



Computer Fundamentals

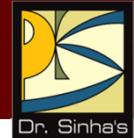
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Chapter 1

Introduction



Learning Objectives



In this chapter you will learn about:

- Computer
- Data processing
- Characteristic features of computers
- Computers' evolution to their present form
- Computer generations
- Characteristic features of each computer generation

Computer

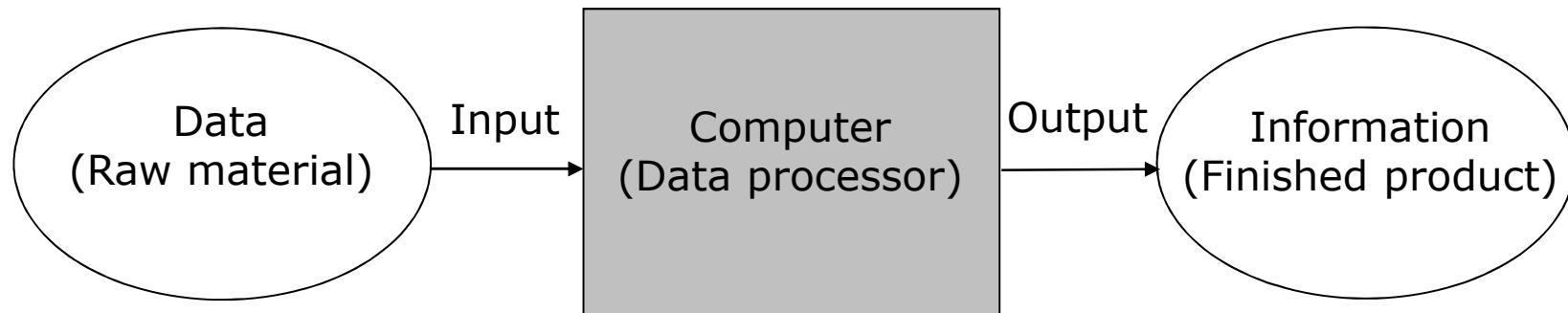


- The word computer comes from the word “compute”, which means, “to calculate”
- Thereby, a computer is an electronic device that can perform arithmetic operations at high speed
- A computer is also called a *data processor* because it can store, process, and retrieve data whenever desired

Data Processing



The activity of processing data using a computer is called *data processing*



Data is raw material used as input to data processing and *information* is processed data obtained as output

Characteristics of Computers



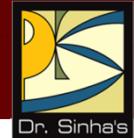
Sr. No.	Characteristics	Description
1	Automatic	It carries out a job normally without any human intervention
2	Speed	It can perform several billion (10^9) simple arithmetic operations per second
3	Accuracy	It performs every calculation with the same accuracy
4	Diligence	It is free from monotony, tiredness, and lack of concentration
5	Versatility	It can perform a wide variety of tasks
6	Memory	It can store huge amount of information and can recall any piece of this information whenever required
7	No I. Q.	It cannot take its own decisions, and has to be instructed what to do and in what sequence
8	No Feelings	It cannot make judgments based on feelings and instincts



Evolution of Computers



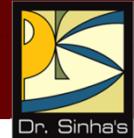
Evolution of Computers



- Blaise Pascal invented the first *mechanical adding machine* in 1642
- Baron Gottfried Wilhelm von Leibniz invented the first *calculator for multiplication* in 1671
- *Keyboard machines* originated in the United States around 1880
- Around 1880, Herman Hollerith came up with the concept of *punched cards* that were extensively used as input media until late 1970s

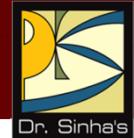
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Evolution of Computers



- *Charles Babbage* is considered to be the father of modern digital computers
 - He designed “Difference Engine” in 1822
 - He designed a *fully automatic analytical engine* in 1842 for performing basic arithmetic functions
 - His efforts established a number of principles that are fundamental to the design of any digital computer

Some Well Known Early Computers



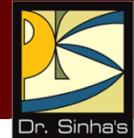
- The Mark I Computer (1937-44)
- The Atanasoff-Berry Computer (1939-42)
- The Electronic Numerical Integrator And Calculator (ENIAC) (1943-46)
- The Electronic Discrete Variable Automatic Computer (EDVAC) (1946-52)
- The Electronic Delay Storage Automatic Calculator (EDSAC) (1947-49)
- Manchester Mark I (1948)
- The Universal Automatic Computer (UNIVAC) I (1951)
- IBM 701 (1952)
- IBM 650 (1953)



Computer Generations



Computer Generations



- “*Generation*” in computer talk is a step in technology. It provides a framework for the growth of computer industry
- Originally it was used to distinguish between various hardware technologies, but now it has been extended to include both hardware and software
- Till today, there are five computer generations

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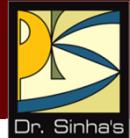
Computer Generations



Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some representative systems
First (1942-1955)	<ul style="list-style-type: none"> ▪ Vacuum tubes ▪ Electromagnetic relay memory ▪ Punched cards secondary storage 	<ul style="list-style-type: none"> ▪ Machine and assembly languages ▪ Stored program concept ▪ Mostly scientific applications 	<ul style="list-style-type: none"> ▪ Bulky in size ▪ Highly unreliable ▪ Limited commercial use and costly ▪ Difficult commercial production ▪ Difficult to use 	<ul style="list-style-type: none"> ▪ ENIAC ▪ EDVAC ▪ EDSAC ▪ UNIVAC I ▪ IBM 701
Second (1955-1964)	<ul style="list-style-type: none"> ▪ Transistors ▪ Magnetic cores memory ▪ Magnetic tapes ▪ Disks for secondary storage 	<ul style="list-style-type: none"> ▪ Batch operating system ▪ High-level programming languages ▪ Scientific and commercial applications 	<ul style="list-style-type: none"> ▪ Faster, smaller, more reliable and easier to program than previous generation systems ▪ Commercial production was still difficult and costly 	<ul style="list-style-type: none"> ▪ Honeywell 400 ▪ IBM 7030 ▪ CDC 1604 ▪ UNIVAC LARC

