

Computer Hardware - An Overview

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Abstract: *The main objective is to discuss and analyze the key components of a computer hardware system and explain each of its functions. The hardware's consists of many important aspects which make it a worthwhile to discuss it.*

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1. Computer Hardware

Computers are used in day to day activities. One of the most important factor used in a computer are its hardware. The hardware is a vital part of a computer. The hardware play a main role in the computation and execution process of a computer. Computers have a tremendous scope for improvement and refinement. The computers always have a scope which can be fully exploited. The components explained below are as following: (1) Computer hardware–A Historical perspective (2) The Peripheral hardware (3)The CPU (4) Conclusion

2. Computer Hardware- A Historical Perceptive

2.1 Initial Application and birth of the system

The first computer hardware were developed for the sole purpose of calculation. In the early 20th century calculation was done only by the humans. As calculation got complex, means to develop a system to make calculation easier was developed. This was how a computer was born. The early computers were used for the the purpose of calculation and evaluation. The first calculation device could be traced back to the 1667. The first device for computation was devised by John Napier. It was based on the slide rule. This device eventually paved way for the modern day development of computer. The Napier bones device was followed by the next break through device “The Difference Engine”. It was designed by Charles Babbage in the 19th century. He is also known as the father of modern day computer. It was the first developed device to have an input and an output. The input was in the form of punched cards. The output was in the printed format . This invention was followed by Analytical engine. This was the first general purpose computer used. It is to be noted that all these system used vacuum tubes. It was only in 1947 that a transistor replaced these vacuum tubes and paved way for more generalized programming .The first computer mouse was invented in 1963 by Douglas Engelbart in Stanford research Institute. The first track ball was invented eleven years before the invention of the mouse by Tom Cranston and Fred Long staff as part of a computerized battlefield information system called DATAR. It was in 1972 that the first microprocessor was developed by intel. The intel 4004 was the first microprocessor that used 4 bit CPU. This chip was what enabled various aspects of computing to be performed including the usage of computer other than that of calculation. The first portable

computer was developed by IBM in 1975. It was the IBM-5100. It weighed about 25 Kg and needed an external power supply. Its dimensions were The IBM-5100 used a 16 bit processor module called PALM (Put All Logic In Microcode) it was in the size of a small suitcase. The portable computers were the first to come before the introduction of PC. The first laptop computer came in the year 1979. It was introduced by Bill Moggridge. It made use of a magnetic bubble memory which made its use obsolete. It also used an Intel 8086 microprocessor. The first Read Only Memory (Magnetic Core Memory) was first developed by An Wang at Harvard University. Later these magnetic core were replaced by the more efficient and cost-friendly silicon. The Most important part of any computer is its hard disk. This was initially developed by IBM. Its model IBM -350 was the first hard disk to be created. It was part of The IBM-350 RAMAC computer system where RAMAC stood for “Random Access Method Of Accounting And Control”. Initially it was cancelled since IBM thought that it might affect their punch card system. Later it was approved by the IBM president. The first Laser printer and Web server were introduced in the year 1969 by Gary Starkweather and Mr Tim Berners in 1991 respectively.

3. The Peripheral Hardware

3.1 The Computer Monitor/Screen

The computer monitor is an electronic device which is used to display the contents processed by the CPU. It is an output device. They have high resolution when compared to a television. The monitor is connected to the Central Processing Unit. The CPU sends details which are to be displayed through the monitor. There are 3 types of monitor display. They are

- The CRT Monitor
- The LCD Monitor
- The LED Monitor

1. The CRT Monitor

The CRT monitor or the Cathode Ray Monitor very the ones that were used in early period. These were the device that were used until the 2000's. They were heavy and huge. They also used up a lot of Disk space. They were made the same way as the Television was made but with better parts so as to increase the display quality and resolution. The electricity consumed was also very high. This monitor is no longer produced nor used.

2. The LCD Monitor

The LCD stands for Liquid Crystal Display are light weight low cost and needs a supply of only about 12V. It also produces a low radiation and supports high resolution when compared to CRT

3. The LED Monitor

The LED stands for Light emitting Diode. Monitors made up of this material have better display quality than that of LCD. they are more thinner and efficient than the other types of monitor mentioned above.

