

Classification of Computers

Computers can be classified based on the following:

1. Generation.
2. Size.
3. Types of data handled
4. Degree of versatility (purpose)

Classification of Computers by Generation

The history of computer development is often referred to in reference to the different generations of computing devices. Each generation of computer is characterized by a major technological development that fundamentally changed the way computers operate, resulting in increasingly smaller, cheaper and more efficient and reliable computing devices. There are five notable generations associated with the development of computers. These are:

(i) First Generation Computers (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. 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.

The processing speed was very low; they could only solve one problem at a time. Input was based on punched cards and paper tape, and output was displayed on printouts. Examples are Colossus and ENIAC (Electronic Numerical Integrator and Computer). The UNIVAC was the first commercial computer delivered to a business client the U.S. Census Bureau in 1951. The first generation of computer uses machine language.

(ii) Second Generation of Computers (1956-1963) Transistors

Transistors replaced vacuum tubes and ushered in the second generation computers. The transistor was invented in 1947 but did not see widespread use in computers until the late 1950s. 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 computers.

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 used assembly languages which allowed programmers to specify instructions in words.

High level programming language such as COBOL and FORTRAN were developed at this time. 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 e.g. IBM 360/ 370.

(iii) Third Generation (1964-1971) Integrated Circuits (ICs)

The development of the integrated circuit was the hallmark of the third generation computers. Transistors were miniaturized and placed on silicon chips called semi-conductors, which dramatically increased the speed and efficiency of computers.

Instead of punched cards and printouts, users interacted with third generation computers through keyboards and monitors and interfaced with an operating system, which allow the device to run many different applications at one time with a central program that monitored the memory. Computers for the first time became accessible to a mass audience because they were smaller and cheaper than their predecessors.

(iv) Fourth Generation Computers (1971-present) Microprocessors

In fourth generation computers, many components were combined together to form a smaller components called CHIP. The microprocessor (also called micro-chip) is the brain of the fourth generation computers, as thousands of integrated circuits were built onto a single silicon chip.

Computers in the first generation that filled an entire room could now fit in the palm of the hand. 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 ICT products began to use microprocessors.

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

(v) Fifth Generation (Present and Beyond) Artificial Intelligence

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. The use of parallel processing and super computers is helping to make artificial intelligence a reality.

Quantum computation and molecular nanotechnology will radically change the face of computers in years to come. The goal of fifth-generation computing is to develop devices that respond to natural language input e.g. voice recognition, self driving cars, etc

Classification of Computers by Size

Computers can be classified by physical size, memory size, and processing speed. Classification of computers by size includes:

(i) Main frame computers:

Mainframes (often referred to as **Big Iron**) are powerful computers used mainly by large organizations for critical applications, typically bulk data processing such as census, industry and consumer statistics, enterprise resource planning, and financial transaction processing. Mainframe computers are very large, often filling an entire room.

They can store enormous of information, they can perform many task at the same time, they can communicate with many users at the same time, and are very expensive. Mainframe computers usually have many terminals connected to them.

These terminals look like small computers but they are only devices used to send and receive information from the actual computers using wires. Terminals could be located in the same room with the

mainframe computers, but they can also be in different rooms, building, or cities. Large business, government agencies, and universities usually use this type of computer. An example of a mainframe computer is IBM 704

(ii) Mini Computers:

A minicomputer is a computer of a size intermediate between a microcomputer and a mainframe. Minicomputers are much smaller than the mainframe computers and they are also much less expensive.

They possess much of the features found in mainframe computers, but on a more limited scale. A minicomputer is a multiprocessing system capable of supporting from 4 to about 200 users simultaneously. They can store tremendous amount of information, but not as much as the mainframe computers. Medium and small businesses typically use these computers.

(iii) Micro Computers:

These are the type of computers we are using in our school computer laboratory. These computers are usually divided into desktops models and laptop models. They are terribly limited in what they can do when compared to the larger models discussed earlier (i.e. mainframe and minicomputers) because they can only be used by one person at a time.

They are much slower than the larger computers, and they can store nearly as much information, but are excellent when used in small business, homes and schools classroom. These computers are inexpensive and easy to use. Examples are Desktop PCs, Laptop, Palmtops, PDA, etc

(iv) Supercomputer:

super computers are computers that perform complex calculation at faster speeds than other types of computers mentioned earlier. The primary use for super computers is in scientific computing, which requires high-powered computers to perform complex calculations.

Scientific organizations like NASA uses super computers for the purpose of performing calculations, rendering complex formulas, and performing other task which requires a formidable amount of computer power.

Differences between Mainframe and Supercomputers

A supercomputer is a computer that is at the frontline of current processing capacity, particularly speed of calculation.

Supercomputers are used for scientific and engineering problems which are limited by processing speed and memory size, while mainframes are used for problems which are limited by data movement in input/output devices, reliability, and for handling multiple business transactions concurrently.

Classification of Computers by Types of Data Handled.

(i) Analog Computer:

An analog computer is one which can perform multiple calculations at once and can cope with infinite fractions of numbers.

The word analog comes from the word “analogous” meaning similar thus analog computers deals with quantities that are continuously varied, they only approximate results.

Analog computers recognize data as a continuous measurement of a physical property (voltage, pressure, speed and temperature), e.g. Automobile speedometer.

They are especially useful for solving problems that involve relationships between variable quantities in systems that change with time e.g. Dornier DO 240.

(ii) Digital:

Unlike the continuous quantities that can be measured by the analog computer, digital computer operates by counting values that are discrete. The basic operation performed by a digital computer is addition problems as they accumulate and can complete a single calculation in a fraction of a nanosecond.

The digital computer is capable of storing data as long as needed, performing logical operations, editing input data, and printing out the results of its processing e.g. Microcomputers

Differences between Analogue and Digital Computers

The main difference between digital and analog signal is the data content. An analog signal is a dense collection of sound and picture waves. These waves contain a lot of information, but nothing outside the original waves. Digital signal may contain any type of data that is possible to compress into computer information.

(iii) Hybrid Computer:

The hybrid computers combine the measuring capabilities of the analog computer and the logical and control capabilities of the digital computer. It offers an efficient and economical method of working out special types of problems in science and various areas of engineering.

Classification of Computers by Degree of Versatility (Purpose)

Computers can be classified according to degree of purpose as General purpose computers and Special purpose computers

(i) General Purpose Computers

A 'General Purpose Computer' is a computer that is capable of carrying out some general data processing activities under the control of a program. General purpose machine refers to computers that follow instructions, thus virtually all computers from microcomputers to mainframe computers are general purpose. Even computers in toys, games and single-function devices follow instructions in their built-in program.

(ii) Special Purpose Computers

These are computers that are designed to operate on a restricted class of problems, e.g. an ultrasound machine used in hospital in scanning pregnant women, cancer dialyses machine used to treat cancer patients in the hospital