

**INFORMATION & COMMUNICATION
TECHNOLOGY (ICT)
&
COMPUTER NETWORKING
D.I.T-I**

According to New Syllabus of DIT
Khyber Pakhtunkhwa Board of Technical Education
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By

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PREFACE

Computers are general-purpose electronic device to help in data storage, processing and communication of information. Modern computers can process information not only in text form but also in graphic, audio or video form. Today, they have found their way into application areas that were not feasible twenty years ago. Revolutionary changes have occurred in the field of information technology during this period. I hope this book will not only benefit the students but also the teachers and all other users in a better way for learning about computers and other fields of information technology.

M. Khalid Khan.

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CHAPTER-I

Q. What is Data? Explain different types of data.

A. Data is a plural form of the Latin word Datum. The collection of fact and figure is called Data OR any thing in raw form. Data cannot be used for decision making or action taking. e.g. Name, Address, Number, Phone Number, Roll No etc.

Types of data

There are different types of data

- i. Alphabetic data type:-It consist letter from A-Z capital or from a-z small letter. e.g Abid Peshawar, Pakistan, Khan
- ii. Numeric data type;- It consist of digit from 0-9 e.g 123; 567 etc
- iii. Alphanumeric data type:-It consist alphabetic letter as well as numeric digit. Street no A/10 etc
- iv. Graphic data: It consists tables, charts, graphics and statements
- v. Audio data: It consists only sounds. For example radio news.
- vi. Video data: It consists photos, image and moving picture. Such as TV news.
- vii. Mixed data: It consists more than one type of data. Such as the combination of audio and video.

Q. What is Information?

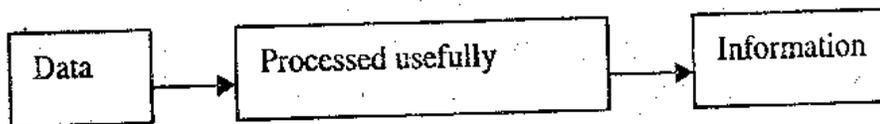
A. To organize the Data in meaningful form upon which people can take necessary decision is called Information. e.g. 2,1,5,4 when sorted it become 1,2,4,5 which is information. Information is the meaningful, processed data, which is relevant and accurate and there by can be used in decision-making. Examples are voucher, bills, fee registration cards or library cards.

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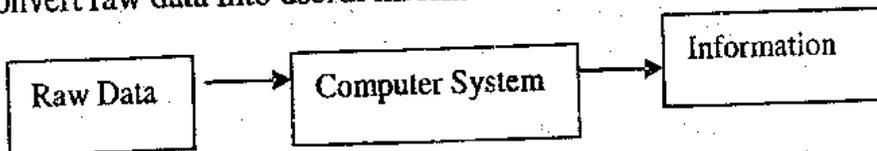
Differentiate between Data and Information

DATA	INFORMATION
Data is a set of raw facts.	Information is processed form of data.
Data is used as input in the computer	Information is the output of computer
Data is not meaningful	Information is meaningful
Data is asset of organization and is not available to people for sale.	Information is normally available for sale.
Data is an independent entity	Information depend on data
Data is not used in decision-making	Information is very important for decision-making
Data is use rarely	Information is use frequently.



e.g. 2,1,5,9,7 Sorted 1,2,5,7,9

Remember that computer is one of the information systems that convert raw data into useful information.



DATA PROCESSING CYCLE

Data processing life cycle is a collection of steps required to convert data into information. Different steps of data processing life cycle are as follows.

INPUT: in this steps, data is collected and given to the computer for processing.

PROCESS: In this steps, computer processes data to generate information.

OUTPUT: In this step, the information is given to the user as output.

STORAGE: In this steps, the information is stored in the computer for future use. This steps is optional.

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CLASSIFICATION OF DATA PROCESSING SYSTEM

MANUAL/CONVENTIONAL DATA PROCESSING

The Conventional Data Processing/Traditional Data Processing system is the manual method of transforming data into information. The human beings themselves collect data, classify and arrange the data, perform manual calculation and hence produce the required output result. It is very simple and inexpensive. Upto the 20th century almost all data processing was done manually. Clerical persons used paper, pen, and pencil to maintain records in offices. Such data processing caused frequently clerical mistakes and hence due to these miss-recorded transactions, the Company record was to be misrepresented. Information was often received too late to serve the organization purposes.

ELECTRONIC DATA PROCESSING (COMPUTER BASED DATA PROCESSING SYSTEM)

An Information System that uses Computer and their hardware and software is called Electronic data processing, Computer-Based Data processing or Computer Based Information System. Electronic Data Processing or Computer Based Information System uses Computer hardware and software, the internet and other telecommunication system, network, Computer based data resource management technique and many other information technologies to transform data resources into information products for consumers and business professionals.

Electronic computers complete all data manipulation and file updating electronically rather than mechanically. This increased data processing productivity and reduced its cost. The speed, accuracy and reliability of computers are more than Traditional data processing.

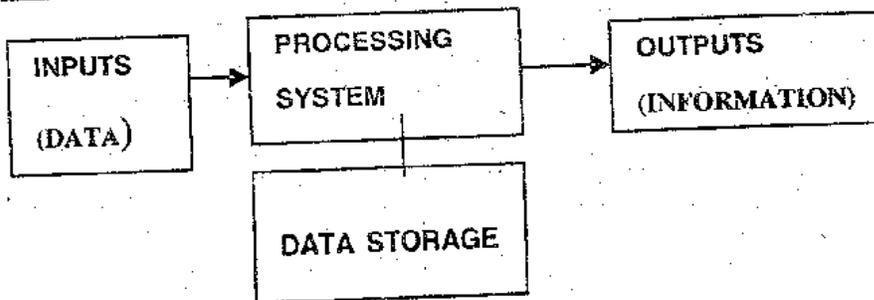
DATA PROCESSING SYSTEM:-

The system that process data and produce information is called Data processing system or Information processing system. The diagrammatic representation of DPS is given below.

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MODEL OF DATA PROCESSING SYSTEM

There are mainly two of data processing systems which are discuss in previous topics.

ADNANTAGES OF ELECTRONIC DATA PROCESSING

Electronic data processing reshaping the basics of business. Now a day customer service, operation, products and marketing strategic and distribution dependent on electronic data processing. Electronic data processing system perform three important roles in any type of organization.

1. Support of business operations.
2. Support of managerial decision making
3. Support of strategic competitive advantage.

In to day business and every field of life electronic data processing is important component. Through electronic data processing it is possible to become a global enterprise. Electronic data processing is used to restructure work by transforming business process.

Electronic data processing is used to simplified complex process. Receiving, recording, processing and retrieval of record in second. It is possible to access the desired record in second. Electronic data processing permits the organization to create, develop, and maintain database. Using electronic data processing to send, receive email and faxes. Access to internet and remote computer is possible through it. EDP process thousand of transaction in second and the processing speed is very high. Electronic data processing process the transaction with high accuracy.

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WHAT IS INFORMATION TECHNOLOGY? DISCUSS ELEMENT OF IT/ ELEMENTS OF DATA PROCESSING SYSTEM:-

The merging of computer and communication is called Information Technology. IT is a technology that merges computing with high-speed communication links carrying data, sound, image, graph, and video. Computer and communication are the parents of the information age.

It manages a network of computer. Creating WEB Pages, producing video, selling, buying, and perform any type of business activity on the Internet.

For example telephone, radio equipment and switches used for voice communication. Managing video conferencing etc.

Through Internet, you can communicate with any computer user having an internet connection any where in the world. You can exchange message with him, you can talk to him through computer or phone, you can send any file to him, you can receive any file from him and you can have on-line conversation with him through typing from keyboard. A computer and communication system is made up six elements.

- 1) People
- 2) Procedure
- 3) Data/Information
- 4) Hardware
- 5) Software
- 6) Communication

1-PEOPLES

It means the users or people who runs and execute the entire data processing task and computer installations or the people who works in the data processing environment. The personnel include System Analysts, Programmers, Data entry operators, and Data processing officers.

2-Procedure

Procedures are rules, policies, and methods for operating computers. The operation of a data processing system requires procedures for use in obtaining and preparing data in order to operate the computer and for distributing the output from the computer. This procedure includes control steps such as actions to be taken to show errors in the data and malfunctioning of the equipment etc.

3-DATA

Fact and figure is called data. Data is raw material of IS. Data can take many forms, including Text data, Audio data, video data, voice data graphics and image data.

4-HARDWARE

Physical parts of computer system. For example input devices, output devices and CPU such as keyboard, Mouse, motherboard, CD-ROM etc.

5-SOFTWARE

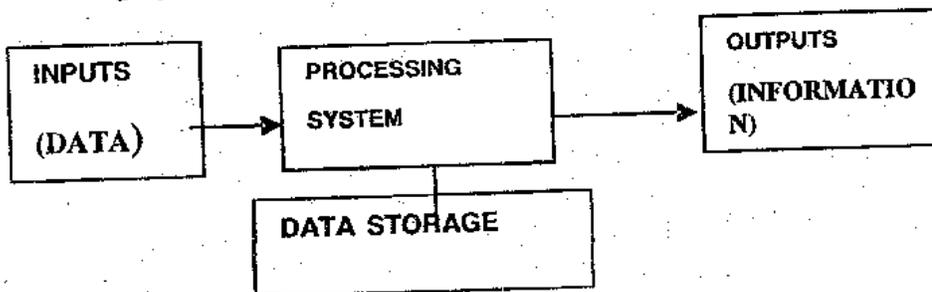
The Software consists of programs whose purpose is to communicate with computer. The Software includes operating system i.e. MS-DOS, PC-DOS, UNIX, XENIX, and Linux etc. General purpose programs i.e. database packages like FoxPro, Dbase, Java etc.

6-Communication

Data Communication/Telecommunication technologies and network like the internet which is necessary for all types of organization and their computer-based data processing. Telecommunication network consist of computers, communications processor and other device interconnected by communication media and control by communication soft ware.

Data processing system:-

The system that process data and produce information is called Data processing system or Information processing system.



MODEL OF DATA PROCESSING SYSTEM

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EXPLAIN MANUAL AND ELECTRONIC DATA PROCESSING SYSTEM. WHAT IS THE DIFFERENCE BETWEEN THESE TWO?

Conventional Data Processing(CDP)/Manual Data Processing:-

The Conventional Data Processing/Traditional Data Processing system is the manual method of transforming data into information. The human beings themselves collect data, classify and arrange the data, perform manual calculation and hence produce the required output result. It is very simple and inexpensive. Upto the 20th century almost all data processing was done manually. Clerical persons used paper, pen, and pencil to maintain records in offices. Such data processing caused frequently clerical mistakes and hence due to these miss-recorded transactions, the Company record was to be misrepresented. Information was often received too late to serve the organization purposes.

Electronic Data Processing (Computer Based data Processing System)

An Information System that uses Computer and their hardware and software is called Electronic data processing, Computer-Based Data processing or Computer Based Information System. Electronic Data Processing or Computer Based Information System uses Computer hardware and software, the internet and other telecommunication system, network, Computer based data resource management technique and many other information technologies to transform data resources into information products for consumers and business professionals.

Electronic computers complete all data manipulation and file updating electronically rather than mechanically. This increased data processing productivity and reduced its cost. The speed, accuracy and reliability of computers are more than Traditional data processing.

CHAPTER -2

(INTRODUCTION TO COMPUTER)

Q. Define Computer?

Ans. Computer:

Computer is an electronic device, which can accept the input data, process the data, and gives the result of the process data according to instruction.

A computer is a system, of an interrelated, interacting components that performs the basic function of input, processing, output, storage, and control. There are three basic component of computer that is Input, CPU, and Output.

Q) Explain History of Computer?

History of Computers: -

The history of Computer is very old, i.e. it goes back to some 500 years BC. The first computing machine was used by the Chinese before 15th century. The name of this machine was Abacus.

However in 1812 an English mathematician from Cambridge University, Mr. Charles Babbage designed a machine called DIFFERENCE ENGINE. This machine was capable of calculating powers of numbers. Babbage also gave the idea of an ANALYTICAL ENGINE, which was supposed to be general-purpose machine having the ability to calculate various arithmetic and/or algebraic formulas, store data and print results. He died soon and never converted his dreams into reality.

The analytical engine was not a successful machine but it gave birth to the research in the field of computers.

In 1946, John Mauchly and J.P. Eckert developed an Electronic, Numerical Integrator and Computer (ENIAC) at the Moore school of Engineering and Technology, Pennsylvania USA. This was the first truly successful computer after Mark-I and Mark-II developed at Manchester University. There were three main drawbacks in the ENIAC as follows:

1. It used serial lines for processing.
2. No storage facility was available.

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memory and have less processing capability. These are also called Chip Computers, because its entire circuitry is fabricated on a single chip. The microcomputer of today is equivalent to the main frame of tomorrow. e.g IBM-PC, XT, AT, Compatibles, 286, 386, 486, 586, P-I, P-II, P-III, P-IV etc.

d) Super Computers: -

Super Computers are also called "Number Crunchers", because they are specialized Computers for dealing with numbers, i.e. they are capable of performing over 10 Mega flops (i.e millions floating point operations per second). These Computers are very much expensive. Two families of commercially available Super Computers are the GRAY-1 and Cyber205 built by Illiac-iv. These are specially used in Atomic reactor, defense system of NASA. (USA)

Q) Explain or discuss Classification of Computer w.r.t purpose.

We can divide the Computers into the following two types.

a) General Purpose Computers. b) Special purpose Computers.

General Purpose Computers: -

These Computers are used for solving a wide variety of problems in many areas such as Business, Education, Science, etc. General-purpose computers can store large amount of data and that is why most business enterprises use them. These Computers are used for multipurpose. For example, P.C, etc.

Special purpose Computers: -

These computers support highly specialized data processing activity. These Computers are used for solving problems of some special types, i.e these Computers are used to perform a single and special task e.g. Computers used in the Atomic Energy Commission, Computer used for eye sight etc.

Q) Explain different generation of computer?

Generations of Computers:

Although, the development of Computers is a continuous process, however, it can be categorized into the following generations based on the technology used for the Computer systems.

1. First Generation (1945-1950):-

All the Computers developed in this generation were based on Vacuum-Tubes technology. For example, ENIAC (Electronic Numerical Integrator And Computer), Mark-I, Mark-II etc. The Computers of this generation were very slow, large, and expensive.

2. Second Generation (1950-1959):-

The Computers of this generation were based on Transistor technology (Vacuum tube replace by transistor) and they opened the gateway to the commercial development for sale of computers. The transistors were small in size, fast in operation and less expensive than vacuum tubes. Hence the Computers of this generation were small and less costly. Also the speed of these Computers was high. e.g., EDVAC, IBM-1401.

3. Third Generation (1960-1969)

The Computers of this generation were based on integrated circuits (ICs) technology (transistor replace by ICs). In early 1960 the electronic technology of solid-state was introduced. The development of integrated circuits (ICs) is called solid-state technology or Small Scale Integration (SSI). The integrated circuits (ICs) are the collection of many electronic devices like transistors on a single chip of silicon. This technology enabled the computers to enter into electronic revolution. Also the Computers of this generation were high in speed, accuracy and less in price. e.g. IBM-360 etc.

4. Fourth Generation (1970-1980)

The Computers of this generation were based on Large Scale Integration (LSI) (ICs replace by LSI). In 1970 the technology was enhanced sufficiently to integrate all main functions of a computer using LSI on a single chip called Microprocessor. In this generation Microprocessor was introduced, due to which microcomputers were made. For example, IBM-PC etc.

5. Fifth Generation(AI)(1980-1990)

The rapid progress in computer technology is still continued and active research is going on in different fields of computer technology but there is no well-defined categorization after fourth generation. The reason may be that now the developments are taking place in a variety of fields of computer hardware and software as compared to the previous developments, which mostly took place in the fields of electronics. As a result of that further grouping of computer developments is difficult. However in the field of software a new era has started called AI (artificial intelligence), which is the main field of study including ROBOTICS, COMPUTER VISION, COMPUTER LEARNING etc. Hence the Computers of this generation were based on the principles of AI and also in this generation, Software development was give more importance than Hardware, as a result of which Artificial Intelligence was introduced. e.g. Robotics, Computer Vision etc.

6.Sixth Generation(ANN'S)(Since 1990):-

The Computers of this generation are based on the principles of Artificial Neural Network System (ANNS). As a result, now the Computers can think and decide for solving different problems. e.g. Character recognition etc.

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CHAPTER-3
(HARDWARE)

Q. Define Computer?

Ans. Computer:

Q. Define Computer?

Ans. Computer is an electronic device, which can accept the data, process the data, and gives the result/information of the process data according to instruction.

A computer is an interrelated combination of components that performs the basic function of input, processing, output, storage, and controlling, and provide information to end users.

Q) Discuss Different components (Input, CPU, Output)? Or Main Components of Computer:

Ans: There are three basic elements of a computer.

1- Input Unit 2-Processing Unit 3-Output Unit

1-Input Unit

The devices through which we enter the data and instructions (Programs) into the computer are called input devices. (e.g. keyboard, Mouse, Scanner etc)

2-Central Processing Unit (CPU)

Central Processing Unit (CPU) is the administrator section of computer. It is the brain of computer. CPU is located on motherboard. Data passes through CPU continually. Data come from RAM and other unit such as keyboard and drivers. CPU processes the data and sends it back to RAM and other units. CPU is connected to all input, output and storage devices and controls all the functions of these devices. CPU receives the data from input device; perform processing on data; and then sends the result of the process data to output devices.

The CPU is the collection of two units.

i) Control Unit (CU)

Control Unit is the nerve center of the computer. It controls all activities of computer system. The control unit direct and coordinate the entire Computer System in carrying out Program instruction. It accepts data from input device and sends it to the memory. From the memory the data are then transferred to ALU and send the result to the output unit.

ii) Arithmetic and Logic Unit (ALU)

This is the calculation section of Computer. All arithmetic operation like addition subtraction, multiplication and division as well as some logical operation are performed in this section. It consists of two units. a- Arithmetic Unit b- Logic unit

a- Arithmetic Unit

Arithmetic unit of the ALU performs basic arithmetic function as addition such as addition, subtraction, multiplication and division.

b- Logic Unit

Logic unit of the ALU performs logical operations like comparing two data items to find which data item is greater than, equal to, or less than the other.

