NILASAILA INSTITUTE OF SCIENCE & TECHNOLOGY
SERGARH-756060, BALASORE (ODISHA)
(Approved by AICTE& affiliated to SCTE&VT, Odisha)

1ST YEAR

COMPUTER APPLICATION

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CONTENTS

UNIT 1

COMPUTER ORGANISATION

INTRODUCTION OF COMPUTER

->Computer is an electronic device which accept raw data as in input from user , process the input data and gives desired output to the user and store it in the memory.

-> computer word comes from a Greek word “compute”.

->Computer is developed by “Charles Babbage”.

Evolution of Computer

- Abacus
- Pascaline
- Difference engine
- Punched card equipment
- ABC
- UNIVAC – I

Abacus

- The present day computers are a result of an evolutionary process which started way back in 500 B.C. when Egyptian used a machine which is an early form of Abacus.
- However the present form of Abacus is attributed to the Chinese and Japanese. This is a machine, which was used for addition, subtraction, multiplication and division operation.

Pascaline

- In 1645 a device known as Pascaline was invented by French mathematician Blaise Pascal. The machine was also used per addition and subtraction purpose. The device was operated by dialing a set of wheels. In 1671 Leibniz improved on Pascal's adding machine and invented the Leibniz's Calculator.

Difference engine

- In 1822 Charles Babbage invented a Difference Engine.

• The purpose of this device was to calculate the roots of polynomial equations and prepare astronomy table for the British Navy. He upgraded this to, invent an Analytical engine, which could store program instructions initially coded on punched cards and subsequently shared internally. Therefore Charles Babbage is known as the father of computers

Punched card equipment

• In 1890 Dr. H. Hollerith developed punched card equipment (Fig 1.6). This equipment read the holes punched in the card and mechanically performed the statistical analysis.

ABC (Atanasoff-Berry Computer)

• The first pure electronic computer was invented by J. V. Atanasoff and C. Berry which is known as Atanasoff-Berry Computer or ABC.

• It used vacume tubes for both data storage and data computation.

• Subsequently Electronic Numerical Integrator and Calculator (ENIAC) was designed and accepted as the general purpose computer

UNIVAC

• In 1945 John Von Neumann first gave the idea of sharing the same internal memory for storing both data and instruction, which was subsequently adopted in every computer organization.

• On this principle subsequently Universal Automatic Computer (UNIVAC-1) was invented.

GENERATION OF COMPUTER

First Generation of computer

->Eckert and Mauchly developed the first electronic computer ENIACin 1946 in the USA .

->Vaccum tube was the core element in first generation of computer.

->The time periode of first generation of computer was from 1946 to 1959.

->Punched card and paper tape was secondary storage device.

->Limited internal storage capacity and slow input/output operation.

->It is not portable.

->Consumes lot of electricity.

->Machine code used for as a programming language.

->Name of the first generation of computers are ENIAC , EDVAC, EDSAC,UNIVAC-I

Second generation of computer

->The second generation of computers are IBM – 700,ATLAS and ICL 1901.

->Transister was the core element in second generation of computer.

->The time periode of second generation of computer was from 1959 to 1965.

->Tapes and magnetic disk was used for secondary storage device.

->It is smaller , reliable and faster than first generation of computer.

->Required less power to operate

->High level procedural language FORTRAN and COBOL were used.

Third generation of computer

Third generation of computers began with the introduction of IBM 360 in 1965.

- This generation of computers were having the following common features.
- The concept of general purpose computing was introduced for the first time.
- They used integrated circuits on wafer chips instead of transistors.
- Different models / versons of the computer were available for different level of usage.

• These computers wee less bulky, required less power and dissipate less heat during operation as compared to their previous generations.

Fourth generation of computer

The revolution in IC manufacturing technology was incorporated in the fourth generation computers. They used Large Scale Integration (LSI) and Very Large Scale Integration (VLSI) ICs as the main switching device. The Ics manufactured using this technology is called microprocessor, which acts as the main components of a forth generation computer.

Fifth generation of computer

Now-a-days research is going for inventing fifth generation computers having following features.

• It should be very small in size and powerful in processing.

• It should be portable and require less amount of power.

• It should have reasonable high amount of primary/secondary memory.

• It should have some artificial intelligence feature.

• It may be based on the latest architecture to support parallel processing and real time processing.

• It should support multimedia computing & artificial intelligence.

Classification of Computer

• All the modern computers are broadly classified into the following three categories.

(i) Analog Computer. (ii) Digital Computer and (iii) Hybrid Computer.

Analog computers

• Are mostly used in industries in process control activities.

• These computers work on analog data such as variation in temperature, pressure speed, voltage etc.

• They are not general purpose computers, rather they are specific to a particular application area. Therefore the cost of such computer vary from application to application depending on the complexity.

• The use of such computers are very limited.

Digital computers

• These computers are general purpose computers, which work on digital / binary data.

• The speed and accuracy with which these computers work are very high.

• Digital computer are also having several ranges form super computers to personal computers.

Hybrid computers

• Practically Hybrid computer are used to control the entire process.

• The analog feature of such computer enables it to measure the physical quantities such a temperature, pressure, voltage level etc. and convert them to digital data.

• These data are then processed by the computer by using its digital data processing capability.

• The output form this computer may be taken in a paper as hardcopy, may be seen on a display device or may be converted into analog form to automatically control various process.

Digital computers are classified into the following four categories :

• Super Computers.

• Mainframe Computers.

• Mini Computers.

• Micro Computer

Super computers

• These computers are specifically designed to maximize the processing of floating point instructions.This is possible because of parallel processing technique which implements multiple processors to work in parallel manner.

• Such computers are very expensive and used in very high-end numerical processing, geographical information system, etc.

• some of the popular super computers are Cray, Param, Anupam etc.

• The speed of processing of super computers are measured in GFLOPS i.e., Giga Floating Point Operations Per Second.

Mainframe computers

• These computers are intended for substantial high volume data processing. These computers are caracterized by–

• Large primary memory.

• Substantial processing capabilities. (MIPS)

• Substantial amount of peripheral devices that can be attached.

• A high data communication capability i.e. ability to connect thousands of terminals.

• Wide variety of memory size and terminal support option.

• Ability to handle large type computer application.

Mini Computers

• Fairly large primary memory.

• Medium scale processing capability i.e., lesser than mainframe but higher than personal computers.

• Can connect upto 500 terminals on LAN.

• Supports wide range of application areas.

• Affordable, unlike mainframe computers by small business organization.

Micro computer

• This is the smallest and least expensive computers are or personal computers popularly known as PC.

• These computers are portable.

• They require minimum power.

• Processing power is appropriate for handling most of the tasks.

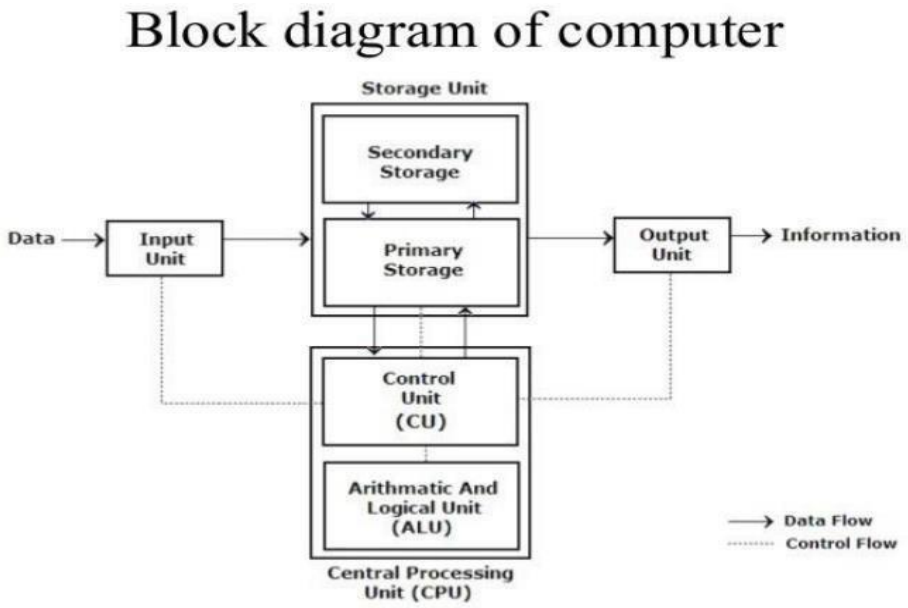
• Memory capacity is sufficient to handle most of the tasks

• Ease of use and support to various types of operating systems and application softwares.

• Affordable price tag.

• These micro computers are further classified into three categories i.e., PC, PC-XT and PC-AT.

BASIC ORGANISATION OF COMPUTER



Any computer can perform the 4 basic operation unit

i. Input unit
ii. CPU(Centeral processing unit)
iii. Memory unit
iv. Output unit

Input device accepts the coded information as source program i.e. high level language. This is either stored in the memory or immediately used by the processor to perform the desired operations. The program stored in the memory determines the processing steps. Basically the computer converts one source program to an object program. i.e. into machine language.

Finally the results are sent to the outside world through output device. All of these actions are coordinated by the control unit.

Input unit

The source program/high level language program/coded information/simply data is fed to a computer through input devices keyboard is a most common type. Whenever a key is pressed, one corresponding word or number is translated into its equivalent binary code over a cable & fed either to memory or processor. Joysticks, trackballs, mouse, scanners etc are other input devices.

CPU

The actual processing of the data is carried out in the centeral processing unit,which is the brain of coumpter.The cpu stores the data and instructions in the primary memory of the computer called the random access memory and process them from thios location.

The arithmetic logic unit(ALU) and the control unit (cu) are the two subcomponents of the cpu.

ALU

The data and instructions stroed in the RAM are transferred to the ALU for processing . The ALU performs the logical and arithmetic operation on the data and the results are temporarily stored in the RAM. After the processing , the final results are stored in the secondary memory and are released through an output devices.

CU

It’s contol the system of CPU.It controls transfor af data and it coordinates between input/output devices.

Memory unit

All input data and output data store in this part.

Its function into store programs and data. It is basically to two types

1. Primary memory

2. Secondary memory

1. Primary memory: - Is the one exclusively associated with the processor and operates at the electronics speeds programs must be stored in this memory while they are being executed. The memory contains a large number of semiconductors storage cells. Each capable of storing one bit of information. These are processed in a group of fixed site called word.

2.Secondary memory:- Is used where large amounts of data & programs have to be stored, particularly information that is accessed infrequently. Examples: - Magnetic disks & tapes, optical disks (ie CD-ROM's), floppies etc.

Output unit

The output unit passes through the final results of compution to the users through the output devices like moniter , printer etc. . A moniter displays the final results of the processed data on the screen while a printer can be used for obtaining the output in a printed format.

UNIT 2

COMPUTER SOFTWARE

A software is a program which helps the human user to give instruction to computer hardware.

Classes of Software

• Systems software

• Application software

System software

System Softwareis a set of programs that manage the –

• Resources of a computer system.

• System Software is a collection of system programs that perform a variety of functions such as –

– File Editing

– Resource Accounting

– I/O Management

– Storage, Memory Management access

System Software can be broadly classified into two types as:

• System control programs

• System support programs

• System development programs

System control programs

• controls the execution of programs

• manage the storage & processing resources of the computer

• perform other management & monitoring function.

System support programs

• Provide routine service functions to the other computer programs & computer users: E.g. Utilities, libraries, performance monitors & job accounting.

System development programs

• Assists in the creation of application

• Programs. e.g., language translators such as BASIC interpreter & application generators.

Application software – Programs that help users solve particular computing problem.

