Department Of Business Administration
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BBA Sem -2

Generation of Computer

First Generation (1940-1956): Vacuum Tubes

The first computers used vacuum tubes for circuitry and magnetic drums for memory, and were often enormous, taking up entire rooms. A magnetic drum, also referred to as drum, is a metal cylinder coated with magnetic iron-oxide material on which data and programs can be stored. Magnetic drums were once used as a primary storage device but have since been implemented as auxiliary storage devices. They were very expensive to operate and in addition to using a great deal of electricity, generated a lot of heat, which was often the cause of malfunctions. First generation computers relied on machine language to perform operations, and they could only solve one problem at a time. Machine languages are the only languages understood by computers. While easily understood by computers, machine languages are almost impossible for humans to use because they consist entirely of numbers. Input was based on punch card and paper tapes, and output was displayed on printouts.

The UNIVAC and ENIAC computers are examples of first-generation computing devices. The UNIVAC was the first commercial computer delivered to a business client, the U.S. Census Bureau in 1951.

Acronym for Electronic Numerical Integrator and Computer, the world's first operational electronic digital computer, developed by Army Ordnance to compute World War II ballistic firing tables. The ENIAC, weighing 30 tons, using 200 kilowatts of electric power and consisting of 18,000 vacuum tubes, 1,500 relays, and hundreds of thousands of resistors, capacitors, and inductors, was completed in 1945. In addition to ballistics, the ENIAC's field of application included weather prediction, atomic-energy calculations, cosmic-ray studies, thermal ignition, random-number studies, wind-tunnel design, and other scientific uses. The ENIAC soon became obsolete as the need arose for faster computing speeds.

Few Examples are:

1. ENIAC
2. EDVAC
3. UNIVAC
4. IBM-701
5. IBM-650

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Advantages:

1. It made use of vacuum tubes which are the only electronic component available during those days.
2. These computers could calculate in milliseconds.

Disadvantages:

a. These were very big in size, weight was about 30 tones.
b. These computers were based on vacuum tubes.
c. These computers were very costly.
d. It could store only a small amount of information due to the presence of magnetic drums.
e. As the invention of first generation computers involves vacuum tubes, so another disadvantage of these computers was, vacuum tubes require a large cooling system.
f. Very less work efficiency.
g. Limited programming capabilities and punch cards were used to take inputs.
h. Large amount of energy consumption.
i. Not reliable and constant maintenance is required.

Second Generation (1956-1963): Transistors

Transistors replaced vacuum tubes and ushered in the second generation computer. Transistor is a device composed of semiconductor material that amplifies a signal or opens or closes a circuit. Invented in 1947 at Bell Labs, transistors have become the key ingredient of all digital circuits, including computers. Today's latest microprocessor contains tens of millions of microscopic transistors.

Prior to the invention of transistors, digital circuits were composed of vacuum tubes, which had many disadvantages. They were much larger, required more energy, dissipated more heat, and were more prone to failures. It's safe to say that without the invention of transistors, computing as we know it today would not be possible.

The transistor was invented in 1947 but did not see widespread use in computers until the late 50s. The transistor was far superior to the vacuum tube, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable than their first-generation predecessors. Though the transistor still generated a great deal of heat that subjected the computer to damage, it was a vast improvement over the vacuum tube. Second-generation computers still relied on punched cards for input and printouts for output.

Second-generation computers moved from cryptic binary machine language to symbolic, or assembly, languages, which allowed programmers to specify instructions in words. High-level programming languages were also being

developed at this time, such as early versions of COBOL and FORTRAN. These were also the first computers that stored their instructions in their memory, which moved from a magnetic drum to magnetic core technology.

The first computers of this generation were developed for the atomic energy industry.

Few Examples are:

1. Honeywell 400
2. IBM 7094
3. CDC 1604
4. CDC 3600
5. UNIVAC 1108

… many more

Advantages:

(1) Due to the presence of transistors instead of vacuum tubes, the size of electron component decreased. This resulted in reducing the size of a computer as compared to first generation computers.
(2) Less energy and not produce as much heat as the first genration.
(3) Assembly language and punch cards were used for input.
(4) Low cost than first generation computers.
(5) Better speed, calculate data in microseconds.
(6) Better portability as compared to first generation

Disadvantages:

1) A cooling system was required.
2) Constant maintenance was required.
3) Only used for specific purposes.

Third Generation (1965-1971): Integrated Circuits

The development of the integrated circuit was the hallmark of the third generation of computers. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers. A non-metallic chemical element in the carbon family of elements. Silicon – atomic symbol “Si” – is the second most abundant element in the earth’s crust, surpassed only by oxygen. Silicon does not happen uncombined in nature. Sand and almost all rocks contain silicon combined with oxygen, forming silica. When silicon combines with other elements, such as iron, aluminum or potassium, a silicate is formed. Compounds of silicon also occur in the atmosphere, natural waters, and many plants and in the bodies of some animals.

Silicon is the basic material used to make computer chips, transistors, silicon diodes and other electronic circuits and switching devices because its atomic structure makes the element an ideal semiconductor. Silicon is commonly doped, or mixed, with other elements, such as boron, phosphorous and arsenic, to alter its conductive properties.

A chip is a small piece of semi conducting material (usually silicon) on which an integrated circuit is embedded. A typical chip is less than ¼-square inches and can contain millions of electronic components (transistors). Computers consist of many chips placed on electronic boards called printed circuit boards. There are different types of chips. For example, CPU chips (also called microprocessors) contain an entire processing unit, whereas memory chips contain blank memory.