3) Storage Unit (Primary Memory)

This memory is the place where the computer program and data are stored during processing. This memory is temporary storage unit for data, instructions and information. The storage unit is often called either main storage or internal storage or primary storage. There is usually two type's primary storage.

a)RAM:- It stands for Random-Access-Memory or read/write Memory because information can either be read from or written to the RAM. RAM is called volatile or semiconductor memory. This is the memory whose information can be erased or changed. It is temporary memory. Any thing stored in RAM is lost when Computer is switched off.

b)ROM:- It stands for Read-Only-Memory. Information can be read from ROM but we cannot write information to it. This is the memory whose information can be not changed. The information stored in it cannot be lost if we turn off the Computer. ROM is used to store permanent program. This information is available on small pieces of the memory called chips. It is also called non-volatile memory or semi-conductor memory.

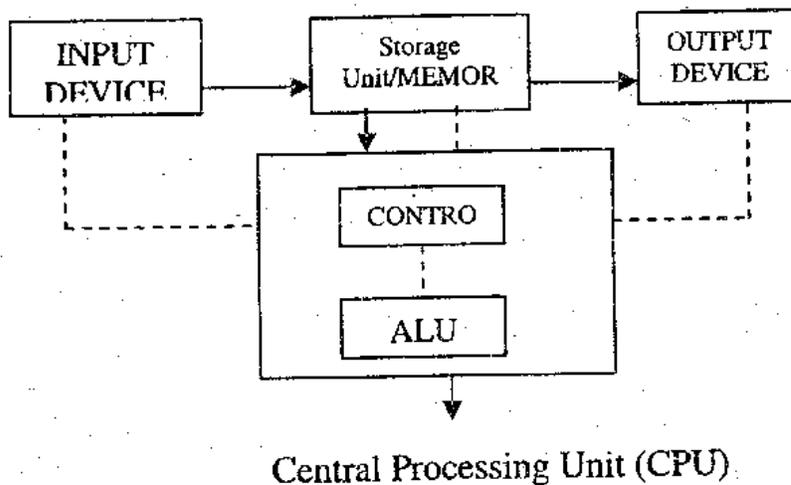
4. Output Unit

The device through which the process information comes to outside world is called output devices. An output device can be used to store,

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display or print the information. (e.g. monitor, printer, floppy Disks, hard Disks etc)



Q) Define Input Device and discuss different input devices.

INPUT DEVICES

The device through which we enter data and program into the computer is called input device. There are many devices for input. These devices of a digital Computer are responsible for accepting programs and data from the outside world, feeding it to the Computer, and storing it into the Computer memory. These devices work under the control of Microprocessor. Some of the famous Input devices are as below Keyboards, mouse, scanners, microphone, video camera, touch screen, and optical scanning.

KEYBOARD:-

It is a very common input device that helps in keying-in the required information into the Computer. Keyboard can be used effectively to communicate with the Computers but it is very slow input device. The keyboard is just like a typical typewriter in shape but enhanced than that. It consists of normal Alphabetic, numeric, functions, and other special characters or control keys, which are not available in a typewriter.

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POINTING DEVICES

An input device used to control a pointer on the screen is called pointing devices. A pointer is a small symbol that appears on the screen in graphical user interface. Some example of pointing devices is Mouse, Track ball, Joy stick etc.

a)MOUSE:-

A Mouse is a quick input-device and is very small in size. Mouse is moved on a flat surface to control the movement of the cursor (pointer) on a screen. A mouse usually has two or three buttons. These buttons are used to perform different task.

b) THE TRACKBALL

Track Ball is pointing devices most often used in the place of the mouse. A trackball is a stationary (motionless) device related to the mouse. It has a ball on the top and you can roll the ball directly with your hand. The trackball is used in laptop computer. There is no need of mouse pad for track ball.

C) POINTING STICK.

Pointing stick is a pressure-sensitive device. It is similar to a pencil eraser and exists between keys on the keyboard. The pointer on the screen moves when the user pushes the pointing stick.

TOUCH SENSITIVE SCREENS

Touch screen is a video display screen that receives input from the touch of finger. The screen is covered with a plastic layer. There are invisible beam of infrared light behind the screen. The user enters data by touching icons or menus on the screen. Most touch screen computer use sensor to detect touch of a finger.

PEN-BASED COMPUTING (LIGHT PEN)

The pen-based devices use photoelectric circuitry to enter data into the computer through a video screen. A user can write on the video display, the light-sensitive pen sends information to the computer when user touches the pen on certain areas of a specially designed screen. Light pen is usually used by engineer, graphic designer, and illustrator.

VOICE RECOGNITION AND RESPONSE.

Voice recognition device is used to directly convert spoken data into electronic form into a computer system. Voices recognition and voice response is the easiest method for data entry and conversational. The

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microphone is attached to the computer with the help of sound card. The capability of a computer to distinguish spoken words is called voice recognition or speech recognition. Voice input is faster way of entering data. Many word processing applications provide the facility of voice input. The user speaks in microphone and the application software writes the spoken words as a text. Speech microprocessors can be found in toys, calculators, appliances, automobiles, and a variety of other consumer, commercial, and industrial products.

OPTICAL AND MAGNETIC RECOGNITION.

Optical character recognition equipment can read special-purpose characters and codes. Thus optical scanning provides a method of direct input of data from sources documents into a computer system.

1- Optical Scanning

An optical reader is a device that uses a light source to read character, marks, and codes. It then converts them into digital data that can be processed by computer.

OCR-based optical scanning systems are used extensively in the credit/debit card billing operations of credit/debit card companies. OCR devices are expensive. e.g SCANNER, Magnetic Data entry (MICR)

a) SCANNER

Scanner is Optical character recognition equipment that can read special-purpose characters and codes. Scanner provides a method of direct input of data from sources documents into a computer system. There are many type of optical reader, but they all use photoelectric devices to scan the characters being read. Reflected light pattern of the data are converted into electronic impulses, which are then accepted as input into the computer system. OCR-based optical scanning systems are used extensively in the credit card billing operations of credit card companies, bank, and oil companies.

b) MAGNETIC DATA ENTRY

Magnetic-ink character recognition reader is used to read text printed with magnetized ink. It is used by bank industry for check processing. Each check contains MICR characters at the lower-left edge. These characters represent check number, bank number and account number.

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Another familiar form of magnetic data entry is the magnetic stripe technology that helps computer read credit cards. The dark magnetic stripe on the back of credit and debit cards is the same iron oxide coating as on magnetic tape. Customer account number can be recorded on the stripe so it can be read by bank ATMs, credit card authorization terminals, and other magnetic strip reader.

MICROPHONE

It is an input device that is used for the input of voice in place of using the keyboard and mouse. Special software is used to convert voice into text. This requires fast processing and a lot of memory and will become more common as the technology improves. The microphone converts audio signals into digital form.

VIDEO CAMERAS

Video cameras are an input device that is able to capture images of any type data. Most scanners incorporate a special sort of camera made up of Charged-Coupled Devices (CCDs). Each CCD receives light from the image and the light generates an electrical charge. This means that light areas or dots of the image are represented by charged cells and dark areas by uncharged cells.

DIGITAL CAMERA. Digital Camera is used to take and store picture in digital form. It does not use traditional camera film. It save money and the photos can be customizing using different application software.

Digital Camera store image using different techniques like floppy disk, SuperDisk, PC Card, Compact flash card, memory stick, mini-CD and micro drive. Digital camera can be connected to a computer easily through USB port.

OUTPUT DEVICES

The device through which the process information comes to outside world is called output devices. An output device can be used to store, display or print the information. (e.g. monitor, printer, plotter, speaker etc)

MONITORS

A TV-like device that is used by the Computer for displaying the information to the outside world is known as CRT or VDU or more simply a Computer Screen. The Computer generates text and/or

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graphs on the Screen using two components called the Monitor and the Video Adopter Card. The Monitor mainly consists of glass cone, which uses special electron guns to hit the Screen from back towards the cone and thus producing text or graphs with various colors. The Monitor is used how to control the coming rays and the Video Adopter card is used what to display i.e. either text or pictures. Monitors/Screens can be selected on the basis of user requirements. There are different types of Monitors are the following.

MONOCHROME MONITOR:-

Monochrome means one color. Monochrome monitors display images in a single color usually white, blue, red or amber. Normally Monochrome is any Monitor that can not display colors. They can be black and white type but they are often available in green colors because green color is easier to eyes. A Monochrome Monitor usually cannot display graphics. But later on some techniques were developed to have the graphics capability in the Monitors,

COLOR MONITOR:

Color monitor display output in different color. Graphics, picture and colorful images are best viewed in color monitor.

FLAT PANEL or LCD MONITORS:

Laptop PCs use flat-panel monitors. These monitors take less space. Flat panel monitor use a variety of technologies. The most common is LCD (Liquid Crystal Display). LCD monitor use much less power than manual monitor.

LCD monitors creates images with a special type of liquid crystal that is normally transparent but becomes solid when charged with electricity.

PRINTERS

Printer is an output device that prints character, symbols, and graphics on paper. The printed output is called hard copy. Print resolution is commonly measured in dots per inch (dpi). There are many types of Printers varying in speed and quality. Different types of printers as follows. 1-Impact 2-Non-impact

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1- IMPACT PRINTER

Impact printer works like a typewriter. It prints character or images by striking a print hammer or wheel against an inked ribbon. Impact printers are the following

a) DOT-MATRIX PRINTER

Dot Matrix printer produces printed images when tiny pins on a print head strikes an inked ribbon. When the ribbon presses against the paper, it creates dots that form characters and graphics. The dot matrix printer head contain nine to 24 pins. This number of pins depends on the manufacture and printer model. A higher number of pins print more dots that produce higher quality. Cheaper dot matrix printer uses 100 to 150 DPI. Their speed is from 200 to 300 characters per minute. The expensive printer use 300 DPI and a speed of 3000 to 1000 character per minute.

b) DAISY-WHEEL PRINTERS

Daisy wheel is similar to type writer. They produce rather excellent letter-quality printout as compared the dot-matrix printer. They work just like the typewriter and use a hammer and a wheel to print something on paper. But they are very much noisy and hence are not so popular.

2- NON-IMPACT PRINTER

Non-impact printer produces character without striking devices on paper. They are much quieter than impact printer. The following are the non-impact printer.

a. LASER PRINTERS

The most expensive and quality bearer printers are the Laser printers, which produce high-quality printout and are used for desktop publishing and graphics. A Laser printer works on the principles of a Photocopier. Simply a metal drum called TONER is filled with special ink which, just sprinkle ink onto the paper and thus prints the character. They are very fast and use multiple fonts for text and graphics.

Besides them now there are color printers available in dot matrix as well as Laser printers and all others as well.

b- INK-JET

It prints character and graphics by spraying tiny drops of liquid ink on paper. These printers can produce text and graphics in both black-

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and-white and color. Inkjet printer is slower than laser printers. They can print 1 to 6 pages per minute. Its print quality is higher than dot matrix printer. Most inkjet printer has usually two print cartridges: one containing black ink and other containing color.

PLOTTERS

A plotter is an output device that is used to produce image-quality graphics in a variety of colors. Plotters work by drawing lines on paper using pens held in a mechanical arm. They are mostly used for Engineering and Maps drawing purposes.

SPEAKER and HEADSET

Speaker is an output device that produces audio output. These devices produce music, speech, or other sounds like beep etc. Speaker and Headsets are two commonly used audio output devices. It produces softcopy output. We use speaker to hear any type of sound.

CHAPTER-4 (STORAGE DEVICES)

Main or Primary Memory or Internal Memory

The Main memory (Primary Memory) of CPU is the place where the computer program and data are stored during processing. This storage unit is often called either main storage or internal storage or primary storage.

There is usually two types primary storage.

a) RAM:-

It stands for Random-Access-Memory or read/write Memory because information can either be read from or written to the RAM. This is the memory whose information can be erased or changed. It is temporary memory. Any thing stored in RAM is lost when computer is switched off.

b) ROM:-

It stands for Read-Only-Memory. Information can be read from ROM but we can't write information to it. This is the memory whose information cannot be changed. The information stored in it can't be lost if we turn off the Computer. ROM is used to store permanent program. This information is available on small pieces of the memory called chips.

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Secondary or Auxiliary or External Memory (Storage)

The devices of a computer that store information such as software and data permanently are called secondary storage. Disk is a secondary storage device where we can store a large amount of data and from where it can be retrieved. It has different types e.g. Hard Disk, Floppy Disk, CD-ROM, Magnetic Tape, Magnetic Drum

Q) DISCUSS THE FOLLOWING STORAGE DEVICES.

a) SEMICONDUCTOR PRIMARY MEMORY STORAGE DEVICES

The primary storage (main memory) of computers consists of microelectronic semiconductor memory circuit. Million of storage circuit can be fixed on a large-scale integrated (LSI) silicon chips.

There are two type of semiconductor memory.

1. RAM 2. ROM (already discuss)

Advantage

Some major attractions of semiconductor memory are small size, great speed, shock and temperature resistance, and low cost due to mass production capabilities.

Disadvantage

Most semiconductor memory is volatile, which lost their contents when electric power is off.

b) SEMICONDUCTOR SECONDARY STORAGE DEVICES

Semiconductor memory chips are being used as direct access primary and secondary storage media for both large and small computers. Plug –in memory circuit boards containing up to several megabytes of semiconductor memory chips (RAM cards) can be added to a microcomputer to increase its capacity. This provides a very-high-speed semiconductor secondary-storage capability, sometimes called a RAM disk. Semiconductor secondary storage devices also include removable credit-card-size “flash memory” RAM card. Flash memory is nonvolatile memory chip. So there was a need to store the memory permanently. So flash memory is made to store memory on permanent basis. Flash chips are currently used in cellular phones, cockpit recorder and flash drive in computer. Now a day flash drive

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is common secondary storage device, which is mostly using for moving data and program.

c) Other Secondary Storage Devices are the following

MAGNETIC STORAGE DEVICES

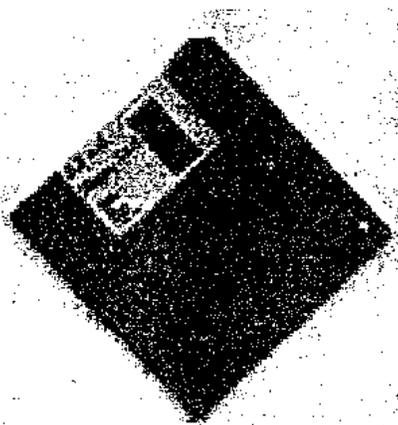
Magnetic storage is the most common form of secondary storage for modern computer system. They provide fast access and high storage capacity at a reasonable cost.

It has different types e.g. Magnetic Disk, Magnetic Tape, Magnetic Drum, and CD-ROMs.

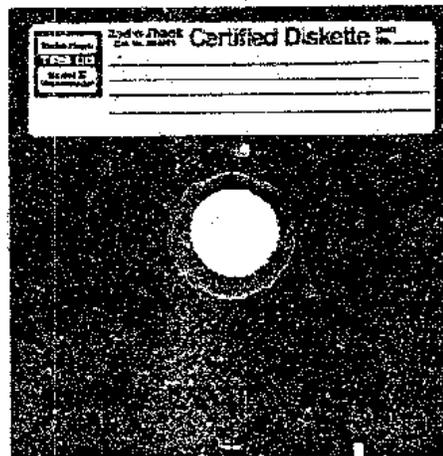
1-FLOPPY DISK

It is a removable Disk i.e. it is not fixed in the computer. It has less storage capacity than a hard Disk. To use a floppy Disk you must have a floppy Disk drive. Letter used for floppy Disk drives are A & B.

Size	Density	Capacity
5.25"	Double	360 Kilobytes
5.25 "	High	1.22 Megabytes
3.5 "	Double	720 Kilobytes
3.5 "	High	1.44Megabytes



Floppy Disk 3.5"



Floppy Disk 5.25"

2-HARD DISK

It is storage device. It circular metallic platter to allow data storage, both sides of each platter are coated with a magnetic material that is iron oxide.

The circular plate is thick in size and permanently sealed in completely enclosed or an airtight case to prevent from dust and other damages. This is also called fixed disk and use for more storage that is it can store a huge amount of data and faster access speeds than floppy diskettes. Its advantage is fast processing speed and to store large amount of data.



3-MAGNETIC TAPE STORAGE.

Magnetic tape is widely used secondary storage medium record data on one side of the tape. Data is recorded in the form of magnetize spot on the plastic tape coated with magnetic material iron oxide by the read/write head of magnetic tape drivers. Magnetic tape is a flexible plastic tape. Magnetic is usually subdivided into horizontal track to accommodate recording bits into common computer codes. Blanks spaces, known as gapes, are used to separate individual data record and blocks of grouped records. Most devices group record into block to conserve storage space instead of leaving gaps between each record. It is used when large amount of data are to be processed sequentially. An advantage of magnetic tape is that it is very cheap and economical storage medium but very slow in processing.

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OPTICAL DISK STORAGE DEVICE

Optical Disk uses laser technology to read and write data. The LASER stands for Light Amplification through Stimulated Emission of Radiation. Laser beam writes on the surface by creating small pits (hole) in the disk.

Optical disk reads data by focusing laser beam on the surface of the disk. A laser detects the presence of pit. The presence of pit indicates 1 and absence of pit indicates 0. Laser beam converts these pits into digital data. Optical disk storage capacity is from 600 MB to over 1 Gb. The optical disk storage is much safer than magnetic media. There are different types of optical storage available.

1- CD-ROM stand for compact disk read only memory. The data stored on CD-ROM can only be read. It cannot be deleted or changed. CD-ROM is portable storage device. The data can be transfer easily by using CD-ROM. It can store about 650 MB of data or above.

Advantages of CD-Rom

CD-ROM is the least expensive way to store large amount of data and information.

CD-ROM disk are durable and easy to handle information can be store on CD-ROM for many years.

Disadvantages

The data can not be edited

It retrieves data and information more slowly than magnetic disk

2- DIGITAL VIDEO DISK (DVD)

DVD stands for Digital Video Disk. It is similar to CD-ROM. It uses a laser beam with short wave length. The short wave length reads smaller holes on the disk.

Data storage capacity of the disk is increased if the holes size is small. So the storage capacity of DVD ROM is much greater than CD-ROM. It can store up to 17 GB of data.

3- WORM DISKS

WORM stand for Write Once Read Many. It can only be read and cannot be updated or changed. It can store greater volumes of information than CD-ROM. Its capacity is 200 GB or above.

