

COMPUTER GENERATIONS

The history of the computer goes back several decades however and there are five definable generations of computers. Each generation is defined by a significant technological development that changes fundamentally how computers operate – leading to more compact, less expensive, but more powerful, efficient and robust machines.

Computer generations are based on when major technological changes in computers occurred, like the use of vacuum tubes, transistors, and the microprocessor. As of 2018, there are five generations of the computer.

Types of Computer Generation and examples

1940 – 1956: First Generation – Vacuum Tubes

The first generation of computers used vacuum tubes as a major piece of technology. Vacuum tubes were widely used in computers from 1940 through 1956. Vacuum tubes were larger components and resulted in first generation computers being quite large in size, taking up a lot of space in a room. Some of the first generation computers took up an entire room.

These early computers used vacuum tubes as circuitry and magnetic drums for memory. As a result, they were enormous, literally taking up entire rooms and costing a fortune to run. These were inefficient materials which generated a lot of heat, sucked huge electricity and subsequently generated a lot of heat which caused ongoing breakdowns.

These first generation computers relied on 'machine language' (which is the most basic programming language that can be understood by computers). These computers were limited to solving one problem at a time. Input was based on punched cards and paper tape. Output came out on print-outs.

The ENIAC is a great example of a first generation computer. It consisted of nearly 20,000 vacuum tubes, as well as 10,000 capacitors and 70,000 resistors. It weighed over 30 tons and took up a lot of space, requiring a large room to house it. Other examples of first generation computers include the EDSAC, IBM-650, IBM 701, and Manchester Mark 1.

The two notable machines of this era were the UNIVAC and ENIAC machines – the UNIVAC is the first ever commercial computer which was purchased in 1951 by a business – the US Census Bureau.

1956 – 1963: Second Generation – Transistors

The second generation of computers saw the use of [transistors](#) instead of vacuum tubes. Transistors were widely used in computers from [1956](#) to [1963](#). Transistors were smaller than vacuum tubes and allowed computers to be smaller in size, faster in speed, and cheaper to build.

The replacement of vacuum tubes by transistors saw the advent of the second generation of computing. Although first invented in 1947, transistors weren't used significantly in computers until the end of the 1950s. They were a big improvement over the vacuum tube, despite still subjecting computers to damaging levels of heat. However, they were hugely superior to the vacuum tubes, making computers smaller, faster, cheaper and less heavy on electricity use. They still relied on punched card for input/printouts.

The language evolved from cryptic binary language to symbolic ('assembly') languages. This meant programmers could create instructions in words. About the same time high level programming languages were being developed (early versions of COBOL and FORTRAN). Transistor-driven machines were the first computers to store instructions into their memories – moving from magnetic drum to magnetic core 'technology'. The early versions of these machines were developed for the atomic energy industry.

The first computer to use transistors was the TX-0 and was introduced in 1956. Other computers that used transistors include the IBM 7070, Philco Transac S-1000, Honeywell 400, IBM 7094, CDC 1604 and RCA 501.

1964 – 1971: Third Generation – Integrated Circuits

The third generation of computers introduced the use of IC (integrated circuits) in computers. Using IC's in computers helped reduce the size of computers even more compared to second-generation computers, as well as make them faster.

By this phase, transistors were now being miniaturized(reduced) and put on silicon chips (called semiconductors). This led to a massive increase in speed and efficiency of these machines. These were the first computers where users interacted using keyboards and monitors which interfaced with an operating system, a significant leap up(rise) from the punch cards and printouts. This enabled these machines to run several applications at once using a central program which functioned to monitor memory.

Nearly all computers since the mid to late 1960s have utilized IC's. While the third generation is considered by many people to have spanned from 1964 to 1971, IC's are still used in computers today. Over 45 years later, today's computers have deep roots going back to the third generation.

As a result of these advances which again made machines cheaper and smaller, a new mass market of users emerged during the '60s. Some examples are: PDP-8, PDP-11, ICL 2900, IBM 360 and IBM 370.

1972 – 2010: Fourth Generation – Microprocessors

The fourth generation of computers took advantage of the invention of the microprocessor, more commonly known as a CPU. Microprocessors, along with integrated circuits, helped make it possible for computers to fit easily on a desk and for the introduction of the laptop.

Some of the earliest computers to use a microprocessor include the Altair 8800, IBM 5100, and Micral. Today's computers still use a microprocessor, despite the fourth generation being considered to have ended in 2010.

This revolution can be summed in one word: Intel. The chip-maker developed the Intel 4004 chip in 1971, which positioned all computer components (CPU, memory, input/output controls) onto a single chip. What filled a room in the 1940s now fit in the palm of the hand. The Intel chip housed thousands of integrated circuits. The year 1981 saw the first ever computer (IBM) specifically designed for home use and 1984 saw the Macintosh introduced by Apple. Microprocessors even moved beyond the realm of computers and into an increasing number of everyday products.