Example – microsoft(word , excel, powerpoint), browser,etc.

Overview of Operating System

An operating system (OS) is software that manages computer hardware resources and provides common services for computer programs. The operating system is an essential component of the system software in a computer system. Application programs usually require an operating system to function. Time-sharing operating systems schedule tasks for efficient use of the system and may also include accounting software for cost allocation of processor time, mass storage, printing, and other resources. For hardware functions such as input and output and memory allocation, the operating system acts as an intermediary between programs and the computer hardware, although the application code is usually executed directly by the hardware and will frequently make a system call to an OS function or be interrupted by it. Operating systems can be found on almost any device that contains a computer—from cellular phones and video game consoles to supercomputers and web servers.

Examples of popular modern operating systems include Android, BSD, iOS, Linux, OS X, QNX, Microsoft Windows, Windows Phone, and IBM z/OS. All these, except Windows, Windows Phone and z/OS, share roots in UNIX.

Types of operating systems

1.1 Real-time

1.2 Multi-use

1.3 Multi-tasking vs. single-tasking

1.4 Distributed

Objectives and Functions of O.S OS typically provides services in thefollowing areas:

1. Program development - The OS provides a variety of facilities and services, such aseditors and debuggers, to assist the programmer in creating programs.

2. Program execution - A number of steps need to be performed to execute a program.Instructions and data must be loaded into main memory, I/O devices and files must beinitialized, and other resources must be prepared. The OS handles these schedulingduties for the user.

3. Access to I/O devices - Each I/O device requires its own peculiar set of instructions orcontrol signals for operation. The OS provides a uniform interface that hides thesedetails so that programmers can access such devices using simple reads and writes.

4. Controlled access to files - For file access, the OS must reflect a detailed understandingof not only the nature of the I/O device (disk drive, tape drive) but also the structure ofthe data contained in the files on the storage medium. In the case of a system withmultiple users, the OS may provide protection mechanisms to control access to the files.

5. System access - For shared or public systems, the OS controls access to the system as awhole and to specific system resources. The access function must

provide protection ofresources and data from unauthorized users and must resolve conflicts for resourcecontention.

6. Error detection and response - A variety of errors can occur while a computer system isrunning. These include internal and external hardware errors, such as a memory error,or a device failure or malfunction; and various software errors, such as division by zero,attempt to access forbidden memory location etc. In each case, the OS must provide

aresponse that clears the error condition with the least impact on running applications.The response may range from ending the program that caused the error, to retrying theoperation, to simply reporting the error to the application.

7. Accounting - A good OS will collect usage statistics for various resources and monitorperformance parameters such as response time

The major function of Operating System are it acts as –

The Resource Manager for Computer.

The Memory Manager for computer

The Device Manager for computer

The User manager

Types of Operating System Following are some major types of Operating system.

Real-time operating system

A real-time operating system is a multitasking operating system that aims at executing real-time applications. Real-time operating systems often use specialized scheduling algorithms so that they can achieve a deterministic nature of behavior. The main objective of real-time operating systems is their quick and predictable response to events. They have an event-driven or timesharing design and often aspects of both. An event-driven system switches between tasks based on their priorities or external events while time-sharing operating systems switch tasks based on clock interrupts.

Multi-user operating system

A multi-user operating system allows multiple users to access a computer system at the same time. Time-sharing systems and Internet servers can be classified as multi-user systems as they enable multiple-user access to a computer through the sharing of time. Single-user operating systems have only one user but may allow multiple programs to run at the same time.

Multi-tasking vs. single-tasking Operating System

A multi-tasking operating system allows more than one program to be running at the same time, from the point of view of human time scales. A single-tasking system has only one running program.

DistributedOperating system

A distributed operating system manages a group of independent computers and makes them appear to be a single computer. The development of networked computers that could be linked and communicate with each other gave rise to distributed computing. Distributed computations are carried out on more than one machine. When computers in a group work in cooperation, they make a distributed system.

Batch Processing

Batch processing is the execution of a series of programs ("jobs") on a computer without manual intervention.Jobs are set up so they can be run to completion without human interaction. All input parameters are predefined through scripts, command-line arguments, control files, or job control language. This is in contrast to "online" or interactive programs which prompt the user for such input. A program takes a set of data files as input, processes the data, and produces a set of output data files. This operating environment is termed as "batch processing" because the input data are collected into batches or sets of records and each batch is processed as a unit.

Multiprogramming

Multiprogramming is a rudimentary form of parallel processing in which several programs are run at the same time on a uniprocessor. Since there is only one processor, there can be no true simultaneous execution of different programs. Instead, the operating system executes part of one program, then part of another, and so on. To the user it appears that all programs are executing at the same time.

Time Sharing OS

In computing, time-sharing is the sharing of a computing resource among many users by means of multiprogramming and multi-tasking. Its introduction in the 1960s, and emergence as the prominent model of computing in the 1970s, represented a major technological shift in the history of computing. By allowing a large number of users to interact concurrently with a single computer, time-sharing dramatically lowered the cost of providing computing capability, made it possible for individuals and organizations to use a computer without owning one, and promoted the interactive use of computers and thedevelopment of new interactive applications

Features of DOS, Windows and UNIX

The operating system is a system software used for management of computer hardware and application software. It is a interactive interface of computer. MS-DOS is a very popular operating system for PC, and it is replaced by its extension Windows operating system. In the Windows environment, DOS is also Boss because many utilities programs of MS-DOS are used in trouble shooting of Windows Operating system.

MS-DOS

MS-DOS stands for Microsoft Disk Operating System. Tim Paterson developed this operating system in 1980. The IBM (International Business Machine) released first PC (Personal Computer) in 1981. MS-DOS version 1.0 was used as operating system in IBM-PC and become talk of town in overnight. The father of PC Operating System is Gary Kildall of Digital Research. He had his Ph.D in computer and designed more

successful operating System called CP/ M. The selling of CP / M is more than 600,000 copies proves its popularity. The Microsoft Disk Operating System or MS-DOS was based on QDOS, the Quick and Dirty Operating System written by Tim Peterson of Seattle Computer Products, for their prototype Intel 8086 based computer. QDOS was based on Gray Kildall's CF/M,. Paterson had bought a CP/ M manual and used it as the basis to write his operating system six weeks, QBOS was different enough from CP / M. MS-DOS version 7.0 is lunched in 1997 which is a hidden with Window 95/98 OS. It has three essential files and many command files.

Windows

It is an operating system, extension of MS-DOS with user friendly GUI and several facilities to control memory, hardware, text, graphics, audio, video, internet connection etc.

Windows 1.0

This operating system with user interface is a notification of MSDOS. The nifty mouse is used to click on desired program to open. It was first called interface manager, but then changed in to the more appealing Windows. Windows 1.0 lunched in November 1985.

Windows 2.0

It was released in 1987 to take advantage of the awesome processing power of the Intel 286 processor. The first version of Microsoft Word and Excel are introduced in this version.

Windows 3.0

It was released in May 1990. It came with a prettier 16-color interface, and new technological bells and whistles that let it make better use of the memory. In 1991, Microsoft brought multimedia support for Windows 3.0, called DTE&T, Odisha Page 21 Multimedia Extensions 1.0. It gave Windows support for CD-ROM drives and sound cards. It also contained a basic CD player application for Windows.

Windows 3.1

It was released in April 1992. It was equipped with big, comprehensive API (Application Program Interface), which simplified the task of creating user interface and let them focus more time on developing the core functionality of software. In 1993, windows for Workgroup 3.1 were released, which added support for networking, file and printer sharing. It also added Microsoft Mail Program to send and receive over the network.

Windows NT

In 1988, Microsoft had been developing, Windows NT; the NT stands for new technology. This was a whole new kernel, built for data and application security. It is a robust, pre-emptive, multithreaded, multi-tasking, 32-bits operating system with symmetric multiprocessing support.

Windows 98

It released in 1995. It is equipped with advance technology like AGP (Accelerated Graphics Port), MMX (multimedia Extension), USB (Universal serial Bus), DVD (Digital Video Disk) etc. Its most visiblefeature, through, is the active desktop, which integrates the web browser (internet Explorer), with operating system. Windows 2000

Its interface is similar to interface for windows 98. It has new security protocol with an encryption facility to authenticate users logging in to the network. It supports 32 FAT file system along with NTFC (New Technology File System), making it easier for users to upgrade for Windows 98. It has quite robust hybrid kernel architecture, make it more stable version.

Windows Me

Later in 2000, Windows Millennium (windows Me) Edition was released for the home user. This was the last version of Windows to be based on Windows 98. Windows Me had always been regarded as Microsoft's way of keeping users busy while they waited for Windows XP.

Windows XP

Here, XP Stands For eXPerience. It bought together the robust Kernel of windows 2000 and all the friendless and multimedia support of windows Me, and painted on a new face for it. Apart from the merger of Windows 2000 and me, Windows Xp also added new features to enhance its performance. The first of Thesewas its ability to work even in lowmemory conditions without crashing, using a technique called Memory Throttling, Usually, Windows likes to do many things at once, but when memory falls short, it will throttle its memory access, doing fewer at a time. This shows the system down considerably, but prevents it form crashing.

UNIX Operating System

The UNIX (pronounced as YEW-nihks) is a powerful, flexible, multi-user Operating system with GUI and several utilities. Ken Thompson and Dennis Ritchie wrote C compiler under UNIX in 1969 at Bell Labs. In 1973, Thompson and Ritchie rewrote the UNIX kernel using C language. It is based on MULTICS operating system. Its first user was Bell patent department. XENIX, VENIX, MICRONIX, LINUX, UNIXWARE-7 etc are version of UNIX operating system. The UNIX operating system is made up from three parts: (a) Kernel: It is a hub of operating system dedicated for memory management, file management and communication within system. (b) Shell: It is an interface between kernel and users. When a user logs in, the login program matches the username and password, and then starts shell. The shell is a command line interpreter (CLI) of UNIX. (c)Program or command is used to accomplish specific tasks. When one command is terminated, the shell displays prompt % to accept next command for execution.

Programming language

A programming language is a formal constructed language designed to communicate instructions to a machine, particularly a computer. Programming languages can be used to create programs to control the behavior of a machine or to express algorithms so that the computer hardware can run with a proper step by step instruction. The earliest programming languages preceded the invention of the computer and were used to direct the behavior of machines such as Jacquard looms and player pianos. Thousands of different programming languages have been created, mainly in the computer field, and many more still are being created

every year. Many programming languages require computation to be specified in an imperative form (i.e., as a sequence of operations to perform), while other languages utilize other forms of program specification such as the declarative form (i.e. the desired result is specified, not how to achieve it). The description of a programming language is usually split into the two components of syntax (form) and semantics (meaning). Some languages aredefined by a specification document (for example, the C programming language is specified by an ISO Standard), while other languages (such as Perl) have a dominant implementation that is treated as a reference. There are two major types of programming languages I,e. Procedural programming language and Object Oriented programming language.

Procedural programming

In procedural programing our code is organised into small "procedures" that use and change our data. In ColdFusion, we write our procedures as either custom tags or functions. These functions typically take some input, do something, then produce some output. Ideally your functions would behave as "black boxes" where input data goes in and output data comes out. The key idea here is that our functions have no intrinsic relationship with the data they operate on. As long as you provide the correct number and type of arguments, the function will do its work and faithfully return its output. Sometimes our functions need to access data that is not provided as a parameter, i.e., we need access data that is outside the function.

Object oriented programming

In object oriented programming, the data and related functions are bundled together into an "object". Ideally, the data inside an object can only be manipulated by calling the object's functions. This means that your data is locked away inside your objects and your functions provide the only means of doing something with that data.