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4- REWRITABLE OPTICAL DISKS

CD-RW provides full rewritable capabilities. This technology record and erases data by using a laser to heat a microscopic point of the disk surface. A 5 ½ inch rewritable disk can store up to 5 GB.

PC CARDS

Pc card is a thin credit card size device. It is used to add memory, disk drives, sound, fax/modem, communications and other capabilities to a mobile computer like laptop. All Pc Cards follow the standard developed by PCMCIA. It stands for Personal Computer Memory Card International Association. PC Card can be attached to the computer without opening the system unit and restarting the computer. The operating System automatically detects the PC Card as it is attached to the system.

SMART CARDS

Smart card is similar to credit card or ATM card. It stores data on a thin microprocessor that is embedded in the card. The card is inserted into a specialized card reader to read and update its contents.

CHAPTER-5

Introduction To Software Design And Algorithm

SOFTWARE

Software is a set of instruction that tells a computer what to do. Software is a written computer program or a series of instructions. Software is program that allows the hardware to perform a useful work. Without software hardware is quite useless. Software is the communication between user and computer. Software is needed to complete the input, processing, output, and storage and control activity of Information System. There are two type of Soft ware

1) System software 2) Application Soft ware.(Over view of soft ware)

1-SYSTEM SOFTWARE

System Software is a group of program that controls all the operation of computer. It controls the usage and allocation of different hardware components. It enables other application program to execute properly. System Software consists of programs that manage

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and support a computer system and its information processing activities. System software is the type of software, which makes better & effective utilization of the entire computer System. It controls all the operations of computer system. System Software serves as interface between systems, network, hardware and the application programs of end users. The manufacturers provide it. The person preparing system software is called System Programmer & the process is called System Programming. The development of Compiler, Operating System, and High-Level Languages come under this category. For example, Operating System, utilities, device drivers and Network Management Programs.

There are three types of System Software

1:-System Management programs 2: System Support program 3:-
System development programs.

a-System Management Programs

It manages the hardware, software, networks and data resources of a computer system during its operation. Examples of system management programs are operating system, network management program, monitor performance program, database management program.

b-System Support Program:

Program that supports the operations and management of computer system by providing a variety of support services. For example system utilities and security monitors program.

c-System Development Program:

Program that helps users in developing programs and procedures and prepare users programs for computer processing. For example language translator, programming editor, debuggers, code generator and CASE tools.

2-Application Software

Application Software is a type of software that is used to perform specific task for users. It is used to perform different task such as word processor, a spreadsheet or database etc. An application is the job or task a user wants the computer to do. Application software enables you to perform specific task, solve problem, and perform work.

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The person preparing application software is called application programmer. For example software developed for the PAYROLL of employees and program for maintain of personal record come under this category.

There are two type of application Software

- 1-General Purpose Program
- 2- Application Specific Program

1-General Purpose Program

General-Purpose application programs are programs that perform common information processing jobs for end user. General Purpose software has enough features to accomplish a wide variety of task. For example, word processing programs, spreadsheet programs, database management programs (Ms-Access, Oracle), and graphics programs are popular with microcomputer users for home, education, business, and scientific etc.

2- Application Specific Program/Special purpose program

Specific Application Program support specific application of end users. Specific software performs a specific task and cannot be changed or programmed to perform a different task.. Some major categories are

Business application program are program that are develop for important business functions or industry requirements. For example program for accounting, marketing, finance, and employee etc.

Scientific application programs are program that are develop for scientific and engineering purpose. For example program for scientific analysis, engineering design, and monitor of experiment.

Other application programs are other than business and scientific. For example computer application in education, entertainment, music, art, law, and medicine, video-game program, entertainment program, etc.

PROGRAM TOOLS:

Following are the programming tools for the programmer with the help of which the programmer can write a perfect program. These are

- 1- Algorithm
- 2- Flow Chart

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ALGORITHM

An algorithm is a finite set of instructions, which accomplishes a particular task.

An algorithm is a finite step-by-step list of well-defined instructions for solving a particular problem.

ALGORITHM NOTATION

The algorithm is a base of not only effective data structure but it is also the base of good programming. Therefore, it is necessary that each algorithm should be written clearly. A complete algorithmic notation is given below.

1) Name of algorithm:

Every algorithm is given a name, written in capital letters.

Introductory Comments.

The algorithm name is followed by a brief description of the tasks the algorithm performs. This description gives the name and types of variables used in the algorithm.

Steps:

The algorithm is made of a sequence of numbered steps. Each beginning with a phrase enclosed in square brackets, which gives an abbreviated description of that step. Following this phrase is an ordered sequence of statements which describe the actions to be executed or tasks to be performed.

Comments:

An algorithm step may terminate with a comment enclosed in round parenthesis, which is used to help the reader better understand that step. Comments specify no action and are enclosed only for clarity.

Example of an algorithm:

Algorithm GRADES(M1, M2, M3, M4, Average)

This algorithm reads four marks denoted by M1, M2, M3, M4 and compute the average grade. All variables are assumed to be real]

- | | | |
|-----|--------------------------|-----------------------------------|
| (1) | [Input individual marks] | Read (M1, M2, M3, M4) |
| 2) | [Compute average grade] | Average = (M1 + M2 + M3 + M4) / 4 |
| 3) | [Output Result] | Write ("Final grade is", average) |
| (4) | [Finish] | Exit |

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FLOW CHART

Charting:

Charting is a graphical or pictorial means of presenting data. Charting takes the flow of work and makes a picture of it. Charts can be used to illustrate statistical data, locations of desks or equipment, relationships between people and jobs, sequences of events, work flow, organizational structure and planning or implementation schedules.

The primary use of charting is for communication and documentation of the system. Charting is also used during feasibility studies, problems definition understanding the existing system, defining new systems requirements, design, cost comparisons, final report, and implementation.

For example Flow chart, Bubble chart or data flow diagram, Grind chart etc.

Flow charts

A flowchart is a pictorial/graphical presentation of flow of data to solving the problem. A flowchart is a diagrammatic representation of the logic or sequence of steps that solve a problem. Flowchart is tools for the programmer to analyze, organize, and solve a problem. A number of pictorial figures are used to help draw the flow charts. Finally the instructions are coded in one of the programming languages, called a program. The person who writes program are called programmer.

When developing a flow chart the systems analyst (or programmer) should observe the following guidelines:

Flow charts are drawn from the top of a page to the bottom and from left to right.

The activity being flow-charted should be carefully defined and this definition made clear to the reader. Where the activity starts and where it end, should be determined.

Each step of the activity should be describes one-verb descriptions, e.g. prepare statement or file customer statement.

Each step of the activity should keep in its proper sequence.

The scope or range of the activity being flowcharted should be carefully observed. Any branches that leave the activity being

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charted should not be drawn on that flow chart. A connection symbol should be used and that branched put on separate pages or omitted entirely if it does not pertain to the system. Use the standard flow-charting symbols.

Type of flowcharts:

The most important types of flowcharts are:
System flowchart, Program flowchart

System Flowchart

A system flow chart show the overall work flow of the system. It is a pictorial description of the sequence of the combined procedures that makes up the system. A system flowchart shows the sequence of physical devices used to solve that problem.

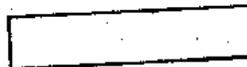
System flowchart symbol
Description

Symbols

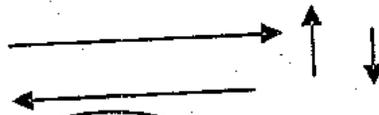
Input/ output symbol



Processing symbol



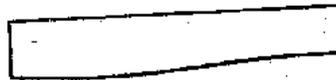
Flow lines



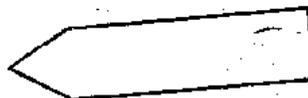
Off page connector



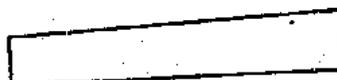
Documents (hard copy)



Display symbol



Manual input symbol



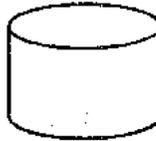
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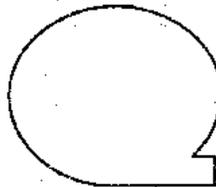
Online storage symbol



Disk storage symbol



Tape storage symbol



Off line storage



Manual operation



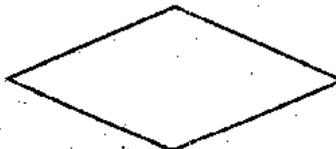
Punched card



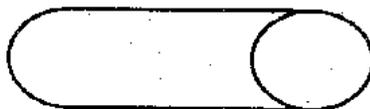
Preparation symbol



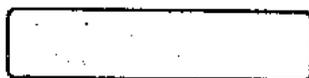
Decision Symbol



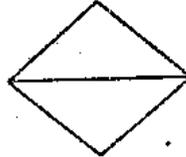
Magnetic Drum



Terminal Interrupt



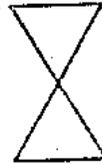
Sort Symbol



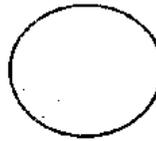
Punched Tape



Collate Symbol



On page connector



Off page connector



Program Flowchart

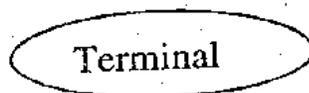
This is the pictorial representation of the logic of the program, showing different steps to solve a problem.

Program flowchart symbols

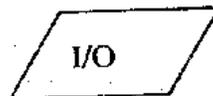
Description

Symbols

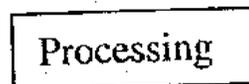
Start/Stop

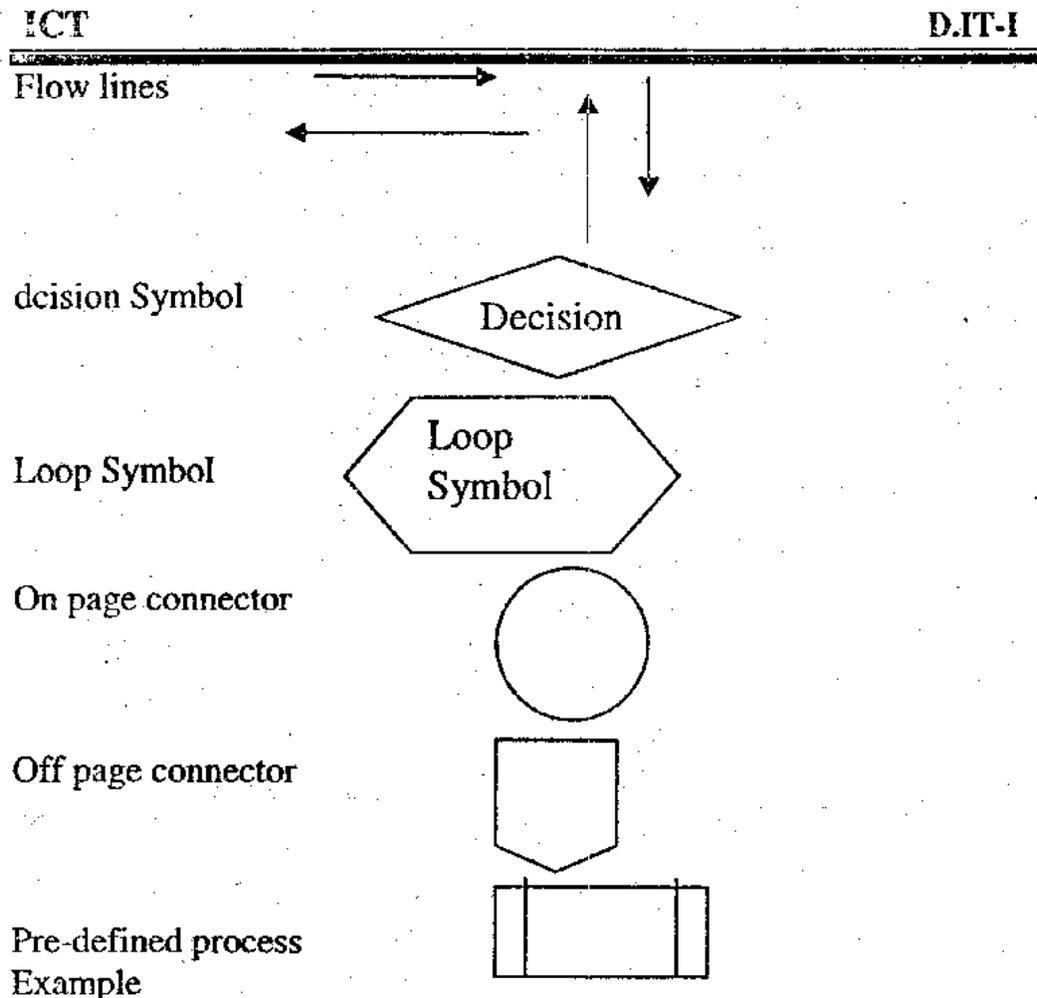


Input/ output symbol



Processing symbol





The XYZ Company has found that it can purchase a raw material at a cost of \$40.00 per order. The company has a 10% carrying charge on average inventory. They expect to use \$20,000 of the raw material within the next year. To determine the economic order quantity (EOQ) by using the formula: $EOQ = \sqrt{2AP/RC}$ Where: A=Annual Cost P=Annual Usage R=Price per order C= Carriage Charges

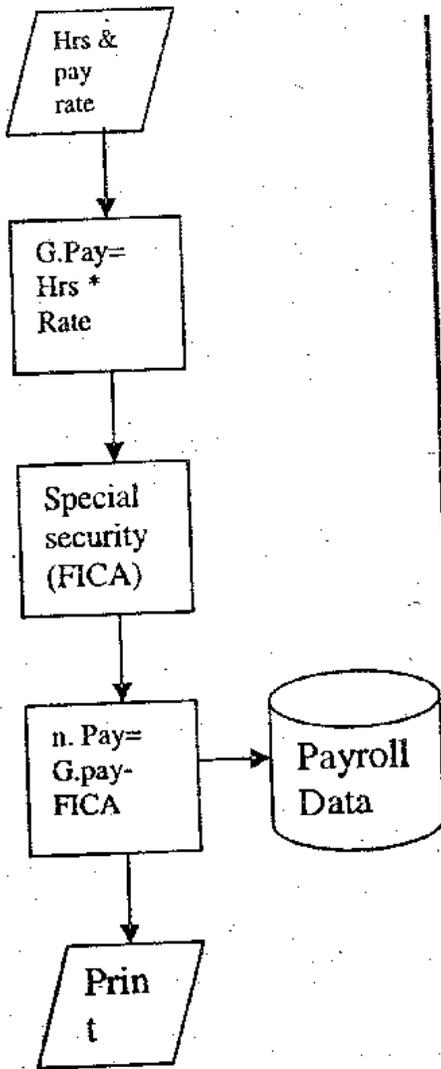
Draw its system Flowchart and program flowchart.

Two very simple program flowcharts are shown in below figure. The one on the left is program flow chart prepared by a systems analyst to show the detail of procedural operation. The one on the right is a programmer to show details of computer program operation. It is noted that the systems analyst into a program flowchart as in below left side figures further expands the systems flowchart in above example. Programmer when expands the detail into program flowchart shown in the below .

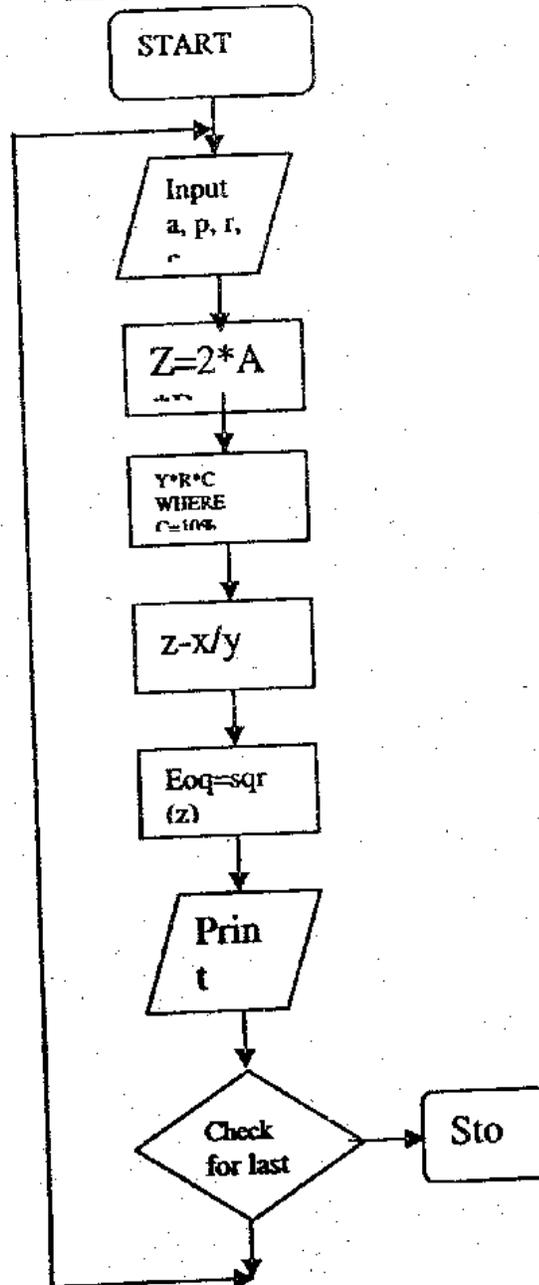
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Systems flowchart



Program flowchart



CHAPTER-6

PRODUCTIVE ENHANCEMENT SOFTWARE PACKAGES

Q) What are WORD PROCESSING PACKAGES?

A Word processing program is used to produce letters, applications and other documents. Word processing is used in business to generate different documents.

Word Processing package provide tool bar which, display shortcut button to make editing. This packages provide word wrap, justification function. In word processing packages we can bold, underline the text. Text can be inserted or deleted. Block-editing tools can be used to move a block of text from one point to another point. Program search function can be used to find user specified word. Default format values are often supplied by the package, but they are easily changed. A word processing package may also include a spelling checker, thesaurus and mail merge.

Word processing packages are Ms-Word, Lotus WordPro, Word Star, Word Pad and Word Perfect These packages can convert all documents to HTML format for publication as Web pages. End-users and organization can use desktop publishing (DTP) software to produce their own printed material that looks professionally published. That is they can design and print their own newsletters, brochures, manuals, and book with several styles, graphics, photo, and colors on each page. Word processing packages and desktop publishing packages like Adobe PageMaker is used to do desktop publishing.

