Basics of Computer Science

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About the Tutorial

Computer Science is one of the disciplines of modern science under which, we study about the various aspects of computer technologies, their development, and their applications in the present world.

Likewise, Computer Science includes a wide range of topics such as the development of Computer Technology (hardware and software), application of Computer technology in today's life, information technology, computer threat, computer security, etc. However, we have segregated this tutorial into different chapters for easy understanding.

Audience

This tutorial is designed exclusively for the students preparing for the different competitive exams including **civil services, banking**, **railway**, **eligibility test**, and all other competitive exams of such kind.

Prerequisites

It is a very basic tutorial that assumes no prior knowledge on any concepts related to Computer Science. Hence, there are no prerequisites whatsoever. This tutorial is entirely based on **reliable sources including books, relevant articles, and facts (taken from the official websites)**.

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1. Basics of Computer Science – Fundamental Concepts

A computer is basically a programmable machine capable to perform arithmetic and logical operations automatically and sequentially. It is also known as a data processor, as it can store, process, and retrieve data as per the wish of the user.

Data processing involves the following three activities:

- Input of data
- Manipulation/processing of data
- Giving output (i.e. management of output result)
- In computer system, data is arranged orderly and systematically.

The term "computer" is derived from a Latin term "compute," which means 'to calculate.' Initially, the computer system had been designed to calculate; it was intended to be a computing device. However, over a period of time, this device technically advanced; at present, it can perform a wide range of desirable works apart from data processing.

Major Functions of Computer System

Following are the core functions of a computer system:

- A computer accepts the command and/or data as input given by the user.
- A computer follows the instructions and stores the data given by the user.
- A computer processes the data as per the instructions given by the user.
- A computer gives the desirable results in the form of output.

Salient Features of Computer System

Following are the salient features of a Computer System:

- **Automation** — The operating system of a computer system is automatic, as no human intervention is required; simply you need to give the command and then it will do the work automatically.
- **Speed** — Depending upon the power of the computer, it can perform, it can take Millions of instructions per second.
- **Storage** — A computer system can store enormous quantity of data in different format. The storage capacity of a computer system is normally expressed in terms of Kilobytes (KB), Megabytes (MB), Gigabytes (GB), or Terabytes (TB).
- **Accuracy** — The accuracy of a computer system is very high.
- **Versatility** — A computer system is capable of performing a wide range of tasks.
- **Diligence** — A computer neither get tired nor lose concentration.
- **Reliability** — As a computer system always gives accurate result; therefore, its reliability is very high.
- **Vast memory** — A computer system can have a wide range of memory which can recall the desired data at any point of time.

Evolution of Computer System

The present Computer System has evolved after centuries of efforts from different intellectuals who contributed their works during different periods of time.

Abacus is (most likely) considered as the earlier counting device.

Let us now read about the innovators who contributed immensely in the development of a computer system.

John Napier

Napier was a Scottish mathematician who invented logarithms.

Further, Napier also invented a computing device, which consisted of sticks with numbers imprinted on them. Napier named sticks 'bones,' as they were made up of bones.

Blaise Pascal

Pascal was a French mathematician who invented a machine based on gear wheels, which helped greatly in calculation.

Charles Babbage

Babbage was an English Polymath, Mathematician, Mechanical Engineer, Philosopher, and Inventor. In 1822, he developed a machine capable to calculate the successive difference of expression and prepared a table which helped him in his calculations.

Lady Ada Lovelace

Lovelace was an English mathematician, who researched on Babbage's work. She has given the concept that 'computers can be programmed'. Her work helped a great deal in the advancement of computer system.

John Atanstoff

With the assistance of Berry, John Atanstoff developed the Atanstoff Berry Computer (more popular as ABC) in 1937. It marked the beginning of the development of electronic digital computer.

John Mauchly and Eckart

In 1947, John Mauchly and Eckart developed the first large scale Electronic Digital Computer. It was called the Electronic Numerical Integrator and Calculator (ENIAC).

Maurice V. Wilkes

In 1949, Wilkes (at Cambridge University) designed Electronic Delay Storage Automatic Calculator (EDSAC). It was the first computer that started its operating system on the stored program concept.

2. Basics of Computer Science – Role of Computer in Today's World

In today's world, for almost every activity whether personal (for example, operating personal savings bank account) or business-related (for example, selling any product or services); in some or the other way, we rely on the computer system.

Due to the growing dependency on computers, every small and big organizations and other business companies have started offering computer-based service. Furthermore, the advancement of communications, electronic service networks, and multimedia have opened a new door for corporates by providing an effective way of business processing, payment transfer, and service delivery.

Advantages of Computers in Business

Following are the major advantages of introducing computer system in business:

Independency

As computers help in making the business automated, the businesses are becoming more and more independent. No more, there is the need to put man-power for every work, as with the help of computer most of the works can be automated. Starting from ticket booking to a luxury car manufacturing, everything is automated.

Cost Cutting

A number of business are based online in recent times; therefore, there is no need to open business branch in every city, rather having one centralized inventory can make the business easier. There is no need to employ many man-power.

Marketing

With the use of computer system with Internet facility, it is very simple to make a business global in a given period of time. Website, email, social media websites, online advertisements, etc. are the important tools of online marketing.

Huge Transaction Capacity

A number of tasks are being done by computer including ticket booking to money transactions; this increases the transaction capacity.

Huge Storage Capacity

Normally, most of the businesses need to store and maintain huge data and other records; manually, it is very difficult to maintain, but the use of computer not only increases the storage capacity, but also facilitates the processing and retrieval of data anytime.

Improvement of Productivity & Efficiency

As most of the tasks in almost every industry has become automated, it has now become much easier to manufacture a huge bulk of products in very less time. Through computer technology, services also became faster and easier.

High Accuracy

There is hardly any scope of errors in an automated system; however, if any error occurs, it is largely a human error.

Ease of Data Sharing

Data sharing has now become very simple just the way it is simple to link one computer system to another.

Competition

The applicability of computer technology has increased competition; now, the customers can avail support 24x7.

Enhanced the Security System

Computer also helps keep the data of businesses secure. However, this security can face threats too. For instance, if someone hacks the system or there is a virus attack, it can have the potential to damage all the data that is secured.

3. Basics of Computer Science – Computer System

A computer system is an integrated form of different components that work together to give a desirable result. It has different component and each works for a specific purpose; however, they generate a common result as required by the user.

Components of Computer System

Let us now understand the following basic components of a computer system.

- Hardware
- Software
- Humanware
- Firmware
- Bridgeware

Hardware

The physical components collectively form the hardware of a computer system. Hardware comprises of the equipment that helps in the working system of the computer.

Following are the different types of hardware components (which have specific functions):

- **Monitor**: It displays (visual) the result.

- **CPU**: It is the Central Processing Unit that controls the computer's functions and transmits data.
- **Motherboard**: It is mainly accountable to establish communication between components and transmission of information.
- **RAM**: It is the Random Access Memory and responsible for the storage of programs that are currently running and also stores data temporarily.
- **Hard Disk Drive**: It is a permanent memory storage device.
- **Floppy Disk Drive**: It is hardly being used in recent times.
- **Optical disks**: It is a device that also store data. For example, CD, DVD, etc.

Input & Output Device

The following table categorically lists down the input and output device:

Input Device	Output Device	Input Device	Output Device
Mouse	Monitor	Microphone	Speaker
Keyboard	Printer	Camera	Earphone
Scanner	Projector	Trackball	Monitor
Touchpad	Plotter	Joystick	Monitor

Software

The hardware components can only function when software components are added to the computer system. Software is a program that performs different commands given by a user.

Software is an intangible part of hardware and controls the sequence of operations.

Types of Software

Depending on the basic features and functionality, software can be categorized as:

- Operating Systems (OS)
- Application Software (AS)
- E–accessibility Software

Let us now discuss the software components in brief.

Operating System

This software helps to load the basic program automatically as soon as the computer is started. Following are the major types of operating system:

Operating Software	Examples
Microsoft Windows	XP, Vista, etc.
Mac OS X	Panther, Cheetah, Snow leopard, etc.
Linux	Debian, Ubuntu, Fedora, Knoppix, etc.

Application Software

The software, which can be used on an installed operating system, is known as application software. Following are the significant examples of application software:

Application Software	Examples
Office programs	Microsoft Office, OpenOffice, LibreOffice, etc.
Web browser	Internet Explorer, Mozilla Firefox, Google Chrome, Opera, Safari, etc.
Antivirus Program	Norton, McAfee, Quick Heal, Avira, Kaspersky, etc.

E –accessibility Software

The E-accessibility software components additional facilities to users such as:

- Voice recognition software
- Screen reader
- Magnifying tool
- On-screen keyboard
- Video games
- Learning software, etc.

4. Basics of Computer Science – Programing Languages

The computer system is simply a machine and hence it cannot perform any work; therefore, in order to make it functional different languages are developed, which are known as programing languages or simply computer languages.

Over the last two decades, dozens of computer languages have been developed. Each of these languages comes with its own set of vocabulary and rules, better known as syntax. Furthermore, while writing the computer language, syntax has to be followed literally, as even a small mistake will result in an error and not generate the required output.

Following are the major categories of Programming Languages:

- Machine Language
- Assembly Language
- High Level Language
- System Language
- Scripting Language

Let us discuss the programming languages in brief.

Machine Language or Code

This is the language that is written for the computer hardware. Such language is effected directly by the central processing unit (CPU) of a computer system.

Assembly Language

It is a language of an encoding of machine code that makes simpler and readable.

High Level Language

The high level language is simple and easy to understand and it is similar to English language. For example, COBOL, FORTRAN, BASIC, C, C+, Python, etc.

High-level languages are very important, as they help in developing complex software and they have the following advantages:

- Unlike assembly language or machine language, users do not need to learn the high-level language in order to work with it.
- High-level languages are similar to natural languages, therefore, easy to learn and understand.
- High-level language is designed in such a way that it detects the errors immediately.
- High-level language is easy to maintain and it can be easily modified.

- High-level language makes development faster.
- High-level language is comparatively cheaper to develop.
- High-level language is easier to document.

Although a high-level language has many benefits, yet it also has a drawback. It has poor control on machine/hardware.

The following table lists down the frequently used languages:

SQL
Java
Javascript
C#
Python
C++
PHP
IOS
Ruby/Rails
.Net

5. Basics of Computer Science – Hardware & Software

The following table highlights the points that differentiate a hardware from a software.

Hardware	Software
It is the physical component of a computer system.	It is the programing language that makes hardware functional.
It has the permanent shape and structure, which cannot be modified.	It can be modified and reused, as it has no permanent shape and structure
The external agents such as dust, mouse, insects, humidity, heat, etc. can affect the hardware (as it is tangible).	The external agents such as dust, mouse, insects, humidity, heat, etc. cannot affect (as it is not tangible).
It works with binary code (i.e., 1's to 0's) .	It functions with the help of high level language like COBOL, BASIC, JAVA, etc.
It takes in only machine language, i.e., lower level language.	It takes in higher level language, easily readable by a human being.
It is not affected by the computer bug or virus.	It is affected by the computer bug or virus.
It cannot be transferred from one place to other electronically.	It can transfer from one place to other electronically.
Duplicate copy of hardware cannot be created.	A user can create copies of a software as many as he wishes.

6. Basics of Computer Science – Analog and Digital

The following table highlights the basic differences between analog and digital:

Analog	Digital
Its functions on physical analog system.	It functions on discrete numbers system.
The calculations in this system are primarily converted to equations and later converted into electrical signals.	The calculations in this system are converted into binary numbers (i.e., 1s and 0s).
To function, it requires physical analog.	To function, it requires discrete numbers.
It gives output in the form of 'graph'.	It gives output in the form of discrete values.
Accuracy comparatively is less.	Accuracy is very high.
Performs at a low speed.	It performs at a very high speed.
Difficult to make changes, as it is less flexible.	It is highly flexible.
It has memory of low capacity.	It has memory of high capacity.
Its application is limited to certain applications.	Its application is applicable to a number of applications.
It is hardly applicable for the business applications.	It is very much suitable for the business applications.
It cannot process alpha-numeric data.	It can process alpha-numeric data.
It requires RF technology.	It requires IP networking.
Static channel assignment.	Automatic channels exist as required.

