enhancement was made in the form of Memory Hierarchy Design because of which the performance of the system increases.
4. **Cost Per Bit:** As we move from bottom to top in the Hierarchy, the cost per bit increases i.e. Internal Memory is costlier than External Memory.



THANK YOU