International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 01 | January - 2023 Impact Factor: 7.185 ISSN: 2582-3930

Computer Memory

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ABSTRACT

In this Research Paper , the spotlight is on computer memories , their introduction , their types , devices which comes under these types , their history , future advancements , future scope of the memories , currently used memories. This research paper briefly states the most efficient part of any computer that is it's storage limitations and ways to overcome storage issues.

Key Words: computer , memory , primary , secondary.

INTRODUCTION

Computers are efficient because of many features they offer but one of the most important feature would be the ability of it to store data/information. The data/information is stored in the memories.

Memory: Memory is a bank of data and instructions (the orders given to the computer programs by the processor).

The main function of Memory is to store the data and to access it whenever needed

On the basis of storage , there are 2 types of memories:

1. Primary Memory
2. Secondary Memory

Primary Memory: Primary memory is basically the main memory of the computer. Primary memory is basically inbuilt memory which the computers offer.

It consists of ram and rom (random access memory) and (read only memory) respectively and some of its types.

Secondary Memory : Secondary memory is the external memory attached to the computer to provide the facility of additional storage.

Secondary memory is a portable memory which can be easily carried around. The users don't get this advantage in primary memory.

The secondary memory has a large amount of storage capacity which can be used to store a large amount of information/data.

So coming to the types of secondary memory ,there are 2 types of secondary memories:

1. Fixed Storage

2. Removable Storage

DID YOU KNOW?

Like human in computer, memory is said to be brain of computer. Memory is a storage area where data is processed and necessary instructions for processing are stored. In earlier times, memory don't allow to store large amount of data. Let us see how memory was used in earlier time. Earlier, Drum memory was the first memory which was invented by Sir Gustav Tauscheck. These drum memory was the magnetic data storage and was used as computer memory in 1940s. ABC (Atanasoff Berry Computer) was the first computer which was successful in test to use drum memory. Later in 1947, Sir Freddie William & Tom Kilburn invented the Williams-Kilburn tube. This tube was the first high speed &entirely electronic memory. In era of 1950s in 1951 Jay Forrester filed a patent to us magnetic core memory as memory. Ahead in 1955, Konrad Zuse successfully completed his 7^{th} computer model and 1^{st} computer that uses magnetic storage memory as memory. In the era of 1960s, Sir John Schmidt invented SRAM (Static Random Access Memory) & Sir Robert Dennard invented DRAM (Dynamic Random Access Memory) further in 1969 Intel produces 1 kb RAM chip which was the largest storing memory chip till that date. Further in 1970s,Intel releases 256 bytes erasable read only memory(EROM), and ahead EPROM(erasable programmable ROM) , EEPROM(Electrically erasable programmable ROM).In 1980s Fujio Masuoka invented flash memory & apple computers releases their first

computer with 128 kb memory. In 1990s, Samsung invented SDRAM (Synchronous Dynamic RAM). Furter Samsung revealed & released there 1st DDR SDRAM chip of 64 Mbit & furtherly added DDR 2,DDR3, DDR4 to increase the speed of computer & storage of data. DDR4 is the latest memory which was invented in 2014.

MEMORY TYPES:

PRIMARY MEMORY:

Primary memory is a part of computer memory that can be accessed directly by the processor. Storing of the data and information and processing it as soon as possible is done by Primary memory . Primary memory is organized in such a way that access time to process the data by the CPU/processor minimized. Primary memory is greater than cache memory .Generally Primary memory can be classified into two parts.

RAM(Random Access Memory):

A program that needs to be executed at the time is loaded in RAM .RAM is processed by CPU as the instructions given in the program. Like if we click on applications like Browser, firstly browser code will be loaded by the Operating system into the RAM after which the CPU will execute and open up the Browser. Mainly RAM is classified into SRAM (static RAM) and DRAM (Dynamic RAM).

- **DRAM :** Dynamic random access memory (DRAM) is a type of semiconductor memory that is used to store the data or program code needed by a computer processor to function. DRAM is made up of capacitors and transistors and electric charge leaks from capacitors. DRAM is widely used in home PCs and servers. DRAM needs charge and refreshment to store the data

- **SRAM :** SRAM (static RAM) is a type of RAM that retains data bits in its memory as long as power is being supplied. Unlike dynamic RAM which must be continuously refreshed, SRAM does not have this requirement, resulting in better performance and lower power usage. SRAM is commonly used for a computer's cache memory.

ROM (Read only Memory):

Any data that does need any changes and access them as their original form are stored in Read Only Memory. ROM is generally used to store Permanent data that can only be read. As it is Read only memory nothing can be written or no changes can be done in the data stored in ROM. It is non volatile.

There are 4 types of ROM

- **MROM :** Masked ROM are hardwired and pre-programmed ROM. Any content or data that is stored in MROM is only written once cannot be changed anyhow.

- **PROM :** Programmable ROM can be modified once by the user. The user buys a blank PROM and writes the desired content but once written content cannot be Changed.

- **EPROM:** Erasable and Programmable ROM , in this ROM content can be changed by erasing the recent data by exposing EPROM to UV radiation. This exposure to ultra-violet light erases the data on ROM and content can be rewritten on it.

- **EEPROM:** Electrically Erasable and Programmable ROM is a ROM where content can be changed by erasing the initial content which could be easily erased electrically. However, one byte can be erased at a time instead of deleting in one go. So reprogramming of EEPROM is a slow process.

You Should know this !