7. Basics of Computer Science – Operating System

An operating system is the fundamental basis of all other application programs. Operating system is an intermediary between the users and the hardware.

Operating system controls and coordinates the use of hardware among application programs. The major services of an operating system are:

- Memory management
- Disk access
- Creating user interface
- Managing the different programs operating parallel
- Likewise, it controls and manage the hardware's working

Applications of Operating System

Following are the major *applications* of an operating system:

- An operating system is accountable for the formation and deletion of files and directories.
- An operating system manages the process of deletion, suspension, resumption, and synchronization.
- An operating system manages memory space by allocation and de-allocation.
- An operating system stores, organizes, and names and protects the existing files.

- Further, an operating system manages all the components and devices of the computers system including modems, printers, plotters, etc.
- In case, if any device fails, the operating system detects and notify.
- An operating system protects from destruction as well as from unauthorized use.
- An operating system facilitates the interface to user and hardware.

Types of Operating System

Following are the major types of operating system:

- Disk Operating System (DOS)
- Windows Operating System
- Unix Operating System

Let us now discuss each operating system in detail.

Disk Operating System

MS-DOS is one of the oldest and widely used operating system. DOS is a set of computer programs, the major functions of which are file management, allocation of system resources, providing essential features to control hardware devices.

DOS commands can be typed in either upper case or lower case.

Features of DOS

Following are the significant features of DOS:

- It is a single user system.
- It controls program.
- It is machine independence.
- It manages (computer) files.
- It manages input and output system.
- It manages (computer) memory.
- It provides command processing facilities.
- It operates with Assembler.

Types of DOS Commands

Following are the major types of DOS Command:

- **Internal Commands**: Commands such as DEL, COPY, TYPE, etc. are the internal commands that remain stored in computer memory.

- **External Commands**: Commands like FORMAT, DISKCOPY, etc. are the external commands and remain stored on the disk.

Windows Operating System

The operating system window is the extension of the disk operating system.

It is the most popular and simplest operating system; it can be used by any person who can read and understand basic English, as it does not require any special training.

However, the Windows Operating System requires DOS to run the various application programs initially. Because of this reason, DOS should be installed into the memory and then window can be executed.

Elements of Windows OS

Following are the significant element of **W**indows **O**perating **S**ystem (WOS):

- Graphical User Interface
- Icons (pictures, documents, application, program icons, etc.)
- Taskbar
- Start button
- Windows explorer
- Mouse button
- Hardware compatibility
- Software compatibility
- Help, etc.

Versions of Windows Operating System

Following are the different versions of Windows Operating System:

Version	Year	Version	Year
Window 1.01	1985	Windows XP Professional x64	2005
Windows NT 3.1	1993	Windows Vista	2007
Windows 95	1995	Windows 7	2009
Windows 98	1998	Windows 8	2012

Windows 2000	2000	Windows 10	2015
Windows ME	2000	Windows Server 2016	2016
Windows XP	2001		

Unix Operating System

The Unix Operating System is the earliest operating system developed in 1970s. Let us consider the following points relating to the Unix Operating System:

- It is an operating system that has multitasking features.
- It has multiuser computer operating systems.
- It runs practically on every sort of hardware and provides stimulus to the open source movement.
- It has comparative complex functionality and hence an untrained user cannot use it; only the one who has taken training can use this system.
- Another drawback of this system is, it does not give notice or warn about the consequences of a user's action (whether user's action is right or wrong).

8. Basics of Computer Science – Internet

Internet is a system that interconnects the different computer systems across the world. It uses the Internet protocol suite to link devices located in different corners of the world.

The Internet system carries an extensive range of information resources and services including World Wide Web (WWW), telephony, electronic mail, etc. It uses standard internet protocols, such as TCP/IP and HTTP, etc.

An internal web comprises of all Hypertext Transfer Protocol (HTTP) nodes on a private network; for example, an organization's LAN or WAN.

Features of Internet

Let us now discuss the features of Internet. The features are described below:

Accessibility

An Internet is a global service and accessible to all. Today, people located in a remote part of an island or interior of Africa can also use Internet.

Easy to Use

The software, which is used to access the Internet (web browser), is designed very simple; therefore, it can be easily learned and used. It is easy to develop.

Interaction with Other Media

Internet service has a high degree of interaction with other media. For example, News and other magazine, publishing houses have extended their business with the help of Internet services.

Low Cost

The development and maintenance cost of Internet service are comparatively low.

Extension of Existing IT Technology

This facilitates the sharing of IT technology by multiple users in organizations and even facilitates other trading partners to use.

Flexibility of Communication

Communication through Internet is flexible enough. It facilitates communication through text, voice, and video too. These services can be availed at both organizational and individual levels.

Security

Last but not the least, Internet facility has to a certain extent helped the security system both at the individual and national level with components such as CCTV camera, etc.

Internet Software

Internet Software comprises of all the tools needed for networking through computer. Following are a few important components of the Internet Software:

- Transmission Control Protocol/ Internet Protocol (TCP/IP)
- Dialer Software
- Interment Browser

Internet Applications

Internet applications are server-based applications. Following are a few Internet Applications:

- World Wide Web (WWW)
- Electronic mail (e-mail)
- File Transfer Protocol (FTP)
- Telnet (i.e., log-in to the computer located remotely)
- Internet Relay Chat (IRC) (Real time video chatting)

9. Basics of Computer Science – Types of Computers

All the computers that are developed are not alike rather they have different designs and features. Some computers have very high capacity as well as working speed; however, some are slow. Depending upon the requirements, computers are being developed.

Types of Computer

Depending upon the internal structure and subsequent features and applicability, computer system is categorized as follows:

Mainframe Computer

It is high capacity and costly computer. It is largely used by big organizations where many people can use it simultaneously.

Super Computer

This category of computer is the fastest and also very expensive. A typical supercomputer can solve up to ten trillion individual calculations per second.

Workstation Computer

The computer of this category is a high-end and expensive one. It is exclusively made for complex work purpose.

Personal Computer (PC)

It is a low capacity computer developed for single users.

Apple Macintosh (Mac)

It is a sort of personal computer manufactured by Apple company.

Laptop computer (notebook)

It is a handy computer that can be easily carried anywhere.

Tablet and Smartphone

Modern technology has advanced further. It has helped develop computers that are pocket-friendly. Tablets and smartphones are the best examples of such computer.

10. Basics of Computer Science – Computer Networking Terminology

In this chapter, we will discuss the major terminologies used in computer networking:

WAN

It stands for Wide Area Network and covers a wide area such as a city.

LAN

It stands for Local Area Network and covers a small area such as a small office or home. It physically connects all the computers located in the premises.

Internet

It is a computer network system that connects the computers of the world. It is normally connecting through WAN and LAN.

Intranet

It is a close room computer network system, as it covers a small area and only authorized people can access it.

Extranet

It is also a sort of Internet the access to which is granted only to a few.

World Wide Web (WWW)

It is the service that is used on Internet to view and search contents (in the form of web-pages).

Instant messaging (IM)

It is an online facility that facilitates us to chat or talk. Such service is provided by Skype, Google Talk, Windows Live Messenger, Yahoo Messenger, etc.

Voice over Internet Protocol (VoIP)

It is a Protocol, which is used especially for voice transfer over IP network. Likewise, it facilitates users to make phone-calls by using internet.

Really Simple Syndication (RSS)

It is a technique, which is used for the dissemination of information, articles, etc. Users normally subscribe to the RSS channel in order to receive news. After subscription, users do not need to visit the respective website rather they receive emails regarding the same.

Web log

It is a sort of online inventory (normally on a specialized topics) that consists of a series of entries. These entries are arranged in opposite chronological order. The person who maintains the weblog regularly update it with a new information.

Podcast

It is a digital file that normally contains audio or video record and is available on the Internet as well.

Social networking websites

It refers to the websites that facilitate users with a common platform where they can share their message (in text, audio, or even video form), images, videos, etc. For example, Facebook, Google+, Twitter, LinkedIn, MySpace, etc.

Chat Rooms

It is a dedicated area on the Internet that facilitates users to communicate.

Public Switched Telephone Network (PSTN)

It is a technical expression for public telephone system.

Integrated Services Digital Network (ISDN)

It is a set of communication standards that transmits voice, video, data, and other network services simultaneously.

Asymmetric Digital Subscriber Line (ADSL)

It is a sort of digital subscriber line (DSL) technology that facilitates faster data transmission.

Download

It is a process that saves data from Internet onto a personal computer.

Upload

It is a process that transfers the saved data from a personal computer to Internet server.

Dial-up

It is a technique in which a phone line is used in order to connect to the Internet.

Broadband

It is a wide bandwidth data transmission that transports multiple signals and traffic types swiftly.

11. Basics of Computer Science – Computer Applications

A number of tasks in today's world is computer based – filling an application, transferring fund, or doing online business everything can be done through computer application.

Easily accessible and user friendly, computer applications process the required transactions very quickly and accurately.

Computer applications are designed in such a simple manner that no qualification or training is required to use it; any person who can read and write can use computer application.

Uses of Computer Applications

In this section, we will discuss the different computer applications and their uses.

- On-line Application
- Real Time Application
- Business Application

Online Applications

Today, most of the applications are being accepted online, whether it is for opening a bank account, filling admission form, filling job application, etc.

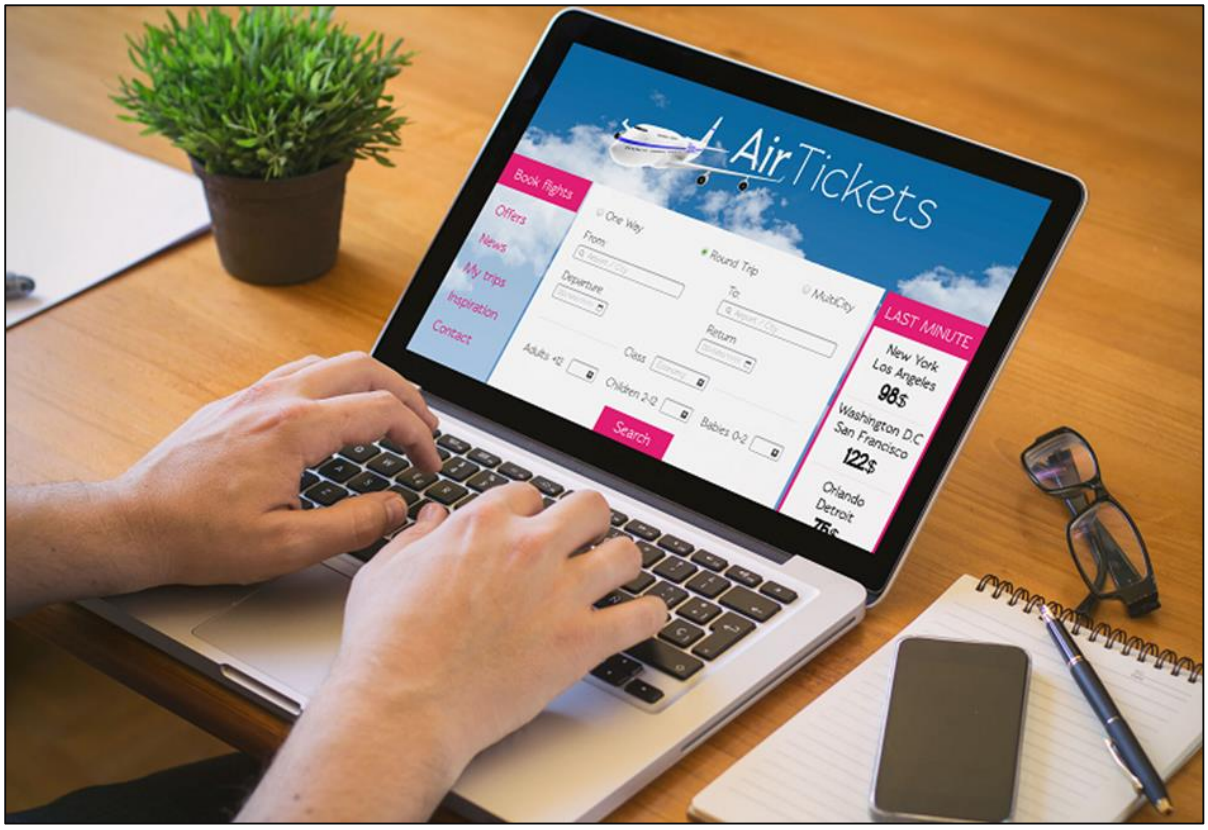
Following are the important forms of online applications:

Banking

Most of the banks are interlinked through computer networking and offer core banking facilities. Computer networking helps maintain accounts online, offers net banking facility, makes available online transactions facility, and offers digital signature facility, the biggest advantage being that ATM machines can dispense money anytime, etc.