3.2 The Mouse/Touchpad

The mouse is an input device that is often associated with a PC. It is a pointing device. A process of clicking is used to select an item on the display (monitor). The mouse is moved on the flat surface which results in the movement of the cursor on-screen. This is possible with the help of the trackball attached to the mouse. There are 2 buttons associated with it. One is the left click which is used to select the item (Clicking process). The other is the right click which is used to display options on the screen giving the various functions which could be done with that item. Another type of key found on the mouse is the scroll wheel. As the name suggests the scroll wheel is used to scroll through documents and files. The touchpad is the flat mouse used in a portable device like laptop. The function of the mouse and the touchpad are the same except the fact that touch pads are non-movable while mouse are movable. The touchpad makes use of the sensitivity caused by our fingers. There are 3 different types of mouse used. They are:

- Ball Mouse
- Optical Mouse
- Laser Mouse

Ball Mouse

The Ball mouse/Mechanical mouse is one of the earliest form of mouse developed. It usually had a mouse that moved in all direction. The sensitivity of the ball was used to move the mouse pointers on the screen.

Optical Mouse

The Optical mouse use LED and photo technology to detect the movement. It uses photo sensors. These sensors capture about 1000 picture/second. It uses plug and play technology which means that there is no special software required to use the mouse.

Laser Mouse

This type of mouse makes use of laser technology to detect the mouse movement. Unlike an optical mouse which makes use of an LED for movement detection, laser mouse makes use of laser to monitor movement.

The Keyboard

The Keyboard is a vital organ for the Computer hardware system. A computer keyboard is an input device. The general definition of a keyboard is defined as a type-writing device which is used to enter data into the computer. The only difference between a key board and a type writing device is

that a keyboard has a few extra keys for input purpose. There are basically 2 types of keyboards. They are

- Basic keyboard
- Extended keyboard

Basic keyboard

These are the standard keyboard that are provided to any system. They consist of the standard 104 keys that are available in most keyboards now-a-days.

Extended keyboard

These are keyboard that consist of a few extra keys to perform a few special functions. This type of keyboard is usually found in a Macintosh system. It has a special set of keys above the alphanumeric keys.

The CPU

The CPU or the Central processing unit of the computer is the heart of the computer. It is the main system that performs various functions like calculation and computation. The Central Processing Unit is very important for the working of an efficient computer system. The central processing unit is the part where the different instruction of a computer program is executed. It is also referred to as the processor. The CPU is the core with which a PC performs. Without the CPU the proper running of a Operating system is not possible. The various components that make the CPU the heart of the computer are:

- **Mother Board**
- **Hard Disk**
- **CD-ROM**
- **Video Card**
- **LAN Card**

Mother Board

The mother board consists of all the chips sets assembled together into one single platform for the various computation to take place. The mother board typically consists of the chipsets consisting of thousands of transistors interconnected to perform tasks in an efficient way. The motherboard usually consists of a micro-processor around which the different components of a system are built. It also has various sockets for the connection to be established between various devices and the CPU. The cache memory of the system is also found on the motherboard. It also has ports and RAM modules along with the controller hub. The CMOS battery is also present in the motherboard.

Micro-Processor

Micro-processor is a small component of a motherboard of the computer. It is used in the performance of the various function of the computer. Micro-processor is very much essential since it is the clocking device of the computer. It is made up of crystal oscillator. This crystal oscillator is the core for any function of the computer. The crystal oscillator is the timing device of the Computer as a whole. Each process is timed by the crystal oscillator. The crystal oscillator is made up of quartz. Quartz is the widely used crystal since it provides with high frequency stability. The speed of the micro-processor is measured in Megahertz. The

micro-processor as a whole is made up of semi-conductor devices.

Sockets & Slots

The dimm Socket is where the Read Only memory is attached with the CPU. RAM is a temporary memory. RAM is mainly used in order for the program to work effectively and efficiently. Slots are those where graphic card and modems, network cards and sound cards are installed. There are 2 types of slots in a mother board.

- AGS Slots
- PGS Slots

Cache Memory

The cache layer is divided into 3 layers. Layers are L1, L2 and L3. The cache memory is those which is used to increase the speed of the computer. It holds data from RAM and helps in fast processing of the instruction. Layer 1 is located inside the micro-processor also known as internal cache. Layer 2 is the cache memory which is located on the CPU or on the motherboard. The other Cache memory layer L3 is optional. It also is located inside the CPU or the motherboard.

