

Computer and Information Technology

Course Code: 510113

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Learning Objectives



■ In this lecture 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

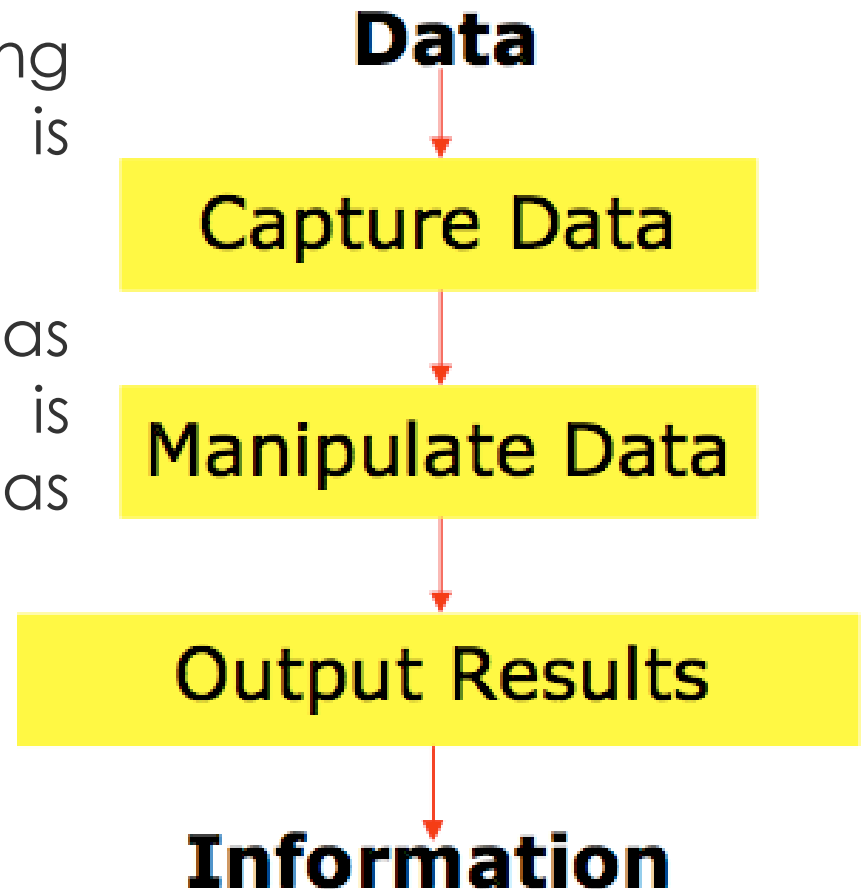
Computer



- 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 and **information** is processed data obtained as output of data processing



Characteristics of Computers



- **Automatic:** Given a job, computer can work on it automatically without human interventions
- **Speed:** Computer can perform data processing jobs very fast, usually measured in **microseconds** (10^{-6}), **nanoseconds** (10^{-9}), and **picoseconds** (10^{-12})
- **Accuracy:** Accuracy of a computer is consistently high and the degree of its accuracy depends upon its design. Computer errors caused due to incorrect input data or unreliable programs are often referred to as *Garbage-In-Garbage-Out (GIGO)*
- **Diligence:** Computer is free from monotony, tiredness, and lack of concentration. It can continuously work for hours without creating any error and without grumbling