Compiler:

It is a program which translates a high level language program into a machine language program. A compiler is more intelligent than an assembler. It checks all

kinds of limits, ranges, errors etc. But its program run time is more and occupies a larger part of the memory. It has slow speed. Because acompiler goes through the entire program and then translates the entire program into machine codes. If a compiler runs on a computer and produces the machine codes for the same computer then it is known as a self compiler or resident compiler. On the other hand, if a compiler runs on a computer and produces the machine codes for other computer then it is known as a cross compiler.

Interpreter:

An interpreter is a program which translates statements of a program into machine code. It translates only one statement of the program at a time. It reads only one statement of program, translates it and executes it. Then it reads the next statement of the program again translates it and executes it. In this way it proceeds further till all the statements are translated and executed. On the other hand, a compiler goes through the entire program and then translates the entire program into machine codes. A compiler is 5 to 25 times faster than an interpreter.

By the compiler, the machine codes are saved permanently for future reference. On the other hand, the machine codes produced by interpreter are not saved. An interpreter is a small program as compared to compiler. It occupies less memory space, so it can be used in a smaller system which has limited memory space.

Computer Virus

A computer virus is a malware program that, when executed, replicates by inserting copies of itself (possibly modified) into other computer programs, data files, or the boot sector of the hard drive. When this replication succeeds, the affected areas are then said to be "infected". Viruses often perform some type of harmful activity on infected hosts, such as stealing hard disk space or CPU time, accessing private information, corrupting data, displaying political or humorous messages on the user's screen, spamming their contacts, or logging their keystrokes. However, not all viruses carry a destructive payload or attempt to hide themselves—the defining characteristic of viruses is that they are selfreplicating computer programs which install themselves without the user's consent.

Different Types of computer virus

There are different types of viruses which can be classified according to their origin, techniques, types of files they infect, where they hide, the kind of damage they cause, the type of operating system, or platform they attack. Let us have a look at few of them.

Memory ResidentVirus

These viruses fix themselves in the computer memory and get activated whenever the OS runs and infects all the files that are then opened.Hideout: This type of virus hides in the RAM and stays there even after the malicious code is executed. It gets control over the system memory and allocate memory blocks through which it runs its own code, and executes the code when any function is executed.Target: It can corrupt files and programs that are opened, closed, copied, renamed, etc.Examples: Randex, CMJ, Meve, and MrKlunkyProtection: Install an antivirus program.

Direct Action Virus

The main purpose of this virus is to replicate and take action when it is executed. When a specific condition is met, the virus will go into action and infect files in the directory or folder that are specified in the AUTOEXEC.BAT file path. This batch file is always located in the root directory of the hard disk and carries out certain operationswhenthecomputerisbooted.FindFirst/FindNext technique is used where the code selects a few files as its victims. It also infects the external devices like pen drives or hard disks by copying itself on them.Hideout: The viruses keep changing their location into new files whenever the code is executed, but are generally found in the hard disk's root directory. Target: It can corrupt files. Basically, it is a file-infecter virus. Examples:Viennavirus

OverwriteViruses

A virus of this kind is characterized by the fact that it deletes the information contained in the files that it infects, rendering them partially or totally useless once they have been infected.Hideout: The virus replaces the file content.

However,itdoesnotchangethefilesize.Examples:Way,Trj.Reboot,Trivial.88.D Protection: The only way to clean a file infected by an overwrite virus is to delete the file completely, thus losing the original content.However, it is very easy to detect this type of virus, as the original program becomes useless.

Boot Sector Virus

This type of virus affects the boot sector of a hard disk. This is a crucial part of the disk, in which information of the disk itself is stored along with a program that makes it possible to boot (start) the computer from the disk. This type of virus is also called Master Boot Sector Virus or Master Boot Record Virus.Hideout: It hides in the memory until DOS accesses the floppy disk, and whichever boot data is accessed, the virus infects it. Examples:Polyboot.B,AntiEXE Protection: The best way of avoiding boot sector viruses is to ensure that floppy disks are write-protected. Also, never start your computer with an unknown floppy disk in the disk drive.

Macro virus

Macro viruses infect files that are created using certain applications or programs that contain macros, like .doc, .xls, .pps, .mdb, etc. These miniprograms make it possible to automate series of operations so that they are performed as a single action, thereby saving the user from having to carry them out one by one. These viruses automatically infect the file that contains macros, and also infects the templates and documents that the file contains. It is referred to as a type of e-mail virus.Hideout: These hide in documents that are shared via e-mail or networks. Examples: Relax, Melissa.A, Bablas, O97M/Y2K Protection: The best protection technique is to avoid opening e-mails from unknown senders. Also, disabling macros can help to protect your useful data.

Directory virus

Directory viruses (also called Cluster Virus/File System Virus) infect the directory of your computer by changing the path that indicates the location of a file. When you execute a program file with an extension .EXE or .COM that has been infected

by a virus, you are unknowingly running the virus program, while the original file and program is previously moved by the virus.

Polymorphic virus

Polymorphic viruses encrypt or encode themselves in a different way (using different algorithms and encryption keys) every time they infect a system. This makes it impossible for antivirus software to find them using string or signature searches (because they are different in each encryption). The virus then goes on to create a large number of copies.Examples: Elkern, Marburg, Satan Bug and Tuareg .

Detection and prevention of Virus

Following steps may be taken for Virus Detection and Prevention.

1. Do not open any files attached to an email from an unknown, suspicious or untrustworthy source.

2. Do not open any files attached to an email unless you know what it is, even if it appears to come from adear friend or someone you know. Some viruses can replicate themselves and spread through email.Better be safe than sorry and confirm that they really sent it.

3. Delete chain emails and junk email. Do not forward or reply to any to them. These types of email areconsidered spam, which is unsolicited, intrusive mail that clogs up the network.

4. Exercise caution when downloading files from the Internet. Ensure that the source is a legitimate and areputable one. Verify that an anti-virus program checks the files on the download site. If you're uncertain,don't download the file at all.

5. Update your anti-virus software regularly. Thousands of viruses are discovered each month, so you'llwant to be protected.

6. Back up your files on a regular basis. If a virus destroys your files, at least you can replace them withyour back-up copy. You should store your backup copy ina separate location from your work files, onethat is preferably not on your computer.

7. When in doubt, always err on the side of caution and do not open, download, or execute any files oremail attachments. Not executing the files is especially important. Check with your product vendors forupdates which include those for your operating system web browser, and email.

8. Stay away from Bit torrent sites. Some of the more popular ones include Limewire, BitTorrent,Frostwire and Pirate Bay. These are heavily laden with viruses, malware and spyware. Downloadingmaterial from these websites is one of the easiest ways to become infected. It's in your best interest tojust avoid these websites completely.

9. Be careful when searching on the internet, the links that come up from your search engine may contain avirus. Never go to sites that sound suspicious.

10. Due to the popularity of the social networking websites such as MySpace, Facebook, and Twitter, virusmakers target them more than any other website. Online gaming and gambling websites also are high riskwebsites. It's best to avoid these kinds of websites altogether.

11. If you happen to see a popup message when on the internet about being infected and to buy theirsoftware to protect yourself, do not fall for it! Most of the time these messages are easy to see as theytend to have bad grammar and spelling errors. Common names are XP Antivirus, Security Tools,ThinkPoint, Security Shield, Win 7 Security 2011, and similar variations. If do see one of these popups, donot click on them, immediately shut down your computer. If you click on any part of thosewindows you will give the virus permission to install and bypass your antivirus program.

12. If you see any suspicious pop-ups appear on your screen, do not click on them. If you do, it is verylikely you will infect your computer. Instead use the following keyboard command, which will allow you toclose the pop-up, without having the click on it or infecting yourself. The keyboard command is ALT + F4. If that fails, then shut down the computer.

Application of computers in different Domain

Uses of Computer at Home

Home Budget

Computer can be used to manage Home Budget. You can easily calculate your expenses and income. You can list all expenses in one column and income in another column. Then you can apply any calculation on these columns to plan your home budget. There are also specialize software that can manage your income and expenses and generate some cool reports.

Computer Games

An important use of computers at home is playing games. Different types of games are available. These games are a source of entertainment and recreation. Many games are available that are specially developed to improve your mental capability and thinking power.

Working from Home

People can manage the office work at home. The owner of a company can check the work of the employees from home. He can control his office while sitting at home.

Entertainment

People can find entertainment on the internet. They can watch movies, listen to songs, and watch videos download different stuff. They can also watch live matches on the internet.

Information

People can find any type of information on the internet. Educational and informative websites are available to download books, tutorials etc. to improve their knowledge and learn new things.

Chatting & Social Media

People can chat with friends and family on the internet using different software like Skype etc. One can interact with friends over social media websites like Facebook, Twitter & Google Plus. They can also share photos and videos with friends.

Uses of Computers in Education

Computer Aided Learning (CAL)

Computer aided learning is the process of using information technology to help teaching and enhance the learning process. The use of computer can reduce the time that is spent on preparing teaching material. It can also reduce the administrative load of teaching and research. The use of multimedia projector and PowerPoint presentations has improved the quality of teaching. It has also helped the learning process.

Distance Learning

Distance learning is a new learning methodology. Computer plays the key role in this kind of learning. Many institutes are providing distance learning programs. The student does not need to come to the institute. The institute provides the reading material and the student attends virtual classroom. In virtual classroom, the teacher delivers lecture at his own workplace. The student can attend the lecture at home by connecting to a network. The student can also ask questions to the teacher.

Online Examination

The trend of online examination is becoming popular. Different examination like GRE, GMAT and SAT are conducted online all over the world. The questions are marked by computer. It minimizes the chance of mistakes. It also enables to announce the result in time.

Uses of Computers in Business

The use of computer technology in business provides many facilities. Businessmen are using computers to interact with their customers anywhere in the world. Many business tasks are performed more quickly and efficiently. Computers also help them to reduce the overall cost of their business. Computer can be used in business in the following ways.

Marketing

An organization can use computers for marketing their products. Marketing applications provide information about the products to customers. Computer is also used to manage distribution system, advertising and selling activities. It can also be used in deciding pricing strategies. Companies can know more about their customers and their needs and requirements etc.

Stock Exchange

Stock Exchange is the most important place for businessmen. Many stock exchanges use computers to conduct bids. The stockbrokers perform all trading activities electronically. They connect with the computer where brokers match the buyers with sellers. It reduces cost as no paper or special building is required to conduct these activities.

Uses of computers in Medical Field

Hospital Management System

Specialized hospital management softwares are used to automate the day to day procedures and operations at hospitals. These tasks may be Online appointments, payroll admittance and discharge records etc

Patient History

Hospital management systems can store data about patients. Computers are used to store data about patients, their diseases & symptoms, the medicinesthat are prescribed

Patients Monitoring

Monitoring systems are installed in medical wards and Intensive care units to monitoring patients continously. These systems can monitor pulse, blood pressure and body temperature and can alert medical staff about any serious situations.

Life Support Systems

Specialized devices are used to help impaired patients like hearing aids.

Diagnosis Purpose

A variety of software are used to investigate symptoms and prescribed medication accordingly. Sophisticated systems are used for tests like CT Scan, ECG, and other medical tests.

UNIT 3

COMPUTER NETWORK AND INTERNET

Networking concept, Protocol, Connecting Media

Introduction

A group of computer which are connetced to eachother for the purpose of sharing their data is called computer network.

Network goals

-Resource sharing

-job sharing

-Achieving reliability

Resource sharing

It is the main objective of the computer network. The goal is to provide all the program,data and hardware available to everyone on the networkwithout regard to the physical location of the resources and the uses.