Ticket Booking

Ticket booking has become easier with computer networking. Flight ticket, railway ticket, and even bus ticket can be booked online with simple and easy steps.



Passport Application

If you want to apply for a new passport, you can do it by yourself online. Besides, you can also apply for other essential documents online such as PAN card, Aadhaar Card, etc.

Job Application

Today, most of the applications (private as well as government) are being filled online. Many of the organizations also conduct competitive exams leading to employment online.

Admission Application

Most of the schools and universities have made their admission applications available online; they also accept fees online.

Real-time Application

Real-time application is a computer based application program that functions in a given period of time. Or in other words, in a given period of time, a user has to perform certain functions before the time lapses.

For example, if you are making online transactions, then you have to provide the required information in a given time framework or else you will miss the chance.

Following are significant examples of real-time application:

Videoconferencing

With this technology, people can connect with each other visually from different places.

VoIP (voice over Internet Protocol)

This technology helps to make telephone calls over digital computer networks.

E-commerce transactions

This technology helps in buying and selling products over the digital computer network.

Online banking

Online banking is virtual banking from any place with the help of computer networks.

Instant messaging

This is where messages can be exchanged over the Internet instantly.

Online gaming

This enables playing of games partially or completely over the Internet.

Business Application

Different businesses have different computer applications; however, a few applications such as for maintaining the data base (of respective business), keeping employees' records, offering online business facilities, online promotions, etc. are the common features of almost every business organization.

As such, introduction of computer technology has made business easier, simpler, and accessible 24x7.

12. Basics of Computer Science – Generations of Computer

The development of computer systems is normally discussed as the development over different generations.

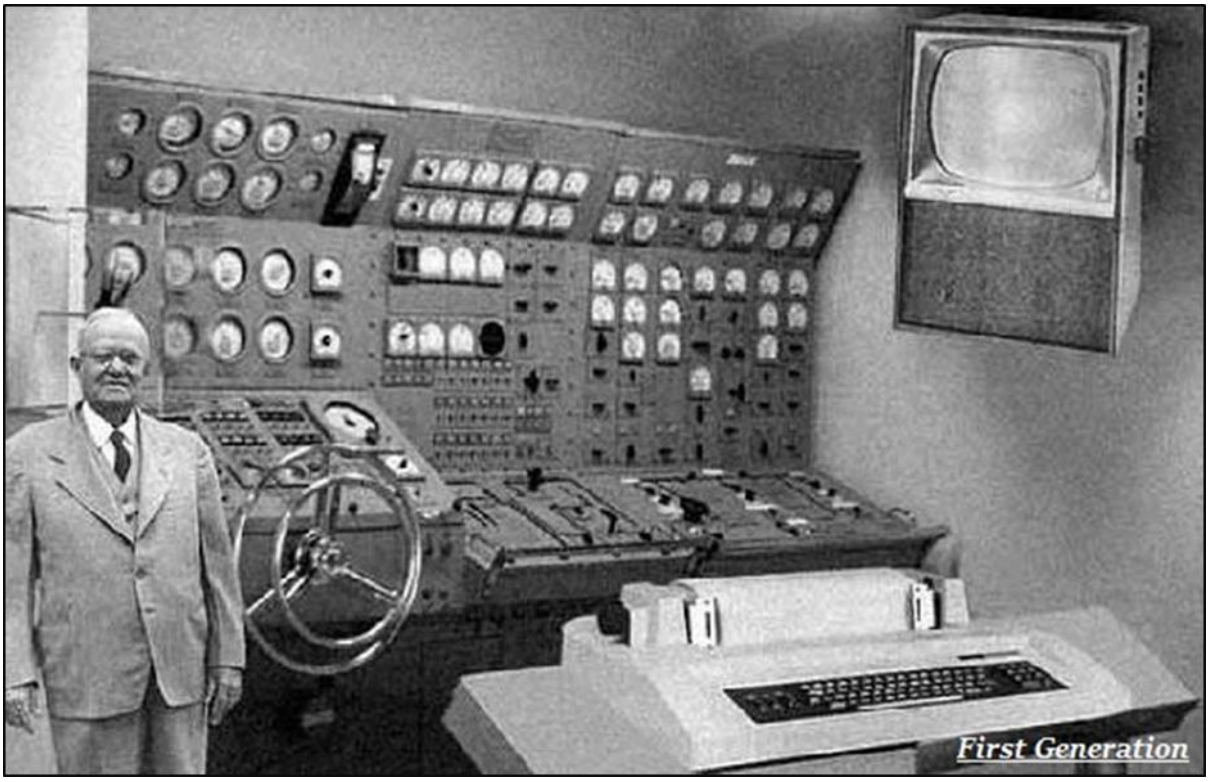
With the succession of different generations, came the advancement in computer technology.

Computer Generations

Let us now discuss the development in Computer Technology over the different generations.

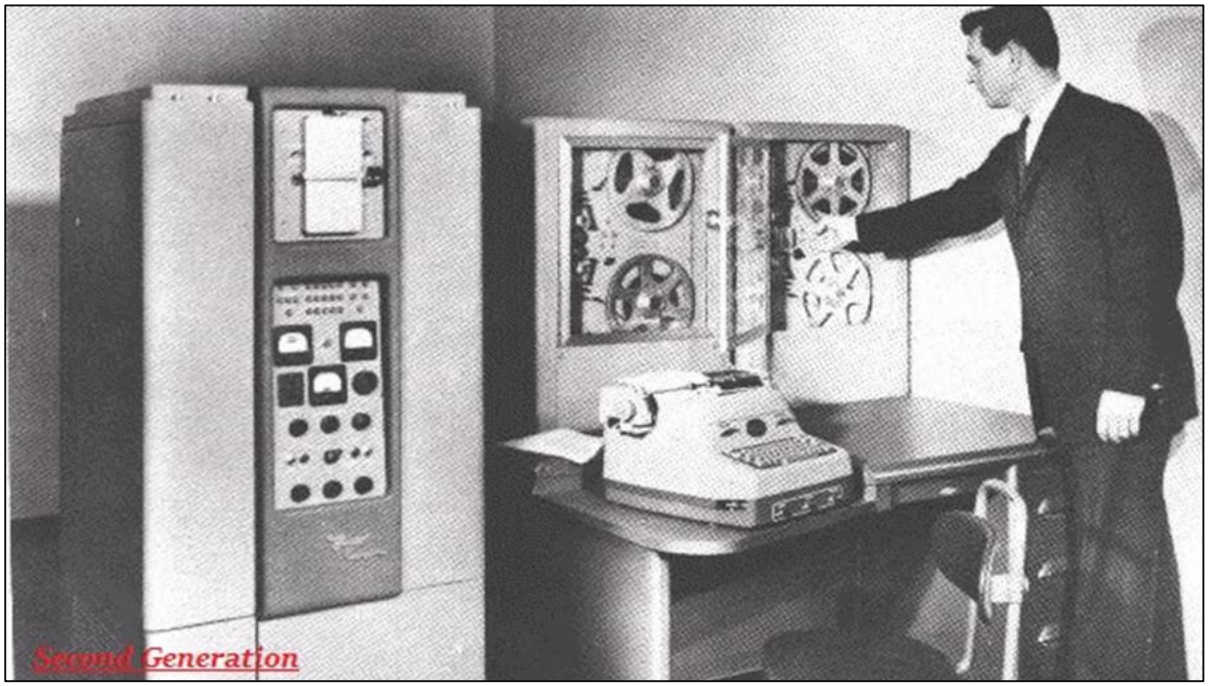
First Generation

- The period 1940 to 1956, roughly considered as the First Generation of Computer.
- The first generation computers were developed by using vacuum tube or thermionic valve machine.
- The input of this system was based on punched cards and paper tape; however, the output was displayed on printouts.
- The first generation computers worked on binary-coded concept (i.e., language of 0-1). **Examples**: ENIAC, EDVAC, etc.



Second Generation

- The period 1956 to 1963 is roughly considered as the period of Second Generation of Computers.
- The second generation computers were developed by using transistor technology.
- In comparison to the first generation, the size of second generation was smaller.
- In comparison to computers of the first generation, the computing time taken by the computers of the second generation was lesser.



Third Generation

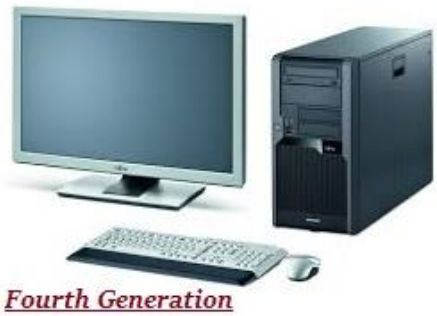
- The period 1963 to 1971 is roughly considered as the period of Third Generation of computers.
- The third generation computers were developed by using the Integrated Circuit (IC) technology.

Third Generation

- In comparison to the computers of the second generation, the size of the computers of the third generation was smaller.
- In comparison to the computers of the second generation, the computing time taken by the computers of the third generation was lesser.
- The third generation computer consumed less power and also generated less heat.
- The maintenance cost of the computers in the third generation was also low.
- The computer system of the computers of the third generation was easier for commercial use.

Fourth Generation

- The period 1972 to 2010 is roughly considered as the fourth generation of computers.
- The fourth generation computers were developed by using microprocessor technology.



Fourth Generation

- By coming to fourth generation, computer became very small in size, it became portable.
- The machine of fourth generation started generating very low amount of heat.
- It is much faster and accuracy became more reliable.
- The production cost reduced to very low in comparison to the previous generation.
- It became available for the common people as well.

Fifth Generation

- The period 2010 to till date and beyond, roughly considered as the period of fifth generation of computers.
- By the time, the computer generation was being categorized on the basis of hardware only, but the fifth generation technology also included software.
- The computers of the fifth generation had high capability and large memory capacity.
- Working with computers of this generation was fast and multiple tasks could be performed simultaneously.
- Some of the popular advanced technologies of the fifth generation include Artificial intelligence, Quantum computation, Nanotechnology, Parallel processing, etc.

13. Basics of Computer Science – Data Processing

Collection, manipulation, and processing collected data for the required use is known as data processing. It is a technique normally performed by a computer; the process includes retrieving, transforming, or classification of information.

However, the processing of data largely depends on the following:

- The volume of data that need to be processed
- The complexity of data processing operations
- Capacity and inbuilt technology of respective computer system
- Technical skills
- Time constraints

Methods of Data Processing

Let us now discuss the different methods of data processing.

- Single user programing
- Multiple programing
- Real-time processing
- On-line processing
- Time sharing processing
- Distributed processing

Single User Programing

It is usually done by a single person for his personal use. This technique is suitable even for small offices.

Multiple Programing

This technique provides facility to store and execute more than one program in the Central Processing Unit (CPU) simultaneously. Further, the multiple programing technique increases the overall working efficiency of the respective computer.

Real-time Processing

This technique facilitates the user to have direct contact with the computer system. This technique eases data processing. This technique is also known as the direct mode or the interactive mode technique and is developed exclusively to perform one task. It is a sort of online processing, which always remains under execution.