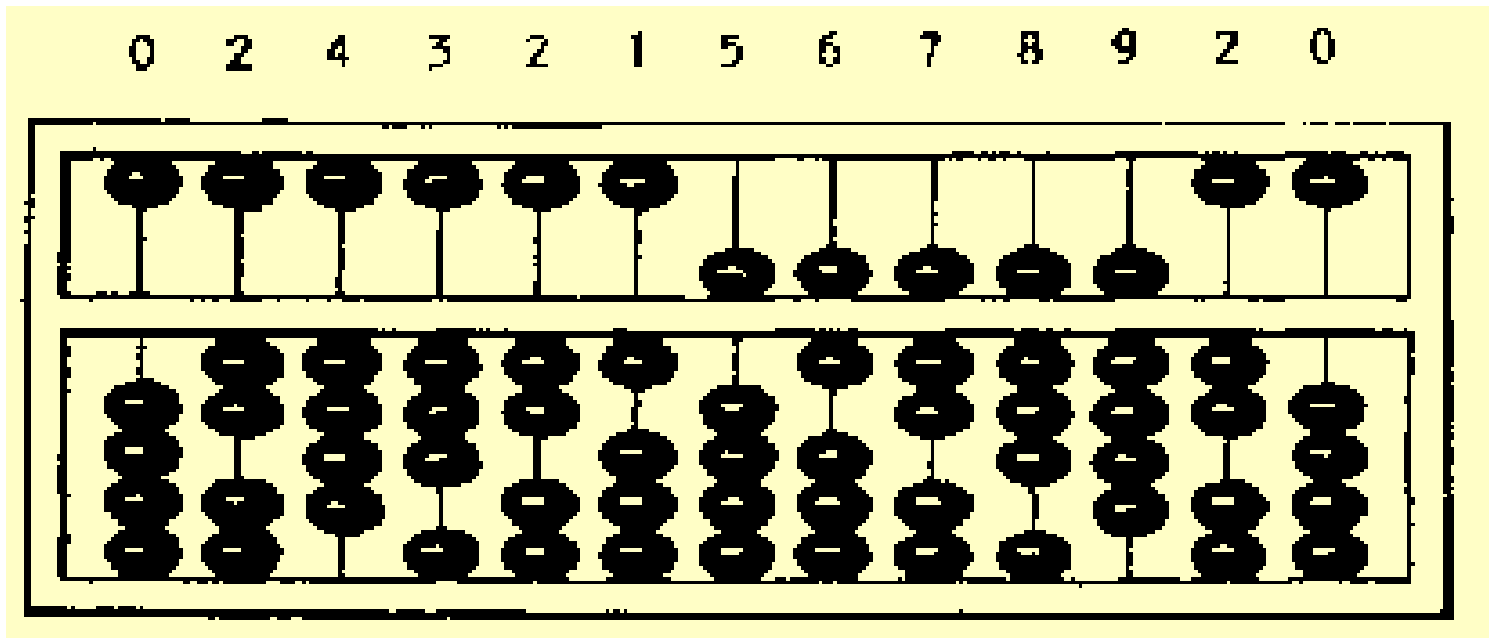
Characteristics of Computers



- **Versatility:** Computer is capable of performing almost any task, if the task can be reduced to a finite series of logical steps
- **Power of Remembering:** Computer can store and recall any amount of information because of its secondary storage capability. It forgets or loses certain information only when it is asked to do so
- **No I.Q.:** A computer does only what it is programmed to do. It cannot take its own *decision* in this regard
- **No Feelings:** Computers are devoid of emotions. Their judgment is based on the instructions given to them in the form of programs that are written by us (human beings)

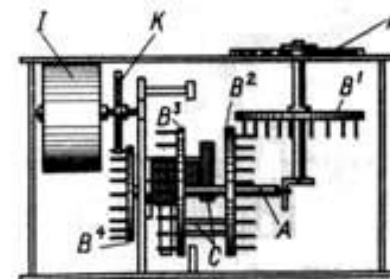
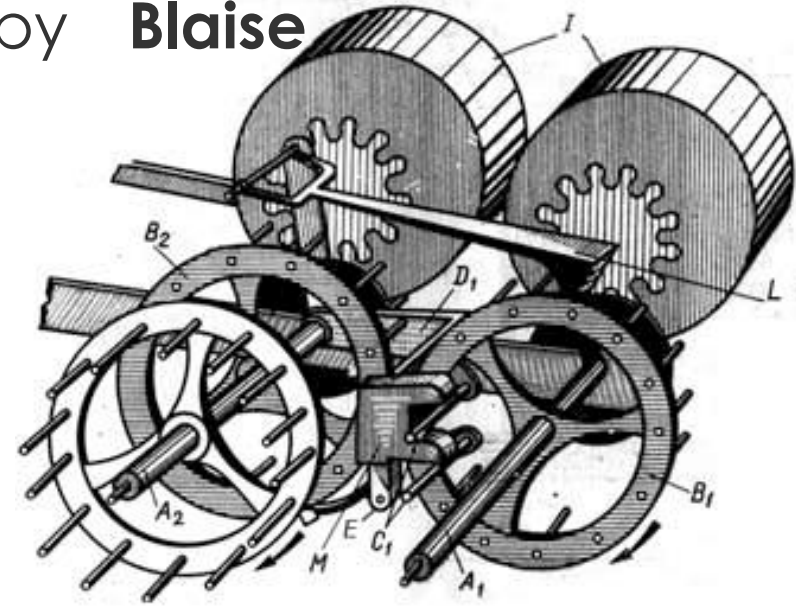
Evolution of Computers

- The abacus is a manually operated digital computer used in ancient civilizations
- The use of the word *abacus* dates before 1387 AD

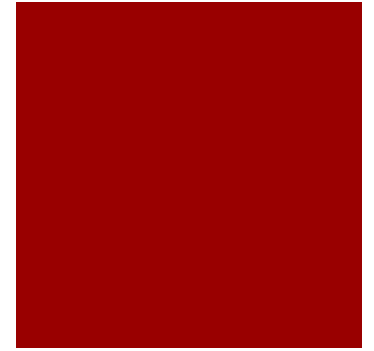


Evolution of Computers

- The first mechanical adding machine (calculator) was invented by **Blaise Pascal** (French) in 1642

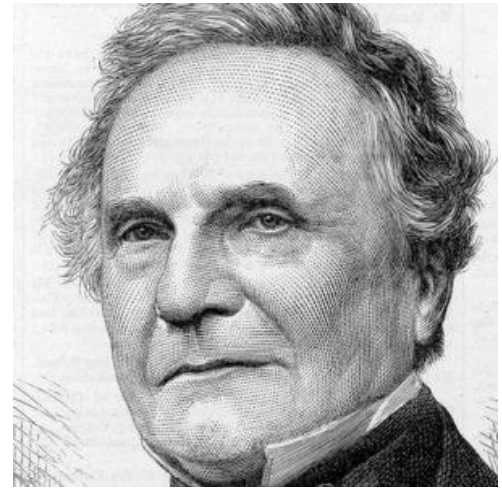


Evolution of Computers



- 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

Evolution of Computers



- *Charles Babbage* is considered to be the father of modern digital computers
- He is best remembered now for originating the concept of a programmable computer
- 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 ENIAC (1943-46)
- The EDVAC (1946-52)
- The EDSAC (1947-49)
- Manchester Mark I (1948)
- The UNIVAC I (1951)