DIFFERENCE BETWEEN MANUAL AND ELECTRONIC WORD PROCESSING.

MANUAL WORD PROCESSING	ELECTRONIC WORD PROCESSING
TYPEWRITER IS USED IN MANUAL word processing	Computer is used in electronic word processing
Text once write cannot be change.	Text can be change.
Text cannot be formatted	Text cannot be formatted

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Word wrap function is not available	Word wrap function is available
Text cannot be deleted or inserted	Text can be inserted or deleted.
Text cannot be moved from one location to another location.	We can move text from one location to another
Word cannot find or replace a word	Word can be find or replace
Spell check function is not available	Spell check function is available.
Text cannot store text	We can store text.

Component of Computer based spread sheet.

Following are the components

- 1- A micro processor computer with sufficient RAM in primary memory storage.
- 2- Spread sheet software (Ms-Excel)
- 3- Secondary storage devices like Hard disk, CD-ROM etc.
- 4- Printer

Q) WHAT IS ELECTRONIC SPREADSHEETS?

Ans:- Electronic spreadsheet software are application program used for calculation. Think of them is multipurpose calculator. Electronic spreadsheet is used for mathematical, statistical, scientific, graphics, tabulation, database and accounting purpose. It consists of row and column. For example Lotus 1-2-3, Microsoft Excel, and Quattro Pro.

DIFFERENCE BETWEEN MANUAL AND ELECTRONIC (COMPUTER) SPREADSHEET

Electronic (Computer Spreadsheet) are far better than manual Spreadsheet in all most all aspect. We will discuss only some of the benefits of using a Electronic spreadsheet

Electronic spreadsheets work thousand of times faster than the manual spreadsheet. Your work in an electronic spreadsheet is better, faster and precise than manual spreadsheet.

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In the manual spreadsheet, if you find an error after making it, you have to erase it or you will have to make the whole worksheet again. Whereas in electronic worksheet, you can check and correct your worksheet before printing.

You can copy the formula once you made to all other amounts in the worksheet, while in the manual worksheet you are to calculate the formula for every amount.

You can make your worksheet more beautiful and smart by adding charts and graphical objects, while the manual worksheet is a dumb-looking piece of white paper. No charm, no glamour.

The electronic worksheet is much bigger than the manual worksheet. Saving your worksheets a big problem you can have with the manual work. Every time you make a worksheet for one purpose, you are to save it in a different file. Also you are to store the previous worksheets to keep track of what going on. In the electronic work, you can save them on your disk, which saves the loss of paper and you can move many worksheets on one floppy disk in your pocket. Other way, you would have to pick a bundle of papers with you.

Other benefits contain the tools for spell-checking, built-in formula list, different fonts and sizes, automatic alignment, copying and pasting, linking and many more which are difficult to be listed here. However, once you get started with a electronic worksheet, it looks damn difficult to go back to the manual method.

Q) WHAT IS DATABASE MANAGEMENT PACKAGE?

Ans: A set of computer programs that control the creation maintenance and utilization of the databases of an organization". The DBMS provides concurrent access to multiple database users and the DBMS must be able to recover and restored a damage database from backup copies.

Database Management software manage and supports the maintenance and retrieval of data store in data base e.g. Ms-Access, Dbase, and Oracle allow you to setup and manage database on your PC, network server, or the World Wide Web.

Databases management packages perform four tasks.

Database development. Define and organize the content, relationships, and structure of the data needed to build a database.

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Database interrogation. Access the data in database to display information in a variety of formats. End users can selectively retrieve and display information and produce forms, reports.

Database maintenance. Add, delete, update, and correct the data in a database.

Application development. Develop prototypes of data entry screen, Web pages, queries, forms, reports, and labels for a proposed business application. Or use a built-in 4GL or application generator to program the application.

CHAPTER-7

INTRODUCTION OF NUMBER SYSTEM AND THEIR CONVERSION

Number systems:

The set of symbols to denote a numerical quantity or figure is called number system. In general a number "N" of a number system is defined as the sum of the terms, where a term is defined by a symbol (digit) multiplied by its base raise to some power. For example,

$$N = \dots x_3b^3 + x_2b^2 + x_1b^1 + x_0b^0 + x_{-1}b^{-1} + x_{-2}b^{-2} + \dots$$

The number system varies according to their names, characteristics and utilization. Following are the four commonly used number systems:

1. Decimal Number System.
2. Binary Number
3. Octal Number
4. Hexadecimal Number

1. Decimal Number System

A number system which has a base (radix) 10 and uses symbols (digits) 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 is called a Decimal number system. For example.

The general rule for representing decimal number system using positional notation.

$$a_{n-1}10^{n-1} + a_{n-2}10^{n-2} + a_{n-3}10^{n-3} + \dots + a_010^0 + a_{-1}10^{-1} + a_{-2}10^{-2} + a_{-3}10^{-3} + \dots + a_{-n}10^{-n}$$

$$(125)_{10} = 1 \times 10^2 + 2 \times 10^1 + 5 \times 10^0 = 00 + 20 + 5 = 125$$

$$(0.532)_{10} = 5 \times 10_{-1} + 3 \times 10_{-2} + 2 \times 10_{-3} = 5/10 + 3/100 + 2/1000 = .0.532$$

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$$(125.532)_{10} = 1 \times 10^2 + 2 \times 10^1 + 5 \times 10^0 + 5 \times 10^{-1} + 3 \times 10^{-2} + 2 \times 10^{-3} = \\ 100 + 20 + 5 + 5/10 + 3/100 + 2/1000 \\ = (125.532)_{10}$$

2. Binary Number System

A number system which has a base 2 and uses symbols 0 and 1 is called binary number system. The computers use the binary number system because computer internal circuitry has two states on and off and the binary number system has also two digits 0 and 1. 1 for on and 0 for off.

$$(101)_2 = 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 = 4 + 2 + 1 = 5$$

$$(0.101)_2 = 1 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3} = \frac{1}{2} + 0 + \frac{1}{8} = \frac{5}{8}$$

3. Octal Number System

A number system which has a base 8 and uses symbols 0,1,2,3,4,5,6,7 is called Octal Number system. For example.

$$(25.32)_8 = 2 \times 8^1 + 5 \times 8^0 + 3 \times 8^{-1} + 2 \times 8^{-2} = 16 + 5 + \frac{3}{8} + \frac{2}{64} = \\ 21.40625$$

4- Hexadecimal Number System

A number system which has a base 16 and uses symbols 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F. For example.

$$(1A2)_{16} = 1 \times 16^2 + A \times 16^1 + 2 \times 16^0 = 256 + 160 + 2 = 418$$

For the fractional part the method is the same as in decimal number system.

$$(2B1.23)_{16} = 2 \times 16^2 + B \times 16^1 + 1 \times 16^0 + 2 \times 16^{-1} + 3 \times 16^{-2}$$

CONVERSION FROM ONE NUMBER SYSTEM TO ANOTHER:

The process of interchanging a number in one base system to another and vice-versa is called conversion of Number system. We discuss the following conversions.

Decimal Conversion to Binary and vice versa

While converting a number from decimal form to binary form divide the number by 2 and to convert from binary to decimal we have a method called positional notation method. It means expand the

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number in base 2. It can be explained with the help of the following example.

$$(25)_{10} = (11001)_2$$

25	
2	12-----1
2	6-----0
2	3-----0
	1-----1

$$(11001)_2 = 1x2^4 + 1x2^3 + 0x2^2 + 0x2^1 + 1x2^0 = 16+8+0+0+1 = 25$$

$$(1100.01)_2 = 1x2^3 + 1x2^2 + 0x2^1 + 0x2^0 + 0x2^{-1} + 1x2^{-2} = 8+4+0+0+0+\frac{1}{4} = 12.25$$

Now to convert back the same number into binary form we have another method called Division method. It means divide the whole number 12 by 2 and multiply the fractional part by 2 (until the fractional part becomes 0 or up to 3 or 4 times) as shown below.

12	
2	6-----0
2	3-----0
	1-----1

.25	
x 2	
	0.5
	x2
	1.00

Hence the resultant number is $(1100.01)_2$

Conversion from Decimal to Octal and vice versa

To convert decimal number system into any other number system divides the decimal number by the base of that number system. To convert any number system back to decimal number system expand that number system using positional notation.

While converting a number from decimal number system to Octal number system divides the number by 8 and to convert from Octal to

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decimal expand in base 8 using positional notation. It can be explained with the help of the following example.

$$(25)_{10} = (?)_8$$

8	25
	3-----1

Result $(31)_8$

Convert $(31)_8 = (?)_{10}$

$$= 3 \times 8^1 + 1 \times 8^0 = 3 \times 8 + 1 \times 1 = 24 + 1 = 25$$

Result $(25)_{10}$

Another example

$$(12.25)_{10} = (?)_8$$

12	
8	1-----4

.25
x8
2.0

Hence the resultant number is $(14.2)_8$

Vice Versa

Convert $(14.2)_8 = (?)_{10}$

$$(14.2)_8 = 1 \times 8^1 + 4 \times 8^0 + 2 \times 8^{-1} = 1 \times 8 + 4 \times 1 + 2 \times 1/8 = 8 + 4 + 2/8 = 12 + 1/4 = 12 + .25 = 12.25$$

Conversion from Decimal to Hexa-Decimal and vice versa

While converting a number from decimal number system to Hexa-Decimal number system divides the number by 16 and to convert from Hexa-Decimal to decimal expand in base 16 using positional notation. It can be explained with the help of the following example.

$$(25)_{10} = (?)_{16}$$

16	25
	1-----9

Result $(19)_{16}$

Vice Versa

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Convert $(19)_{16} = (?)_{10}$

$$(19)_{16} = 1 \times 16^1 + 9 \times 16^0 = 1 \times 16 + 9 \times 1 = 16 + 9 = 25 = \text{Result } (25)_{10}$$

Another example $(12.25)_{10} = (?)_{16}$

$$\begin{array}{r|l} 16 & 12 \\ \hline & .25 \\ & \times 16 \\ \hline & 4.0 \end{array}$$

12 is not divisible by 16 So 12 is equal to C
 Hence the resultant number is $(C.4)_{16}$

Vice Versa

Convert $(C.4)_{16} = (?)_{10}$

$$(C.4)_{16} = C \times 16^0 + 4 \times 16^{-1} = 12 \times 1 + 4 \times 1/16 = 12 + 4/16 = 12 + 1/4 = 12 + .25 = 12.25$$

Table for conversion

Decimal	Hexa	Octal	A	B	C	D
0	0	0	0	0	0	0
1	1	1	0	0	0	1
2	2	2	0	0	1	0
3	3	3	0	0	1	1
4	4	4	0	1	0	0
5	5	5	0	1	0	1
6	6	6	0	1	1	0
7	7	7	0	1	1	1
8	8		1	0	0	0
9	9		1	0	0	1
10	A		1	0	1	0
11	B		1	0	1	1
12	C		1	1	0	0
13	D		1	1	0	1
14	E		1	1	1	0
15	F		1	1	1	1

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Conversion From Binary to Octal and Vice Versa:-

We can convert a binary number to octal number by taking the binary digits in group pairs of three bits to make an octal digit according to $8 = 2^3$ the power of 2 is 3 so make pair of 3 binary digit. For example.

$$(1001.11)_2 = \frac{001}{1} \frac{001}{1} . \frac{110}{6} = (11.6)_8$$

Note : For making pairs in binary form, it must be from right to left for the integer portion and from left to right for fractional portion. Also note that before period (.) we can put leading 0's and after period we can put trailing 0's. Now conversion from octal to binary is simply to reverse the binary to octal process. For example

$$(11.6)_8 = \left(\frac{001}{1} \frac{001}{1} . \frac{110}{6} \right)_2$$

$$(35.125)_8 = \left(\frac{011}{3} \frac{101}{5} . \frac{001}{1} \frac{010}{2} \frac{101}{5} \right)_2 = ($$

Ans is 11101.001010101_2

$$(15.62)_8 = \left(\frac{001}{1} \frac{101}{5} . \frac{110}{6} \frac{010}{2} \right)_2$$

Conversion from Binary to Hexadecimal and vice Versa:-

We can convert a binary number to octal number by taking the binary digits in group pairs of four bits to make an Hexa-decimal number according to $16 = 2^4$ the power of 2 is 4 so make pair of 4 binary digit. For example

$$(1001.11)_2 = \frac{1001}{9} . \frac{1100}{C} = (9.C)_{16}$$

9 C(12)

Note : For making pairs in binary form, it must be from right to left for the integer portion and from left to right for fractional portion. Also note that before period (.) we can put leading 0's and after period we can put trailing 0's. Now conversion from Decimal to binary is simply to reverse the binary to Decimal process. For example

$$(9.C)_{16} = \left(\frac{1001}{9} . \frac{1100}{C(12)} \right)_2$$

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$$(35.125)_{16} = (0011\ 0101\ .\ 0001\ 0010\ 0101)_2 =$$

3 5 1 2 5

Ans is $(110101.000100100101)_2$

$$(15.62)_{16} = (0001\ 0101\ .\ 0110\ 0010)_2$$

1 5 6 2

$$(10000111.1101)_2 = 1000\ 0111\ .\ 1101 = (87.D)_{16}$$

8 7 D (13)

Octal to Hexadecimal Conversion and Vice Versa:-

We have no direct method for this conversion, but using any number system (binary for example) as intermediate indirect conversion, we can easily perform this conversion.

$$(11.6)_8 = (?)_{16}$$

Conversion into binary from octal by making three bits, we have

$$(11.6)_8 = (001\ 001\ .\ 110)_2 = (1001.11)_2$$

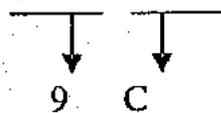
Conversion into Hexadecimal by making four bits, we have

$$(1001.11)_2 = (9.C)_{16} \text{ where } C = 12$$

Hexa to Octal

$$(9.C)_{16} = (?)_8$$

$$(9.C)_{16} = (1001.1100)_8$$



CHAPTER-8

IMPACT OF COMPUTER ON SOCIETY

The Computer and Society:- Computers increasingly affect our lives in many ways, which benefit individual and society as a whole. In medicine, computerized databases, networks, diagnostic devices, and monitoring systems help doctors and hospital personnel to save lives. Computers in laboratory speed up the progress of medical research. In education, computer-aided instruction helps students to learn basic skills through practice tutorials and to carry out advanced experiments in natural sciences and the social sciences through computer simulation. In business and in professional offices, computerized databases, and accounting programs, and word-processing programs make administrative and clerical work easier; computer simulations help businesses to run more efficiently and profitably. In science and engineering, computers are used to process large quantities of statistics; furthermore, computer simulation eliminates the need for costly scale models.

Teams of computer scientists are studying the workings of the human brain. One object of this research is to make better artificial replacements of lost human parts; another is to make more intelligent computers and more capable robots.

In some ways computers are not beneficial for our society. Displacement, or the elimination of jobs by computers and computerized devices, is one of the most pressing problems facing the society today. Another problem is preserving the privacy of confidential information when large data banks are linked by networks.

The trend toward increasing general use of computer networks, a new application of computer technology, has great potential for the transformation of society.

The Social Impact of Computer age:

The Computer is one of the most powerful forces in society today. It is being put to use everywhere, it seems in homes and in organizations of all sizes and no one can doubt that this usage is having a strong impact on the people. But the Computer is the driving force behind the information revolution, and as in any

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$$(35.125)_{16} = (0011\ 0101\ .\ 0001\ 0010\ 0101)_2 =$$

3 5 1 2 5

Ans is $(110101.000100100101)_2$

$$(15.62)_{16} = (0001\ 0101\ .\ 0110\ 0010)_2$$

1 5 6 2

$$(10000111.1101)_2 = 1000\ 0111\ .\ 1101 = (87.D)_{16}$$

8 7 D (13)

Octal to Hexadecimal Conversion and Vice Versa:-

We have no direct method for this conversion, but using any number system (binary for example) as intermediate indirect conversion, we can easily perform this conversion.

$$(11.6)_8 = (?)_{16}$$

Conversion into binary from octal by making three bits, we have

$$(11.6)_8 = (001\ 001\ .\ 110)_2 = (1001.11)_2$$

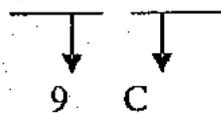
Conversion into Hexadecimal by making four bits, we have

$$(1001.11)_2 = (9.C)_{16} \text{ where } C = 12$$

Hexa to Octal

$$(9.C)_{16} = (?)_8$$

$$(9.C)_{16} = (1001.1100)_8$$



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Better information retrieval:- Most information retrieval tasks obviously do not involve life-or-death decisions, but quick computer assisted retrieval saves time of people.

Entertainment and hobby benefits:- A computer can entertain people with hundreds of challenging games. And computer users can compose , paint pictures, store and maintain stamp and coin collection records, and polish their foreign language skills.

Educational Benefits:- Programs can be educational as well as entertaining . Educators agree that the computer can be a powerful motivating and learning tool. Thousands of educational programs are available in such categories as reading languages, Science, Mathematics, social studies and art and music.

Personal Finance benefits:- A pc can help a person in budgeting and balancing his checkbooks, control his installment purchases, control his home's energy use, and analyze his investments.

2-Negative Impact

In spite of the many benefits of computer age , there are also some potential dangers and problems. Computer usage sometimes produces displacement and unemployment. Unemployment refers to the total number of people, which are out of work. Displacement occurs when technological change eliminates jobs. If displacement workers cannot find similar jobs elsewhere or if they cannot find other work, then there is indeed an increase in unemployment. Another problem is preserving the privacy of confidential information when large data banks are linked by networks, etc.

Importance and Applications of Computers

Not two many years ago, the computer was so inconspicuous that most people were seldom aware of its existence. We knew that similar machines guided missiles and satellites and controlled space flights. We knew they sent out our bank statements and calculated our payments. They made our airline reservations, and they saw to it that our plane did not collide with another. We knew there were tiny special-purpose computers in our pocket calculators, and our digital watches. Things are different now. Suddenly we are all aware of the

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computer as a force in our lives. We are in the midst of the computer revolution; we live in the computer age.

The computer is reshaping our world and will go on reshaping it. The word computer is not new to us. Today's world is world of computers, we can say that this is IT/computer age because computer are playing a role of growing importance in our lives less than fifty year back there was no computer and no body new about it. Since then, there have rapid change in the computer Technology/IT which continuous to progress computer performs a given complex task in a very short period or does calculation very quickly and accurately. Computer are useful to a wide range of pupils because they can serve many purpose.