On-line Processing

This technique facilitates the entry and execution of data directly; so, it does not store or accumulate first and then process. The technique is developed in such a way that reduces the data entry errors, as it validates data at various points and also ensures that only corrected data is entered. This technique is widely used for online applications.

Time-sharing Processing

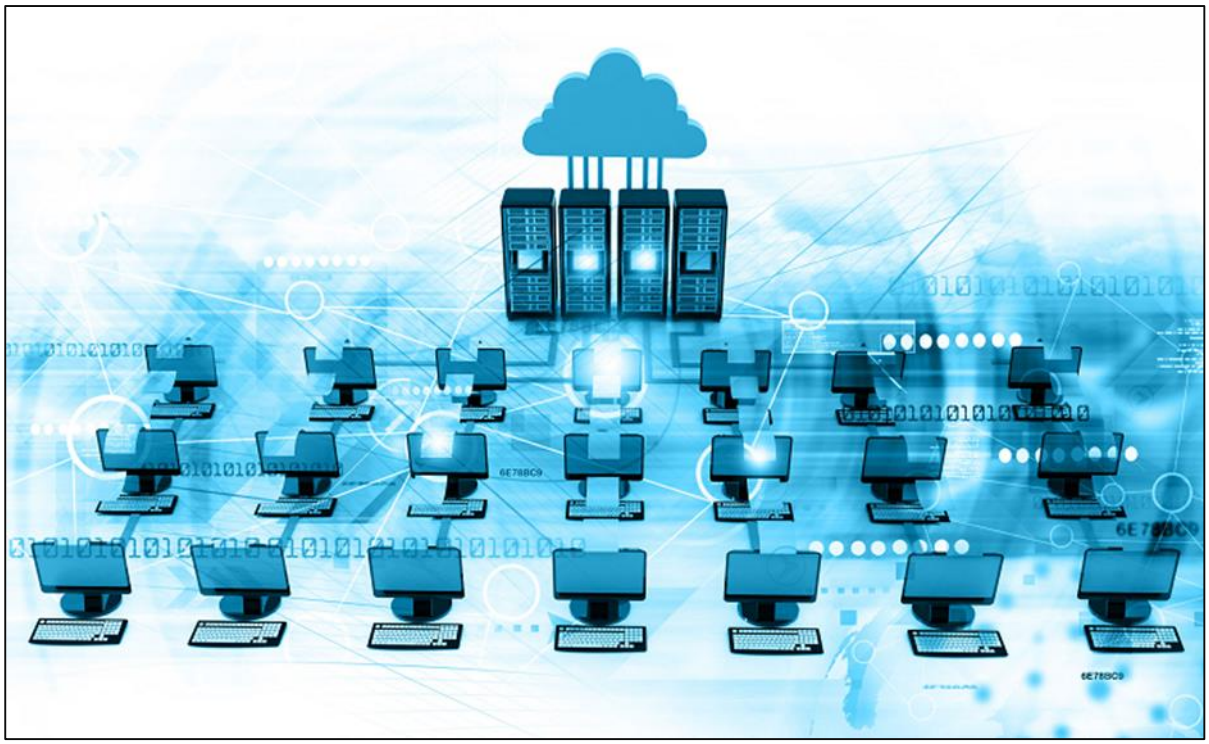
This is another form of online data processing that facilitates several users to share the resources of an online computer system. This technique is adopted when results are needed swiftly. Moreover, as the name suggests, this system is time based.

Following are some of the major advantages of time-sharing processing:

- Several users can be served simultaneously
- All the users have almost equal amount of processing time
- There is possibility of interaction with the running programs

Distributed Processing

This is a specialized data processing technique in which various computers (which are located remotely) remain interconnected with a single host computer making a network of computer.

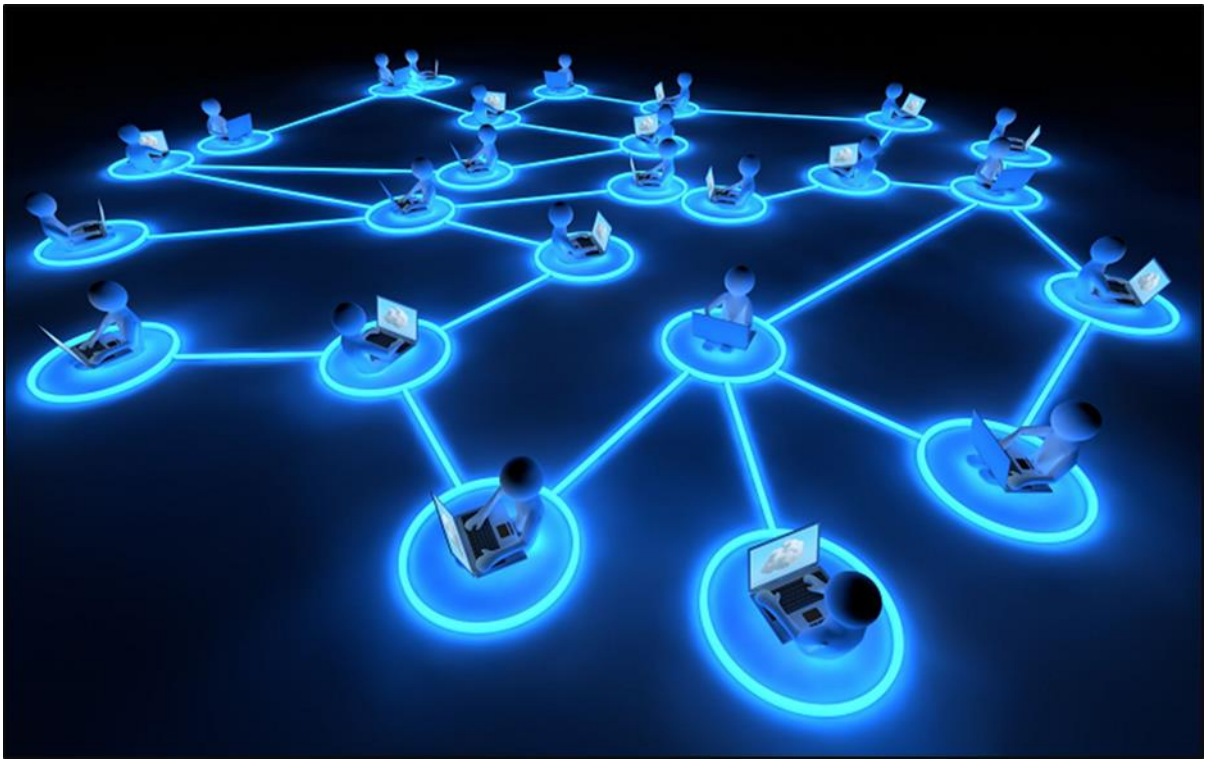


All these computer systems remain interconnected with a high speed communication network. This facilitates in the communication between computers. However, the central computer system maintains the master data base and monitors accordingly.

14. Basics of Computer Science – Computer Networking

A computer networking is a process of connecting two more than two computers with the purpose to share data, provide technical support, and to communicate (especially for the business purpose.

Internet is the technology that is used to connect different computer systems (located in different geographic location). Networking technology has revolutionized the world and created a new arena for the overall development of every nation.



Advantages of Networking

Let us now discuss the advantages of networking. The advantages are described below:

Facility of Technical Support

Because of having computer networking, a person sitting in the United States of America provides technical support to a person sitting in a remote part of India.

Easy Sharing of Data

With the help of networking, it is very simple to share all formats of digital data from one computer system to another (irrespective of their geographic location).

Easy Sharing of Hardware Resource

With the help of networking, it has now become very simple to share the expensive resources including storage space, processor, fax, etc.

Easy Sharing Software

Through the networking system, it is easy to share and install the software from one computer system to another computer system.

Easy to Decentralize Data Processing

Through the networking system, it is very simple to decentralize the data processing system. It ultimately helps to control, secure, and manage the important data.

Easy to Communicate

With the help of networking, the communication system has now become highly efficient, frugal, and fast. The different modes of communication are text chatting, video chatting, emails, etc.

Types of Network

In this section, we will discuss the different types of network. The types are described below:

- Local Area Network (LAN)
- Metropolitan Area Network (MAN)
- Wide Area Network (WAN)

Local Area Network

Local Area Network or simply LAN is the technique of interconnecting a few computers located in a given premise. It is normally used for a single business office or a residential apartment.

The major purpose of such interconnectivity is to establish a communication system in order to make the work easier.

However, in such connectivity, some other devices can also be attached such as laser printers, fax machine, etc.

Metropolitan Area Network

Metropolitan Area Network or simply MAN is a system of network that normally covers a large metropolitan area (city part).

It provides high speed Internet services throughout the area covered within the network.

Wide Area Network

Wide Area Network or simply WAN is a system of network that covers a large geographical area across the world.

The services of WAN are provided by public (government) agencies as well as private agencies. The network also provides the facility to access databases located remotely.

The WAN system is highly beneficial for MNCs and other big corporate companies (offering online services).

15. Basics of Computer Science – Computer Related Jobs

The fast computerization of every work and gradual dependency on computer based work has exponentially opened a new arena of Information technology for employment.

However, the IT field requires qualified and trained employees who can design and develop a new information system.

Information technology has also helped in research and development and has further developed new technologies. The IT employees emphasize on planning, designing, developing, managing the work, and providing technical support to various users.

Types of Computer Related Jobs

In recent times, a number of jobs have come up that are done with the assistance of computer. We will discuss the different job titles performing computer related jobs:

Programmer

A person who is qualified enough to write a creative code for the computer program is known as Programmer.

The codes written by programmer are the instructions given to the computer over what to do, how to do, when to do, etc.

There are dozens of languages, which are written by the different programmers. E.g. Java, C, C++, python, Ajx, etc.

System Analyst

The job of a system analyst is highly classified and also very crucial.

A system analyst fundamentally designs, develops, and implements new systems or adds some additional features in the existing system to give instructions to perform additional tasks.

System analyst also specializes in fields such as engineering, science & technology, finance, business, accounting, etc.

Database Administrator

A database administrator or simply DBA is a trained person who is accountable for the storage of and management of the database system.

Network Administrator

Computer networking is another specialized field where a qualified person is required.

A network administrator specializes in installing, configuring, and supporting computer network system. Likewise, he manages the local area network, wide area network, the Internet system or the segment of a network system in the respective organization.

The job of a network administrator is a very crucial one as almost every network in an organization requires at least one network administrator.

Web Designers

A web designer is an architect who designs an effective and communicative website.

He places the images, contents, and other such information on right places to make the website interactive and user friendly.

Information Security Analysts

This is one of the most significant jobs under which an Information Security Analyst designs, implements, and supports the security system of a computer or whole network.

16. Basics of Computer Science – Electronic Commerce

The advancement of computer technology and internet, domestic as well as international businesses are being fascinated towards these technologies. Today, most of the small or big businesses and domestic or international businesses offer their products and services through Internet.

The business organizations these days have attractive and interactive website through which they promote and market their business.

The facility of computer based technology and Internet collectively integrates the fragmented markets by offering them a common arena. Technology has further helped organizations in cost cutting and has also helped reduce the cost of products and services.

Technology facilitates customers in buying products or services of their requirement by sitting at home or any place.

What is Electronic Commerce?

Electronic commerce or simply ecommerce is normally a process that involves facilitating the availability of products and services online. The users can search, choose, sell, buy from a wide range of options through Internet.

The major activities of ecommerce are as follows:

- Selling products and services online (through internet)
- Buying products and services online
- Paying and accepting payment online
- Transaction of businesses and other services online

Features of E-Commerce

Following are the important features of ecommerce:

- It efficiently increases the business capability.
- It substantially reduces the cost.
- It perceptively increases the delivery services.
- It unbreakable solution of quick business transactions and office automation.
- It potentially increases the intra-business functionality.
- It competently increases the business communication.

Types of E-Commerce

Following are the major types of e-commerce businesses:

Business-to-Business (B2B)

It is conducted between two business firms.