Computer Generations



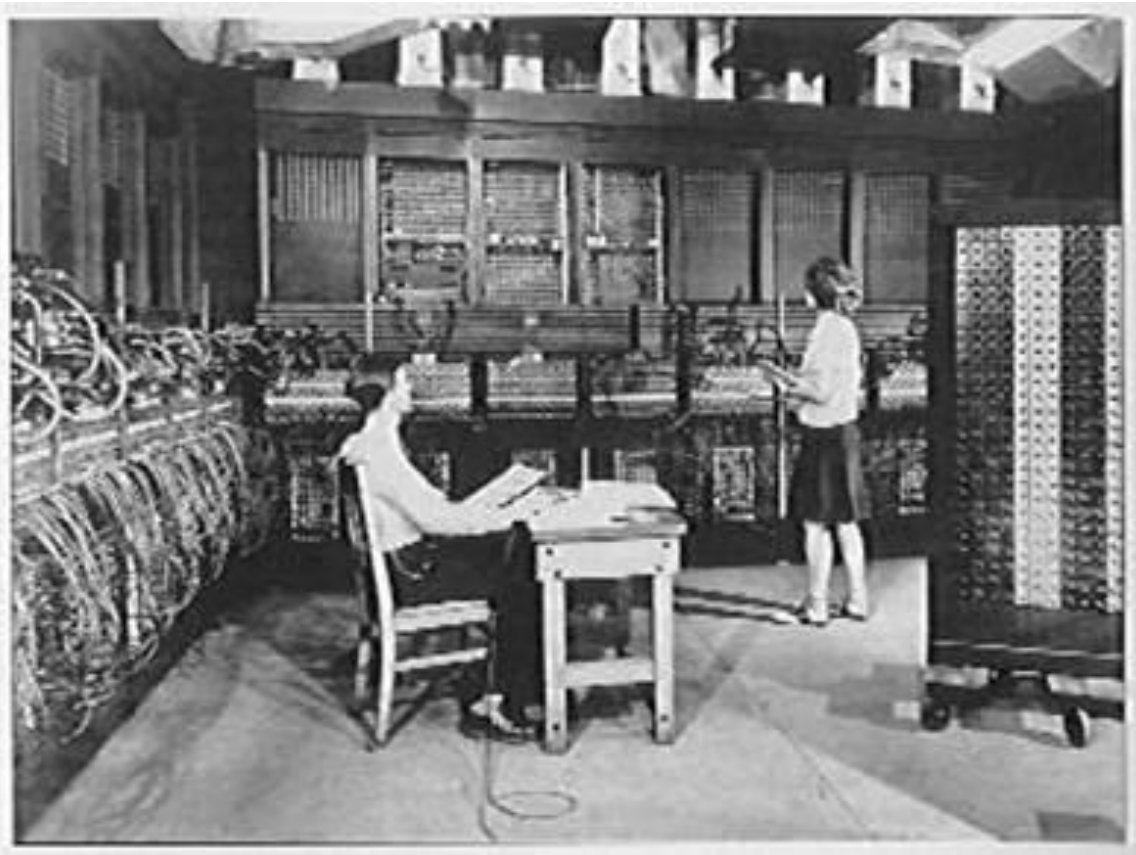
- “*Generation*” in computer talk is a step in technology. It provides a framework for the growth of computer industry
- Originally it was used to distinguish between various hardware technologies, but now it has been extended to include both hardware and software
- Till today, there are five computer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

Computer Generations



Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some representative systems
First (1942-1955)	Vacuum tubes Electromagnetic relay memory Punched cards secondary storage	Machine and assembly languages Stored program concept Mostly scientific applications	Bulky in size Highly unreliable Limited commercial use and costly Difficult commercial production Difficult to use	ENIAC EDVAC EDSAC UNIVAC I IBM 701

1st Generation Computer



Vacuum tube based



Vacuum tube

Computer Generations

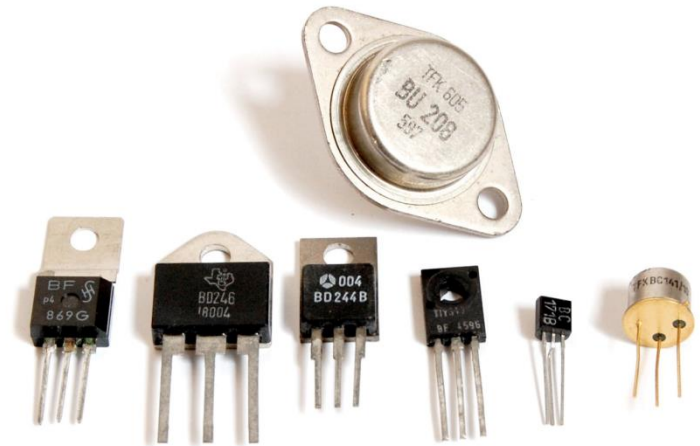


Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some representative systems
Second (1955-1964)	Transistors Magnetic cores memory Magnetic tapes Disks for secondary storage	Batch operating system High-level programming languages Scientific and commercial applications	Faster, smaller, more reliable and easier to program than previous generation systems Commercial production was still difficult and costly	Honeywell 400 IBM 7030 CDC 1604 UNIVAC LARC

2nd Generation Computer



Transistor based.



