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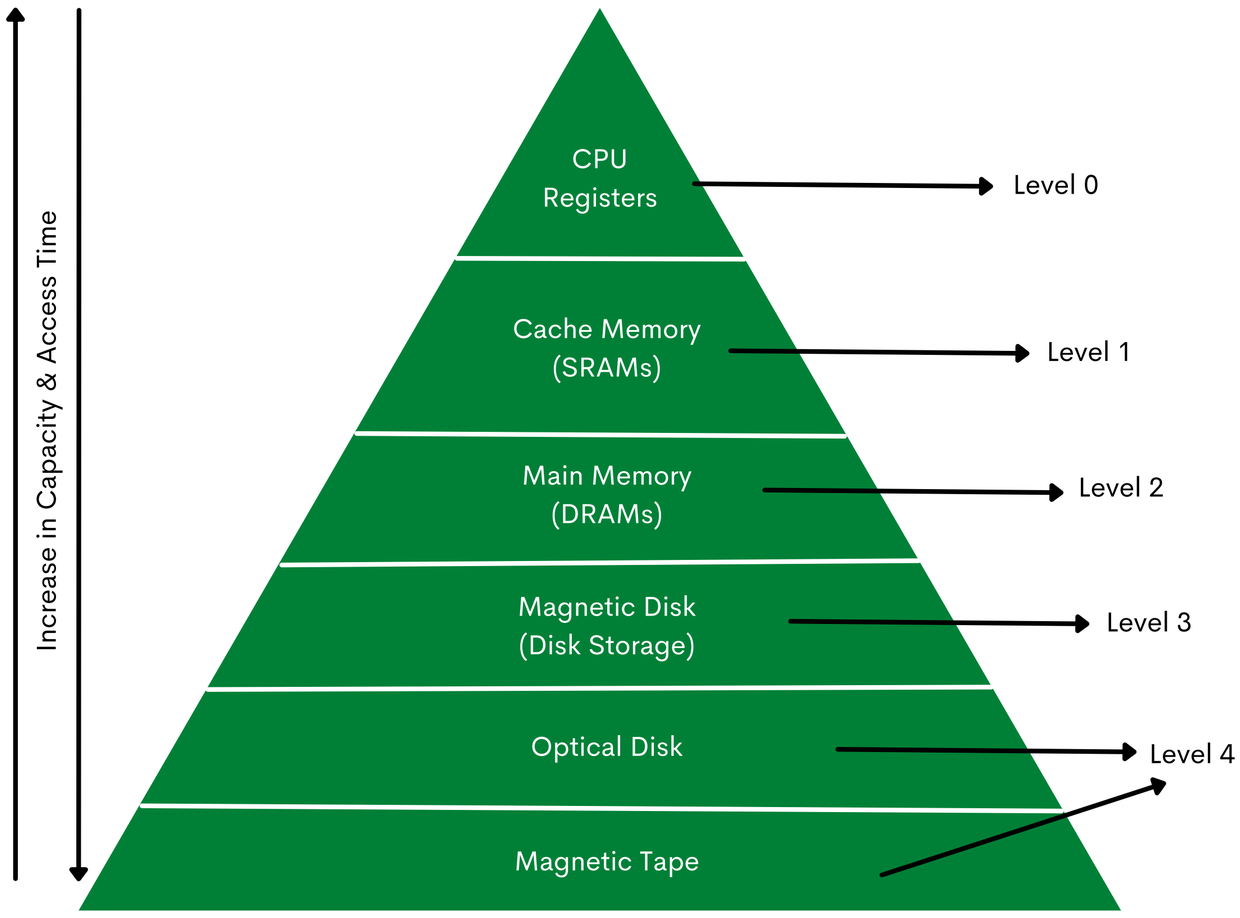
TAE 2

Computer Architecture and Organization

Memory Hierarchy

In the Computer System Design, 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 behaviour known as the locality of references. The figure below clearly demonstrates the different levels of memory hierarchy :



This Memory Hierarchy Design is divided into 2 main types:

1. External Memory or Secondary Memory – Comprising of Magnetic Disk, Optical Disk, Magnetic Tape i.e. peripheral storage devices which are accessible by the processor via I/O Module.

2. Internal Memory or Primary Memory – Comprising of Main Memory, Cache Memory & CPU registers. This is directly accessible by the processor.

We can infer the following characteristics of Memory Hierarchy Design from above figure:

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.

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.

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.

Performance:
This enhancement was made in the form of Memory Hierarchy Design because of which the performance of the system increases. One of the most significant ways to increase system performance is minimizing how far down the memory hierarchy one has to go to manipulate data.

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