Business-to-Consumer (B2C)

It is conducted between the business firm and the consumer.

Consumer-to-Consumer (C2C)

Consumer-to-consumer business deals happen between two consumers; there are certain websites that facilitate a common platform to both the consumers – one who wants to buy and one who wants to sell.

Benefits of E-Commerce

Let us now discuss the benefits of e-commerce:

- It facilitates free market.
- It is available 24x7.
- Its presence is global (there is no constrain of political boundary as such).
- Set up cost is substantially low.
- It provides user-friendly technology.
- It offers multiple opportunity parallel and simultaneously.
- It provides frugal facilities to promote and market businesses.

- It has features to offer market research facility.
- It makes customer relations management easier.
- It facilitates the provision of 24x7 customer care services.
- It provides fund transfer facility domestically as well as internationally with simple steps.

17. Basics of Computer Science – Software Programming

In order to make a computer functional, a set of instructions need to be programmed, as these programmed languages are carriers to the performance of a task.

Likewise, a computer accepts users' instructions in the form of computer programming and then carries out the given task.

Features of Software Programming

A computer program, which actually is a set of instructions and helps computer to perform a specific task, has the following basic features:

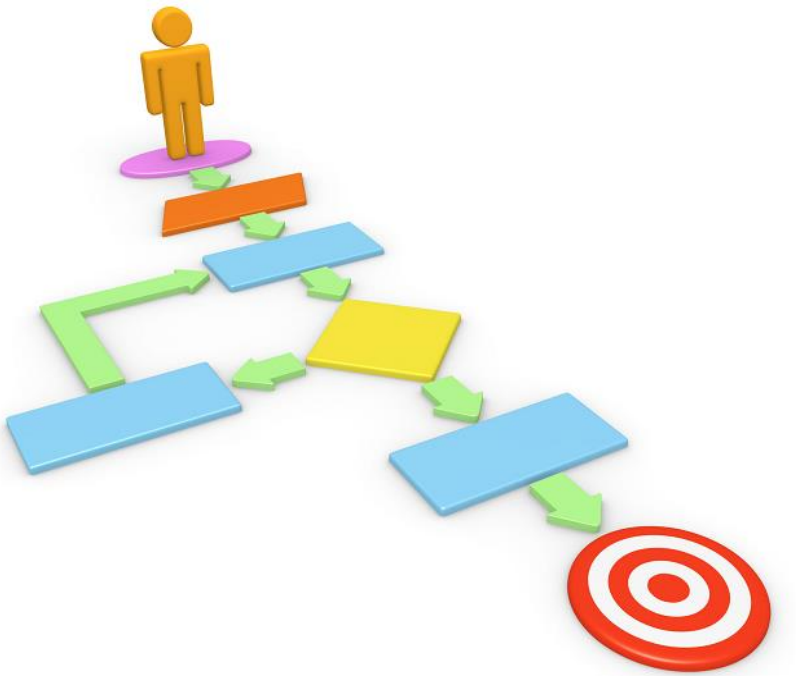
- It ensures the given instructions are performed successfully.
- It ensures the given instructions are performed in sequential order.
- Explains the input (data) given is correct or insufficient and accordingly gives the result.
- It is written with high level language.

Steps to Development of Program

Development of programming language is entirely dependent on the kind of problem and requirement. However, development of a programming language normally (not essentially, but) includes the following steps:

Defining the Problem

This the first step, wherein the problem has to be defined.



Analysis of Task & Methods

Once the problem is defined, the developer analyzes and develops various solutions in order to solve the problem and finally, the best feasible solution is developed.

Development of Algorithm

Algorithm is a proper technique that illustrates the right solution in logical and feasible steps. Algorithm is normally done in the form of flowcharts and pseudo codes.

Verification of Algorithm

Once the algorithm is developed, it cannot be applied directly rather primarily it needs to be tested specially for the accuracy. If there is any error, it is rectified and solved in the beginning itself. The verification process saves time, money, and energy.

Coding

Once the basic processes and steps are completed successfully, then the actual coding of a program starts in the given programming language.

Testing of Program

Testing of the development of program code is another essential feature, as it is bound with errors; hence, testing makes it error free. The developer keeps testing and correcting the coding until he/she develops it finally.

Documentation

Once the coding and programming is done successfully, it is the job of the developer to document all these features and steps. The documented program instructs users on how to run and operate the respective program.

Implementation

Once the above steps are executed successfully, the developed codes (programing language) are installed in the computer system for the end users. The users are also manuals – explaining how to run the respective programs.

18. Basics of Computer Science – Algorithm – Flowchart

A flowchart is a blueprint that pictorially represents the algorithm and its steps. The steps of a flowchart do not have a specific size and shape rather it is designed in different shapes and sizes (see the image given below).

As shown in the above image, the boxes in different shapes and interconnected with arrows, are logically making a flow chart. A flow-chart represents the general steps in a process.

Benefits of Flowchart

Let us now discuss the benefits of a flowchart.

Simplify the Logic

As it provides the pictorial representation of the steps; therefore, it simplifies the logic and subsequent steps.

Makes Communication Better

Because of having easily understandable pictorial logic and steps, it is a better and simple way of representation.

Effective Analysis

Once the flow-chart is prepared, it becomes very simple to analyze the problem in an effective way.

Useful in Coding

The flow-chart also helps in coding process efficiently, as it gives directions on what to do, when to do, and where to do. It makes the work easier.

Proper Testing

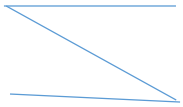
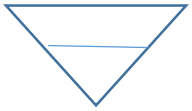
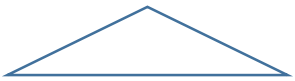
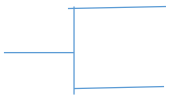
Further, flowchart also helps in finding the error (if any) in program

Applicable Documentation

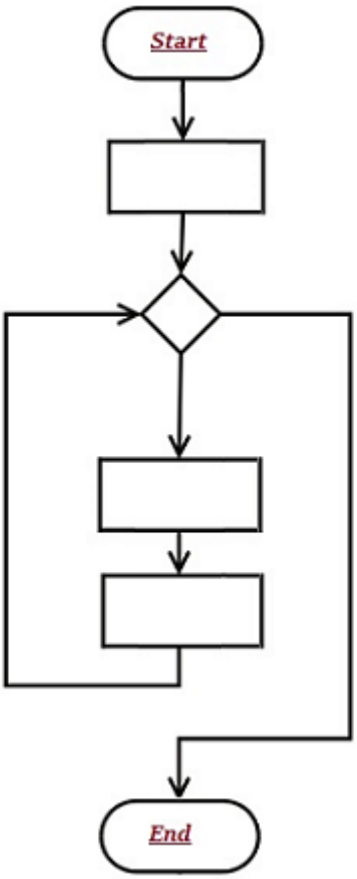
Last but not the least, a flowchart also helps in preparing the proper document (once the codes are written).

Flow-Chart Symbols

The following table illustrates the symbols along with their names (used in a flow-chart):

Name	Symbol	Name	Symbol
	Flow Line		Magnetic Disk
	Terminal		Communication Link
	Processing		Offline Storage
	Decision		Annotation
	Connector		Flow line
	Document		Off-Page Connector

Sample of Flow Chart

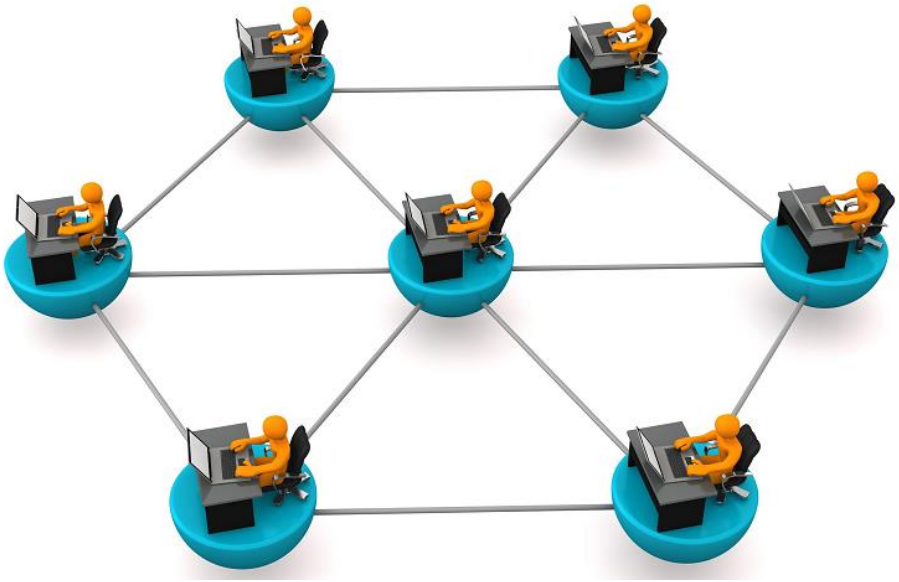


19. Basics of Computer Science – Extranet

An extranet is a sort of personalized service, which is controlled and regulated by private network.

This personalized and controlled technology provides access only to partners, vendors, and suppliers; sometimes, not essentially, but also to some specific customers.

An extranet is a private network organization, which is actually the part of respective company's intranet and its services are extended to users outside the company. Sometimes, it is also considered as a specialized technique to practice business with other companies and selling products to the customers.



In order to do business with other business partners, extranet technology facilitates the intranet from one location to other and also provides security to data flow.

An extranet service requires firewall server management in order to provide security and privacy.

Features of Extranet Services

Following are the significant features of extranet services:

- Extranet is an extended Internet service to the private business network.
- The services extend outside the corporate firewall.
- Sometimes, it can be referred to an Intranet, as it can be (partially) accessible to some outsiders (with permission).
- The technique of extranet links two (or more) business organizations who share common business goals.

Application of Extranet

Extranet can be applied for the following services:

- It facilitates collaborative business between two (or more) companies
- By using this technology, a joint training program (with other company) is conducted
- By using electronic data interchange, large volumes of data are shared swiftly
- It is used to share product catalogs especially with wholesalers
- Extranet service is also used in providing customer support
- It is used to share business news with partner companies

Advantages of Extranet

The advantages of Extranet services are as follows:

- It makes business (services) swift and faster.
- It helps greatly in improving the business communication.
- It helps in reducing the cost (especially in terms of stationery stuff).
- It helps in improving the efficiency and confidence of the employees.
- It reduces some big physical barriers (especially the geographical distance).

Major Fields Using Extranet

Following are some of the major fields that are using Extranet service on a large scale:

- Corporate houses
- Government offices
- Education centers

Intranet is more localized, as only internal employees have the accessibility. In contrast, Extranet covers a wider area, as outsiders (such as partner, vendor, or even customer) have the authorized accessibility.

20. Basics of Computer Science – Mobile Computer

Mobile computers are the systems, which are physically not remain connected to specific place rather these are mobile in nature, as one can carry anywhere anytime.

The mobile computer technology carries battery back; therefore, it does not require consistent electric power.

Mobile computers can be connected with Internet through wire or the connection can be wireless as well through Wi-Fi or Bluetooth technology. Likewise, it is portable, self-powered (because of inbuilt battery), and infused with wireless technology computing device.

Types of Mobile Computing Device

Following are the popular mobile computing devices:

Laptop

A laptop is a portable version of desktop computer. It is equally competent to do any computing work.

Notebook

It is a light weight portable personal computer.

Tablet

It is comparatively handier slate-shaped mobile computer.

Smart Phone

A smart phone is a fully equipped cell phone with most of the computing features.

Personal Digital Assistant (PDA)

It is a computer device more popular as pocket computer. It is largely used in calculation, accessing the Internet, sending and receiving E-mails, scanning bar codes, use as a radio or stereo, playing computer games, video recording, typewriting and word processing, use as an address book, making and writing on spreadsheets, Global Positioning System (GPS), as a clock and calendar, etc.

Portable Data Terminal (PDT)

It is a computer device, which is largely used to enter or retrieve data through wireless transmission (i.e., WLAN or WWAN).