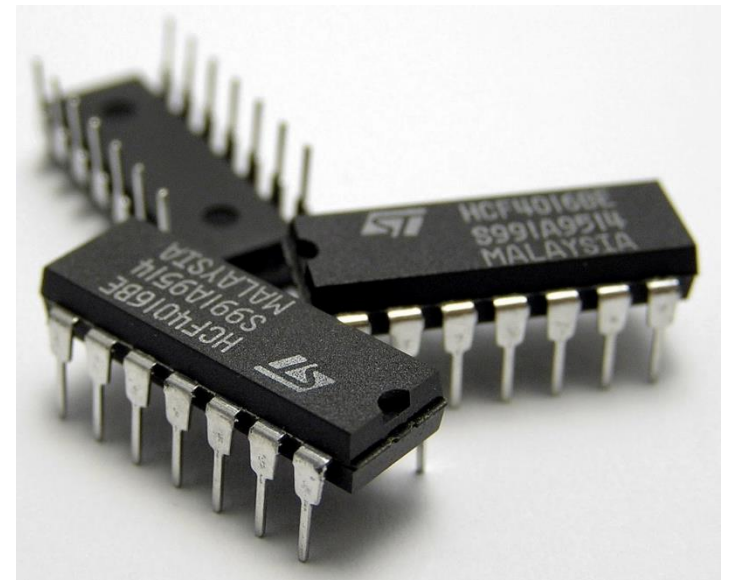
Transistor

Computer Generations



Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some rep. systems
Third (1964-1975)	ICs with SSI and MSI technologies Larger magnetic cores memory Larger capacity disks and magnetic tapes secondary storage Minicomputers; upward compatible family of computers	Timesharing operating system Standardization of high-level programming languages Unbundling of software from hardware	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	IBM 360/370 PDP-8 PDP-11 CDC 6600

3rd Generation Computer



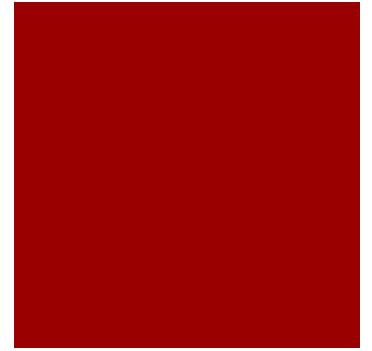
IC

Computer Generations



Generation (Period)	Key hardware Technologies	Key software technologies	Key characteristics	Some rep. systems
Fourth (1975-1989)	<p>ICs with VLSI technology</p> <p>Microprocessors; semiconductor memory</p> <p>Larger capacity hard disks as in-built secondary storage</p> <p>Magnetic tapes and floppy disks as portable storage media</p> <p>Personal computers</p> <p>Supercomputers based on parallel vector processing and symmetric multiprocessing technologies</p> <p>Spread of high-speed computer networks</p>	<p>Operating systems for PCs with GUI and multiple windows on a single terminal screen</p> <p>Multiprocessing OS with concurrent programming languages</p> <p>UNIX operating system with C programming language</p> <p>Object-oriented design and programming</p> <p>PC, Network-based, and supercomputing applications</p>	<p>Small, affordable, reliable, and easy to use PCs</p> <p>More powerful and reliable mainframe systems and supercomputers</p> <p>Totally general purpose machines</p> <p>Easier to produce commercially</p> <p>Easier to upgrade</p> <p>Rapid software development possible</p>	<p>IBM PC and its clones</p> <p>Apple II</p> <p>TRS-80</p> <p>VAX 9000</p> <p>CRAY-1</p> <p>CRAY-2</p> <p>CRAY-X/MP</p>

4th Generation Computer

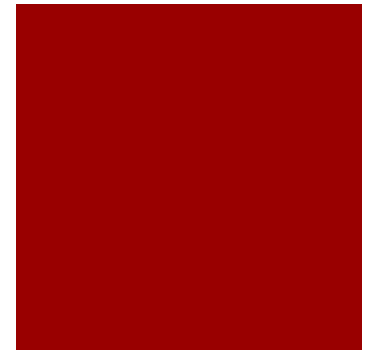


Computer Generations



Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some rep. systems
Fifth (1989- Present)	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	Micro-kernel based, multithreading, distributed OS Parallel programming libraries like MPI & PVM JAVA World Wide Web Multimedia, Internet applications More complex supercomputing applications	Portable computers Powerful, cheaper, reliable, and easier to use desktop machines Powerful supercomputers High uptime due to hot-pluggable components Totally general purpose machines Easier to produce commercially, easier to upgrade Rapid software development possible	IBM notebooks Pentium PCs SUN Workstations IBM SP/2 SGI Origin 2000 PARAM 10000