Job sharing

A huge task is divided into small modules and distributed to the various computer present in a network.

Achieving reliability

Achieving reliability by making a system available at any instant of time.

Protocol

The Internet Protocol family contains a set of related (and among the most widely used network protocols. Besides Internet Protocol (IP) itself, higher-level protocols like TCP, UDP, HTTP, and FTP all integrate with IP to provide additional capabilities. Similarly, lower-level Internet Protocols like ARP and ICMP also co-exist with IP.

These higher level protocols interact more closely with applications like Web browsers while lower-level protocols interact with network adapters and other computer hardware. Routing Protocols Routing protocols are special-purpose protocols designed specifically for use by network routers on the Internet. Common routing protocols include EIGRP, OSPF and BGP.

Date Transmission mode

Network devices use three transmission modes (methods) to exchange data, or "talk" to each other, as follows: simplex, half duplex, and full duplex.

-Simplex

-Half Duplex

-Full Duplex

Simplex mode

Simplex transmission is like a one-way street where traffic moves in only one direction. Simplex mode is a one-way-only transmission, which means that data can flow only in one direction from the sending device to the receiving device.

Half duplex mode

Half-duplex transmission is like the center lane on some three-lane roads. It is a single lane in which traffic can move in one direction or the other, but not in both directions at the same time. Half-duplex mode limits data transmission because each device must take turns using the line. Therefore, data can flow from A to B and from B to A, but not at the same time.

Full duplex

Full-duplex transmission is like a major highway with two lanes of traffic, each lane accommodating traffic going in opposite directions. Full-duplex mode accommodates two-way simultaneous transmission, which means that both sides can send and receive at the same time. In full-duplex mode, data can flow from A to B and B to A at the same time.

Network Topologies

A topology is a network's virtual shape or structure. This shape does not necessarily correspond to the actual physical layout of the devices on the network. For example, the computers on a home LAN may be arranged in a circle in a family room, but it would be highly unlikely to find a ring topology there. Network topologies are categorized into the following basic types:

-bus

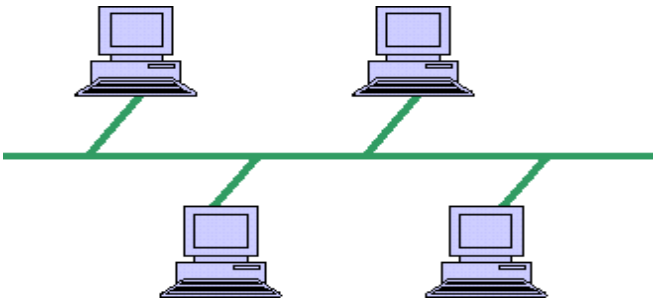
-ring

-star

-tree

-mesh

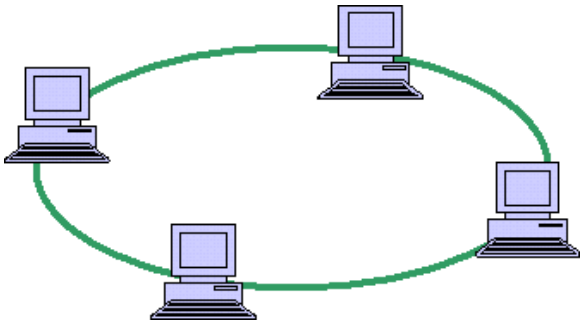
Bus Topology



Bus networks (not to be confused with the system bus of a computer) use a common backbone to connect all devices. A single cable, the backbone functions as a shared communication medium that devices attach or tap into with an interface connector. A device wanting to communicate with another device on the network sends a broadcast message onto the wire that all other devices see, but only the intended recipient actually accepts and processes the message. Ethernet bus topologies are relatively easy to install and don't require much cabling compared to the alternatives. 10Base-2 ("ThinNet") and 10Base-5 ("ThickNet")

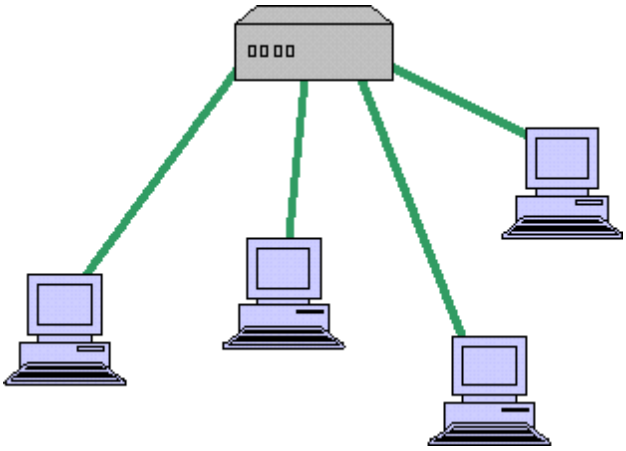
both were popular Ethernet cabling options many years ago for bus topologies. However, bus networks work best with a limited number of devices. If more than a few dozen computers are added to a network bus, performance problems will likely result. In addition, if the backbone cable fails, the entire network effectively becomes unusable.

Ring Topology



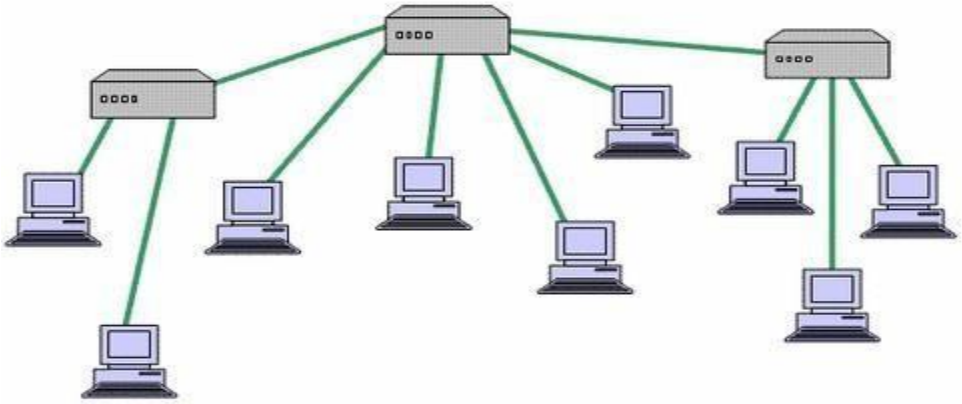
In a ring network, every device has exactly two neighbors for communication purposes. All messages travel through a ring in the same direction (either "clockwise" or "counterclockwise"). A failure in any cable or device breaks the loop and can take down the entire network. To implement a ring network, one typically uses FDDI, SONET, or Token Ring technology. Ring topologies are found in some office buildings or school campuses.

Star Topology



Many home networks use the star topology. A star network features a central connection point called a "hub" that may be a hub, switch or router. Devices typically connect to the hub with Unshielded Twisted Pair (UTP) Ethernet. Compared to the bus topology, a star network generally requires more cable, but a failure in any star network cable will only take down one computer's network access and not the entire LAN. (If the hub fails, however, the entire network also fails.)

Tree Topology

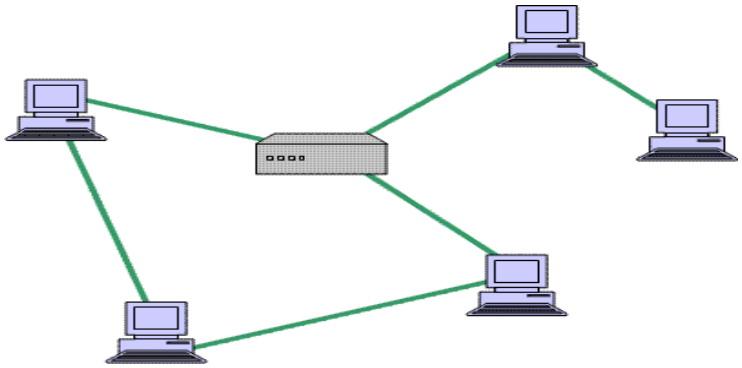


Tree topologies integrate multiple star topologies together onto a bus. In its simplest form, only hub devices connect directly to the tree bus, and each hub functions as the "root" of a tree of devices. This bus/star hybrid approach supports future expandability of the network much better than a bus (limited in the number of devices due to the broadcast traffic it generates) or a star (limited by the number of hub connection points) alone.

Mesh Topology

Mesh topologies involve the concept of routes. Unlike each of the previous topologies, messages sent on a mesh network can take any of several possible paths from source to destination. (Recall that even in a ring, although two cable paths exist, messages can only travel in one direction.) Some WANs, most notably the Internet, employ mesh routing. A mesh network in which every device connects

to every other is called a full mesh. As shown in the illustration below, partial mesh networks also exist in which some devices connect only indirectly to others.



Types of network

-LAN(local area network)

-MAN(metropolitan area network)

-WAN(wide area network)

And there are two other types of networks:TAN(tiny area network),which are same as LAN.CAN(campus area network),which are the same as MAN

LAN

A network covering a small geographic area, like a home, office, or building. Current LANs are most likely to be based on Ethernet technology. For example, a library may have a wired or wireless LAN for users to interconnect local devices (e.g., printers and servers) and to connect to the internet. On a wired LAN, PCs in the library are typically connected by category 5 (Cat5) cable, running the IEEE 802.3 protocol through a system of interconnection devices and eventually connect to the internet. The cables to the servers are typically on Cat 5e enhanced cable, which will support IEEE 802.3 at 1 Gbit/s. A wireless LAN may exist using a different IEEE protocol, 802.11b or 802.11g. The staff computers (bright green in the figure) can get to the color printer, checkout records, and the academic network and the

Internet. All user computers can get to the Internet and the card catalog. Each workgroup can get to its local printer. Note that the printers are not accessible from outside their workgroup.

The defining characteristics of LANs, in contrast to WANs (wide area networks), include their higher data transfer rates, smaller geographic range, and lack of a need for leased telecommunication lines. Current Ethernet or other IEEE 802.3 LAN technologies operate at speeds up to 10 Gbit/s. This is the data transfer rate. IEEE has projects investigating the standardization of 100 Gbit/s, and possibly 40 Gbit/s.

MAN

A Metropolitan Area Network is a network that connects two or more Local Area Networks or Campus Area Networks together but does not extend beyond the boundaries of the immediate town/city. Routers, switches and hubs are connected to create a Metropolitan Area Network.

WAN

A WAN is a data communications network that covers a relatively broad geographic area (i.e. one city to another and one country to another country) and that often uses transmission facilities provided by common carriers, such as telephone companies. WAN technologies generally function at the lower three layers of the OSI reference model: the physical layer, the data link layer, and the network layer.