Application of computer (USES) Computer in offices

In many offices computer are used for word processing instead of using typewriters. The key punch operator type the letter, report or documents. Once changes are made in the existing documents, store in the computer instead of retyping the whole thing again. The printer can immediately produced as many copies as required.

Computer in the Banks

Banks keep most of the record and data on computer, bank account are maintained on computer to avoid duplication are any chance of error. The cheque are read by MICR (Magnetic ink readers a device used to allow the data on cheque to be read by machine). The number in special character along the bottom of each cheque or printed in Magnetic ink so they can read by MIRC. In this way computer are used the keep track of customer accounts, deposit, withdrawal, loan, interest.

Computer in the Industries

Computer is used to control manufacturing systems and continuous running of the machinery. These are also helpful in monitoring temperature and pressure measurements in the manufacturing process. In many industry computers are used in the form of robot.

Computer in Education

Computer is used in schools in many different ways. They are use to help Montessori children learn different skills such as to distinguish

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between shapes, colors etc. college students can take advantage of making graphs and charts and do calculations of their mathematical and scientific assignments.

Computer simulation for training

Computer models can be used to train people such as pilots. A working model of an airplane cockpit is built, with a large screen in front of it. On the screen a computer show picture of the view that a pilots would see from a real cockpit.

Computer aided Design

Computer is proved to be an assisting machine or designing tool for engineers, architects and designer to perform their large, and complex job in a very short period.

Example of such designing. project of car making, designing, office building, and shaping plaza.

Computer in Health Care

Doctor diagnoses illness by entering patients, symptoms in computer and prescribe medicines accordingly. The doctor mistakes the final decision but the computer speedup the process. It also keeps record of the patients appointment and bills etc.

Computer and law

In law chambers, computers are used to store a data bank of all those cases that have been priory solved or decided. This enables the lawyer to study any case that helps him deal with his current case.

Computer in Police Department

The Police used the computer to help them catch criminals. Data about criminals and suspects can be stored on computer. All the information about a crime can be fed into a computer, which can search through its tore and checks facts.

Computer in the Home

Now day the computer become a necessity of home like other electrical appliances. Children play game on it keeps track of the stamp collections, draw pictures, play music view movies and do some sort of reading and writing according to the needs. Father can write his reports and make calculation while mother can play nutritional meals, make budget etc. they can use computer for electronic mail and inter net services.

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Word Processing applications: -Word processing or the use of computer as a typewriter is one of the most widely appreciated functions of the modern computers. Anyone who deals in words finds it useful: i.e. secretaries, newspaper reporters, scholars, novelist, and other writers. With a word processor, a user can type out a report, a letter, a story, or whatever is desired, and see it on the computer screen. Revision is easy, Words, phrases, or paragraphs can be inserted or deleted or moved to a different part of the document. The computer can check the spellings, and finally it is copied on the paper using a printer.

Science and Technology: - All of us know that large computers can do millions of engineering calculations per second, can rapidly process the results of hundreds of thousands of experiments in the physics laboratory, and are a crucial too for the modern designer of cars, airplanes and most importantly the microelectronic parts of computers.

In science and technology, the computer is useful not only as a number cruncher but also for its capabilities in the techniques of simulation. Simulation exploits the computer's graphics and numerical capabilities to construct model objects and model worlds. Computer simulation has been especially useful in space exploration. Computer simulation is also useful for weather prediction and earthquake prediction.

MISUSES of computer

Hacking

Hacking is one of the most important disadvantages of Internet. The hackers access the data stored on the computers across the Internet. They can use this data illegally or even destroy it.

Immorality

Internet contains a large number of immoral websites. These websites contains such material that is against the moral values of our society. These websites are damaging character of young people.

Security Problems

Internet has created many security problems. Important data can be hacked on Internet. Hackers also damage different websites and

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delete their contents. They also retrieve critical data of different organizations and governments.

Viruses

Internet is the most important source of spreading computer viruses. Peoples spread viruses using Internet and emails. Many websites also contain different viruses that are copied to the computers when the users download data from these websites.

Wastage of Time

Many people use Internet without any positive purpose. The young people waste their time in chatting. It affects their performance and makes them inefficient.

Cyber Crime

Internet is a source of many cyber crimes. People use Internet for negative activities. They hacks the credit card numbers of the people and use them for shopping. Some use Internet to spread illegal and immoral material. Many government are introducing laws to stop cyber crimes

Others are

The excessive use of computer damage eye sight.

The people uses computer for playing movies.

Mostly the students and teenage uses it for playing different games.

CHAPTER-9

SPECIAL USES OF COMPUTER

History of artificial intelligence:

The term artificial intelligence was first coined in 1956, at Dartmouth conference. The advancement in the field of A.I has been slower than first estimated progress continuous to be made from its birth 4 decades ago.

Q:- What is AI ?

Artificial Intelligence is a group of related technologies that attempt to develop machine to emulate human-like qualities, such as learning, reasoning, communicating, seeing and hearing. The goal of AI is to develop computer that can think, as well as see, hear, walk, talk, and feel. It is an attempt to convert the human information processing into computer-based system. Some scientists claim that development human like intelligence and capabilities (think,

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reasoning, decision, learning and responding) is not totally possible. But progress continues for this ambitious target is going on and only the time tell the truth. Some examples of artificial intelligence technologies are ;

1. Robotics
2. Chess playing machine
3. Expert system etc.

Q) What is CAD/CAM?

CAD (computer aided design):

Computer aided design is the integration of the computer and graphics to aid in the areas of design and drafting. Computer aided design and drafting software are design for mechanical designer and draftsmen, but also for the other fields.

Architectural firms use form of CAD. Use of CAD architecture can draw different design like room plan and different structural model.

Computer aided design, or simply CAD, by definition is the combination of hardware and software components providing the tool of planning and designing and modeling.

History of CAD:

The history of CAD began traced back to 1950. CAD was initially used on mainframe computers in early 1980 AutoDesk revolutionized CAD system by making AutoCAD, which could be run on a PC.

Uses/Application of CAD:

The CAD is used in great number of professional application. This can be a category in three categories.

MCAD (mechanical CAD). Used by engineers to design complex parts of different machines.

AEC (architecture engineering and construction) used for creation of buildings and their system.

GIS (geographical information system) to generate maps from topographic data.

Automobile designer at large auto manufacturing plants use cad to design many prototypes of different cars before creating solid models.

CAM (computer aided manufacturing):

CAM is a form of automation where computers communicate work instructions directly to the manufacturing machinery. Today a single

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computer can control banks of robotics milling machine, lathes, and welding machine and other tools. The use of computer to control the factory machines in the manufacturing process is called computer aided manufacturing (CAM).

Computer Numerical Control (CNC): - is the system in which operator program computer that control the milling process apparatus. A human does not attend the actual machine. Unlike a human, a compute-controlled difficult tasks. CNC devices make a possible to cut more difficult parts with greater precision. Often a CNC machine a connected to a CAD workstation. By watching the monitor, the CNC operator can view the part as the machine is making it.

ROBOTICS:-

This technology produces computer-based machines which have computer-based intelligence and computer controlled human like capabilities. This area of knowledge produces machine to have touch, power of sight, visual perception and other human like system through the combination of hardware and software. The use of robotics in computer-aided manufacturing.

Most robots are unintelligent; that is, they are programmed to do specific tasks. An unintelligent robot cannot respond to a situation for which it has not been specifically programmed. Intelligence is provided either by a direct link to a compute or by on-board computers that reside in the robot. Most robots are use in factories, spray-painting, and welding. Often these uses are functions that would be tedious or even dangerous for a human to perform. For example, with the help of a TV camera eye, a robot can see components to assemble. It is able to pick them up, rearrange them in the right order. There are some dangerous places inside a nuclear power plant, next to a suspected bomb, at the bottom of the sea, on the floor of a volcano, or in the middle of a chemical spill. But robots readily go to all those places.

Another area of interest is the "personal" robot, familiar to us from science fiction. Scientists believe that in just a few years we'll all have robots in our homes to do practical tasks.

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EXPERT SYSTEM

What is Expert System:

A computer-based information system that uses its knowledge about a specific complex application area to act as an expert consultant to users. The system consists of a knowledge base and software modules that perform inferences on the knowledge and communicate answers to users questions.

Expert system can be used for either operational or management applications. Expert systems are related to knowledge-based decision support systems.

Knowledge-based information system: A knowledge-based information system is an expert system database of knowledge about a particular subject, including relevant facts, information, belief, assumptions, and procedure for solving problems. The basic unit of knowledge is expressed as an IF-THEN-ELSE rule.

Expert-Assisted IS:- The integration of expert systems into decision support systems and other types of information systems is expected to become a major characteristic of a trend towards expert-assisted information systems. This integration adds expertise as well as a knowledge base to information systems. An important example is the integration of expert systems and decision support systems with executive information systems.

The expert system is MACSYMA for MATH and MYCIN for MEDICAL (blood oriented) PROSPECTOR for GEOLOGY (stone/dust/liquid)

Expert system is used to simulate human intelligence, simulate means (artificial representation of some natural phenomena).

NEURAL NETWORK

Computer processor or software whose architecture is based on the human brain's mesh like neuron structure. Neural networks can process many pieces of information simultaneously and can learn to recognize patterns and program themselves to solve related problem on their own. Neural networks can be implemented on microcomputers and other traditional computer systems by using software packages that simulate the activity of a neural networks. Specialized neural networks coprocessor circuit boards for PCs are also available that provide significantly greater processing power.

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CHAPTER-10

COMPUTER VIRUSES:

What is Virus?

Biologically, a Virus is defined as a tiny scrap of genetic code that attacks a living cell and produces replications of itself.

What is Computer Virus?

Computer Virus is a small program that attaches itself to another program and often attacks software by making copies of itself. Like biological viruses, it can also be spread from one Computer system to another while swapping disks or via Computer networks. A Computer Virus is a program that replicates itself by attaching itself to another program. The latest count includes thousands of Viruses, which have infected the Computers.

A Virus program often small i.e. consists of a few lines of programming code that can be easily hidden in another healthy program. They may infect MicroComputers, mini Computers and even main frame Computers.

Computer Virus can be created in any microcomputer and are transmitted to other when an infected disk is used. Computer Viruses may be harmless and do nothing more than to display a short message or they may be malignant which destroy or alter data.

ANTI-VIRUS SOFTWARE:-

There are many companies in the US that sell computer software to protect computer systems from Virus infections. These includes programs with names like Toolkit, Virus-Scan, Vaccine, etc. Anti-Virus programs use Virus signatures to detect known computer Viruses. A Virus signature is a series of hexadecimal codes that uniquely identify a Virus. By updating signature file, we can enable Anti-Virus to detect new Viruses.

COMPUTER CRIME

Computer crime can be defined as any crime that is committed by means of the special knowledge or expert use of computer technology. Computer crime became a serious problem in the late

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20th century. Since the first reported case of computer crime in 1958. Computer have been involved in most types of crimes, including theft, burglary, larceny, fraud, embezzlement, extortion, sabotage, espionage, kidnapping and murder. Computer system themselves can be targets of attack, as when a computer virus is secretly introduced into a system to alter or destroy data. Breaking into private computer system to destroy, steal or alter information became easier once modems were introduced in the 1960s. Technology expert computer hobbyist who uses personal computer and modems to break into computer system are known as "Hackers". Most serious computer crimes are committed in the banking and financial service industries where money, credit and other financial assets are recorded in electronic databases and are transmitted as signals over telephone lines. Persons with access to such system may use these records for their own purposes by illegally transferring money balances to their own accounts.

For example, one employee programmed a computer to pay vast sums of money into a fictitious bank amount. He also programmed it to return the money to its owner every time there was an audit (account check). All he stole was the interest. Some thieves in banks steal money held in dormant accounts. This is where someone has died and the account still has some money in it. There is no customer around to complain and people have got away with large amounts of money with the help of computer. Quite often, the person who is caught is only dismissed and those who are prosecuted only received comparatively light sentences.

What is Virus Hoax?

Virus hoaxes are false reports about non-existent viruses, often claiming to do impossible things. Some recipients occasionally believe a hoax to be a true virus warning and may take drastic action such as shutting down their network.

Hoaxes are E-Mails, which describe a dangerous new undetectable virus, usually using bogus technical terms. Hoaxes often ask you to avoid reading or downloading E-mails that have a particular subject line. For instance, the Good Times hoax claims to put your computer's CPU in "an complexity infinite binary loop which can

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severely damage the processor". The hoax warns you not to read or download anything the subject "Good Times" because the message is a virus. It then urges you to forward the warning to as many people as possible.

Some times hoaxes can cost you even more than a genuine virus incident. After all no anti-virus will detect hoaxes because they are not viruses. Some companies panic when they receive a hoax virus warning and assume the worst, making the situation much worse.

Q) WHAT IS TELECOMMUNICATIONS ? WHY TELECOMMUNICATIONS IS IMPORTANT

Ans: To send information in any form (e.g., voice, data, text, and images) from one place to another place using electronic device is called Telecommunication..

Or

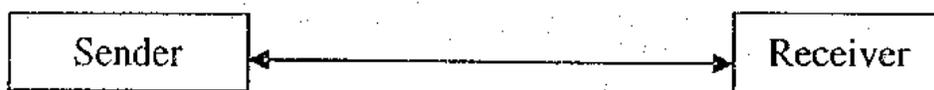
Telecommunication/Data communication is a process of transferring data electronically from one place to another.

Elements of data communication:

There are three basic element of data-communication

- 1) Sender
- 2) Receiver
- 3) Channel

The digital communication system component shown in the following figure.



Channel (Transmission Medium)

- 1) Sender: - A device used to send the data.
- 2) Receiver: - A device used to receive the message.
- 3) Channel: - A medium over which the data is sent.

Q) WHY TELECOMMUNICATION IS IMPORTANT?

Telecommunication is important because end users need to communicate electronically to succeed in today's global information society. Managers, end users, and their organizations need to electronically exchange data and information with other end users, customers, suppliers, and other organizations. Only through the use

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of telecommunications they can perform their tasks, manage organizational resources, and compete successfully in today's fast-changing global economy. Thus, many organizations today could not survive without interconnected *networks of computers* to service the information processing and communications needs of their end users.

APPLICATIONS OF TELECOMMUNICATIONS

Telecommunications networks provide invaluable (very important) capabilities to an organization and its end users. For example, some networks enable work groups to communicate electronically and share hardware, software, and data resources. Through telecommunication Network Company process sales transactions immediately from many remote locations, exchange business documents electronically with its customers and suppliers, or remotely monitor and control production processes. Telecommunications networks can also interconnect the computer systems of a business and can be accessed by end users throughout an enterprise. Telecommunication networks enhance collaboration and communication among individuals both inside and outside an organization.

Q) DISCUSS TRENDS (DEVELOPMENT) IN TELECOMMUNICATIONS

Ans: The information system (computer based system) of many organizations depends on telecommunication networks to service the communications and information processing needs of their end users. The following are the trends in telecommunication.

1) Industry Trends

Hundreds of companies now offer businesses through Internet and give end users a choice of everything from long-distance telephone services and access to communication satellite channels, to mobile radio and cellular phone services. Telecommunication has entered into a competitive environment with many vendors, carriers, and telecommunication network service.

2) Technology Trends (Development)

Telecommunications has always depended on analog transmission systems designed to transmit the variable electrical frequencies

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generated by the sound waves of the human voice. However, local and global telecommunications networks are rapidly converting to digital transmission technologies, which transmit information in the form of discrete pulses. This provides the following advantages

1) Higher transmission speeds, (2) The movement of larger amounts of information, (3) Greater economy, and (4) Much lower error rates than analog systems.

Digital technologies, including ISDN(Integrated Services Digital Network), will allow telecommunications networks to carry multiple types of communications (data, voice, video) on the same circuits with faster transfer rate. Another major trend in telecommunications technology is a change in communications media that is from copper wire-based media (such as coaxial/twisted cable) and land-based microwave relay systems to fiber optic lines and communications satellite transmissions. These trends in technology give organizations more alternatives in overcoming the limitations of their present telecommunications systems.

3) Open system trend

An open system is a model that allows any two systems to communicate even if their architectures are different. Open systems are information systems with common standards that provide easy access to end users and their networked computer system. Open systems provide greater connectivity, that is, the ability of networked; computers and other devices to easily access and communicate with each other and share information.

Network architectures like the Open Systems Interconnection (OSI) model of the International Standards Organization (ISO) promote open, flexible, and efficient standards for the development of open telecommunications networks.

4) Application/uses Trends

Telecommunication is playing a more important role in support of the operations, management, and strategic objectives of both large and small companies. An organization's telecommunications function is use in office telephone systems, as well as it is used for long-distance calling arrangements, and for data communications. It has become an integral part of local and global networks of computers which are used to cut costs, improve the collaboration of work

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groups, develop online operational processes, share resources, lock in customers and suppliers, and develop new products and services. This makes telecommunications a more complex and important decision area for businesses, which must increasingly compete in both domestic and global markets.

Q) WHAT IS INFORMATION SUPERHIGHWAY

Superhighway is the high-speed, digital networks with fiber optic and satellite links. In this concept, local, regional, nationwide, and global networks will be integrated into a vast "network of networks" also called Internet. The information superhighway system would connect individuals, households, businesses, government agencies, libraries, universities, and all other institutions and would support interactive voice, data, video, and multimedia communications. Internet is superhighway way network.

Q) WHY BUILD SUCH A SUPERHIGHWAY NETWORK?

The information superhighway would create a national information infrastructure (communication) that would dramatically increase business efficiency and competitiveness by improving economic communications, collaboration, and information gathering.

For example, the information superhighway could use electronic mail, video conferencing, e-commerce, on-line shopping, job search and electronic databank services to enable businesses throughout the country. Information superhighway could support an interactive video home shopping and entertainment system that could revolutionize the retailing and entertainment industries. The information superhighway has a major impact on development in telecommunications and on our nation's economic and social life.

Q) DISCUSS TELECOMMUNICATIONS NETWORK MODEL

Ans: A communication network is any arrangement where a sender transmits a message to a receiver over a channel (medium).