5th Generation Computer



Classification of Computers



- § Traditionally, computers were classified by their size, processing speed, and cost
- § Based on these factors, computers were classified as microcomputers, minicomputers, mainframes, and supercomputers
- § However, with rapidly changing technology, this classification is no more relevant
- § Today, computers are classified based on their mode of use

Classification of Computers



Based on their mode of use, computers are classified as:

- § Notebook computers
- § Personal computers
- § Workstations
- § Mainframe systems
- § Supercomputers
- § Clients and servers
- § Handheld computers

Notebook Computers

- § Portable computers mainly meant for use by people who need computing resource wherever they go
- § Approximately of the size of an 8½ x 11 inch notebook and can easily fit inside a briefcase
- § Weigh around 2 Kg only
- § Comfortably placed on ones lap while being used. Hence, they are also called *laptop PC*
- § Lid with display screen is foldable in a manner that when not in use it can be folded to flush with keyboard to convert the system into notebook form

Notebook Computers

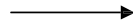


- § Designed to operate with chargeable batteries
- § Mostly used for word processing, spreadsheet computing, data entry, and power point presentations
- § Normally run MS-DOS or MS WINDOWS operating system
- § Some manufacturers are also offering models with GNU/Linux or its distributions
- § Each device of laptop is designed to use little power and remain suspended if not used

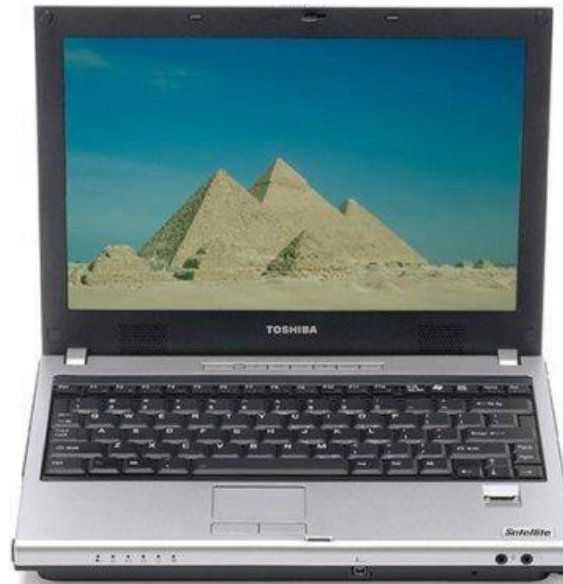
Notebook Computers



Foldable
flat screen



Keyboard, trackball,
hard disk, floppy
disk drive, etc. are
in this unit

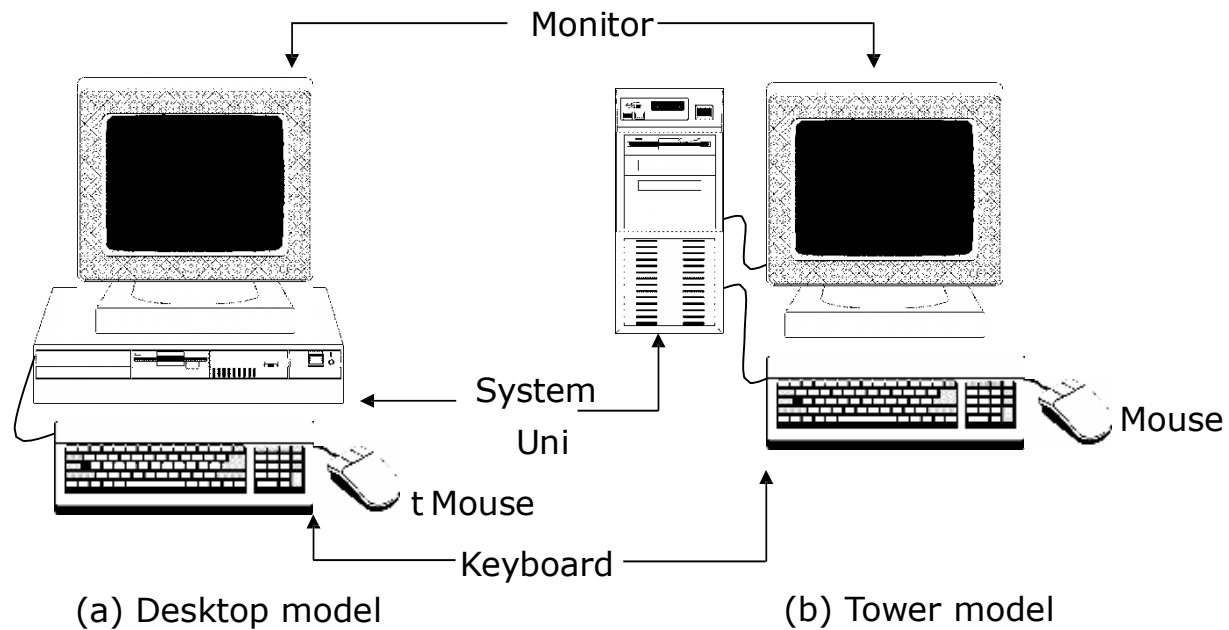
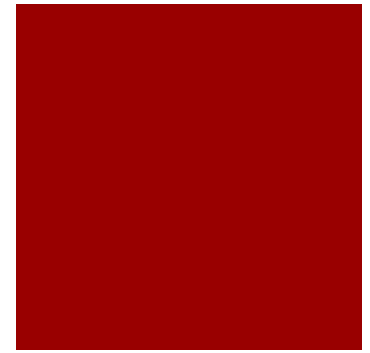