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Computer Generations



Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some rep. systems
Third (1964-1975)	<ul style="list-style-type: none"> ▪ ICs with SSI and MSI technologies ▪ Larger magnetic cores memory ▪ Larger capacity disks and magnetic tapes secondary storage ▪ Minicomputers; upward compatible family of computers 	<ul style="list-style-type: none"> ▪ Timesharing operating system ▪ Standardization of high-level programming languages ▪ Unbundling of software from hardware 	<ul style="list-style-type: none"> ▪ Faster, smaller, more reliable, easier and cheaper to produce ▪ Commercially, easier to use, and easier to upgrade than previous generation systems ▪ Scientific, commercial and interactive on-line applications 	<ul style="list-style-type: none"> ▪ IBM 360/370 ▪ PDP-8 ▪ PDP-11 ▪ CDC 6600

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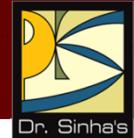
Computer Generations



Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some rep. systems
Fourth (1975-1989)	<ul style="list-style-type: none"> ▪ ICs with VLSI technology ▪ Microprocessors; semiconductor memory ▪ Larger capacity hard disks as in-built secondary storage ▪ Magnetic tapes and floppy disks as portable storage media ▪ Personal computers ▪ Supercomputers based on parallel vector processing and symmetric multiprocessing technologies ▪ Spread of high-speed computer networks 	<ul style="list-style-type: none"> ▪ Operating systems for PCs with GUI and multiple windows on a single terminal screen ▪ Multiprocessing OS with concurrent programming languages ▪ UNIX operating system ▪ C and C++ programming language ▪ PC, Network-based, and supercomputing applications ▪ Object-oriented design and programming 	<ul style="list-style-type: none"> ▪ Small, affordable, reliable, and easy to use PCs ▪ More powerful and reliable mainframe systems and supercomputers ▪ Totally general purpose machines ▪ Easier to produce commercially ▪ Easier to upgrade ▪ Rapid software development possible 	<ul style="list-style-type: none"> ▪ IBM PC and its clones ▪ Apple II ▪ TRS-80 ▪ VAX 9000 ▪ CRAY-1 ▪ CRAY-2 ▪ CRAY-X/MP

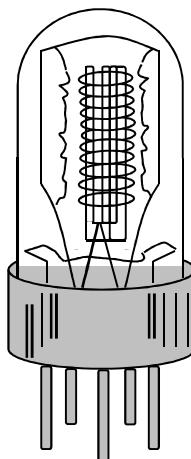
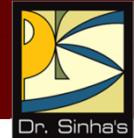
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Computer Generations

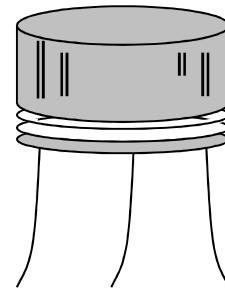


Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some rep. systems
Fifth (1989- Present)	<ul style="list-style-type: none"> ▪ ICs with ULSI technology ▪ Larger capacity main memory, hard disks with RAID support ▪ Optical disks as portable read-only storage media ▪ Notebooks, powerful desktop PCs and workstations ▪ Powerful servers, supercomputers ▪ Internet ▪ Cluster computing 	<ul style="list-style-type: none"> ▪ World Wide Web ▪ Multimedia, Internet applications ▪ Micro-kernel, multithreading, multicore OS ▪ JAVA ▪ MPI and PVM libraries for parallel programming 	<ul style="list-style-type: none"> ▪ Portable computers ▪ Powerful, cheaper, reliable, and easier to use desktop machines ▪ Very powerful mainframes ▪ High uptime due to hot-pluggable components ▪ General purpose machines ▪ Easier to produce commercially 	<ul style="list-style-type: none"> ▪ IBM notebooks ▪ Pentium PCs ▪ SUN Workstations ▪ IBM SP/2 ▪ SGI Origin 2000 ▪ PARAM Supercomputers

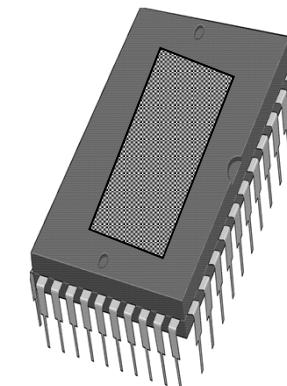
Electronic Devices Used in Computers of Different Generations



(a) A Vacuum tube



(b) A Transistor



(c) An IC chip

Key Words/Phrases



- Computer
- Computer generations
- Computer Supported Cooperative Working (CSCW)
- Data
- Data processing
- Data processor
- First-generation computers
- Fourth-generation computers
- Garbage-in-garbage-out (GIGO)
- Graphical User Interface (GUI)
- Groupware
- Information
- Integrated Circuit (IC)
- Large Scale Integration (VLSI)
- Medium Scale Integration (MSI)
- Microprocessor
- Personal Computer (PC)
- Second-generation computers
- Small Scale Integration (SSI)
- Stored program concept
- Third-generation computers
- Transistor
- Ultra Large Scale Integration (ULSI)
- Vacuum tubes