Mobile Data Terminal(MDT)

It is a computer device, which is used in police cars, taxi-cabs, military logistics, service trucks, commercial trucking fleets, courier vehicles, fishing fleets, etc.

Ultra-mobile Personal Computer (UMPC)

It is small form of tablet PC.

21. Basics of Computer Science – Windows Desktop Elements

Once you are logged in a window computer system, you will get dozens of applications, so you can choose an option of your requirement.

Many of the options have shortcut icon readily available on your computer screen; however, in some computers, you may not find any such option on the screen; in such a case, you can take the help of menu button (as shown in the image given below):

As you can see in the above image, in the left bottom, there is a window symbol (i.e., menu button); once you click on it, the given menu option will appear and from here you can choose your option.

Start Menu Options

The following table lists down the options that appear after clicking on the Start menu:

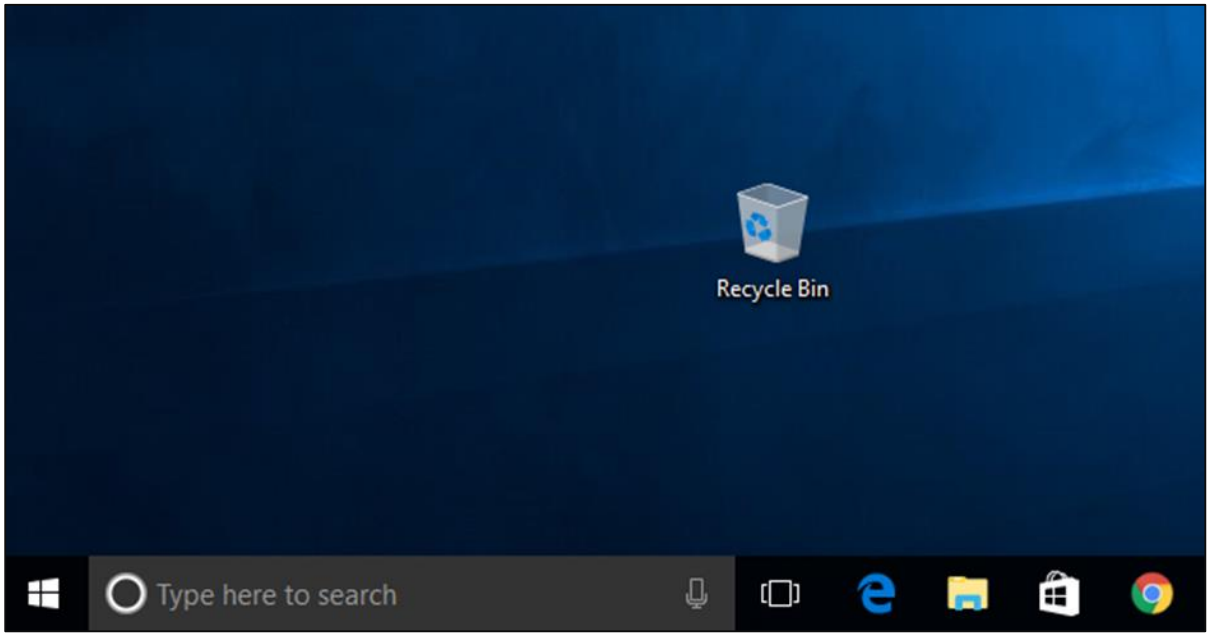
Option	Description
All programs	It displays all those programs, which are installed in your system.
Document	It displays a list of folders used by the user.
Recent file	It displays the recently used file.
My picture	It displays a list of pictures.

My music	It displays a list of music/song, etc.
My computer	It displays the drives of computer where user keeps his/her work, file, folder, song, video, picture, e-book, etc.
Control panel	It displays all the installed computer programs (software).
Printer	It displays the installed printers (if printer is installed in the system, user can take print easily).
Help (support)	It helps users to know how to do a particular task.
Search	It helps a user to find a file in computer.
Run	It helps to start an application program or execute a DOS command.
Setting	It has different options that help to manage different settings of the computer, software as well as hardware.
Log Off	It helps a user to log off the currently logged in user of the system.
Sleep	It makes the system non-functional; however, puts the ongoing work and settings in memory and also keeps drawing small amount of power.
Hibernation	Hibernation puts the open documents and programs on hard disk and then turns off your computer; in comparison to 'sleep', it uses very low power.
Restart	Its function is to shut down and again start (log on) computer; it is done normally to refresh computer especially when computer is hanged.
Shut down	It simply shuts down the system.

Note: Depending on the version of your window, the menu option may vary in terms of appearance and number of menu options; however, there would not be any change in basics.

Recycle Bin

Recycle Bin is a trash location where deleted files remain stored. Once you delete any sort of file, it gets stored (automatically) into recycle bin; therefore, if you mistakenly deleted some important file, don't panic, go to recycle bin and restore it. However, if you deleted file from recycle bin as well, then it is very difficult to restore that permanently deleted file.



Internet Option

The option (i.e., short-cut key) of the Internet browser may be available on the main screen or at the bottom menu bar (as shown in the image given below). However, if do not find it at both these places, go to the menu, as all programs are listed there.

22. Basics of Computer Science – Computer Multimedia

In this chapter, we will discuss how the Computer Multimedia works. If a system presents, some information through more than two media, it is known as multimedia. For example, TV presents audio and video; book presents text, image, and graphs, computer, etc.

The information presented through multimedia has better quality and capability, as it can be understood easily.

The advanced computer system is a great example of modern multimedia.

Literal Meaning of Multimedia

In this section, we will understand the literal meaning of multimedia.

- **Multi** – it means more than one
- **Medium** – it is singular and it means intermediary or mean
- **Media** – it is plural and it means conveying the information

Likewise, Multimedia is the field of Computer Science that integrates different forms of information and represents in the form of audio, video, and animation along with the traditional media, i.e., text, graphics/drawings, images, etc.

Multimedia Computer System

Multimedia computer system has high capacity to integrate different media including text, image, graphics, audio, and video.

The multimedia computer system stores, represents, processes, manipulates, and makes available to users.

Significant Features of Multimedia Computer System

Following are the major features multimedia computer system:

- Its Central Processing Unit (CPU) is very fast, as it needs to process large amount of data.
- It has huge storage capacity.
- It has huge memory power that helps in running heavy data programs.
- It has high capacity graphic card that helps in displaying graphics, animation, video, etc.
- The sound system makes it easy to listen to audio .
- With all these features (discussed above), a computer system is known as high end multimedia computer system.
- However, all the features listed above are not essentially required for every multimedia computer system, but rather the features of a multimedia computer system are configured as per the need of respective user.

Multimedia Components

Following are the major components of a multimedia computer system:

Text

It contains alphanumeric and some other special characters. Keyboard is usually used for input of text; however, there are some internal (inbuilt) features to include such text.

Graphics

It is technology to generate, represent, process, manipulate, and display pictures. It is one of the most important components of multimedia application. The development of graphics is supported by a different software.

Animation

Computer animation is a modern technology, which helps in creating, developing, sequencing, and displaying a set of images (technically known as '*frames*'). Animation gives visual effects or motion very similar to that of a video file (see image given below).

Audio

This technology records, synthesizes, and plays audio (sound). There are many learning courses and different instructions that can be delivered through this medium appropriately.

Video

This technology records, synthesizes, and displays images (known as frames) in such sequences (at a fixed speed) that makes the creation appear as moving; this is how we see a completely developed video. In order to watch a video without any interruption, video device must display 25 to 30 frames/second.

Multimedia Application

Let us now see the different fields where multimedia is applied. The fields are described in brief below:

Presentation

With the help of multimedia, presentation can be made effective.

E-books

Today, books are digitized and easily available on the Internet.

Digital Library

The need to be physically present at a library is no more necessary. Libraries can be accessed from the Internet also. Digitization has helped libraries to come to this level of development.

E-learning

Today, most of the institutions (public as well as private both) are using such technology to education people.

Movie making

Most of the special effects that we see in any movie, is only because of multimedia technology.

Video games

Video games are one of the most interesting creations of multimedia technology. Video games fascinate not only the children but adults too.

Animated films

Along with video games, animated film is another great source of entertainment for children.

Multimedia conferencing

People can arrange personal as well as business meetings online with the help of multimedia conferencing technology.

E-shopping

Multimedia technology has created a virtual arena for the e-commerce.

23. Basics of Computer Science – Computer Security

Advancement of computer technology has radically changed the world; resultantly, most of the works whether it is matter of nation's security system or buying a shoe online everything depends on computer.

Such increased dependency also raises the issue of security, as most of the data is now stored in the computer system.

Your computer systems store various sorts of data and hence if it is not secured, then you might be in for a big trouble.

Why Do We Computer Security?

Let us now see why do we need Computer security. It is required for the following major reasons:

- To prevent damage of the hardware.
- To prevent theft or damage of the installed software.
- To prevent theft or damage of stored data and information.
- To prevent the disruption of service.
- Likewise, security system keeps the computer system safe by protecting the installed software and the stored data (information).

Protection of Data & Information

Following are the important steps to protect data:

- Make backup of all your important files.
- Keep your system virus by using anti-virus software.
- Keep updating your computer system.
- Run disk defragmenter and disk cleanup on certain interval of time.
- Use a firewall.
- Use anti-spyware software.

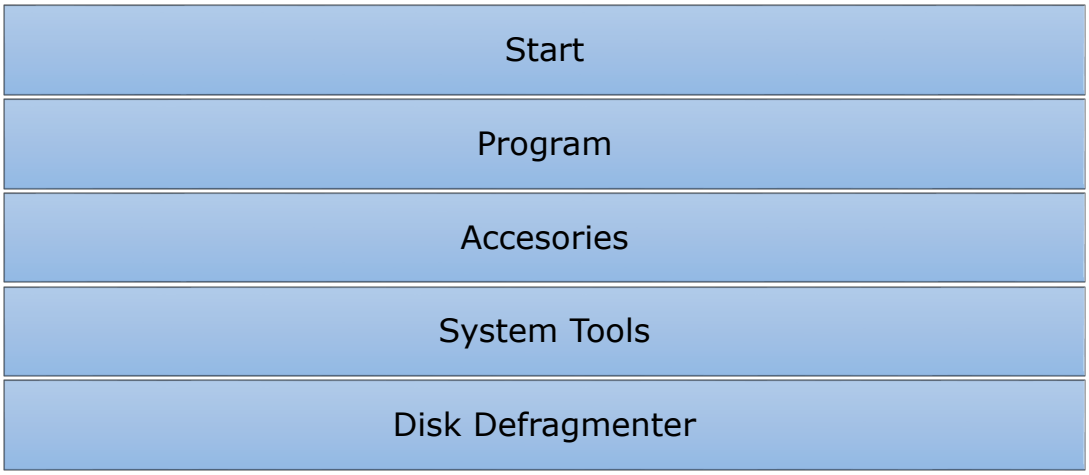
Further, if you use internet, then you need to take greater precaution. Consider the following points to understand the precautions that need to be taken:

- Do not click on any link that you don't know (as it may be dangerous for your computer – virus attack).
- Do not open unauthorized an unlawful website (it may damage your computer system).
- Do not download unsolicited data from unknown website.

What is Defragmentation?

Frequent saving and deleting of file (data) from the hard disk creates problems in performance and also reduce the space; therefore, defragmentation again clean-up the drive and restore the system to run smoothly.