Personal Computers (PCs)



- § Non-portable, general-purpose computer that fits on a normal size office table
- § Designed to meet personal computing needs of individuals
- § Often used by children and adults for education and entertainment also
- § Generally used by one person at a time, supports multitasking
- § Two common models of PCs are desktop model and tower model
- § Popular OS are MS-DOS, MS-Windows, Windows-NT, Linux, and UNIX

Personal Computers (PCs)



Workstations



- § Powerful desktop computer designed to meet the computing needs of engineers, architects, and other professionals
- § Provides greater processing power, larger storage, and better graphics display facility than PCs
- § Commonly used for computer-aided design, multimedia applications, simulation of complex scientific and engineering problems, and visualization
- § Generally run the UNIX operating system or a variation of it
- § Operating system is generally designed to support multiuser environment

Workstations

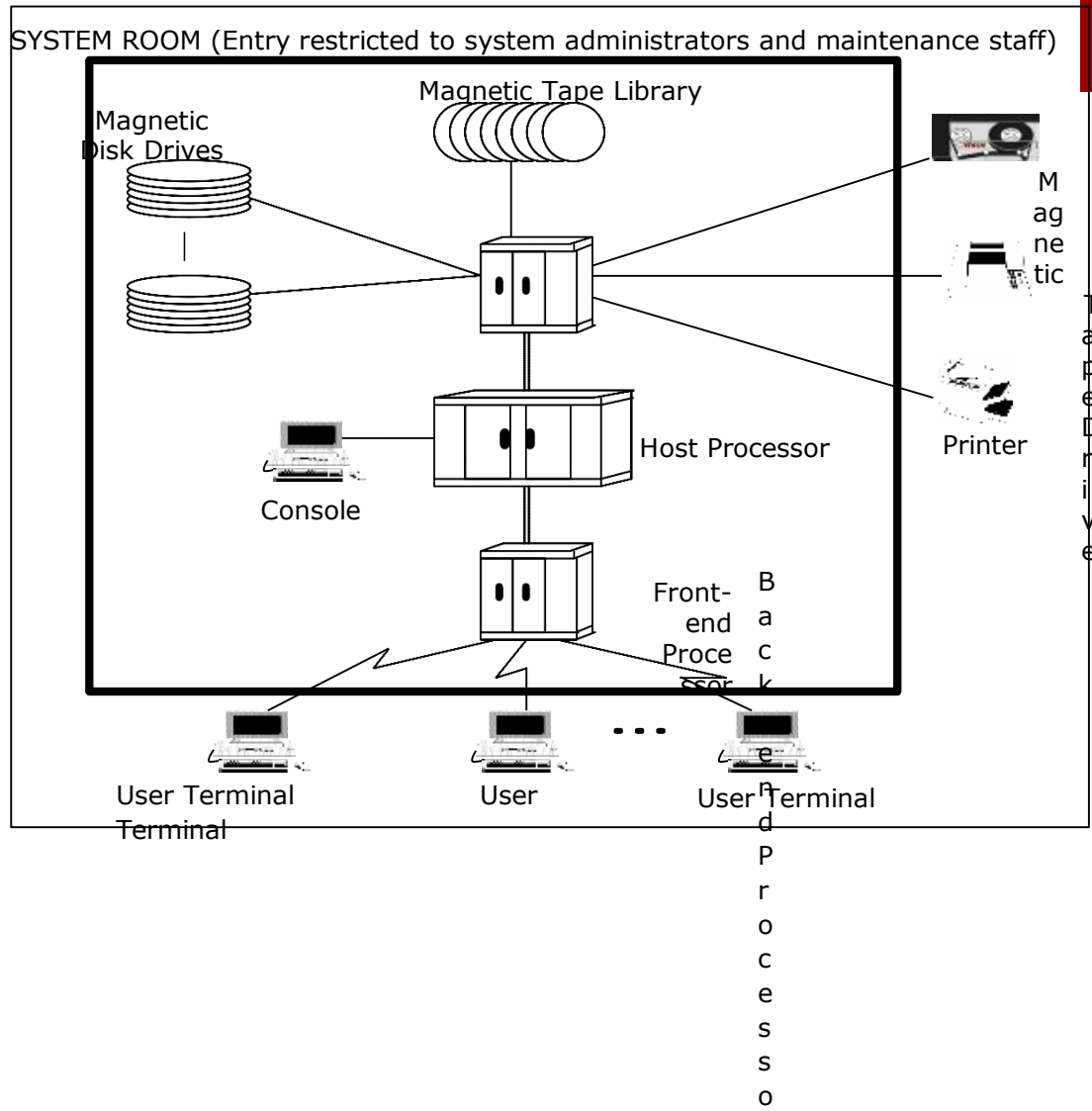


- § Mainly used by large organizations as banks, insurance companies, hospitals, railways, etc.
- § Used for data handling and information processing requirements
- § Used in such environments where a large number of users need to share a common computing facility
- § Oriented to input/output-bound applications