The below figure illustrates a simple conceptual model of a telecommunications network, which shows that it consist of five basic categories of components:

1-Terminals:- Any input/output device that uses telecommunications networks to transmit or receive data is called terminal. For example

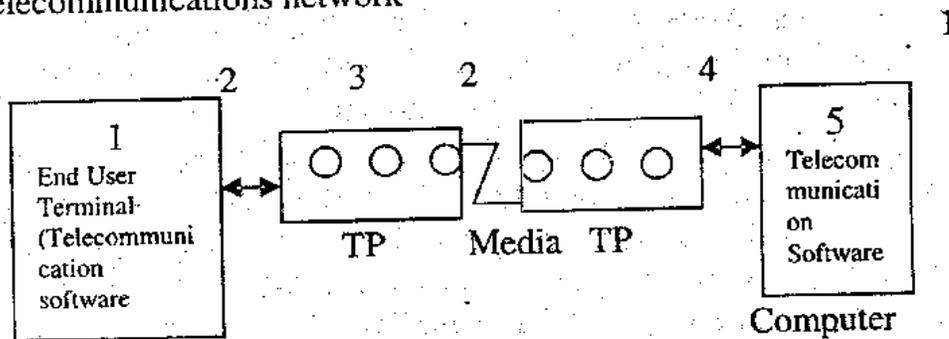
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telephones, office equipment, networked microcomputer workstations or video terminals.

2-Telecommunications processors (TP):- The devices which perform a variety of control and support functions which support data transmission and reception between terminals and computers in a telecommunications network. For example, they convert data from digital to analog and back, code and decode data, and control the accuracy and efficiency of the communications flow between computers and terminals in a telecommunications network. For example Modem Card, Hub, Bridge, router etc

3-Telecommunications channels and media:- The media/channel over which data are transmitted and received. Telecommunications channels/media/medium is copper wires, coaxial cables, fiber optic cables, microwave systems, and telecommunications satellites, to interconnect the other components of a telecommunications network



4-Computers:- Computers of all sizes and types are interconnected by telecommunication networks. For example, mainframe, mini, and microcomputers.

5-Telecommunications control software:- These are programs that control telecommunications activities and manage the functions of telecommunication networks. For examples telecommunications monitors, network operating systems, and communications packages.

Q) WHAT IS TELECOMMUNICATIONS NETWORKS? DISCUSS

ITS DIFFERENT TYPES

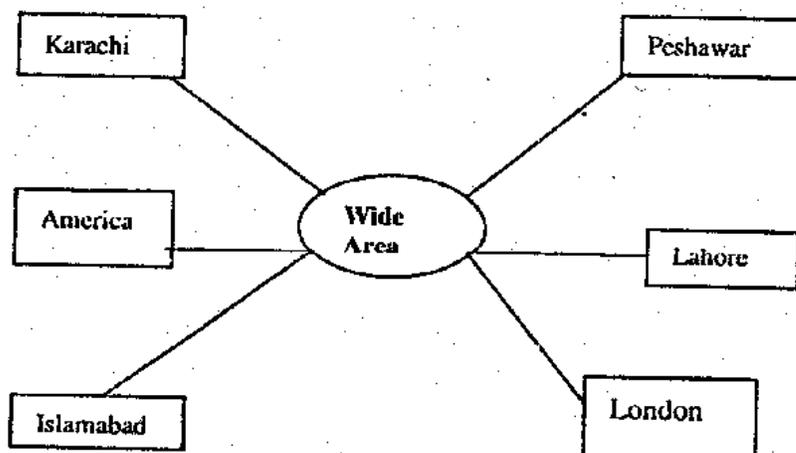
Ans: A Computer network links two or more computers so that they can exchange data, information, and share resources such as printer etc.

There are six type of telecommunication network

1-Local-Area-Network (LAN): LAN connects computer and other devices within a limited physical area, such as in office, a building, or a campus. It use direct cable or localized wireless radio or infrared signals to link computer with the small geographic area. LANs use a variety of telecommunications media, such as ordinary telephone wiring, coaxial cable, or even wireless radio systems to interconnect microcomputer workstation and computer peripherals. LANs allow end users in a work group to communicate electronically; share hardware, software, and data resources.

2-Metropolitan area Network (MAN): Telecommunications networks covering a large city are called MAN. It uses high-speed fiber optics lines to connect computer located at various places at city. It is greater than LAN such as the networks in different town in cities.

3-Wide area Network (WAN): Telecommunications networks covering a large geographic area are called remote networks, long-distance networks, or, wide area networks. It uses long distance transmission media including telecommunication networks to link computer separated by a few miles or even thousand of miles. WANs are used by manufacturing firms, bank, retailers, distributors, transportation companies, and government agencies to transmit and receive information among their employees, customers, suppliers, and organizations across cities, regions, countries, or the world. For example Internet.



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4-Internetwork: Interconnected local and wide area network is called internetwork. The end users need to communicate with workstations of colleagues on other LANs, or to access the resources and databases at other company locations or at other organizations. Local area network uses internetwork processors, such as bridges, routers, hubs, or gateways; to make internetworking connections to other LANs and wide area networks.

The goal of such internetwork architectures is to create a "Network" within each organization and between organizations that have business relationships. Such networks are designed to be open systems, whose connectivity provides easy access and interoperability among its interconnected workstation, computer-based devices.

5- Client/Server computing: Client-server LAN is a network in which one or more computers works as servers and other computers works as client. The server computer provides services for the client. Server is also called host computer.

Client computers request resources from the server. Server computer is more powerful than client computers and contain more memory. With client/server computing, end user at client LAN workstation can handle a large number of tasks. They can thus perform some or most of the processing of their business application. LAN server share application, manages work group collaboration, and control common hardware, software, and database.

6- Inter Organization Networks

Inter Organization Networks is a network which links a company wide area and local area networks to the networks of its customers, suppliers, information services provider, and other organization. For example the use of electronics document interchange, which links the computer of a company with its suppliers and customers. Electronic fund transfer application also depend on inter organizational networks established among banks, business, employees, customer, and suppliers.

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Q) WHAT IS INTERNET/HISTORY? DISCUSS MERITS AND DEMERITS OF INTERNET.

Ans: The internet is a collection of million of computers around the world that are all connected to one another. It is global network of computers. These computers are connected through different telecommunication links: Phone lines, Fiber optic lines, Satellites and wireless connection

The internet is used to find information stored on the computers called host or servers that are part of the Internet. More than one-half billion users in the world use the internet for different purposes.

The Internet began in 1969, as an experimental four computer network called ARPAnet (Advance research project agencies network) which was designed by the U.S Defense Department so that research scientists could communicate. In approximately two years, ARPAnet grew to about two dozen sites and by 1981, consisted of more than two hundred sites. In 1990, ARPAnet was officially renamed and the network, which consisted of hundred of sites, came to be known as Internet

After a while, commercial organizations began to recognize the use of such a network, which converted the whole world into a 'Global village' and allowed almost instant access to business or commerce data and a host of other service such as e-mail and e-commerce.

Some uses of the Internet are as follows.

- To access information, news, research, and educational material.
- To conduct business
- To access sources of entertainment such as on-line games, magazines etc.
- To shop for goods and services
- To meet and talk with people around the world in discussion groups or chat room:
- To access other computer and exchange files
- To send messages and receive messages from other connected users.

No government and organization is the owner of Internet. Many people, organizations, universities and research agencies participate to run the Internet.

Merits and Demerits of Internet

Advantages of Internet

1. Information search

Internet contains information on all types of topics. People can search information on any topic. Search engines are used to search information on Internet.

2. Email

Email is an inexpensive and fast ways of communication. It is used to send messages, picture and files from one part of the world to another part.

3. E-commerce

E-Commerce means to carry out financial and business dealings using Internet. A person can deals with his customer throughout the world.

4. Internet provides the facility to display the result of the students on websites. The students can watch their results from any part of the world.

5. Online shopping

People can buy and sell good on Internet and payment can be made using credit card number etc.

6. Fast Communication

Internet is a way of fast communication. People can communicate with one another in less time from any part of the world.

7. Discussion Group.

People can communicate over the Internet using discussion groups. Different people discuss different topics and distribute their ideas to other people by email.

8. Job Search

Internet is used to search different types of jobs all over the world. Many websites are developed that provides information to the people about jobs.

9. Entertainment

Internet provides a lot of entertainment to the people. The user can play online games, listen songs, watch movies and live match etc.

10. Research

Internet provides many facilities for research work. It contain details information on different topics.

11. Advertisement

Many commercial organization use Internet to advertise their products. They provide information about their products to the people all over the world.

12. Video Conferencing

People can use Internet for video conferencing. They can talk on different topics by watching to one another.

13. Government Authorities

Government can provide information about service and facilities for the people.

14. News

Most newspapers have their websites. Latest news and interview are provided on these websites.

15. Online education

The process of getting education through Internet is called online education. Many websites provides tutorial and lecture on different subjects and topics.

16. Encyclopedia Publisher

Online *encyclopedias* are available. You can find detailed information on any topic in the world.

17. Search Engines

Search engine is a website that provides you the facility to find the required websites on a particular topic. You can find thousands of websites about any topic. ;

18. Medical

Many sites in the world provide detailed information on diseases. You can also a panel of on-line doctor to get the advise about any medical problem.

Disadvantages OF Internet

Some important disadvantages of Internet are as follows:

1. Hacking

Hacking is one of the most important disadvantages of Internet. The hackers access the data stored on the computers across the Internet. They can use this data illegally or even destroy it.

2. Immorality

Internet contains a large number of immoral websites. These websites contains such material that is against the moral values of our society. These websites are damaging character of young people.

3. Security Problems

Internet has created many security problems. Important data can be hacked on Internet. Hackers also damage different websites and delete their contents. They also retrieve critical data of different organizations and governments.

4. Viruses

Internet is the most important source of spreading computer viruses. Peoples spread viruses using Internet and emails. Many websites also contain different viruses that are copied to the computers when the users download data from these websites.

5. Wastage of Time

Many people use Internet without any positive purpose. The young people waste their time in chatting. It affects their performance and makes them inefficient.

6. Cyber Crime

Internet is a source of many cyber crimes. People use Internet for negative activities. They hacks the credit card numbers of the people and use them for shopping. Some use Internet to spread illegal and immoral material. Many government are introducing laws to stop cyber crimes

Q) Discuss Business on the Internet/E-Commerce

Or Importance of business on the internet

Ans: Now a day the business on Internet has taken a new era. From small business to large business uses of the Internet has expanded rapidly. Businesses are connecting their networks to the Internet for several reasons.

One is the Ease of worldwide communications and collaboration through Internet's global E-mail and bulletin board systems.

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Another reason is the access to a vast range of information provided by the networks on the Internet. But businesses are also connecting to the Internet because it represents the way of the future in business telecommunications.

Networked information and communication are the standard for the future. For businesses, the information superhighway and the Internet are available now. Many businesses use the Internet primarily as a way to send E-mail message to colleagues anywhere in the world.

Businesses also rely on the Internet to support worldwide collaboration among their employee and consultants, customers, and suppliers. They use the Internet to link their workstations together to form virtual *work groups* to work on joint projects such as product development, marketing campaigns, and scientific research.

Another major business use of the Internet is gathering information. You can make online searches for information in a variety of ways. Hundreds of library catalogues forms are available. You can also access hundreds of databases, downloading everything from the latest satellite weather photos.

Other uses of the Internet are developing as companies investigate its business, potential. They have developed home *page* sites on the World Wide Web that provide multimedia versions of advertising, press releases, new product demonstrations, product catalogues, and shopping malls.

Q) Discuss Online Transaction/E-Commerce method.

On line transaction is the buying, selling, marketing and servicing of product, and information over a variety of computer networks. There are three of online transaction.

1. Business-to-Business Transaction/ E-commerce (B2B)

It is the type of e-commerce where both the buyer and the seller are business. One business provides service to other business. Online advertisement, recruiting, sales, marketing, technical support, and training are some example of B2B e-commerce. For example, some companies provides online purchasing, transaction facilities to other companies.

2. Business to Consumer Transaction/ E-commerce (B2C)

It is the type of e-commerce where a business is selling online to an individual consumer/general public. There are retailing transaction

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with the individual shopper. In this type, customers or consumer can visit the website and purchase goods online.

3.Consumer-to-Consumer Transaction/E-commerce (C2C).

It is the type of e-commerce where consumer sells directly to consumer. For example, one consumer sells an item through on line auction. Examples are individual selling in classified ads and selling residential property, cars and so on. Several auction sites allow individual to put item for auction. Many individual are using intranet and other organizational network to advertise items for sale or service.

Q) DISCUSS ONLINE PAYMENT METHOD.

Ans:

CREDIT CARD. Credit is Use for online payment using computer network. Credit are the most popular payment method for cyberspace consumer shopping today.

The process of using credit are

- Issue a credit card to a potential cardholder.
- The card holder show the card to a merchant whenever he or she needs to pay for a product or service
- The merchant then asks for approval from the brand company, and the transaction is paid by credit. The merchant keeps a sale slip.
- The merchant sells the slip to the acquiring bank and pays a fee for the service.
- The acquiring bank requests the brand to clear for the credit amount and gets paid. Then the bank asks for clearance to the issuer bank.
- The amount is transferred from issuer to brand. The amount is deducted from the cardholder account in the issuing bank.

ATM:

ATM stands for Automatic Teller Machine. It is special purpose transaction terminal used to provide remote banking services. ATM use for online payment. ATM card is debit card also known check card that authorizes the electronic fund transfer. An ATM card is a way to pay now. When you use ATM card, the amount is

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immediately deducted from your account. The ATM card allows you to spend only what is in your bank account.

Process of ATM Card

- Enter your card in ATM device
- Enter your PIN code
- Enter required amount to be withdraw
- The amount will be paid by the machine

TECHNICAL TELECOMMUNICATIONS ALTERNATIVES (TELECOMMUNICATION NETWORK COMPONENT)

Telecommunications is a highly technical, rapidly changing field of information system Technology. The following is the list of different telecommunication alternatives.

NETWORK EXAMPLES OF COMPONENT ALTERNATIVES

Media Twisted-pair wire, coaxial cable, fiber optics, microwave radio, communications satellites, cellular and LAN radio, infrared

Processor Modems, multiplexers, bridges, routers, hubs, gateways, front-end processors, private branch-exchanges

Software Telecommunications monitors, telecommunications access programs, network operating systems, end user communications packages

Channels Analog/digital, switched/non-switched, transmission speed, circuit/message/packet switching, simplex/duplex, asynchronous/synchronous

Topology/ Architecture Point-to-point, multidrop, star/ring/bus, OSI,

ISDN

Q) What is Telecommunications Media/Channel. Discuss its different types.

Ans:- Telecommunications Media/channels (also called communications lines or links) is the path that connects sender and receiver to transfer data between sending and receiving devices in a telecommunications network.

There are different types of telecommunication media/channel, which are the following.

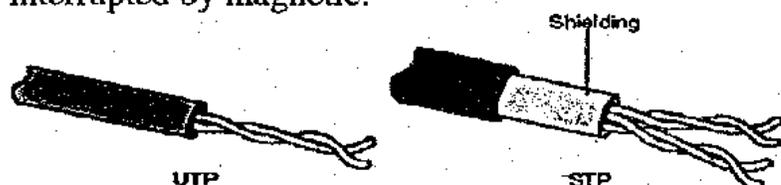
BOUNDED/GUIDED MEDIA

1) TWISTED PAIR WIRING

Twisted pair wire consists of two strands of insulated copper wire, twisted around each other in pair. They are then covered by another layer of plastic insulation. Twisted pair cabling is the same type of cabling system used for home and office telephone system and local area networking.

Advantage:- It is inexpensive and easy to install.

Disadvantage:- It create noise and its transmission is easily interrupted by magnetic.



unshielded twisted pair

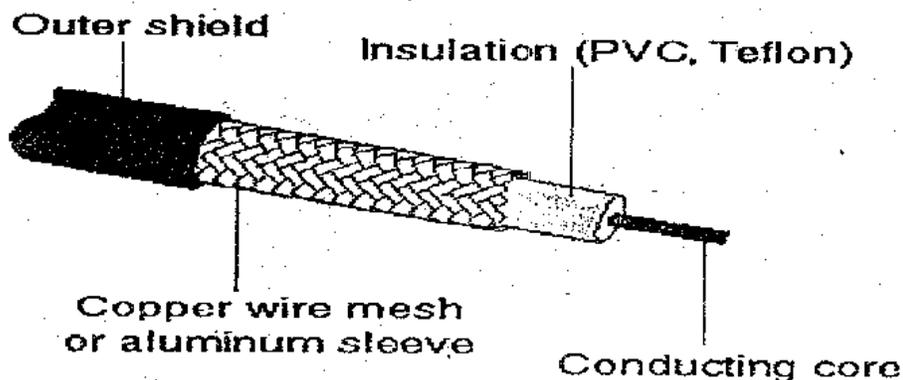
shielded twisted pair

2) COAXIAL CABLE

Coaxial cable consists of insulated copper or aluminum wire covered by insulating material. The insulated copper wire is covered by copper mesh. It is widely used for cable television and local area network. They allow high-speed data transmission and are used instead of twisted pair wire lines. The extra insulation makes coaxial cable much better resisting noise than twisted pair wiring.

Advantage:- The extra insulation makes coaxial cable much better resisting noise than twisted pair wiring. These can transmit data much faster than twisted pairs.

Disadvantage:- It is expensive than twisted pair.