Semiconductor is a material that is neither a good conductor of electricity (like copper) nor a good insulator (like rubber). The most common semiconductor materials are silicon and germanium. These materials are then doped to create an excess or lack of electrons.

Computer chips, both for CPU and memory, are composed of semiconductor materials. Semiconductors make it possible to miniaturize electronic components, such as transistors. Not only does miniaturization mean that the components take up less space, it also means that they are faster and require less energy.

Few Examples are:

1. PDP-8
2. PDP-11
3. ICL 2900
4. IBM 360
5. IBM 370

… and many more

Advantages:

1. These computers were cheaper as compared to second-generation computers.
2. They were fast and reliable.
3. Use of IC in the computer provides the small size of the computer.
4. IC not only reduce the size of the computer but it also improves the performance of the computer as compared to previous computers.
5. This generation of computers has big storage capacity.
6. Instead of punch cards, mouse and keyboard are used for input.
7. They used an operating system for better resource management and used the concept of time-sharing and multiple programming.
8. These computers reduce the computational time from microseconds to nanoseconds.

Disadvantages:

1. IC chips are difficult to maintain.
2. The highly sophisticated technology required for the manufacturing of IC chips.
3. Air conditioning is required.

Fourth Generation (1971- 1989): Microprocessors

The microprocessor brought the fourth generation of computers, as thousands of integrated circuits we rebuilt onto a single silicon chip and this will contains a Central Processing Unit. In the world of personal computers, the terms microprocessor and CPU are used interchangeably. At the heart of all personal computers and most workstations sits a microprocessor. Microprocessors also control the logic of almost all digital devices, from clock radios to fuel-injection systems for automobiles.

Three basic characteristics differentiate microprocessors:

Instruction Set: The set of instructions that the microprocessor can execute.

Bandwidth: The number of bits processed in a single instruction.

Clock Speed: Given in megahertz (MHz), the clock speed determines how many instructions per second the processor can execute.

In both cases, the higher the value, the more powerful the CPU. For example, a 32-bit microprocessor that runs at 50MHz is more powerful than a 16-bit microprocessor that runs at 25MHz. What in the first generation filled an entire room could now fit in the palm of the hand. The Intel 4004chip, developed in 1971, located all the components of the computer – from the central processing unit and memory to input/output controls – on a single chip.

Abbreviation of central processing unit, and pronounced as separate letters. The CPU is the brains of the computer. Sometimes referred to simply as the processor or central processor, the CPU is where most calculations take place. In terms of computing power the CPU is the most important element of a computer system.

On large machines, CPUs require one or more printed circuit boards. On personal computers and small workstations, the CPU is housed in a single chip called a microprocessor.

Two typical components of a CPU are:The arithmetic logic unit (ALU), which performs arithmetic and logical operations.The control unit, which extracts

instructions from memory and decodes and executes them, calling on the ALU when necessary.

In 1981 IBM introduced its first computer for the home user, and in 1984 Apple introduced the Macintosh. Microprocessors also moved out of the realm of desktop computers and into many areas of life as more and more everyday products began to use microprocessors.

As these small computers became more powerful, they could be linked together to form networks, which eventually led to the development of the Internet. Fourth generation computers also saw the development of GUI's, the mouse and handheld devices.

Few Examples are:

1. IBM 4341
2. DEC 10
3. STAR 1000
4. PUP 11

… and many more

Advantages:

1. Fastest in computation and size get reduced as compared to the previous generation of computer.
2. Heat generated is negligible.
3. Small in size as compared to previous generation computers.
4. Less maintenance is required.
5. All types of high-level language can be used in this type of computers.

Disadvantages:

1. The Microprocessor design and fabrication are very complex.
2. Air conditioning is required in many cases due to the presence of ICs.
3. Advance technology is required to make the ICs.

Fifth Generation Computer

Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today.

Artificial Intelligence is the branch of computer science concerned with making computers behave like humans. The term was coined in 1956 by John McCarthy at the Massachusetts Institute of Technology.

Games playing: programming computers to play games such as chess and checkers

Expert Ssystems: programming computers to make decisions in real-life situations (for example, some expert systems help doctors diagnose diseases based on symptoms)

Natural Llanguage: programming computers to understand natural human languages

Neural Nnetworks: Systems that simulate intelligence by attempting to reproduce the types of physical connections that occur in animal brains

Robotics: programming computers to see and hear and react to other sensory stimuli. Currently, no computers exhibit full artificial intelligence (that is, are able to simulate human behavior). The greatest advances have occurred in the field of games playing. The best computer chess programs are now capable of beating humans. In May,1997, an IBM super-computer called Deep Blue defeated world chess champion Gary Kasparov in a chess match. In the area of robotics, computers are now widely used in assembly plants, but they are capable only of very limited tasks. Robots have great difficulty identifying objects based on appearance or feel, and they still move and handle objects clumsily.

Natural-language processing offers the greatest potential rewards because it would allow people to interact with computers without needing any specialized knowledge. You could simply walk up to a computer and talk to it. Unfortunately, programming computers to understand natural languages has proved to be more difficult than originally thought. Some rudimentary translation systems that translate from one human language to another are in existence, but they are not nearly as good as human translators.

There are also voice recognition systems that can convert spoken sounds into written words, but they do not understand what they are writing; they simply take dictation. Even these systems are quite limited – you must speak slowly and distinctly.

Few Examples are:

1. Desktop
2. Laptop
3. NoteBook
4. UltraBook
5. Chromebook

… and many more

Advantages:

1. It is more reliable and works faster.
2. It is available in different sizes and unique features.
3. It provides computers with more user-friendly interfaces with multimedia features.

Disadvantages:

1. They need very low-level languages.
2. They may make the human brains dull and doomed.

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