Workstations

- § Typically consist of a host computer, front-end computer, back-end computer, console terminals, magnetic disk drives, tape drives, magnetic tape library, user terminals, printers, and plotters
- § Typical mainframe system looks like a row of large file cabinets and needs a large room
- § Smaller configuration (slower host and subordinate computers, lesser storage space, and fewer user terminals) is often referred to as a *minicomputer system*

Workstations



Supercomputers



- § Most powerful and most expensive computers available at a given time.
- § Primarily used for processing complex scientific applications that require enormous processing power
- § Well known supercomputing applications include:
 - § Analysis of large volumes of seismic data
 - § Simulation of airflow around an aircraft
 - § Crash simulation of the design of an automobile
 - § Solving complex structure engineering problems
 - § Weather forecasting

Supercomputers

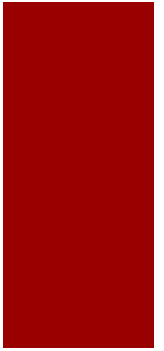


- § Supercomputers also support multiprogramming
- § Supercomputers primarily address processor-bound applications

Supercomputers



- § Use multiprocessing and parallel processing technologies to solve complex problems faster
- § Also known as *parallel computers* or *parallel processing systems*
- § Modern supercomputers employ hundreds of processors and are also known as *massively parallel processors*



Clients and Servers



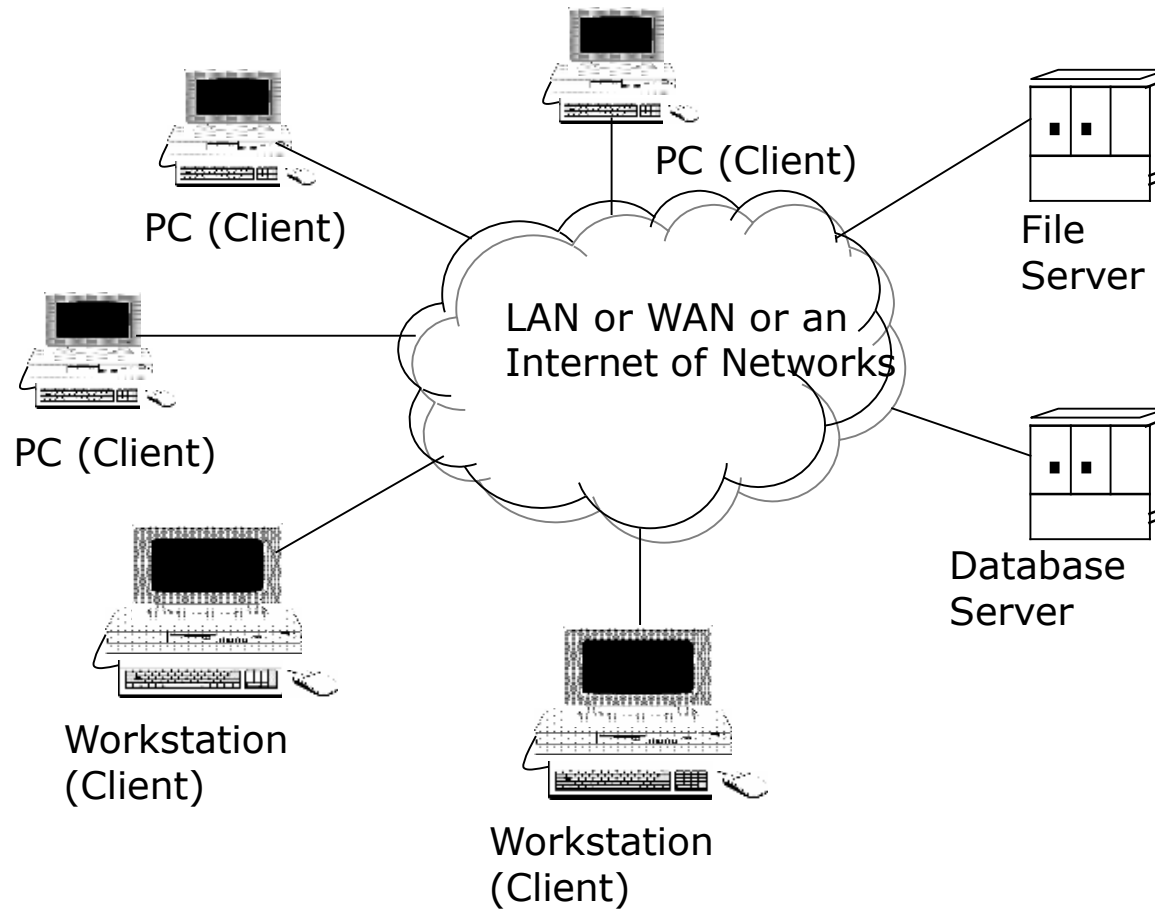
- § Client-server computing environment has multiple clients, one/more servers, and a network
- § *Client* is a PC/workstation with user-friendly interface running client processes that send service requests to the server
- § *Server* is generally a relatively large computer that manages a shared resource and provides a set of shared user services to the clients
- § Server runs the server process that services client requests for use of managed resources
- § *Network* may be a single LAN or WAN or an internet work