Network devices

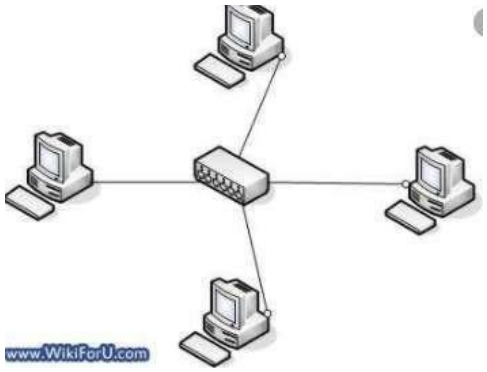
Networking Devices like Hub, Repeater, Switch, Bridge, Router, Gateway & NIC

Repeater

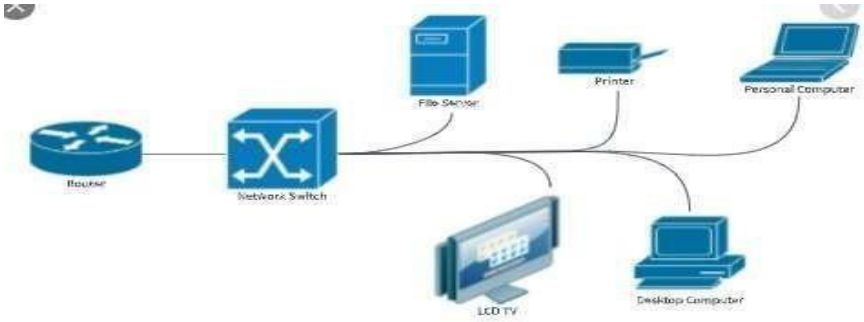
A repeater is a device that receives electronic signals, cleans them and retransmits them at a higher power level. Signals transmitted over cable tend to degrade over long distances. Repeaters are needed so that the signal can travel longer distances.

Hub

A hub is a networking device used to connect multiple devices directly to the network using cables. Each connection is called a 'port.' The connections typically consist of a fiber optic Ethernet cable. When the hub receives data at one of its ports, it distributes the data to the other ports in the network. Typically, a hub sends all the data it receives to all the other ports.



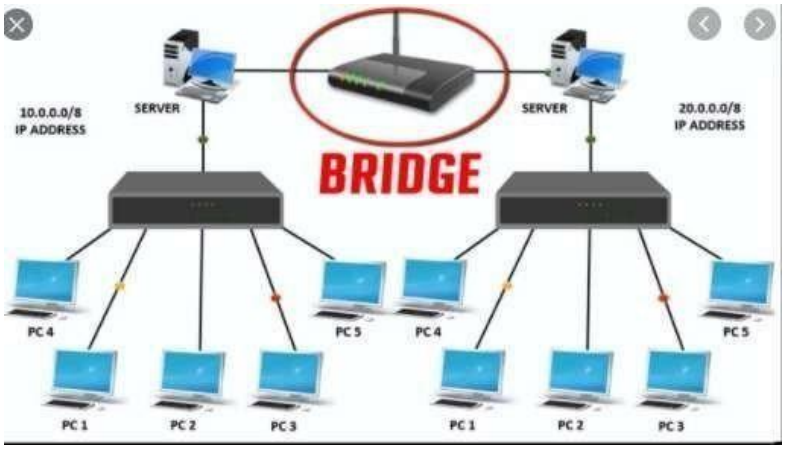
Switches



Switches contain many ports to connect different network segments. They are similar to hubs, but offer greater performance. When a network contains a largenumber of devices, switches are needed instead of hubs to make sure the communications between devices does not slow down. Contrary to hubs, switches send the data it receives only to specific ports.

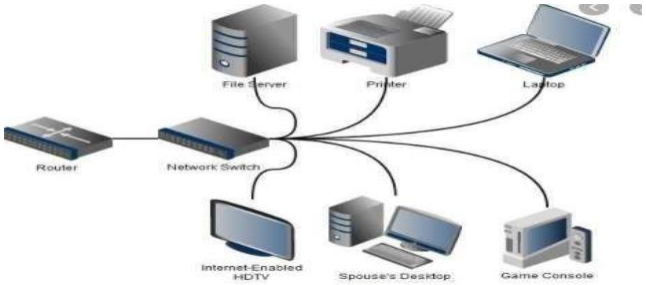
Bridge

Bridges are networking devices that divide up the network into different segments to manage the amount of traffic. This prevents unnecessary traffic from entering other parts of the network and reduces congestion. As a network becomes more complex, bridges make sure your network speed doesn't drop dramatically.



Routers

Routers are communication devices used to connect two different networks. A router sorts incoming data and distributes it to the correct destination. For example, if you have a network within a single office building, many different devices from within the network may access resources outside the network. The best example of this would be the Internet. A router ensures that requests from within the network for information over the Internet are distributed to the correct computer within the network. The Internet itself uses numerous routers to direct all the traffic taking place. Such routers are typically very large and heavy-duty pieces of hardware, designed to handle huge amounts of data traffic. Routers can be used for wired connection, wireless connections or both. A router that provides a wireless connection is referred to as a 'wireless router.' While routers are used to connect different networks, they only work if the network protocols are the same.



Gateway

A gateway interfaces networks that use different protocols. You can think of a gateway as a router that includes protocol translators. The terms 'router' and 'gateway' are often used interchangeably, but it is important to remember that only gateways make it possible to connect networks using different protocols. Since the Internet and many other computer networks use the same TCP/IP protocols, routers are sometimes all that is needed for a particular network. However, any network that also includes a mainframe system will need a gateway since this type of network uses different communication protocols.

Modems

A modem is used to modulate and demodulate data signals. The term itself is a combination of the first two letters of modulator and the first three letters of demodulator. What does this really mean? While all computer data is digital, signals over certain types of connections are analog.A modem is used to encode digital information onto an analog carrier signal and to decode the transmitted information back to digital.

Internet Services

The World Wide Web (www)

•Like an Internet library with millions of books and documents

•Non-Linear structure (documents read in any order)

•Navigate by clicking on Hypertext links

Features of the WWW

•Graphical

•Easy to use

•Cross platform

•Distributed

•Dynamic

•Interactive

File Transfer Protocol (FTP)

•Used to transfer files (any type) from one computer to another

•FTP sites all use Login and Password –Anonymous FTP sites (anonymous login and E-mail address as password) or automatic logon –FTP runs on Client/Server model

•Windows has a client command-line FTP program, but there are other, easier to use programs(WinSCP)

•FTP Daemon runs on FTP server, handling all FTP transactions, asks for account name and password

•Connection command link opened

•Downloading opens second link – data connection link –Data connection link closes automatically after data uploaded/downloaded

•File compression used for large files

•Note that there is a secure variant known as SFTP, where S stands for “Secure”.

Chat and Instant Messaging

•Instant Messaging (IM) – usually just between two people, but may be more – e.g. Facebook Chat, Skype etc.

•Internet Relay Chat (IRC) – requires software on client – many chat rooms (channels)

•Though text-based, still very popular particularly in the tech community

Interbet conferencing

Internet Conferencing or Web conferencing refers to a service that allows conferencing events to be shared with remote locations. These are sometimes referred to as webinars or, for interactive conferences, online workshops. In general, the service is made possible by Internet technologies, particularly on TCP/IPconnections. The service allows real-timepoint-to-point communications as well as multicastcommunications from one sender to many receivers. It offers data streams of text-based messages, voice and video chat to be shared simultaneously, across geographically dispersed locations. Applications for web conferencing include meetings, training events, lectures, or short presentations from any computer.

Electronic Online newspaper

An online newspaper is the online version of a newspaper, either as a stand-alone publication or as the online version of a printed periodical. Going online created more opportunities for newspapers, such as competing with broadcast journalism in presenting breaking news in a more timely manner. The credibility and strong brand recognition of well-established newspapers, and the close relationships they have with advertisers, are also seen by many in the newspaper industry as strengthening their chances of survival. The movement away from the printing process can also help decrease costs.

Online shopping

Online shopping or e-shopping is a form of electronic commerce which allows consumers to directly buy goods or services from a seller over the Internet using a web browser. Alternative names are: e-web-store, e-shop, e-store, Internet shop, web-shop, web-store, online store, online storefront and virtual store. Mobile

commerce (or m-commerce) describes purchasing from an online retailer's mobile optimized online site or app.

Different types of Internet connectivity and ISP

There are several different ways to connect to the Internet that will give you a powerful connection and let you browse the Internet in no time. Depending on where you live, not all Internet connections are available, so you may have to shop around. Here are five types of Internet connections for you to look into.

Cable: Most Common High-Speed Internet Connection. Cable is the most common type of high-speed Internet used today. You can easily add Internet service to your current cable package for a nominal monthly fee. Most cable companies offer different packages depending on the speed you require for your Internet needs, and the number of computers in your house that will run off of it. They'll usually offer high-speed Internet at a reduced cost if purchased as part of a package deal.

DSL: One of the Cheaper Options of Internet Service DSL Internet connection is usually provided by your local phone company and can also be modified to provide Internet service to a certain number of computers in your home. The speed is slightly different than a cable modem provides, but the cost may make the difference worthwhile. Another advantage to DSL over cable is you're not sharing the modem line with other subscribers in your area. The line is hardwired directly to your house, so there is no "down time" when a lot of people are logged on. You might need to have at least one phone line connected through the company in order to add DSL.

WiFi: Most Convenient High-Speed Connection WiFi is the best option if you have a laptop or handheld devices you want to use around the house. You can set the WiFi connection up on all of your wireless devices and use them from anywhere in the house, perhaps even outside if the signal is strong enough. You need to be careful to keep your WiFi protected from hackers. Be sure to set up a password that only you know.

UNIT 4

FILE MANAGEMENT AND DATA PROCESSING

File

File is nothing but an Electronic document. The contents can be ordinary Text or it can be an executable program. Each file is given a file name to identify it. The File name is in the form File Name . Extension Filename can consist of Alphabets or combinations of alphabets, numerals and special characters. Extension indicates the type of file. Example : XY.Doc Here File name is XY Extension name is .DOC which indicates Document file.

Folder

Folder contains a group of files. Folder is otherwise called as directory. Folder may have a set of files under it. It may have other folders under it also. This files and folders can be arranged in hierarchical manner or a tree like structure.

File organization

The arrangement of records in a file is known as File Organisation. File Organisation deals with the arrangement of data items in the secondary storage devices like magnetic disk. That is, the file organisation deals with how the logical tuples (rows) of tables (relations) are organised on the physical storage medium. For organising records efficiently in the form of a computer file, following three things are important:

(a) A logical method should be selected to organise records in a file.

(b) File structure should be so designed that it would allow quick access to needed data items.

(c) Means of adding or deleting data items or records from files must be present. Depending on the above considerations, a file may be organised as:

(a) Sequential file (b) Direct or random access file (c) Indexed-sequential file

Sequential file

A sequential file is a file in which the records are stored in some order, say the student file contains records of students in the ascending order of roll number of students. It is not necessary that all the records of a sequential file should be in physical adjacent positions. On a magnetic tape, the records are written one after the other along the length of the tape. In case of magnetic disks, the records of a sequential file may not be in contiguous locations. The sequential order may be given with the help of pointers on each record.

The main advantages of sequential file organisation are:

(a) File design is simple.

(b) Location or records requires only the record key.

(c) When the activity rate is high, simplicity of the accessing method makes processing efficient.

(d) Low-cost file media such as magnetic tapes can be used for storing data.

The main drawbacks of sequential file organisation are.

(a) Updating requires that all transaction records are sorted in the record key sequence.

(b) A new master file, physically separate and exclusive, is always created as a result of sequential updating.

(c) Addition and deletion of records is not simple.

Direct Access File

A sequential file is not suitable for on-line enquiry. Suppose a customer at a bank wishes to know the balance amount in his savings account. If the customer file Ls organised sequentially, the record of this customer has to be obtained by searching sequentially from the beginning. There is no way of picking out the particular record wit'hout traversing the file from the beginning and this mpy take a long time.

Hence, in such situations, random access or direct access file organisation provides a means of accessing records speedily.

In random access or direct access method of file organisation, each record has its own address on the file. With the help of this physical address, the record can be directly accessed for reading or writing. The records need not be in any sequence within the file and also need not be in adjacent locations on the storage medium. Such a file cannot be created on a magnetic tape medium. Random (or direct) filesare created only on magnetic disks. Since every record can be independently accessed, every transaction can be manipulated individually. Random access file organisation is best suited for on-line processing systems where current information is the one that is always required.