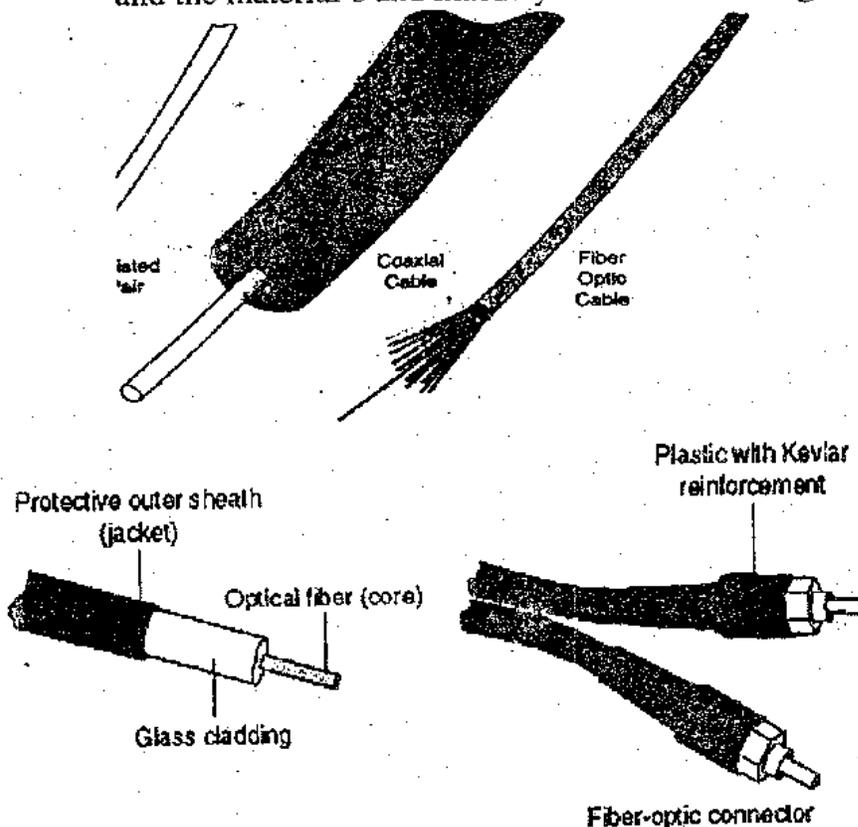
3) FIBER OPTIC CABLE

A fiber-optics cable consists of hundreds or thousands of thin strands of glass that transmit pulsating beams of light instead of electricity. It is thinner than a human hair. Data transfer rate of fiber optics is very fast. There is no chance of data loss. Light pulse is not affected by random electromagnetic interference in the environment. They have much lower error rates than normal telephone twisted pair or coaxial cable.

It is latest technology according to a research if half population of the world is on one side of a single fiber optics cable and the other half on the other side of the same fiber optics cable, then they can communicate with each other if proper multiplexing technique are used.

Advantage: -A final advantage is that it cannot be easily wiretapped or listened, so transmissions are more secure.

Disadvantage: The main drawback until recently have been cost and the material's and inability to bend around tight covers.



UNBOUNDED/UNGUIDED MEDIA OR WIRELESS MEDIA

4-Terrestrial Microwave or Microwave

Microwaves are radio waves that are used to provide high-speed transmission. Microwave system transmit high-speed radio signals in a line-of-sight path between relay stations placed approximately 30 miles apart each other. Microwave antennas are usually placed on top of building, towers, hills, and mountain peaks. They are still a popular medium, for both long-distance and metropolitan area networks. There is no cable involve.

5-Communications Satellites

Communication satellite is a space station. It receive microwave signal from earth station. It amplifies the signal and retransmits them back to earth. Communication satellite is established in space about 23,300 miles above earth. The data transfer speed of communication satellite is very high. The transmission from earth station to satellite is called uplink. The transmission from satellite to earth station is called downlink. There is no insight path problem.

6-Cellular radio

Cellular radio is a broadcast radio used for mobile communications. It is specially used in wireless modems and cellular telephones. Cellular telephone is a telephone device that uses high frequency radio waves to transmit voice and digital data.

Cellular radio has become an important communications medium for mobile voice and data communications. The integration of cellular and other mobile radio technology is expected to accelerate in the next few years.

Personal Communications Service (PCS) is set of technologies used for digital cellular devices. Handheld computer, cellular telephones, and fax machine use PCS.

7-Wireless LANs

Using radio or infrared transmission to link devices in a local area network. Wireless LAN radio is a high-frequency radio technology similar to cellular radio, or a low-frequency radio

technology called spread spectrum. The other wireless LAN technology is called infrared, because it uses beams of infrared light to establish network links between LAN components.

Advantage:- A wireless LAN eliminates or greatly reduces the need for wires and cables, thus making a LAN easier to set up, relocate, and maintain.

Disadvantage:- Wireless LAN's technologies have higher initial costs and other limitations. For example, an infrared LAN transmits faster than radio LANs but is limited to line of sight arrangements to a maximum of about 80 feet between components. High frequency radio LANs do not need line-of-sight links, but are limited to 40 to 70 feet components in enclosed area.

8- BROADCAST RADIO

Broadcast radio is a wireless transmission medium. It distributes radio signals through the air over long and short distance. Radio transmission requires a transmitter to send broadcast radio signals and a receiver to receive the signal.

An example of short-range broadcast radio communication is Bluetooth. It uses short range radio waves.

Q) WHAT IS TELECOMMUNICATIONS CARRIERS? EXPLAIN ITS TYPES.

Ans: The company or organization that provides network/communication facility is called telecommunication carriers. Telecommunications channels for wide area networks can be owned by an organization or provided by other companies. In the United States, several companies have traditionally used a variety of communications media to create networks that can provide a broad range of communications services. For example, Internet, which is wide area network run by some organization voluntarily in USA. There are two types of carriers.

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1) Common carriers

An organization that supplies communications services to other organization and to the public as authorized by government agencies. Examples are the former Bell operating companies, General Telephone and electronics, Western Union, and many independent telephone companies. Some common carriers specialize in selling long-distance voice and digital data communication services. Examples of such specialized carriers are AT&T Long Distance, ITT World Communications, Southern Pacific Communications, U.S. Sprint, and MCI Communications. In Pakistan PTCL is common carrier telecommunication system.

2) Value-Added Carriers

Third party vendor who leas telecommunication lines from common carriers and offer a variety of telecommunication services to customer. Messages from customers are transmitted in groupings called packets, via packet-switching network. However, the networks of such carriers are known as value-added networks (VANs) because they add value to their leased communications lines by using communications hardware and software and their expertise to provide not only packet switching but also other data-communication services.

Example of value-added companies is GTE Telnet, General Electric's Mark and Compunet by CompuServe. These VANs have become so popular that common carriers such as the Bell operating companies, AT&T, MCI, and Western union and large corporations such as IBM and RCA now offer VAN services.

In Pakistan the Value-aded Companies are World Call, Nokia, Mobilink, U-fone, Paktel and Insta-one etc

Q) What is Telecommunications processors/devices.

Explain its types.

Ans: Telecommunications processors perform a variety of support functions between the terminals and server computers in a telecommunications network.

Or

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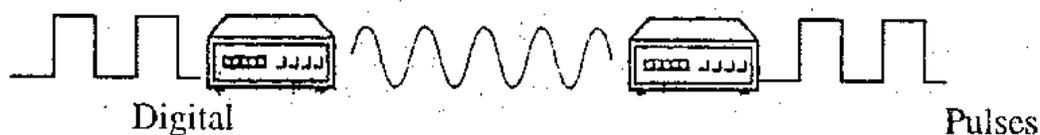
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The hardware used to transmit data, instruction, and information between a sending and receiving device is called Telecommunication processor or telecommunication devices. Telecommunication processors are the following

1-MODEMS

Modem stands for modulation and demodulation. Modem is an electronic device that converts digital signals to analog and analog signal into digital. Modem is the most common type of communications processor.

Digital Pulses Modem Analog Signal Modem



Analog Frequencies over Communications Channels

2-Multiplexer

Multiplexing means transmitting a large number of information unites over a smaller number of channels or lines.

Multiplexer is an electronic device that allow a single communication channel to carry simultancous data transmissions from many terminals. Thus, a single communications line can be shared by several terminals. A multiplexer merges the transmissions, of several terminals at one end of a communications channel, while a similar unit separates the individual transmissions at the receiving end.

3-Internetwork processors

These are the communication processor used by local area network to interconnect them with other local area and wide area networks example of network processor are bridges, routers, hubs, or gateways.

4-Private Branch Exchange

The private branch exchange (PBX) is a switching device that serves as an interface between the many telephone lines within a work area and the local telephone company's main telephone lines or trunks. Computerized PBXs can handle the switching of both voice and data in the local area networks that are needed in

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such locations. PBXs can be as small as a telephone or as large as a minicomputer. They not only route telephone calls within a office but also provide other services, such as automatic forwarding of calls, conference calling, and least-cost routing of long-distance calls. Some PBX models can control communications among the terminals, computers, and other informal processing devices in local area networks in offices and other work areas.

5-Front-End Processor

A front-end processor is a smaller, general-purpose computer to handling data communications control functions in a communication network for large mainframe host computers.

For example, a front-end processor uses telecommunications control programs to provide temporary buffer storage, data coding and decoding, error detection, recovery, and the recording, interpreting, and processing of control information.

It controls access to a network and allows only authorized users to use the system, assigns priorities to messages, and routes and reroutes messages among alternative communication links.

Q) Discuss Telecommunications Software

Ans: Telecommunication software consists of program used to establish a connection to other computer or network. It manages transmission of data, instruction, and information. Telecommunication software controls, manage, and supports telecommunication network. For example, telecommunications software packages for mainframe-based wide area networks are telecommunications monitors. Local area networks software are network operating systems, such as Novell NetWare , Windows-NT, windows 2000, and Windows XP etc

Q) Discuss Telecommunications Network Topologies with its types

Ans: The physical layout or the way in which network connection are made is called a topology.

Or the wiring scheme of a local area network is called topologies. The two simplest are point-to-point lines and multi drop lines. Point-

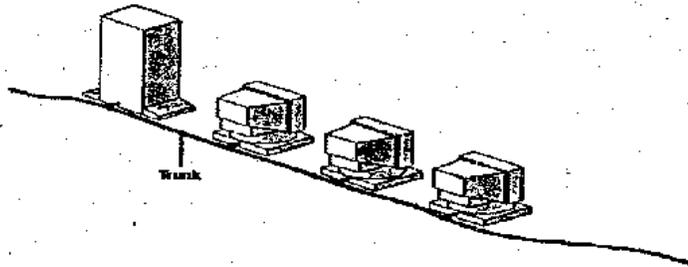
to-point lines are used, when each terminal is connected by its own line to a computer system. Multidrop lines are used, when several terminals share each data communications line to a computer. Point-to-point lines are more expensive than Multidrop lines: All of the communications capacity and equipment of a communications line is being used by a single terminal. Therefore, point-to-point are used only if there will be continuous communications between a computer and a terminal or other computer system. A multidrop line decreases communication costs, because each line is shared by many terminals.

Types of topologies

There are three types of topology

1. Bus Topology 2. Star Topology 3. Ring Topology

1-Bus topology: A topology that connects each computer, or station, to a common communication medium. In a local network, this medium is a central wires called a bus. There is terminator at each end of the bus. If a computer wants to send data to other computer in the network, it sends the data and destination address via the bus. This data and address move from one end of the network to the other. Each computer checks this address and if it matches with this computer, the computer keeps the data. Otherwise the data move to the next.



Advantages:

- Simple, easy to use, and suitable for every small network.
- Least amount of cable is required to connect the computers so it is less expensive.
- Easy to extend a bus, two cables can be joined with a connector.
- Allowing more computers to join the network

Disadvantages

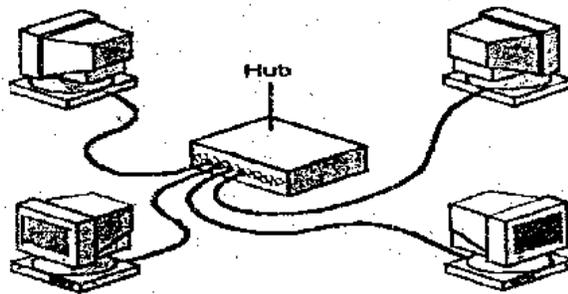
- Heavy network traffic can slow a bus.

- Each connector reduce the strength of the electrical signal
- A cable break or loose connector will cause to stop entire network
- As the number of computer increases, the speed of the network slow down.

2-Star Topology

In the star topology, cable from each computer is connected to a centralized device called a *hub or switch*. Below Figure shows four computers and a hub connected in a star topology. Signals are transmitted from the sending computer through the hub to all computers on the network. If two computer want to share data, the sender computer sends data to the hub and hub sends it to the receiving computer. A hub provides a central connection point so that all computers can communicate across the network.

It is expensive than Bus Topology because it required more cabling than bus and as well as the extra cost of the hub. A single workstation failure does not create problem but if HUB is fail the entire network will stop working.



Advantages

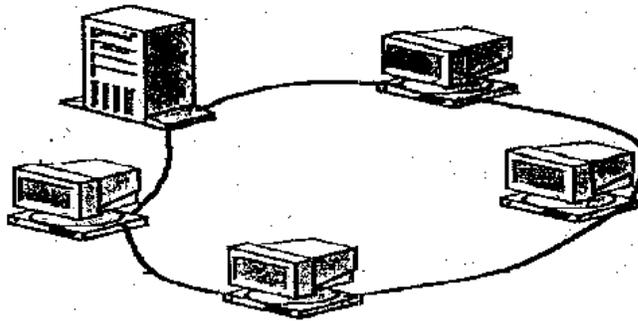
- It is easy to modify and add new computer to a star network.
- Hub can accommodate multiple cable type
- Finding fault becomes very simple
- Single computer failure does not bring down the whole network.

Disadvantages

- If central hub fails, the entire network breaks down
- It is more expensive

3. Ring Topology:

In this topology all workstation are attached to each other in a circular wiring arrangement. In this topology a token travels around the ring. A token is a message, which a workstation can send to any computer in the ring. Each retransmits what it receives from the previous computer. The message flow in one direction. If the cable is break then all computer will not functioning.



Advantages

Because every computer is given equal access to the token

Disadvantages

Failure of one computer on this can affect the whole network

Difficult to troubleshoot

Adding or removing computer disrupts the network.

BCD(Binary Coded Decimal)

Short for Binary Coded Decimal, BCD is also known as packed decimal and is numbers 0 through 9 converted to four-digit binary. Below is a list of the decimal numbers 0 through 9 and the binary conversion.

Decimal		Decimal	BCD
0	0000	5	0101
1	0001	6	0110
2	0010	7	0111
3	0011	8	1000
4	0100	9	1001

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Using this conversion, the number 25, for example, would have a BCD number of 0010 0101 or 00100101. However, in binary, 25 is represented as 11001.

EBCDIC (Extended Binary Coded Decimal Information Code) is an eight-bit character set that was developed by International Business Machines (IBM). It was the character set used on most computers manufactured by IBM prior to 1981.

EBCDIC is not used on the IBM PC and all subsequent "PC clones". These computer systems use ASCII as the primary character and symbol coding system. (Computer makers other than IBM used the ASCII system since its inception in the 1960s.)

EBCDIC is widely considered to be an obsolete coding system, but is still used in some equipment, mainly in order to allow for continued use of software written many years ago that expects an EBCDIC communication environment

ASCII Table and Description

ASCII stands for American Standard Code for Information Interchange. Computers can only understand numbers, so an ASCII code is the numerical representation of a character such as 'a' or '@' or an action of some sort. ASCII was developed a long time ago and now the non-printing characters are rarely used for their original purpose. Below is the ASCII character table and this includes descriptions of the first 32 non-printing characters. ASCII was actually designed for use with teletypes and so the descriptions are somewhat obscure. If someone says they want your CV however in ASCII format, all this means is they want 'plain' text with no formatting such as tabs, bold or underscoring - the raw format that any computer can understand. This is usually so they can easily import the file into their own applications without issues. Notepad.exe creates ASCII text, or in MS Word you can save a file as 'text only'.

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ASCII TABLE

Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char
0	0	[NULL]	32	20	[SPACE]	64	40	@	96	60	a
1	1	[START OF HEADLINE]	33	21	!	65	41	A	97	61	b
2	2	[START OF TEXT]	34	22	"	66	42	B	98	62	c
3	3	[END OF TEXT]	35	23	#	67	43	C	99	63	d
4	4	[END OF TRANSMISSION]	36	24	\$	68	44	D	100	64	e
5	5	[ENQUIRY]	37	25	%	69	45	E	101	65	f
6	6	[ACKNOWLEDGE]	38	26	&	70	46	F	102	66	g
7	7	[BELL]	39	27	'	71	47	G	103	67	h
8	8	[BACKSPACE]	40	28	(	72	48	H	104	68	i
9	9	[HORIZONTAL TAB]	41	29	)	73	49	I	105	69	l
10	A	[LINE FEED]	42	2A	*	74	4A	J	106	6A	k
11	B	[VERTICAL TAB]	43	2B	+	75	4B	K	107	6B	l
12	C	[FORM FEED]	44	2C	,	76	4C	L	108	6C	!
13	D	[CARRIAGE RETURN]	45	2D	-	77	4D	M	109	6D	m
14	E	[SHIFT OUT]	46	2E	.	78	4E	N	110	6E	n
15	F	[SHIFT IN]	47	2F	/	79	4F	O	111	6F	o
16	10	[DATA LINK ESCAPE]	48	30	0	80	50	P	112	70	p
17	11	[DEVICE CONTROL 1]	49	31	1	81	51	Q	113	71	q
18	12	[DEVICE CONTROL 2]	50	32	2	82	52	R	114	72	r
19	13	[DEVICE CONTROL 3]	51	33	3	83	53	S	115	73	s
20	14	[DEVICE CONTROL 4]	52	34	4	84	54	T	116	74	t
21	15	[NEGATIVE ACKNOWLEDGE]	53	35	5	85	55	U	117	75	u
22	16	[SYNCHRONOUS IDLE]	54	36	6	86	56	V	118	76	v
23	17	[END OF TRANS. BLOCK]	55	37	7	87	57	W	119	77	w
24	18	[CANCEL]	56	38	8	88	58	X	120	78	x
25	19	[END OF MEDIUM]	57	39	9	89	59	Y	121	79	y
26	1A	[SUBSTITUTE]	58	3A	:	90	5A	Z	122	7A	z
27	1B	[ESCAPE]	59	3B	;	91	5B	[	123	7B	{
28	1C	[FILE SEPARATOR]	60	3C	<	92	5C	\	124	7C	|
29	1D	[GROUP SEPARATOR]	61	3D	=	93	5D	]	125	7D	}
30	1E	[RECORD SEPARATOR]	62	3E	>	94	5E	^	126	7E	~
31	1F	[UNIT SEPARATOR]	63	3F	?	95	5F	_	127	7F	[DEL]

Unicode

Unicode is a computing industry standard for the consistent encoding, representation and handling of text expressed in most of the world's writing systems. Developed in conjunction with the Universal Character Set standard and published as The Unicode Standard, the latest version of Unicode contains a repertoire of more than 110,000 characters covering 100 scripts and multiple symbol sets. The standard consists of a set of code charts for visual reference, an encoding method and set of standard character encodings, a set of reference data computer files, and a number of related items, such as character properties, rules for normalization, decomposition, collation, rendering, and bidirectional display order (for the correct display of text containing both right-to-left scripts, such as Arabic and Hebrew, and left-to-right scripts). As of June 2014, the most recent version is Unicode 7.0. The standard is maintained by the Unicode Consortium.