The increased power of these small computers meant they could be linked, creating networks. Which ultimately led to the development, birth and rapid evolution of the Internet. Other major advances during this period have been the Graphical user interface (GUI), the mouse and more recently the astounding advances in lap-top capability and hand-held devices.

2010- : Fifth Generation – Artificial Intelligence

The fifth generation of computers is beginning to use [AI](#) (artificial intelligence), an exciting technology that has many potential applications around the world. Leaps have been made in AI technology and computers, but there is still much room for improvement.

Computer devices with artificial intelligence are still in development, but some of these technologies are beginning to emerge and be used such as voice recognition.

One of the more well-known examples of AI in computers is IBM's Watson, which has been featured on the TV show Jeopardy as a contestant. Other better-known examples include Apple's [Siri](#) on the iPhone and Microsoft's [Cortana](#) on Windows 8 and Windows 10 computers. The [Google](#) search engine also utilizes AI to process user searches.

AI is a reality made possible by using parallel processing and superconductors. Looking to the future, computers will be radically transformed again by quantum computation, molecular and nano technology.

The essence of fifth generation will be using these technologies to ultimately create machines which can process and respond to natural language, and have capability to learn and organise themselves. Some Basic examples of 5th Generation computers include; Desktop, Laptop, Notebook, UltraBook, Chromebook, etc.

The Ten Commandments of Computer Ethics

1. Thou shalt not use a computer to harm other people.
2. Thou shalt not interfere with other people's computer work.
3. Thou shalt not snoop around in other people's computer files.
4. Thou shalt not use a computer to steal.
5. Thou shalt not use a computer to bear false witness.
6. Thou shalt not copy or use proprietary software for which you have not paid.
7. Thou shalt not use other people's computer resources without authorization or proper compensation.
8. Thou shalt not appropriate other people's intellectual output.
9. Thou shalt think about the social consequences of the program you are writing or the system you are designing.
10. Thou shalt always use a computer in ways that ensure consideration and respect for your fellow humans.

TYPES OF COMPUTER SOFTWARES

Software is the language of a computer. And like human language, there are many different computer languages. Essentially, computer software can be divided into three main groups depending on their use and application. These are system software or operating system referred simply as the OS, application software and programming languages. Usually most of us interact with a computer using application software.

1. **System Software:** System software or operating system is the software used by the computer to translate inputs from various sources into a language which a machine can understand. Basically, the OS coordinates the different hardware components of a computer. There are many OS in the market. The most popular OS are from the stable of Microsoft. We have all heard, used and wondered at the Windows software, which is an OS. Starting with Windows, Microsoft has migrated to Vista, its latest offering in the market. It may come as a surprise to some that there are other operating systems used by others. Among these UNIX is used for large office setups with extensive networking. XENIX is software which has now become redundant. HP -UX and AIX are some operating systems used by HP computers. Apache OS is quite popular with web servers. IBM still uses proprietary operating systems for its main frames. Proprietary systems are generally built with the help of a variant of UNIX operating system.

2. **Application software:** A normal user rarely gets to see the operating system or to work with it. But all of us are familiar with application software which we must use to interact with a computer. Popular examples of application software are the Microsoft office suite which includes Word, Excel and PowerPoint. We have used these applications extensively. Internet explorer, Mozilla Firefox is two applications used to access the internet. E-mail software like Outlook express is used to manage Emails. It is obvious that all software utilized for working on a computer is classified as application software. In fact, all user interfaces are an application. The anti-virus is an application and so is the Media player.

3. Programming languages: Now this is a kind of computer software which is used exclusively by computer programmers. Unless we are also programmers, we are unlikely to come across programming languages. A simple way to understand programming languages is to think of them as bricks which can be used to create applications and operating system. C++, Java and Simlab are some popular programming languages. Generally, Java is used for internet applications. C++ is a language of professional developers and used extensively in developing operating systems. PHP is another language used for internet applications. There is a new class of languages which are being utilized for the mobiles. These are light weight, modular languages which are used to design mobile applications.

Computer software falls under three basic categories; System software or operating system, application software and programming languages. We usually use applications on a day to day basis. These applications are themselves created using programming languages.

I. Computer: Definition

A computer is a machine that can be programmed to manipulate symbols. Its principal characteristics are:

- It responds to a specific set of instructions in a well-defined manner.
- It can execute a prerecorded list of instructions (a program).
- It can quickly store and retrieve large amounts of data.