The advantages of Direct Access file organisation are

(a) Immediate access to records is possible.

(b) Up-to-date information will always be available on the file.

(c) Several files can be simultaneously updated.

(d) Addition and deletion or records is not very complex.

(e) No new master file is created for updating a random access file.

The disadvantages of Direct Access file organisation are:

(a) Less efficient in the use of storage space.

(b) Uses a relatively expensive medium.

(c) Not well suited for batch processing.

(d) Data security is less due to direct access facility.

Indexed Sequential

File Some files may be required to support both batch processing and on-line processing. For example, an inventory or stock file may be updated periodically by

batch processing and at the same time may have to provide current information about stock availability on-line. They can be thus, organised as indexed sequential files.

Indexed Sequential file combines the advantages of sequential and direct access file organisations. An indexed sequential file is basically a sequential file organised serially on key fields. In addition, an index is maintained which speedsúp the access of isolated records. Just as you may se indexes to locate information in book, similarly an indexis provided for the file. The file is divided into a number of blocks and the highest key in each block is indexed.

Indexed sequential files are also known as Indexed Sequential Access Method (ISAM) files.

DATA PROCESSING

Data Processing means, processing the input data to produce some meaningful and purposeful information. Computer has the capability of processing high-volume of data in less time with higher accuracy. Hence the data processing performed by computer is sometimes called Electronic Data Processing (EDP). Data processing involves 5 distinct steps.

- Data capturing

- Data validation

- Processing / Execution

- Data storage

- Data Retrieval/Out generation

Data capturing encompasses the activities of inputing data to the computer. Before giving input to the system the required data are to be first identified and put in the defined format called source data layout. The aim of this layout is to have faster data entry. To reduce the volume of data and also have better organisation and easyaccess to data those can suitably be coded. After data are ready they can be entered to the computer through keyboard. This is sometimes called data

capture through intelligent terminal. The other form of data capture is through scanners or optical devices. In this type of data capturing data are not entered rather data are captured from the source document or paper as it is Photographs, fingerprints, signatures, objective multiple type answers in answer papers etc. are captured through this method. Another form of data capturing is through some interfacing devices from where data can be transferred directly to the computer. Example of this is Electronic cash Registers used in shops and cash counters.

After data capturing, the data is validated. Data validation involves checking of input data to fit to requirements or specifications. For example price of a book can be numeric only. If by mistake Alphabetic data are entered then it is checked and error is shown to revalidate the data. This prevents unwanted and unspecified data to enter into the system and causing errors.

The valid input data are stored in file or database and processed as per the instructions. The instructions are put in programs or software. This software or program, when executed does the processing of input data and produces the output. Again outputs are stored in files in memory.

After processing of data, the outputs are produced. The outputs may be formed in different ways depending on the requirements and specifications. The same set of data can be printed in tabular form or in form of graphs. There are variety of ways for presenting data. The printed output is sometimes called hardcopy. There can be provision of answering to queries of user where the answer is displayed on the monitor screen itself. So it depends on the requirements of user.

An important step of Data Processing is maintaining Database. Database is nothing but collection of data which is controlled centrally with many provisions of data security. This is where, normally data are stored for reference. The input data and output data are stored in database. Even after processing of data and producing of data is over, database is maintained properly with safety for future needs and reference. The important tool of data processing is file. File is nothing but an electronic document where data can be stored. Depending on the type of file structure and organisation the data access speed varies.

UNIT 5

PROBLEM SOLVING METHODOLOGY

Algorithm

Definition:

- An algorithm is a well-defined procedure that allows a computer to solve a problem.
- Algorithm is defined as the step-by-step solution of problem in user's language.
- It is considered as an effective procedure for solving a problem in finite number of steps.
- Another way to describe an algorithm is a sequence of unambiguous instructions.
- In fact, it is difficult to think of a task performed by your computer that does not use algorithms.

The characteristics of Algorithm are

- Precise
- Unambiguous
- Finite termination
- Unique solution

Example:

1. Algorithm to find out sum of two numbers to be taken as input.

Step-1
Read thenumber x
Step-2

Read the 2nd number y
Step-3
Sum=x+y
Step-4
Print Sum

Pseudocode

It is a concise description algorithm in English language that uses programming language constructs. It contains outlines of the program that can be easily converted to program. It focuses on the logic of the algorithm without giving stress on the syntax of programming language. This is meant for understanding the logic of the program easily. Flowchart can be considered as an alternative to pseudo code. Several constructs/key words of programming language can be used in the algorithm to write the pseudo code.

Flowchart

Flowchart is a graphical or symbolic representation of the process of solution to a problem or algorithm. It helps to visualize the complex logic of the solution of the problem in a simplified manner through diagrammatic representation. Each step of the algorithm is presented using a symbol and a short description.

Generation of Programming Languages

Programming Language
Programming language is a tool to express the logic or instructions for understanding of the computer. Any programming language has two components:

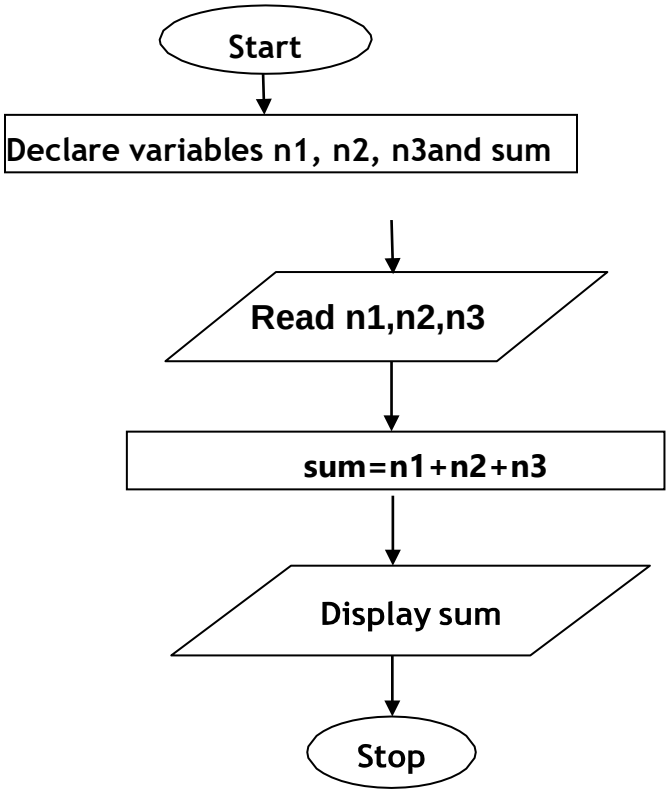
a) Syntax
b) Semantics

Structured Programming Language

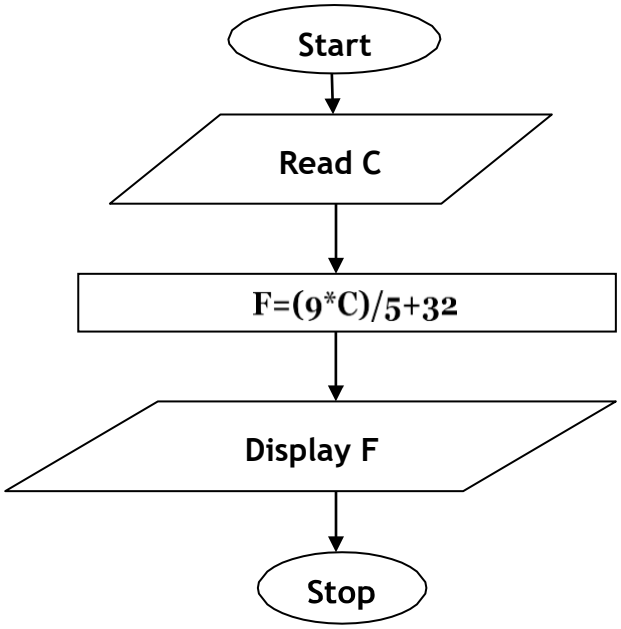
Structured Programming is also known as Modular Programming. In this type of programming technique, the program shall be broken into several modules. This helps in managing memory efficiently as the required module of the program will be loaded into the memory only and not the entire program. This will also enhance code reuse. Writing, understanding, debugging and modifying the individual module of the program is also easier.

Examples of Problem solving through Flowchart

1. **Add three numbers entered by theuser.**


Start
Declare variables n1, n2, n3and sum
Read n1,n2,n3
sum=n1+n2+n3
Display sum
Stop

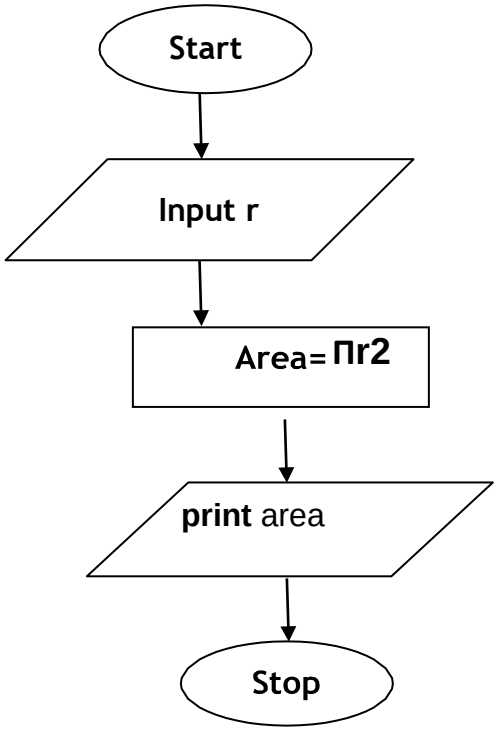
2.To convert temperature from degree Celsius TO FAHRENHEIT



. Algorithm

- Step1 :Start
- Step2 :Read the input of temperature in Celsius (say F)
- Step3 :F=(9*C)/5+32
- Step4 :Print temperature in Fahrenheit is F
- Step5 :Stop

3.Flowchart to calculate the area of a circle.



Generation of Programming Languages

Programming Language

Programming language is a tool to express the logic or instructions for understanding of the computer. Any programming language has two components:

c) Syntax
d) Semantics

Generations of Programming Language

The Programming languages can be classified into 4 generations:

1stGeneration: Machine Language

2ndGeneration: Assembly Language

3rdGeneration: High Level Language

4thGeneration: Very High Level Language

Machine Level language contains instructions in binary form (0s and 1s.) Thus writing instruction was very difficult and needs heavy expertise. This was used in early days computers.

Assembly level language instructions were written using symbolic codes known as mnemonics. In comparison to Machine language, it is relatively easier to write program, but still it requires lot of expertise. A translator called assembler is used to translate assembly language program to machine level language.

High level language contains instructions in English like words so that user will feel easier to formulate and write the logical statements of the program. Here the logic may spread over multiple statements as against a single statement in assembly language. It uses a translator called compiler for translation of High level language program to machine level language program. There are many High level languages used for programming such as COBOL, PASCAL, C, C++ etc.

Very High Level language otherwise called as 4GL uses nonprocedural logical statements.

Structured Programming Language

Structured Programming is also known as Modular Programming.

In this type of programming technique, the program shall be broken into several modules. This helps in managing memory efficiently as the required module of the program will be loaded into the memory only and not the entire program. This will also enhance code reuse.