Clients and Servers



- § Involves splitting an application into tasks and putting each task on computer where it can be handled most efficiently
- § Computers and operating systems of a client and a server may be different
- § Common for one server to use the services of another server, and hence act both as client and server
- § Concept of client and server computers is purely role-based and may change dynamically as the role of a computer changes

Clients and Servers



Handheld Computers



- § Small computing device that can be used by holding in hand, also known as *palmtop*
- § Size, weight, and design are such that it can be used comfortably by holding in hand
- § Types of Handheld are:
 - § **Tablet PC:** Miniaturized laptop with light weight, screen flip, handwriting and voice recognition
 - § **PDA/ Pocket PC:** Acts as PIM device with LCD touch screen, pen for handwriting recognition, PC based synchronization, and optionally mobile phone services
 - § **Smartphone:** Fully functional mobile phone with computing power, voice centric, having a touch screen and are smaller than PDA

Handheld Computers



(a) Table PC



(b) PDA/Pocket PC



(c) Smartphone



Summary



Types of Computers	Notebook	PC	Workstation	Mainframe system	Super computer	Client	Server	Handheld
Key features								
Size	Very small (can be placed on ones lap)	Small (can be placed on an office table)	Medium (slightly larger than PC)	Large (needs a large room)	Large (needs a large room)	Generally small (may be large if it is also play the role of a server)	Generally large	Very small (can be placed on ones palm)
Processing power	Low	Low	High	Higher	Highest	Generally low	Generally high	Low
Main memory capacity	Low	Low	High	Higher	Highest	Generally low	Generally high	Low
Hard disk storage capacity	Low	Low	High	Highest	Higher	Generally low	Generally high	Low
Has its own monitor, keyboard, and mouse for user interface	Yes	Yes	Yes	Generally no	Generally no	Yes	Generally no	No

Importance of Computers in Business



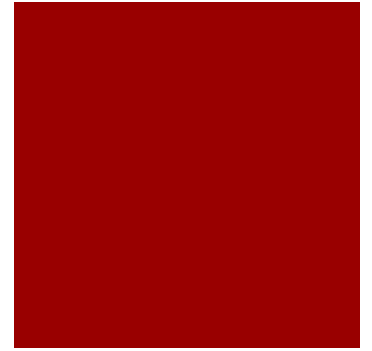
- § Computers Are Used for Communication
- § Computers Are Used for Marketing
- § Computers Are Used for Accounting
- § Computers Are Used for Storage
- § Computers Are Used to Produce Documents
- § Computers Are Used for Educational Purposes
- § Computers Are Used for Research

Importance of Computers in Business



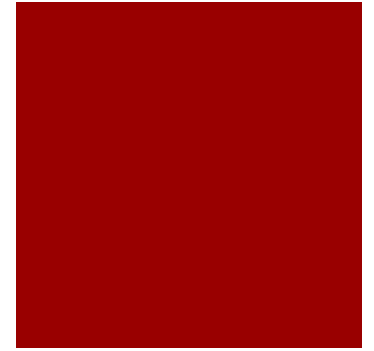
- § When anyone wants to start the business they use Computer
- § When business owners start executing the business idea and plan they use Computer
- § When they want to Print marketing and Advertising Material they Use Computer
- § When companies want to hire employees they use Computer
- § When organizations want to Advertise and Market their products and services they use Computer with an internet connection
- § When Businesses want to sell the products around the World they use Computer

Importance of Computers in Business



- § Reduce the cost of product and service development
- § Increase the demand for product and services
- § Help to faster the business transactions and reports
- § Computer Help thousands of people worldwide to earn money by using Computer

Computer Application in Business



- § Business Communication
- § Inventory Management
- § Customer Relationship Management
- § Payroll System
- § Advertisement
- § Data Management
- § Management Information System
- § Human Resource Management

Online Application in Business



§ A business application is a collection of components that provides a business functionality that you can use internally, externally, or with other business applications. You can create business applications of individual components, which are related to each other. Business application is a type of a custom collection.

§ E-commerce

§ Quickbooks

§ Slack

§ Facebook

§ Instagram

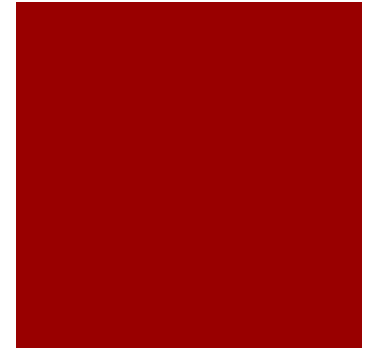
§ Google

§ Online Accounting software

Real-time Application in Business



- § A real-time application (RTA) is an application program that functions within a time frame that the user senses as immediate or current. The latency must be less than a defined value, usually measured in seconds. The use of RTAs is called real-time computing (RTC).
- § Videoconference applications
- § VoIP (voice over Internet Protocol)
- § Online gaming
- § Community storage solutions
- § Some e-commerce transactions
- § Chatting
- § IM (instant messaging)



Thank you