Therefore, computers can perform complex and repetitive procedures quickly, precisely and reliably. Modern computers are electronic and digital. The actual machinery (wires, transistors, and circuits) is called hardware; the instructions and data are called software. All general-purpose computers require the following hardware components:

- Central processing unit (CPU): The heart of the computer, this is the component that actually executes instructions organized in programs ("software") which tell the computer what to do.
- Memory (fast, expensive, short-term memory): Enables a computer to store, at least temporarily, data, programs, and intermediate results.
- Mass storage device (slower, cheaper, long-term memory): Allows a computer to permanently retain large amounts of data and programs between jobs. Common mass storage devices include disk drives and tape drives.
- Input device: Usually a keyboard and mouse, the input device is the conduit through which data and instructions enter a computer.
- Output device: A display screen, printer, or other device that lets you see what the computer has accomplished.

In addition to these components, many others make it possible for the basic components to work together efficiently. For example, every computer requires a bus that transmits data from one part of the computer to another.

II. Computer sizes and power

Computers can be generally classified by size and power as follows, though there is considerable overlap:

- Personal computer: A small, single-user computer based on a microprocessor.
- Workstation: A powerful, single-user computer. A workstation is like a personal computer, but it has a more powerful microprocessor and, in general, a higher-quality monitor.
- Minicomputer: A multi-user computer capable of supporting up to hundreds of users simultaneously.
- Mainframe: A powerful multi-user computer capable of supporting many hundreds or thousands of users simultaneously.
- Supercomputer: An extremely fast computer that can perform hundreds of millions of instructions per second.

Supercomputer and Mainframe

Supercomputer is a broad term for one of the fastest computers currently available. Supercomputers are very expensive and are employed for specialized applications that require immense amounts of mathematical calculations (number crunching). For example, weather forecasting requires a supercomputer. Other uses of supercomputers scientific simulations, (animated) graphics, fluid dynamic calculations, nuclear energy research, electronic design, and analysis of geological data (e.g. in petrochemical prospecting). Perhaps the best known supercomputer manufacturer is Cray Research.

Mainframe was a term originally referring to the cabinet containing the central processor unit or "main frame" of a room-filling Stone Age batch machine. After the emergence of smaller "minicomputer" designs in the early 1970s, the traditional big iron machines were described as "mainframe computers" and eventually just as mainframes. Nowadays a Mainframe is a very large and expensive computer capable of supporting hundreds, or even thousands, of users simultaneously. The chief difference between a supercomputer and a mainframe is that a supercomputer channels all its power into executing a few programs as fast as possible, whereas a mainframe uses its power to execute many programs concurrently. In some ways, mainframes are more powerful than supercomputers because they support more simultaneous programs. But supercomputers can execute a single program faster than a mainframe. The distinction between small mainframes and minicomputers is vague, depending really on how the manufacturer wants to market its machines.

Minicomputer

It is a midsize computer. In the past decade, the distinction between large minicomputers and small mainframes has blurred, however, as has the distinction between small minicomputers and workstations. But in general, a minicomputer is a multiprocessing system capable of supporting from up to 200 users simultaneously.

Workstation

It is a type of computer used for engineering applications (CAD/CAM), desktop publishing, software development, and other types of applications that require a moderate amount of computing power and relatively high quality graphics capabilities. Workstations generally come with a large, high-resolution graphics screen, at large amount of RAM, built-in network support, and a graphical user interface. Most workstations also have a mass storage device such as a disk drive, but a special type of workstation, called a diskless workstation, comes without a disk drive. The most common operating systems for workstations are UNIX and Windows NT. Like personal computers, most workstations are single-user computers. However, workstations are typically linked together to form a local-area network, although they can also be used as stand-alone systems.

N.B.: In networking, workstation refers to any computer connected to a local-area network. It could be a workstation or a personal computer.

Personal computer:

It can be defined as a small, relatively inexpensive computer designed for an individual user. In price, personal computers range anywhere from a few hundred pounds to over five thousand pounds. All are based on the microprocessor technology that enables manufacturers to put an entire CPU on one chip. Businesses use personal computers for word processing, accounting, desktop publishing, and for running spreadsheet and database management applications. At home, the most popular use for personal computers is for playing games and recently for surfing the Internet.

Personal computers first appeared in the late 1970s. One of the first and most popular personal computers was the Apple II, introduced in 1977 by Apple Computer. During the late 1970s and early 1980s, new models and competing operating systems seemed to appear daily. Then, in 1981, IBM entered the fray with its first personal computer, known as the IBM PC. The IBM PC quickly became the personal computer of choice, and most other personal computer manufacturers fell by the wayside. P.C. is short for personal computer or IBM PC. One of the few companies to survive IBM's onslaught was Apple Computer, which remains a major player in the personal computer marketplace. Other companies adjusted to IBM's dominance by building IBM clones, computers that were internally almost the same as the IBM PC, but that cost less. Because IBM clones used the same microprocessors as IBM PCs, they were capable of running the same software. Over the years, IBM has lost much of its influence in directing the evolution of PCs. Therefore, after the release of the first PC by IBM the term PC increasingly came to mean IBM or IBM-compatible personal computers, to the exclusion of other types of personal computers, such as Macintoshes. In recent years, the term PC has become more and more difficult to pin down. In general, though, it applies to any personal computer based on an Intel microprocessor, or on an Intel-compatible microprocessor. For nearly every other component, including the operating system, there are several options, all of which fall under the rubric of PC