UNIT 6

C PROGRAMMING LANGUAGE

- The C Language is developed by Dennis Ritchie for creating system applications that directly interact with the hardware devices such as drivers, kernels, etc.
- C programming is considered as the base for other programming languages, that is why it is known as mother language.
- It can be defined by the following ways:

    1. Mother language
    2. System programming language
    3. Procedure-oriented programming language
    4. Structured programming language
    5. Mid-level programming language

Constants

In C programming language, a constant is similar to the variable but the constant hold only one value during the program execution. That means, once a value is assigned to the constant, that value can't be changed during the program execution. Once the value is assigned to the constant, it is fixed throughout the program.

Integer constants

An integer constant can be a decimal integer or octal integer or hexadecimal integer. A decimal integer value is specified as direct integer value whereas octal integer value is prefixed with 'O' and hexadecimal value is prefixed with 'OX'.

An integer constant can also be unsigned type of integer constant or long type of integer constant. Unsigned integer constant value is suffixed with 'u' and long integer constant value is suffixed with 'l' whereas unsigned long integer constant value is suffixed with 'ul'.

Floating Point constants

A floating-point constant must contain both integer and decimal parts. Sometimes it may also contain the exponent part. When a floating-point constant is represented in exponent form, the value must be suffixed with 'e' or 'E'.

Example

The floating-point value 3.14 is represented as 3E-14 in exponent form.

Character Constants

A character constant is a symbol enclosed in single quotation. A character constant has amaximum length of one character.

Example

'A'

'2'

'+'

In the C programming language, there are some predefined character constants called escape sequences. Every escape sequence has its own special functionality and every escape sequence is prefixed with '\' symbol. These escape sequences are used in output function called 'printf()'.

String Constants

- A string constant is a collection of characters, digits, special symbols and escape sequences that are enclosed in double quotations.
- We define string constant in a single line as follows. "This is Diploma smart class"

- We can define string constant using multiple lines as follows... " This\

  is\

  Diploma smart class "

- We can also define string constant by separating it with white space as follows... "This" "is" "Diploma smart class"

- All the above three defines the same string constant.

Creating constants in C

In a c programming language, constants can be created using two concepts...

- Using the —**const**‖ keyword

- Using —**#define**‖ preprocessor

VARIABLE

Variable is a name given to a memory location where we can store different values of the same datatype during the program execution.

Every variable in c programming language must be declared in the declaration section before it is used. Every variable must have a data type that determines the range and type of values be stored and the size of the memory to be allocated.

DATA TYPES

Data types in the c programming language are used to specify what kind of value can be stored in a variable. The memory size and type of the value of a variable are determined by the variable data type. In a c program, each variable or constant or array must have a datatype and this data type specifies how much memory is to be allocated and what type of values are to be stored in that variable or constant or array.

Primary data types

The primary data types in the C programming language are the basic data types. All the primary data types are already defined in the system. Primary data types are also called as Built-In data types. The following are the primary data types in c programming language.

Integer data type

The integer data type is a set of whole numbers. Every integer value does not have the decimal value. We use the keyword "int" to represent integer data type in c.

Floating point data type

Floating-point data types are a set of numbers with the decimal value. Every floating- point value must contain the decimal value. The floating-point data type has two variants...

- float
- double

We use the keyword "float" to represent floating-point data type and "double" to represent double data type in c.

Character data type

The character data type is a set of characters enclosed in single quotations.

Void data type

The void data type means nothing or no value. Generally, the void is used to specify a function which does not return any value.

Derived data type

Derived data types are user-defined data types. The derived data types are also called as user- defined data types or secondary data types.

Managing Input and Output operations.

Output Functions

C programming language provides built-in functions to perform output operation. The output operations are used to display data on user screen or printer or any file.

- printf()
- putchar()
- puts()
- fprintf()

printf() function

The printf() function is used to print string or data values or a combination of string and data values on the output screen

Syntax:

printf("message to be display");

putchar() function

The putchar() function is used to display a single character on the output screen

puts() function

The puts() function is used to display a string on the output screen.

fprintf() function

The fprintf() function is used to print a line into the file.

Input Functions

C programming language provides built-in functions to perform input operations. The input operations are used to read user values (input) from the keyboard. The c programming language provides the following built-in input functions.

- scanf()
- getchar()
- getch()
- gets()
- fscanf()

scanf ( ) function

The scanf() function is used to read multiple data values of different data types from the keyboard. The scanf() function is built-in function defined in a header file called "stdio.h".

Syntax:

scanf("format strings",&variableNames”);

getchar ( ) function:

The getchar() function is used to read a character from the keyboard and return it to the program

Getch ( ) function

The getch() function is similar to getchar function. The getch() function is used to read a character from the keyboard and return it to the program

Gets ( ) function

The gets() function is used to read a line of string and stores it into a character array.

Fscanf ( ) function

The fscanf() function is used with the concept of files. The fscanf() function is used to read data values from a file

Operators

An operator is a symbol used to perform arithmetic and logical operations in a program. That means an operator is a special symbol that tells the compiler to perform mathematical or logical operations. C programming language supports a rich set of operators that are classified as follows.

- Arithmetic Operators(+,-,×,÷)
- Relational Operators(<,>,<=,>=,==)
- Logical Operators (&&,!,ıı)
- Increment & Decrement Operators(++,--)

Operator	Meaning	Example	
++	Increment	Adds one to existing value	int a = 7;a++; ⇒ a = 8
--	Decrement	Subtracts one from existing value	int a = 7;a--; ⇒ a = 6

- Assignment Operators(=,+=,-=,*=,%=)
- Bitwise Operators(&,I,^,~,<<,>>)
- Conditional Operator(?)

- Special Operator(sizeof, pointer, comma, dot, etc.)

Expressions

In any programming language, if we want to perform any calculation or to frame any condition etc., we use a set of symbols to perform the task. These set of symbols makes an expression.

Expression Types in C

In the C programming language, expressions are divided into THREE types. They are as follows

- Infix Expression
- Postfix Expression
- Prefix Expression

Infix Expression

- The expression in which the operator is used between operands is called infix expression.

Operand1 Operator Operand2

Postfix Expression

- The expression in which the operator is used after operands is called postfix expression.

Operand1 Operand2 Operator

Prefix Expression

- The expression in which the operator is used before operands is called a prefix expression.

Operator Operand1 Operand2

Type Conversion

The type conversion is the process of converting a data value from one data type to another data type automatically by the compiler. Sometimes type conversion is also called implicit type conversion. The implicit type conversion is automatically performed by the compiler.

EXAMPLE

```
#include<stdio.h>

#include<conio.h>

Void main()

{

Int i = 25;

Float x = 26.07;

Char ch = ‘A’;

I = x;

Print f(“I value is %d\n”,i);

X = I;

Printf(“I value is %f\n”x);

I = ch;

Printf(“I value is %d\n”,i);

}
```

In the above program, we assign i = x, i.e., float variable value is assigned to the integer variable. Here, the compiler automatically converts the float value (26.07) into integer value(26) by removing the decimal part of the float value (26.07) and then it is assigned to variable i. Similarly, when we assign x

= i, the integer value (26) gets converted to float value(26.000) by adding zero as the decimal part.

Typecasting

Typecasting is also called an explicit type conversion. Compiler converts data from one data type to another data type implicitly. When compiler converts implicitly, there may be a data loss. In such a case, we convert the data from one data type to another data type using explicit type conversion. To perform this we use the unary cast operator.

To convert data from one type to another type we specify the target data type in parenthesis as a prefix to the data value that has to be converted.

EXAMPLE-

```
#include<stdio.h>

#include<conio.h>

int main()

{

int a, b, c ;

float avg;

printf( "Enter any three integer values : ");

scanf(—%d%d%d‖,a,b, c);

avg = (a + b + c) / 3 ;

printf("avg before casting = &f", avg \n);

avg = (float)(a + b + c) / 3 ;

printf("avg after casting = %f",avg\n);

return 0; }
```

Decision Control and Looping Statements (If, If-else, If-else-if, Switch, While, Do- while, For, Break, Continue & Goto)

Decision Making Statement

In C programming language, the program execution flow is line by line from top to bottom. That means the c program is executed line by line from the main method. But this type of execution flow may not be suitable for all the program solutions. Sometimes, we make some decisions or we may skip the execution of one or more lines of code.

Decision-making statements are the statements that are used to verify a given condition and decide whether a block of statements gets executed or not based on the condition result.

if statement

if statement is used to verify the given condition and executes the block of statements based on the condition result. If it is TRUE, it executes the next statement or block of statements. If the condition is FALSE, it skips the execution of the next statement or block of statements.

SYNTAX

If(condition)

{

……

…….

}

If else statement

The if-else statement is used to verify the given condition and executes only one out of the two blocks of statements based on the condition result..

If it is TRUE, it executes a block of statements (True block). If the condition is FALSE, it executes another block of statements (False block).

SYSNTAX

```
If(condition)
{
……
True statement;
……
}
Else
{
……
False statement;
…
}
```

If-else-if statement

Writing a if statement inside else of an if statement is called if-else-if statement.

Syntax

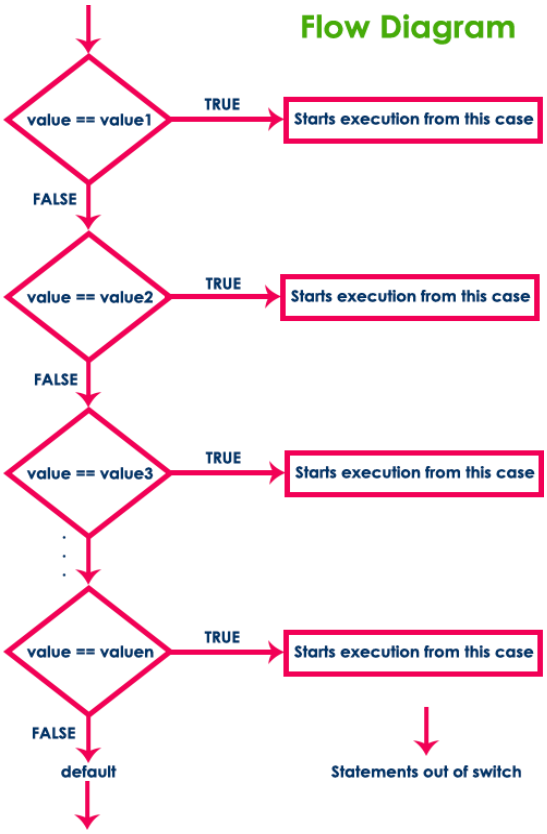
```
if ( condition1 )
{
    ....
    True block of statements1;
    ....
}
else if ( condition2 )
{
    False block of condition1;
    &
    True block of condition2
}
```

'switch' statement in C

Using the switch statement, one can select only one option from more number of options very easily. Inthe switch statement, we provide a value that is to be compared with a value associated with each option. Whenever the given value matches the value associated with an option, the execution starts from that option. In the switch statement, every option is defined as a case.

Syntax

```
switch ( expression or value )
{
        case  value1:  set of statements;
                       ....
        case  value2:  set of statements;
                       ....
        case  value3:  set of statements;
                       ....
        case  value4:  set of statements;
                       ....
        case  value5:  set of statements;
                       ....
        .
        .
        default: set of statements;
}
```



LOOPING STATEMENT

The looping statements are used to execute a single statement or block of statements repeatedly until the given condition is FALSE.

C language provides three looping statements...

- while statement
- do-while statement
- for statement

while statement

The while statement is used to execute a single statement or block of statements repeatedly as long as the given condition is TRUE. The while statement is also known as Entry control looping statement.