Following are the simple steps of defragmentation:

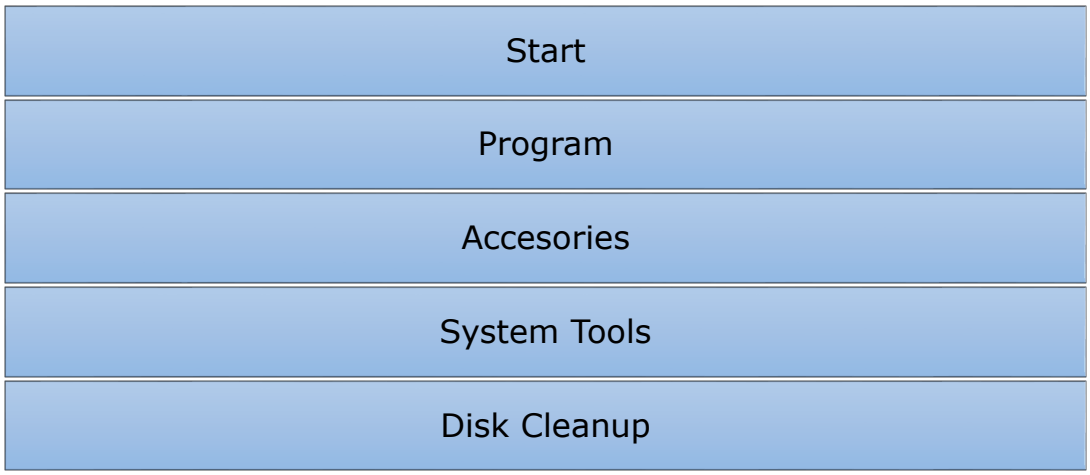


Disk Cleanup

While browsing websites (on internet), many of the files get stored in the hard disk automatically (actually these stored files later help to reopen the website faster); besides some other cookies also get stored in the hard disk. All these stored files create problem along with eating space.

So, disk cleanup process cleans all these files and releases the space occupied by these unwanted files.

Following are the simple steps of disk cleanup:



24. Basics of Computer Science – Computer Threat

Threat in a computer system is a possible danger that might put your data security on stake. The damage is at times irreparable.

Definition

As defined by the National Information Assurance Glossary:

- "*Any circumstance or event with the potential to adversely impact an IS through unauthorized access, destruction, disclosure, modification of data, and/or denial of service*."

- A computer threat can be "**intentional**" such as hacking or "**accidental**" such as malfunctioning of or physical damage.

Types of Threat

Following are the most common types of computer threats:

- **Physical damage** – It includes fire, water, pollution, etc.
- **Natural events** – It includes climatic, earthquake, volcanic activity, etc.
- **Loss of services** – It includes electrical power, air conditioning, telecommunication, etc.

- **Technical failures** – It includes problems in equipment, software, capacity saturation, etc.
- **Deliberate type** – It includes spying, illegal processing of data, etc.

Some other threats include error in use, abuse of rights, denial of actions, eavesdropping, theft of media, retrieval of discarded materials, etc.

Sources of Threat

The possible sources of a computer threat may be:

- **Internal** – It includes employees, partners, contractors (and vendors).
- **External** – It includes cyber-criminals (professional hackers), spies, non-professional hackers, activists, malware (virus/worm/etc.), etc.

Common Terms

Following are the common terms frequently used to define computer threat:

Virus Threats

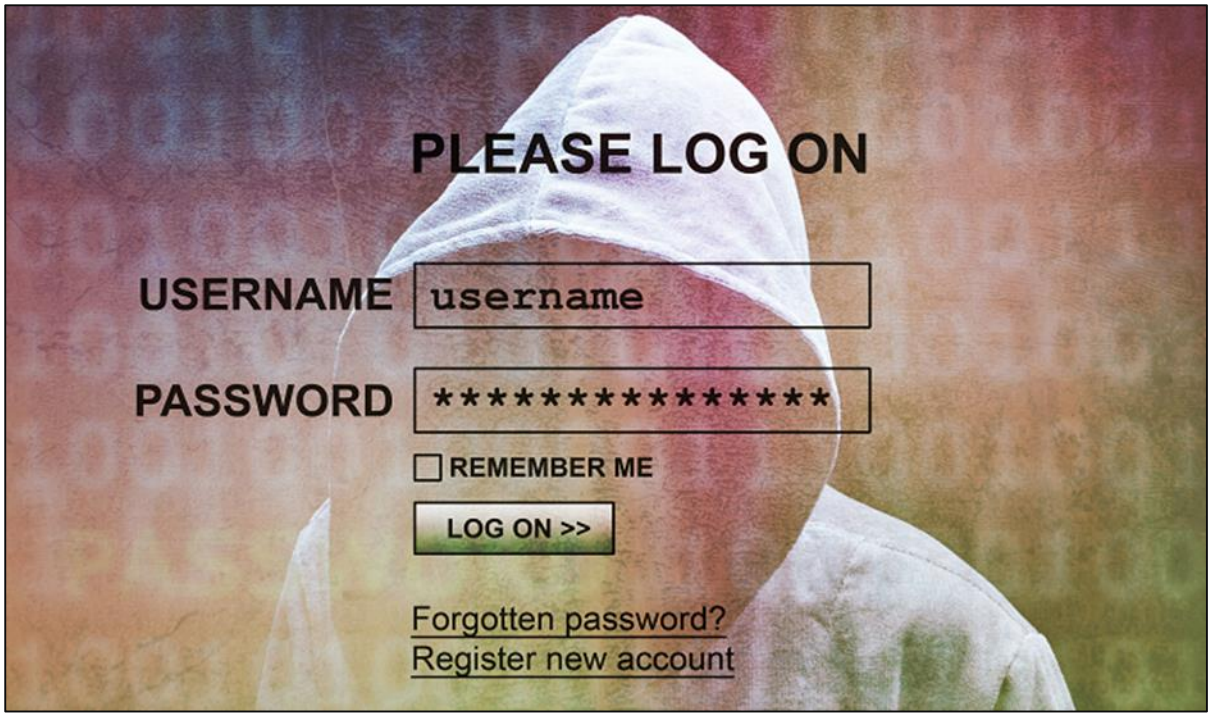
A computer virus is a program designed to disrupt the normal functioning of the computer without the permission of the user.

Spyware Threats

Spyware is a computer program that monitors user's online activities or installs programs without user's consent for profit or theft of personal information.

Hackers

Hackers are programmers who put others on threats for their personal gain by breaking into computer systems with the purpose to steal, change or destroy information.



Phishing Threats

It is an illegal activity through which phishers attempt to steal sensitive financial or personal data by means of fraudulent email or instant messages.

How to Secure Your Computer System from Threats?

Following are the significant tips through which you can protect your system from different types of threat:

- Install, use, and keep updated Anti-Virus in your system.
- Install, use, and keep updated a Firewall Program.
- Always take backups of your important Files and Folders.
- Use Strong and Typical Passwords.
- Take precaution especially when Downloading and Installing Programs.
- Install, use, and keep updated a File Encryption Program.
- Take precaution especially when Reading Email with Attachments.
- Keep your Children aware of Internet threats and safe browsing.

25. Basics of Computer Science – Computer Virus

A virus is a computer code or program, which is capable of affecting your computer data badly by corrupting or destroying them.

Computer virus has the tendency to make its duplicate copies at a swift pace, and also spread it across every folder and damage the data of your computer system.

A computer virus is actually a malicious software program or "malware" that, when infecting your system, replicates itself by modifying other computer programs and inserting its own code.

Infected computer programs may include data files, or even the "boot" sector of the hard drive.

Types of Virus

Following are the major types of computer virus:

Worms

This is a computer program that replicates itself at a swift pace. Unlike a computer virus, it is self-contained and hence does not need to be part of another program to propagate itself.

Trojan Horse

A Trojan Horse is also a sort of destructive program that remains disguised in a normal software program. It is not exactly a virus, as it cannot replicate itself. However, there is possibility that virus program may remain concealed in the Trojan Horse.

Bombs

It is similar to Trojan Horse, but Logic bombs have some specialty; these include a timing device and hence it will go off only at a particular date and time.

How Does Virus Affect?

Let us discuss in what ways a virus can affect your computer system. The ways are mentioned below:

- By downloading files from the Internet.
- During the removable of media or drives.
- Through pen drive.
- Through e-mail attachments.
- Through unpatched software & services.
- Through unprotected or poor administrator passwords.

Impact of Virus

Let us now see the impact of virus on your computer system:

- Disrupts the normal functionality of respective computer system.
- Disrupts system network use.
- Modifies configuration setting of the system.
- Destructs data.
- Disrupts computer network resources.
- Destructs of confidential data.

Virus Detection

The most fundamental method of detection of virus is to check the functionality of your computer system; a virus affected computer does not take command properly.

However, if there is antivirus software in your computer system, then it can easily check programs and files on a system for virus signatures.

Virus Preventive Measures

Let us now see the different virus preventive measures. A computer system can be protected from virus through the following:

- Installation of an effective antivirus software.
- Patching up the operating system.
- Patching up the client software.
- Putting highly secured Passwords.
- Use of Firewalls.

Most Effective Antivirus

Following are the most popular and effective antivirus from which you can choose one for your personal computer:

- McAfee Antivirus Plus
- Symantec Norton Antivirus
- Avast Pro Antivirus
- Bitdefender Antivirus Plus
- Kaspersky Anti-Virus
- Avira Antivirus
- Webroot Secure Anywhere Antivirus
- Emsisoft Anti-Malware
- Quick Heal Antivirus
- ESET NOD32 Antivirus

26. Basics of Computer Science – Abbreviations

In this chapter, we will discuss the different abbreviations in Computer Science. The following table lists down those abbreviations:

Abbreviation	Full-name
A/D	Analog-to-Digital
ABC	Atanasoff Berry Computer
ACM	Association for Computing Machinery
AI	Artificial Intelligence
ALGOL	Algorithic Language
ALU	Arithmetic Logic Unit
AMD	Advanced Micro Devices
APRANET	Advanced Research Project Agency Network
ASCII	American Standard Code for Information Interchange
BASIC	Beginners All-purpose Symbolic Instruction Code
BCD	Binary Coded Decimal
BIOS	Basic Inpute Output System
BIPS	Billions of Instructions Per Second
BPI	Bytes Per Inch
CAD	Computer Aided Design
CAE	Computer Aided Engineering
CAN	Campus Area Network
CASE	Computer Aided Software Engineering

CD	Compact Disk
CDC	Control Data Corporation
CD-R	CD-Recordable
CD-ROM	Compact Disk Read Only Memory
CD-RW	CD Read/Write
CL	Command Language
CLI	Command Line Interface
COBOL	Common Business Oriented
CODASYL	Conference On Data Systems
CPU	Central Processing Unit
CRT	Cathode Ray Tube
D/A	Digital-to-Analog
DAT	Digital Audio Tape
DBMS	Data Base Management System
DBS	Demand Based Switching
DDL	Data Definition Language
DDS	Digital Data Storage
DEC	Digital Equipment Corporation
DMA	Direct Memory Access
DNA	Digital Network Architecture
DPI	Dots Per Inch

DRAM	Dynamic RAM
DSN	Distributed Systems Network
DTS	Digital Theater System
DVD	Digital Video/Versatile Disk
EBCDIC	Extended Binary Coded Decimal Interchange Code
EDSAC	Electronic Delay Storage Automatic Calculator
EDVAC	Electronic Discrete Variable Automatic Calculator
EFM	Eight-to-Fourteen Modulation
ENIAC	Electronic Numerical Integrator And Claculator
EPG	Electronic Programming Guide
EPIC	Explicitly Parallel Instruction Computing
EPROM	Erasable Programmable Read-Only Memory
FAT	File Allocation Table
FDM	Frequency Division Multiplexing
FEP	Front End Processor
FLOPS	Floating Point Operations Per Second
FM	Frequency Modulation
FMS	File Management System
FORTRAN	FORmula TRANslation
FSK	Frequency Shift Keying
FTP	File Transfer Protocol

GB	Giga Bytes
GFLOPS	Giga FLOPS
GHz	Giga Hertz
GNU	Gnu Not Unix
GPRS	General Packet Radio Service
GSM	Global System for Mobile communication
GUI	Graphical User Interface
HP	Hewlett Packard
HSS	Hierarchical Storage System
HTML	HyperText Markup Language
HTTP	HyperText Transport Protocol
IBM	International Business Machine
IC	Integrated Circuit
IDN	Integrated Digital Networks
IP	Internet Protocol
IrDA	Infrared Data Association
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
JPEG	Joint Photographic Experts Group
JRE	Java Runtime Engine
JSP	Java Server Pages