Ports and Controller Hub

Each and every computer operating in this world have ports. Ports are those that are used for interfacing purpose between various hardware of a computer. It includes ports like keyboard and mouse connection. Also a number of ports are used in the connection of external devices such as digital cameras, pen drive etc. The controller hub of the motherboard is a small square metal component found on the right side of the motherboard. These are the heat sinks between the There are two types of controller

- North Bridge
- South Bridge

The North Bridge is one of the two chipsets which is present inside the motherboard. The north bridge is also known as memory controller hub. The northbridge plays a vital role in bus speed. It is also connected to the CPU. It handles various components of the data and also determines the speed with which the process takes place. The northbridge is used in places where extreme speed is necessary like Graphic loading and other area which require large data and also high speed. It controls PCI bus, processor memory etc.. The Southbridge is connected to the Northbridge. The south bridge is also known as I/O Controller Hub. As the alias term mentions its main function is to integrate the I/O devices attached to the computer. Some of the devices which it integrates are USB, serial, IDE, ISA. These are the slower capabilities of the motherboard. It is not directly connected to the CPU.

Hard Disk

The magnetic disk which is present in the computer is known as the hard disk. The main purpose of the hard disk is to store computer data and values in it. The first hard disk was introduced by IBM in the year 1956. The hard disk records data by magnetizing a thin film of ferromagnetic material. A hard disk contains platters which are used for processing data. The platters usually contain 2 read/write present on both the sides. Each platter contains a track. A track is something which is used to write data to the disk. A single track location that cuts through all the platters is

known as a cylinder. Hard-Disk have thousands of cylinder. Each track is further divided into a number of sectors. The hard disk of a computer retains its data even when the power is off. Data is read in the hard-disk. The hard disk contains vital information for the proper performance of the computer. Data sent to and from the hard disk is interpreted by the Disk Compiler. When the Operating System wants to read or write it checks the File Allocation Table (FAT). The rotational speed is from 4500 to 7200 rpm. The disk access time is measured in millisecond. The components used for hard disk are:

- Platters
- Spindle
- Read/Write ARM
- Actuators

Platters:

It is a glass, aluminium or ceramic disk that is coated in a magnetic media to store permanent data of computer. As they rotate the read/write head accesses information on one of the platters.

Spindle:

It is the spindle that keeps the platters in place and helps it in its rotation. The spindle keeps the platters at a fixed distance apart from each other to enable the read/write arm to gain access.

Read/Write ARM:

The Read/Write ARM controls the movement of the read and write head. The arm makes sure that the head is in the correct position based on the data that has to be accessed or written. It is also known as head arm or Actuator Arm. There is one read/one write for every platter side, which floats 3 to 20 millionth of an inch above the surface.

Actuator:

It is a motor that takes instruction from driver to control the movement of read/write arm. It also helps in the supervising of data to and from the platters.

CD-ROM:

A CD-ROM stands for Compact Disk Read Only memory. It can be read by the computer using an optical drive. It is a read only device and it cannot be altered. The CD-ROM initially could hold upto 600 MB of data. But the CD-ROM developed later could hold upto 700 MB of data.

VIDEO CARD:

The video card is a graphic card that is part of a CPU. It is used to connect to the monitor and display images to us via the monitor. The video card consists of 3 ports associated with it. The ports are

- VGA connector
- S-Video Connector
- DVI Connector

LAN CARD

Lan cards are those which help in connecting several systems to each other and also to the network. Many Large industries cannot perform without the help of the LAN card. The LAN card is used to provide the data link for network access. It is

very much important for a system to consist of a LAN card in order for network accessing.

4. Conclusion

A diverse range of important parts of a computer hardware were analysed. These parts are the core elements of a computer system. Without these parts a system can never perform. All the technical terms discussed above are the core elements of a computer. The hardware and the software together provide us with the proper usability of the computer. A system may not be able to perform without the help of a hardware neither can it perform without the help of the software. Hence the hardware and software component of a computer system are vital. The above discussed hardware of the computers are the basic for any operating system. Apart from the above discussed hardware, there do exist many which are yet to be discussed. The most prominent hardware found in an operating system has been discussed.

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