At first, the given condition is evaluated. If the condition is TRUE, the single statement or block of statements gets executed. Once the execution gets completed the condition is evaluated again. If it is TRUE, again the same statements get executed. The same process is repeated until the condition is evaluated to FALSE. Whenever the condition is evaluated to FALSE, the execution control moves out of the while block.

Syntax:

```
while( condition )
{
    ...
    block of statements;
    ...
}
```

'do-while' statement

The do-while statement is used to execute a single statement or block of statements repeatedly as long as given the condition is TRUE. The do-while statement is also known as the Exit control looping statement.

At first, the single statement or block of statements which are defined in do block are executed. After the execution of the do block, the given condition gets evaluated. If the conditionis evaluated to TRUE, the single statement or block of statements of do block are executed again.

Once the execution gets completed again the condition is evaluated. If it is TRUE, again the same statements are executed. The same process is repeated until the condition is evaluated to FALSE. Whenever the condition is evaluated to FALSE, the execution control moves out of the while block.

Syntax:

```
do
{
    ...
    block of statements;
    ...
} while( condition ) ;
```

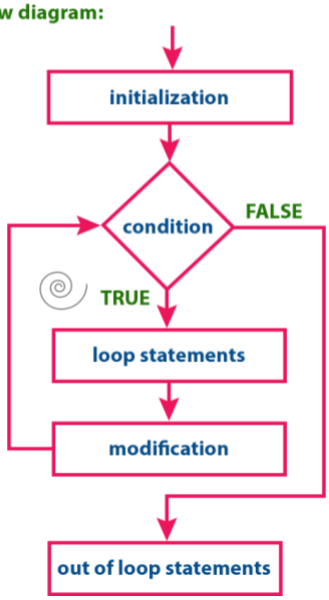
For statement

for statement is used to execute a single statement or a block of statements repeatedly as long as the given condition is TRUE.

Syntax:

```
for( initialization ; condition ; modification )
{
    ...
    block of statements;
    ...
}
```

Execution flow diagram:



“break” statement

break statement is used to terminate the switch case statement.

break statement is also used to terminate looping statements like while, do-while and for.

EXAMPLE

```
#include<stdio.h>

#include<stdlib.h>

void main ()

{

int i;

for(i = 0; i<10; i++)

{
```

```
printf("%d ",i);

if(i == 5)

break;

}

printf("\ncame outside of loop i = %d",i);

}
```

Output

0 1 2 3 4 5

came outside of loop i = 5

continue statement

The continue statement is used to move the program execution control to the beginning of the looping statement. When the continue statement is encountered in a looping statement, the execution control skips the rest of the statements in the looping block and directly jumps to the beginning of the loop. The continue statement can be used with looping statements like while, dowhile and for.

EXAMPLE

```
#include<stdio.h>

 void main ()

{

int i = 0; while(i!=10)

{

printf("%d", i); continue;

i++;
```

```
}

}
```

Output:

Infinite loop

goto statement

The goto statement is used to jump from one line to another line in the program. Using goto statement we can jump from top to bottom or bottom to top. To jump from one line to another line, the goto statement requires a label. Label is a name given to the instruction or line in the program. When we use a goto statement in the program, the execution control directly jumps to the line with the specified label.

EXAMPLE

```
#include <stdio.h>

 void main()

{

int num,i=1;

printf("Enter the number whose table you want to print:");

scanf("%d",&num);

table: printf("%d x %d = %d\n",num,i,num*i);

 i++;

if(i<=10)

goto table;

}
```

Output:

Enter the number whose table you want to print:10

10 x 1 = 10

10 x 2 = 20

10 x 3 = 30

10 x 4 = 40

10 x 5 = 50

10 x 6 = 60

10 x 7 = 70

10 x 8 = 80

10 x 9 = 90

10 x 10 = 100

***To find the Factorial of a Number**

```
#include <stdio.h>
int main()
{
int n, i;
unsigned long long fact = 1;
printf("Enter an integer: ");
scanf("%d", &n);
printf("Error! Factorial of a negative number doesn't exist.");
 else
```

```
{
for (i = 1; i<= n; ++i)
{
fact *= i;
}
printf("Factorial of %d = %llu", n, fact);
}
return 0;
}
```

Output

Enter an integer: 5

Factorial of 3 = 6

***Program to Check Palindrome**

```
#include <stdio.h>
 int main()
{
int n, reversedN = 0, remainder, originalN;
 printf("Enter an integer: ");
scanf("%d", &n);
originalN = n;
// reversed integer is stored in reversedN
while (n != 0)
```

```
 {
remainder = n % 10;
reversedN = reversedN * 10 + remainder;
n /= 10;
}
if (originalN == reversedN)
printf("%d is a palindrome.", originalN);
else
printf("%d is not a palindrome.", originalN);
 return 0;
```

OUTPUT

```
Enter an integer 2002
2002 is a palindrome.
```

UNIT 7

ADVANCE FEATURES OF C

Functions

- A function is a group of statements that together perform a task.
- Every C program has at least one function, which is main (), and all the most trivial programs can define additional functions.
- You can divide up your code into separate functions. How you divide up your code among different functions is up to you, but logically the division is such that each function performs a specific task.
- A function declaration tells the compiler about a function's name, return type, and parameters. A function definition provides the actual body of the function.

Defining a Function

-return type function name(parameter list) {

-body of the function

-}

Here are all the parts of a function −

-Return Type − A function may return a value. The return type is the data type of the value the function returns. Some functions perform the desired operations without returning a value. In this case, the return type is the keyword void.

-Function Name − This is the actual name of the function. The function name and the parameter list together constitute the function signature.

-Parameters − A parameter is like a placeholder. When a function is invoked, you pass a value to the parameter. This value is referred to as actual parameter or argument. The parameter list refers to the type, order, and number of the parameters of a function. Parameters are optional; that is, a function may contain no parameters.

-Function Body − The function body contains a collection of statements that define what the function does.

Parameters in C functions

- A Parameter is the symbolic name for "data" that goes into a function. There are two ways to pass parameters in C: Pass by Value, Pass by Reference.

Call by Value

- ✓ Pass by Value, means that a copy of the data is made and stored by way of the name of the parameter. Any changes to the parameter have NO effect on data inthe calling function.
- ✓ In call by value method, the value of the actual parameters is copied into the formal parameters. In other words, we can say that the value of the variable is used in the function call in the call by value method
- ✓ In call by value method, we cannot modify the value of the actual parameter by the formal parameter**.**
- ✓ In call by value, different memory is allocated for actual and formal parameters since the value of the actual parameter is copied into the formal parameter

Call by Reference

- ✓ A reference parameter "refers" to the original data in the calling function. Thus, any changes made to the parameter are also made to the original variable.
- ✓ In call by reference, the address of the variable is passed into the function call as the actual parameter.
- ✓ The value of the actual parameters can be modified by changing the formal parameters since the address of the actual parameters is passed**.**

In call by reference, the memory allocation is similar for both formal parameters and actual parameters. All the operations in the function are performed on the value stored at the address of the actual parameters, and the modified value gets stored at the same address

Scope of variables

Scope of a variable is the portion of the program where a defined variable can

be accessed.

The variable scope defines the visibility of variable in the program. Scope of a variable depends on the position of variable declaration.

- In C programming language, a variable can be declared in three different positions and they are as followS

Before the function definition (Global Declaration)

Inside the function or block (Local Declaration)

In the function definition parameters (Formal Parameters)

Storage Classes

Storage classes in C are used to determine the lifetime, visibility, memory location, andinitial value of a variable. There are four types of storage classes in C

Automatic

External

Static

Register

Recursion Function

Recursion is the process of repeating items in a self-similar way. In programming languages, if a program allows you to call a function inside the same function, then it is called a recursive call of the function.

```
void recursion()
{
recursion (); /* function calls itself */
}
int main()
{
 recursion ();
}
```

Types of Recursion

Recursion are mainly of two types depending on weather a function calls itself from within itself weather two function call one another mutually.

Thus, the two types of recursion are:

- Direct recursion
- Indirect recursion

Recursion may be further categorized as:

- Linear recursion
- Binary recursion
- Multiple recursion

One-dimensional array

- ✓ Conceptually you can think of a one-dimensional array as a row, where elements are stored one after another.
- ✓ Syntax: data type array_name[size];
- ✓ datatype: It denotes the type of the elements in the array.
- ✓ array_name: Name of the array. It must be a valid identifier.
- ✓ size: Number of elements an array can hold. here are some example of array declarations:

```
int num[100];
 float temp[20];
char ch[50];
```

Multidimensional Arrays

The simplest form of multidimensional array is the two-dimensional array. A two dimensional array is, in essence, a list of one-dimensional arrays. To declare a two-dimensional integer array of size [x][y], you would write something as follows −

type array Name [x][y];

- ✓ Where type can be any valid C data type and array Name will be a valid C identifier.
- ✓ A two-dimensional array can be considered as a table which will have x number of rows and y number of columns.

String operations

- ✓ Strings are actually one-dimensional array of characters terminated by a null character '\0'. Thus a null-terminated string contains the characters that comprise the string followed by a null.
- ✓ The following declaration and initialization create a string consisting of the word "Hello". To hold the null character at the end of the array, the size of the character array containing the string is one more than the number of characters in the word "Hello."

char greeting[6] = {'H', 'e', 'l', 'l', 'o', '\0'};

- ✓ If you follow the rule of array initialization then you can write the above statement as follows −

char greeting[] = "Hello";

Pointers

- ✓ A pointer is a variable whose value is the address of another variable, i.e., direct address of the memory location. Like any variable or constant, you must declare a pointer before using it to store any variable address. The general form of a pointer variable declaration is –

  type *var-name;

- ✓ Here, type is the pointer's base type; it must be a valid C data type and var-name is the name of the pointer variable. The asterisk * used to declare a pointer is the same asterisk used for multiplication

Pointer Arithmetic Programming

Pointer in c is an address, which is a numeric value. Therefore, you can perform arithmetic operations on a pointer just as you can on a numeric value. There are four arithmetic operators that can be used on pointers: ++, --, +, and –

Incrementing a Pointer

We prefer using a pointer in our program instead of an array because the variable pointer can be incremented, unlike the array name which cannot be incremented because it is a constant pointer

EXAMPLE

```
#include <stdio.h>
 const int MAX = 3;
 void main ()
{
int var[] = {10, 100, 200};
int i, *ptr;
ptr = var;      /* let us have array address in pointer */ for ( i = 0; i< MAX; i++)
for ( i = 0; i< MAX; i++)
{
printf("Address of var[%d] = %x\n", i, ptr );
printf("Value of var[%d] = %d\n", i, *ptr );
 ptr++;
}
}
```

Decrementing a Pointer

The same considerations apply to decrementing a pointer, which decreases its value by the number of bytes of its data type as shown below –

```
#include <stdio.h>
 const int MAX = 3;
int main ()
{
int var[] = {10, 100, 200};
int i, *ptr;
ptr = &var[MAX-1];/* let us have array address in pointer */
for ( i = MAX; i> 0; i--)
{
printf("Address of var[%d] = %x\n", i-1, ptr );
 printf("Value of var[%d] = %d\n", i-1, *ptr );
 ptr--;
}
return 0;
}
```

Structure and Union

A structure is a user defined data type in C. A structure creates a data type that can be used to group items of possibly different types into a single type.

A structure variable can either be declared with structure declaration or as a separate declaration like basic types.

A variable declaration with structure declaration.

```
 struct Point
{
int x, y;
} p1;
```

The variable p1 is declared with 'Point'**.**

Union

A union is a special data type available in C that allows storing different data types in the same memory location.

You can define a union with many members, but only one member can contain a value at any given time.Unions provide an efficient way of using the samememory location for multiple purposes.