KB	Kilo Bytes
KHz	Kilo Hertz
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LPM	Line Per Minute
LSI	Large Scael Integration
MAN	Metropolitan Area Network
MAR	Memory Address Register
MB	Mega Bytes
MBR	Memory Buffer Register
MHz	Mega Hertz
MIDI	Musical Instrument Digital Interface
MIPS	Millions of Instructions Per Second
MNP	Microcom Network Protocol
MPEG	Moving Pictures Experts Group
MS-DOS	MicroSoft Disk Operating System
MVT	Multiprogramming with Variable Tasks
NIC	Network Interface Card
NICNET	National Informatics Center NETwork
NOS	Network Operating System

OCR	Optical Character Recognition
OMR	Optical Mark Reader
OS	Operating System
OSI	Open System Interconnection
OSS	Open Source Software
PAN	Personal Area Network
PC	Personal Computer
PDF	Protable Document Format
PDL	Program Design Language
PDP	Program Data Processor
PIP	Peripheral Interchange Program
PROM	Programmable Read-Only Memory
QoS	Quality of Service
RAM	Random Access Memory
ROM	Read Only Memory
SDLC	Software Development Life Cycle
SEQUEL	Structured English QUEry Language
SGML	Syntax for Generalized Markup Language
SIMM	Single In-line Memory Module
SNA	Systems Network Architecture
SNOBOL	StriNg Oriented and symBOlic Language

SQL	Structured Query Language
SRAM	Static RAM
SSI	Small Scale Integration
TB	Tera Bytes
TCP	Transport Control Protocol
TDM	Time Division Multiplexing
UDP	User Datagram Protocol
ULSI	Ultra Large Scale Integration
UPC	Universal Product Code
URL	Uniform Resource Locator
USB	Universal Serial Bus
UTF	Unicode Transformation Format
VAN	Value Added Network
VCR	Vodeo Cassette Recorder
VDT	Video Display Terminal
VGA	Video Graphics Array
VOD	Video-On-Demand
VoIP	Voice over Internet Protocol
VSAT	Very Small Aperture Terminal
WAN	Wide Area Network
WAP	Wireless Application Protocol

WiMAX	Worldwide Interoperability for Microwave Access
WLAN	Wireless Local Area Network
WLL	Wireless Local Loop
WORM	Write Once Read Many
WWW	World Wide Web
XHTML	eXtensible HyperText Markup Language
XML	eXtensible Markup Language
X.400	Electronic Mail Protocol
X.500	Directory Server Protocol

27. Basics of Computer Science – Development

In this chapter, we will discuss the development in Computer Science chronologically.

The following table lists down the development:

Year	Development
1959	Transistors: IBM 7090; IBM 1401
1962	NPN transistor
1963	Mouse; CMOS patented
1964	CDC 6600; IBM Data Cell Drive
1966	Integrated circuits: HP 2116A
1966	Apollo Guidance Computer
1969	Honeywell 316
1971	8" floppy disk; ILLIAC IV
1973	Micral first microprocessor PC
1980	Sinclair ZX80, Seagate hard disk drive
1981	IBM PC, Acorn BBC Micro
1983	Apple Lisa; 3.5" floppy
1984	Apple Mac; Apple Lisa 2
1988	Dell
1989	NeXT
1991	Apple Switches to PowerPC
1992	HP 95LX; Palmtop PC

1995	IBM Deep Blue chess computer
1996	USB 1.0
1997	Compaq buys Tandem; CD-RW
1998	iMac
2000	USB 2
2001	Apple iPod
2005	Mac Mini
2006	Apple transition to Intel
2007	iPhone 1
2008	USB 3.0
2010	Apple iPad
2012	IBM zEnterprise System

28. Basics of Computer Science – Innovators

The following table illustrates the names of major innovators with their works and year:

Person	Achievement	Period/Year
Pāṇini	Pāṇini, the ancient Indian Sanskrit linguist, grammarian, and honorable scholar had systematized and mentioned the technical use of metarules, transformations, and recursions, in his book 'Ashtadhyayi.' It is considred as the forerunner to the computer programing language.	5th Century BC (about)
Al-Khwārizmī	Al-Khwarizmi had the technique of performing arithmetic with Hindu-Arabic numerals developed.	830 AD (about)
Al-Jazari	Al-Jazari had invented the programmable machines, namely programmable humanoid robots, and an astronomical clock, which is considered as the first programmable analog computer.	1206 AD (about)
Ramon Llull	Ramon Llull had designed multiple symbolic representations machines.	1300 AD (about)
Blaise Pascal	Pascal had invented the mechanical calculator.	1642 AD (about)
Gottfried Leibniz	Leibniz had developed the first-order predicate calculus, which were very important for the theoretical foundations of computer science.	1670 AD (about)

Charles Babbage	Babbage, who was popular as mathematician, philosopher, inventor and mechanical engineer, designed the Analytical Engine and developed a prototype for a less powerful mechanical calculator. Likewise, he originated the concept of digital programmable computer. Babbage is popular as "father of the computer".	1822 AD (about)
George Boole	Boole conceptualized the Boolean algebra, which became the basis for digital logic and computer science.	1847 AD (about)
Gottlob Frege	Frege developed the first-order predicate calculus, which later became a crucial precursor requirement in developing the computation theory.	1879 AD (about)
Herman Hollerith	Hollerith invented the punched card evaluating machine and hence, he is popularly considered as the father of modern machine data processing.	1889 AD (about)
Vannevar Bush	Bush developed the Memex concept, which later led to the development of Hypertext.	1930 AD (about)
Alonzo Church	Church had developed the lambda calculus and found the un-decidability problem within it.	1936 AD (about)
Stephen Cole Kleene	Founded the computation theory.	1936 AD (about)

Claude Shannon	Founded practical digital circuit design.	1937 AD
Konrad Zuse	Built the first digital freely programmable computer of Z series.	1938 AD
Tommy Flowers	Designed and built the Mark Colossus computers, the world's first programmable, digital, electronic, and computing devices.	1943 AD
Max Newman	Newman founded the Computing Machine Laboratory at the University of Manchester. It was the place where world's first stored-program computer, the Manchester Small-Scale Experimental Machine was invented.	1943 AD
John Mauchly & J. Presper Ecker	Designed and built the ENIAC, the first modern computer, and the UNIVAC I, the first commercially available computer.	1943 AD
Yoshiro Nakamatsu	Invented the first floppy disk at Tokyo Imperial University.	1950 AD
David Caminer & John Pinkerton	Developed the LEO computer i.e. the first business computer	1951 AD
Sergei Alekseyevich Lebedev	Independently designed the first electronic computer in the Soviet Union (i.e. Ukraine).	1951 AD

Grace Hopper	Hopper wrote the A-O compiler (a sort of automatic programming language), which heavily influenced the COBOL language.	1952 AD
Cuthbert Hurd	Worked for the International Business Machines Corporation and developed first general-purpose computer, the IBM 701.	1952 AD
Alan Perlis et al	Developed the ALGOL programming language, and the first recipient of the Turing Award.	1952 AD
Noam Chomsky	Chomsky developed Chomsky hierarchy. He made contributions to computer science with his work in linguistics.	1956 AD
Douglas Engelbart and Bill English	Best known for inventing the computer mouse.	1963 AD
Tadashi Sasaki	Sasaki was an engineer at Sharp company and he conceived a single-chip microprocessor CPU. He also developed LCD calculators at Sharp.	1963 AD
Dennis Ritchie and Ken Thompson	Pioneered the C programming language and the Unix computer operating system at Bell Labs.	1967 AD
Ken Thompson	Thompson developed the Unix operating system, the B programming language, Plan 9 operating system, the first computer chess game and the UTF-8 encoding at Bell Labs. Further, he developed 'Go' programming language at Google.	1967 AD

Adriaan van Wijngaarden	Wijngaarden developed the W-grammar first used in the definition of ALGOL 68	1968 AD
Masatoshi Shima	Designed the Intel 4004, the first commercial microprocessor.	1968 AD
Leslie Lamport	Formulated algorithms to solve different fundamental problems in distributed systems (e.g. the bakery algorithm).	1974 AD
Vint Cerf and Bob Kahn	Designed the Transmission Control Protocol and Internet Protocol (TCP and IP), the primary data communication protocols of the Internet and other computer networks.	1978 AD
Tim Berners-Lee	Invented worldwide web.	1989 AD
Tim Berners-Lee and Robert Cailliau	Sent first HTTP communication between client and server.	1989 AD

29. Basics of Computer Science – Short-cut Keys

The following table shows the different short-cut keys frequently used while working on the computer system:

Function	Short-cut keys
Commonly Used Short-cut Keys	
F1	Universal help (for any sort of program).
Alt + F	File menu options in current program.
Alt + E	Edits options in current program.
Ctrl + A	Selects all text.
Ctrl + X	Cuts the selected item.
Ctrl + C	Copies the selected item.
Ctrl + V	Pastes copied item.
Home	Takes the user to the beginning of the current line.
End	Takes the user to the end of the current line.
Ctrl + Home	Takes the user to the beginning of the document.
Ctrl + End	Takes the user to the end of the document.
Shift + Home	Highlights from the current place to the beginning of line.
Shift + End	Highlights from the current place to the end of line.
Microsoft Windows Shortcut Keys	
Ctrl + F4	Closes window in program.
Alt + F4	Closes current open program.

F2	Renames the selected icon.
F3	Start find from desktop.
F4	Opens the drive selection when browsing.
F5	Refreshes contents.
Alt + Tab	Switches from one open application to another open application.
Alt + Shift + Tab	Switches backwards between open applications.
Alt + Print Screen	Creates screen shot for current program.
Ctrl + Alt + Del.	Opens windows task manager/reboot.
Ctrl + Esc	Brings up start menu.
Alt + Esc	Switches between applications on taskbar.
Ctrl + Plus (+) Key	Automatically adjusts widths of all columns in Windows Explorer.
Alt + Enter	Opens properties window of selected icon or program.
Shift + F10	Simulates right-click on selected item.
Shift + Del	Deletes selected programs/files permanently.
Holding Shift During Boot-up	Enables boot safe mode or bypass system files.
Ctrl + N	Starts a new note.
Ctrl + O	Opens a recently used note.
Ctrl + S	Saves changes to a note.
Ctrl + P	Prints a note.
Alt + F4	Closes a note and its Journal window.

Ctrl + Z	Helps Undo a change.
Ctrl + Y	Helps Redo a change.
Ctrl + A	Selects all items on a page.
Ctrl + X	Cuts a selection.
Ctrl + C	Copies a selection to the Clipboard.
Ctrl + V	Pastes a selection from the Clipboard.
Esc	Cancels a selection.
Ctrl + F	Start a search tool.
Ctrl + Shift + C	Display a shortcut menu for column headings in a note list.
Microsoft Word Shortcut Keys	
Ctrl + N	Creates a new document.
Ctrl + O	Opens an existing document.
Ctrl + S	Saves changes to a document.
F12	Saves the document as a new file.
Ctrl + P	Prints a document.
Ctrl + Z	Helps Undo a change.
Ctrl + Y	Helps Redo a change.
Ctrl + A	Selects the whole document.
Ctrl + X	Helps cut a selection
Ctrl + C	Copies a selection to the Clipboard.
Ctrl + V	Pastes a selection from the Clipboard.

Ctrl + B	Makes selected text bold.
Ctrl + I	Italicizes selected text.
Ctrl + U	Underlines selected texts.
Ctrl + L	Aligns text left.
Ctrl + R	Aligns text right.
Ctrl + E	Aligns text center.
Ctrl + J	Helps justify text.
Ctrl + 1	Sets single line spacing.
Ctrl + 2	Sets double line spacing.
Ctrl + 5	Sets line spacing to 1.5.
Ctrl + Shift + A	Changes characters to all capitals.
Ctrl + D	Inserts a Microsoft Paint drawing.
Ctrl + F	Finds text
Ctrl + Home	Moves to the beginning of the document.
Ctrl + End	Moves to the end of the document.