Today, the world of personal computers is basically divided between Apple Macintoshes and PCs. The principal characteristics of personal computers are that they are single-user systems and are based on microprocessors. However, although personal computers are designed as single-user systems, it is common to link them together to form a network. In terms of power, there is great variety. At the high end, the distinction between personal computers and workstations has faded. High-end models of the Macintosh and PC offer the same computing power and graphics capability as low-end workstations by Sun Microsystems, Hewlett-Packard, and DEC.

III. Personal Computer Types

Actual personal computers can be generally classified by size and chassis / case. The chassis or case is the metal frame that serves as the structural support for electronic components. Every computer system requires at least one chassis to house the circuit boards and wiring. The chassis also contains slots for expansion boards. If you want to insert more boards than there are slots, you will need an expansion chassis, which provides additional slots. There are two basic flavors

of chassis designs—desktop models and tower models—but there are many variations on these two basic types. Then come the portable computers that are computers small enough to carry. Portable computers include notebook and subnotebook computers, hand-held computers, palmtops, and PDAs.

Tower model

The term refers to a computer in which the power supply, motherboard, and mass storage devices are stacked on top of each other in a cabinet. This is in contrast to desktop models, in which these components are housed in a more compact box. The main advantage of tower models is that there are fewer space constraints, which makes installation of additional storage devices easier.

Desktop model

A computer designed to fit comfortably on top of a desk, typically with the monitor sitting on top of the computer. Desktop model computers are broad and low, whereas tower model computers are narrow and tall. Because of their shape, desktop model computers are generally limited to three internal mass storage devices. Desktop models designed to be very small are sometimes referred to as **slim line models**.

Notebook computer

An extremely lightweight personal computer. Notebook computers typically weigh less than 6 pounds and are small enough to fit easily in a briefcase. Aside from size, the principal difference between a notebook computer and a personal computer is the display screen. Notebook computers use a variety of techniques, known as flat-panel technologies, to produce a lightweight and non-bulky display screen. The quality of notebook display screens varies considerably. In terms of computing power, modern notebook computers are nearly equivalent to personal computers. They have the same CPUs, memory capacity, and disk drives. However, all this power in a small package is expensive. Notebook computers cost about twice as much as equivalent regular-sized computers. Notebook computers come with battery packs that enable you to run them without plugging them in. However, the batteries need to be recharged every few hours.

Laptop computer

A small, portable computer -- small enough that it can sit on your lap. Nowadays, laptop computers are more frequently called notebook computers.

Subnotebook computer

A portable computer that is slightly lighter and smaller than a full-sized notebook computer. Typically, subnotebook computers have a smaller keyboard and screen, but are otherwise equivalent to notebook computers.

Hand-held computer

A portable computer that is small enough to be held in one's hand. Although extremely convenient to carry, handheld computers have not replaced notebook computers because of

their small keyboards and screens. The most popular hand-held computers are those that are specifically designed to provide PIM (personal information manager) functions, such as a calendar and address book. Some manufacturers are trying to solve the small keyboard problem by replacing the keyboard with an electronic pen. However, these pen-based devices rely on handwriting recognition technologies, which are still in their infancy. Hand-held computers are also called PDAs, palmtops and pocket computers.

Palmtop

A small computer that literally fits in your palm. Compared to full-size computers, palmtops are severely limited, but they are practical for certain functions such as phone books and calendars. Palmtops that use a pen rather than a keyboard for input are often called hand-held computers or PDAs. Because of their small size, most palmtop computers do not include disk drives. However, many contain PCMCIA slots in which you can insert disk drives, modems, memory, and other devices. Palmtops are also called PDAs, hand-held computers and pocket computers.

PDA

Short for personal digital assistant, a handheld device that combines computing, telephone/fax, and networking features. A typical PDA can function as a cellular phone, fax sender, and personal organizer. Unlike portable computers, most PDAs are pen-based, using a stylus rather than a keyboard for input. This means that they also incorporate handwriting recognition features. Some PDAs can also react to voice input by using voice recognition technologies. The field of PDA was pioneered by Apple Computer, which introduced the Newton Message Pad in 1993. Shortly thereafter, several other manufacturers offered similar products. To date, PDAs have had only modest success in the marketplace, due to their high price tags and limited applications. However, many experts believe that PDAs will eventually become common gadgets. PDAs are also called palmtops, hand-held computers and pocket computers.