Data in primary memory can be accessed faster than secondary memory but still, access times of primary memory are generally in few microseconds, whereas CPU is capable of performing operations in nanoseconds. Due to the time lag between accessing data and acting of data performance of the system decreases as the CPU is not utilized properly, it may remain idle for some time. In order to minimize this time gap new segment of memory is Introduced known as Cache Memory.

Cache Memory is present between cpu and main memory. The recently used data or the main part of data is stored in Cache. A faster and smaller segment of memory whose access time is as close as registers are known as Cache memory.

SECONDARY MEMORY:

It is very important to have another form of memory that has a larger storage capacity than the primary memory because of its limitations like minimum capacity of storage and its volatile nature. Secondary memory allows the user to store a large amount of data and the data and programs are not lost when the computer is shut down. Secondary Memory is not directly accessible through the CPU and is non-volatile in nature. The main advantage of Secondary Memory is that it is much more cheaper than the primary memory.

Types of Secondary Memories are:

Fixed Storage

A fixed storage is an inner media device that is used to store data in a computer. It is generally known as fixed disk drives or hard drives. We can remove the fixed storage devices for repairing and upgradation.

Internal flash memory, SSD(solid state disk), HDD (Hard disk drives) are some devices which are of fixed storage type.

- **Internal flash memory:**

  Flash memory was developed from electronically erasable programmable read-only memory(EEPROM). It is a non volatile kind of memory .It keeps the data even if the computer is turned off.

- **Solid State Drive(SSD):**

  These Drives uses flash memory to store the data. Data can be processed internally through parallelism

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- **Hard Disk Drive(HHD):**

  A hard drive or hard disk drive (HDD) is a type of storage device that is used in laptops and desktop computers.An HDD is non-volatile in nature, which means it can retain the stored data even when no power is supplied to the device.

Removable Storage:

Removable storage is an external media device that is used to store data in a computer. Removable storage is generally known as external drives. It is a storage device that can be inserted or removed from the computer according to our requirements. We can easily remove them from the computer system while the computer system is running.

Types of removable Storage are :

- **Optical discs (like CDs, DVDs, Blu-ray discs, etc.):**

  Optical disks uses laser technology for reading and writing data. An early analog optical disc used for video recording was invented by David Paul Gregg in 1958 and patented in the US in 1961 and 1969. This form of optical disc was a very early form of the DVD (U.S. Patent 3,430,966).Optical disks uses laser technology for reading and writing data.

- **Memory cards:**

  A memory card is a type of storage device that is used for storing media and data files. It provides a permanent and non-volatile medium to store data and files from the attached device.

- **Floppy disks:**

  A floppy disk is a magnetic storage disk for computers. The floppy disk is composed of a thin, flexible magnetic disk sealed in a square plastic carrier. In order to read and write data from a floppy disk, a computer system must have a floppy disk drive (FDD).

- **Magnetic tapes:**

  Magnetic tapes are used in most organizations to save data files. Magnetic tapes use a read-write format. Thread-write format defines writing data on or reading data from a magnetic tape.

- **Paper storage (like punched tapes, punched cards, etc.):**

  Paper data storage refers to the use of paper as a data storage device. This includes writing, illustrating, and the use of data that can be interpreted by a machine or is the result of the functioning of a machine.

CURRENTLY MOST USED MEMORIES:

RAM is used as active memory that performs calculations on the data retrieved from storage. One significant difference between RAM and flash memory is that data must be erased from NAND flash memory in entire blocks. Today, the most common type of RAM is DDR-SDRAM, or Double Data Rate Synchronous Dynamic Random-Access Memory. And there are various iterations, including DDR2, DDR3, DDR4, and even DDR5

Flash Memory Devices - storage devices have now replaced both magnetic and optical storage devices. They are easy to use, portable and easily available and accessible. They have become a cheaper and more convenient option to store data.

FUTURE ADVANCEMENTS:

Next-generation memory technology is the advanced storage technology used in the field of computers. Memory technology you might recognize is DRAM, SRAM, and magnetic storage media. Next-generation memory storage has multiple applications – mobile phones, mass storage, computer electronics, and aerospace and defence are just a few of the applications. It's expected that next-gen memory technology will bridge the gap in the current storage hierarchy and deliver data effectively. The emerging technologies are primarily non-volatile and come without the high running costs of DRAM and SRAM. The emerging non-volatile memory technology, such as MRAM, STT-RAM, and FRAM, combines the speed and density of SRAM and DRAM to create more effective memory storage.

NVDIMM, PCM(THE FUTURE) :

Flash is much faster at reading and writing data than a magnetic hard disk, but much slower than DRAM. That brings us to the newest emerging memory technology: phase-change memory (PCM) and its first commercial product, 3D XPoint. With PCM products such as 3D XPoint, the writing of a bit from a 1 to a 0 is handled by electronically flipping the resistance of the individual cell. This makes it potentially much faster than even NAND flash, bordering on the speeds of DRAM. But PCM is nonvolatile, like flash.The goal for some people interested in emerging memory technology is a single memory type for both storage and computing, in which any amount of memory attached to the system can be used for either purpose. New technologies such as PCM promise to bring that goal to reality within the next decade.

CONCLUSION:

This research paper gives detailed information about the computer memories. Computer is incomplete without its memories , Computer memories are a very essential part of any computer and future additions can be made in these memories to store even huge amount of data. Memories have a good scope. Computer memories can be developed in future and are used worldwide.

REFERENCES:

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