COMPUTER NETWORKING

A computer network or data network is a telecommunications network that allows computers to exchange data. In computer networks, networked computing devices pass data to each other along data connections. Data is transferred in the form of packets. The connections (network links) between nodes are established using either cable media or wireless media. The best-known computer network is the Internet. Network computer devices that originate, route and terminate the data are called network nodes.[1] Nodes can include hosts such as personal computers, phones, servers as well as networking hardware. Two such devices are said to be networked together when one device is able to exchange information with the other device, whether or not they have a direct connection to each other.

History

The following is a chronology of significant computer network developments:

- In the late 1950s, early networks of communicating computers included the military radar system Semi-Automatic Ground Environment (SAGE).
- In 1960, the commercial airline reservation system semi-automatic business research environment (SABRE) went online with two connected mainframes.
- In 1962, J.C.R. Licklider developed a working group he called the "Intergalactic Computer Network", a precursor to the ARPANET, at the Advanced Research Projects Agency (ARPA).
- In 1964, researchers at Dartmouth developed the Dartmouth Time Sharing System for distributed users of large computer systems. The same year, at Massachusetts Institute of Technology, a research group supported by General Electric and Bell Labs used a computer to route and manage telephone connections.
- Throughout the 1960s, Leonard Kleinrock, Paul Baran, and Donald Davies independently developed network systems

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that used packets to transfer information between computers over a network.

- In 1965, Thomas Marill and Lawrence G. Roberts created the first wide area network (WAN). This was an immediate precursor to the ARPANET, of which Roberts became program manager.
- Also in 1965, the first widely used telephone switch that implemented true computer control was introduced by Western Electric.
- In 1969, the University of California at Los Angeles, the Stanford Research Institute, the University of California at Santa Barbara, and the University of Utah were connected as the beginning of the ARPANET network using 50 kbit/s circuits.[2]
- In 1972, commercial services using X.25 were deployed, and later used as an underlying infrastructure for expanding TCP/IP networks.
- In 1973, Robert Metcalfe wrote a formal memo at Xerox PARC describing Ethernet, a networking system that was based on the Aloha network, developed in the 1960s by Norman Abramson and colleagues at the University of Hawaii. In July 1976, Robert Metcalfe and David Boggs published their paper "Ethernet: Distributed Packet Switching for Local Computer Networks"[3] and collaborated on several patents received in 1977 and 1978. In 1979, Robert Metcalfe pursued making Ethernet an open standard.[4]
- In 1976, John Murphy of Data point Corporation created ARCNET, a token-passing network first used to share storage devices.
- In 1995, the transmission speed capacity for Ethernet was increased from 10 Mbit/s to 100 Mbit/s. By 1998, Ethernet supported transmission speeds of a Gigabit. The ability of Ethernet to scale easily (such as quickly adapting to support new fiber optic cable speeds) is a contributing factor to its continued use today

DATA COMMUNICATION/TELECOMMUNICATION.

Introduction to Data Communication:

The transmission of data from one location to another location is called Data Communication. A simple data communication system links I/O devices at remote location with one or more control processors. Interface elements such as modem and front-end processors are used to bridge and control the different data communication environments. The entire data communications activity is controlled by program instructions stored in communication processors and/or central processors.

Or communication also called Telecom refers to the electronic collection and transfer of information from one location to another. The data being communicated may consist of voice, sound, text, video, graphics or all of them. The electromagnetic instruments sending the data may be telegraph, telephone, cable, microwave, radio, or television. The distance may be as close as the next room or as far away as the outer edge of the solar system.

WHY DATA COMMUNICATION (TELECOMMUNICATION) IS IMPORTANT?

Telecommunication is important because End users need to communicate electronically to succeed in today's global information society. Managers, end users, and their organizations need to electronically exchange data and information with other end users, customers, suppliers, and other organizations. Only through the use of telecommunications they can perform their tasks, manage organizational resources, and compete successfully in today's fast-changing global economy. Thus, many organizations today could not survive without interconnected *networks of* computers to service the information processing and communications needs of their end users.

Applications of Telecommunications

Telecommunications networks provide invaluable (very important) capabilities to an organization and its end users. For example, some networks enable work groups to communicate electronically and share hardware, software, and data resources. Through networks company process sales transactions immediately from many remote locations, exchange business documents electronically with its

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customers and suppliers, or remotely monitor and control production processes. Telecommunications networks can also interconnect the computer systems of a business so their computing power can be shared by end users throughout an enterprise. Telecommunication networks enhance collaboration and communication among individuals both inside and outside an organization.

Data Communication Software:

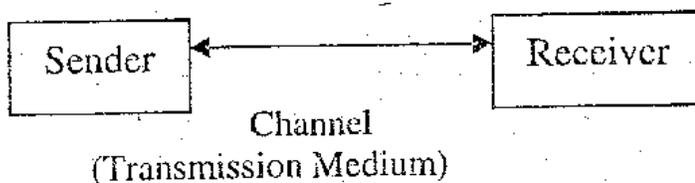
Data Communication software manages the transmission of data between computer. They are special type software. These are programs that control telecommunications activities and manage the functions of telecommunication networks. For examples telecommunications monitors for mainframe host computer, network operating systems for microcomputer network servers, and communications packages for microcomputers.

Elements of data communication:

There are three element of data-communication

- 1) Sender
- 2) Receiver
- 3) Channel

The digital communication system component shown in the following figure.



Sender :- A device used to send the data.

Receiver:- A device used to receive the message.

Channel:- A medium over which the data is sent.

A communication system may be simplex, half duplex and full duplex.

Type of Transmission mode (Data transmission modes)

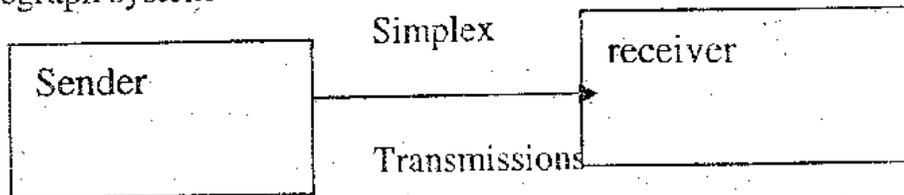
There are three types of transmission modes.

- 1) Simplex Transmission:

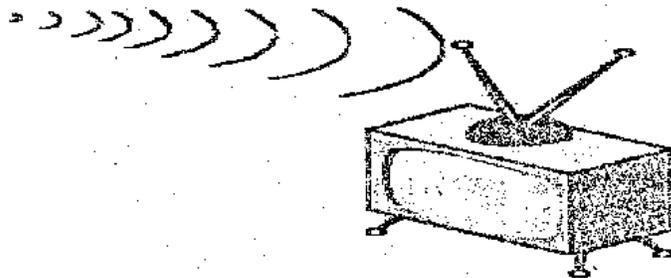
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A simplex transmission circuit permits data follow in only one direction. A terminal connected to such a circuit is either a send-only or a receive-only device
e.g. Telegraph system

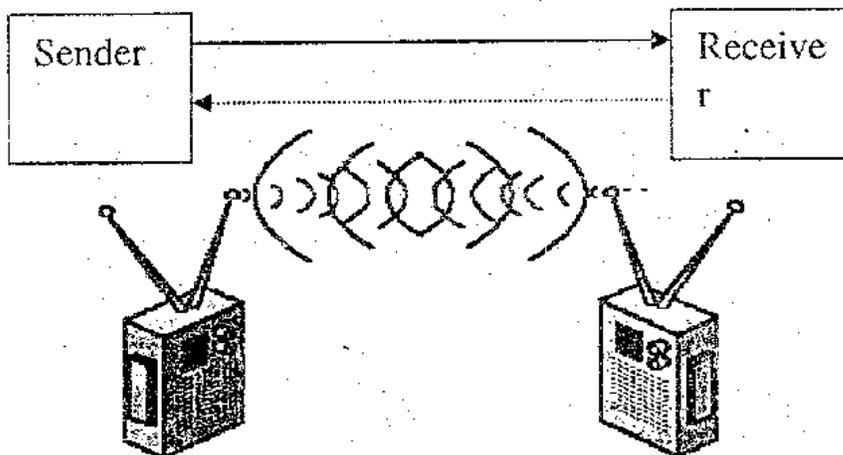


An example is a traditionally television broadcast, in which the signal s sent from the transmitter to your television antenna. There is no return signal.



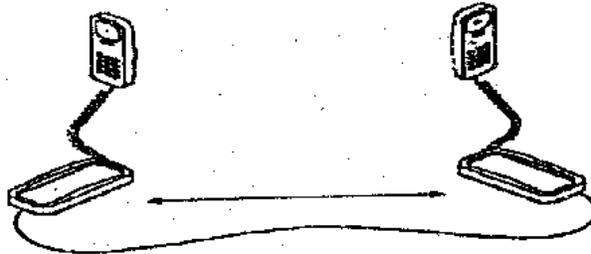
2) Half-duplex:

In half-duplex transmission, data travels in both direction but only in one direction at a time. This arrangement resembles traffic on a one-lane bridge; the separate streams of cars heading in both directions must take turns. Half-duplex transmission is seen with CB or marine radios, in which both position must take turns or wireless system.



3) Full-duplex transmission

In Full-duplex transmission, data is transmitted back and forth at the same time. An example is two people on telephones talking and listening simultaneously.



Types of communication:

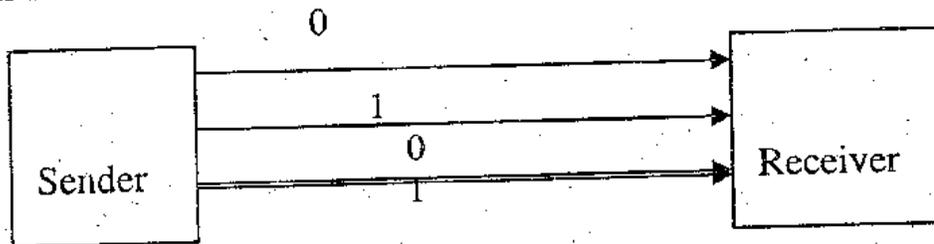
There are two possible ways to transmit the data from sender to receiver.

Parallel transmission and 2) Serial transmission.

1) Parallel transmission

In parallel transmission mode each bit to be send on separate channel.

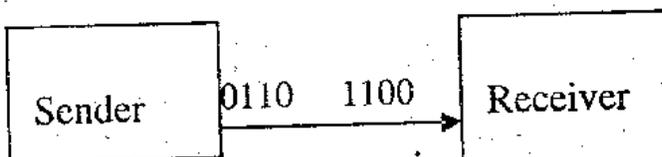
As shown



Here all the bits of the characters are transmitted simultaneously, thus the transmission is parallel by bit but Serial by character. It has transmitting speed but expensive because large number of channels are required. It is used for short distance communication.

2) Serial transmission

In Serial transmission each bit is transmit on single channel. It is shown as



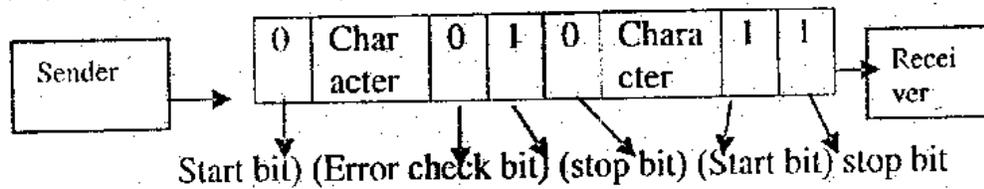
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The character bit is transmitted one after another on single channel. The receiver resembles the incoming bits stream into character. Serial transmission has the synchronization problem. Mean the receiver is unable when one character is ended and next is beginning. Therefore the serial transmission is divided into synchronous and asynchronous transmission

Asynchronous transmission:

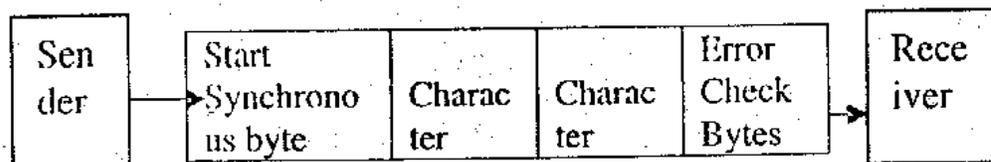
In this method transmission messages is send one character at a time. The character is headed with a start bit and is ended with one or more stop bit. The start and stop bits tell the receiving devices that character are coming and that the character has been sent. The receiving devices to verify that the data was received correctly use parity bits. As a result, asynchronous transmission is not used when great amounts of data must be sent rapidly. Its advantages are that the data can be transmitted whenever it is convenient for the sender.



Synchronous transmission:

Synchronous transmission sends data in blocks. Start and stop bit patterns, called synchronous byte, are transmitted at the beginning and end of the blocks.

This method is rarely used with microwave computers because it is more complicated and more expensive than asynchronous transmission. It also requires careful timing between sending and receiving equipment. It is appropriate for computer systems that need to transmit great quantities of data quickly.



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NETWORK

A Computer network links two or more computers so that they can exchange data and share resources such as printer etc.

There are three types of computer network

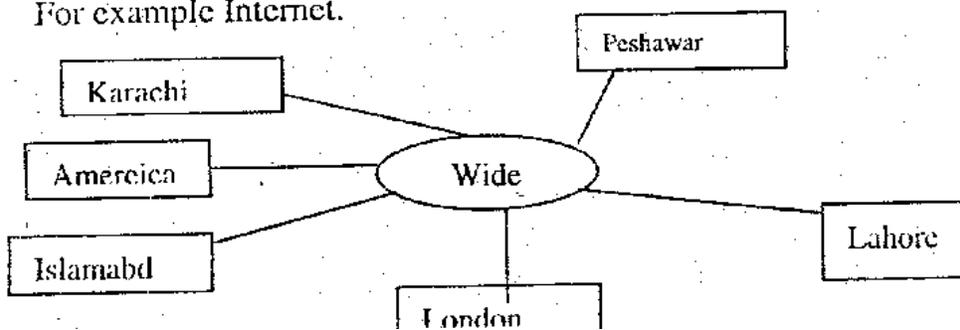
Local-Area-Network (LAN): LAN connects computer and other devices within a limited physical area, such as in office, a building, or a campus. It use direct cable or localized wireless radio or infrared signals to link computer with the small geographic area. LANs use a variety of telecommunications media, such as ordinary telephone wiring, coaxial cable, or even wireless radio systems to interconnect microcomputer workstation and computer peripherals.

LANs allow end users in a work group to communicate electronically; share hardware, software, and data resources.

Metropolitan area Network (MAN): A Telecommunications network covering a large city is called MAN. It uses high-speed fiber optics lines to connect computer located at various places at city. It is greater than LAN such as the networks in different town in cities.

Wide area Network (WAN): Telecommunications networks covering a large geographic area are called remote networks, long-distance networks, or, wide area networks It uses long distance transmission media including telecommunication networks to link computer separated by a few miles or even thousand of miles. WAN are used by manufacturing firms, bank, retailers, distributors, transportation companies, and government agencies to transmit and receive information among their employees, customers, suppliers, and organizations across cities, regions, countries, or the world.

For example Internet.



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DEDICATED SERVER NETWORKS

In many computer networks, there is a clear distinction between server computers and client computers. Each computer on the network acts as either a server or a client. This type of network is called a dedicated server network and each server computer on the network is called a dedicated server. Servers are not used as client computers.

PEER-TO-PEER NETWORKS

Some networks don't distinguish between servers and clients at all. In these networks, every computer is capable of playing the role of client, server or both at the same time. This type of network is called peer-to-peer network, each computer on the network is referred to as peer. In a peer-to-peer network, a peer computer acts as both a server and a client at the same time. So the peer computer on your desktop can share files and printers with other computers and it can simultaneously access other shared resources on the network.

BENEFITS OF NETWORKING

The benefits of networking in organizations include increased productivity, lowered costs, smaller storage requirements and reduced efforts.

(i) Increasing Productivity

Just as standalone PCs can increase user productivity, networks of PCs enhance that productivity even further. Users can share, access, view and modify information anywhere on the network without leaving their desks. Users don't have to carry floppy disks from one place to another, wait to print out information they want to share and become distracted from their normal workflow.

(ii) Saving Money

Sharing expensive devices such as printers, plotters, scanners and large hard disks over a network can save money. The most obvious thing of these savings is the total purchase price. Fewer expensive devices also mean fewer maintenance contracts, service calls and upgrade costs.

Longer distances involved, WANs are sometimes referred to as long haul networks. In theory, the concepts and purposes of WANs are

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identical to those of LANs. In practice WANs typically rely on slower long distance connections sites and use leased lines or even satellite links.

A WAN is often made up of two or more LANs connected together. For example, you might have LAN at each site of your organization and each of those LANs might be connected together to form a WAN.

PURPOSE OF NETWORKS

(i) File sharing:-The most important use of networks is sharing data files. One approach to sharing files involves placing the file in a shared location on one computer and making it available to other computers. Other users who want access to the file can either open the shared copy directly or copy it over the network to their own local hard disks.

(ii) Printer Sharing

High-end printers are relatively expensive devices. As a result, sharing printers became a primary use of networks. To share a printer, you physically connect the printer to a computer acting as a server. Using the NOS, you share the printer over the network; users can then print to your shared printer as easily as if the printer were directly connected to their own local PCs.

(iii) Hard disk sharing

When large hard disks are relatively expensive devices, network users attached them to servers and shared them over the networks. Users could access the contents of one or more hard disks or store and retrieve their own data in a directory on the server's hard disk. A simple hard disk might accommodate many users, each with his own private directory. This approach kept the cost of individual PCs lower and the extra cost of server hardware was spread across many users.

(iv) Saving Disk Space

Sharing software applications can generate savings in several ways. Perhaps the most obvious is in the cost of the software itself. Most networked versions of applications cost less per user than purchasing individual copies for each user. You can also realize savings in your

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total disk space requirements. If nearly everyone in your organization uses a word-processing program, you may not have to consume all that space on every computer. Instead, install the software only once on a server computer and let everyone access that single copy.

(v) Saving Efforts

Another benefit of application sharing involves the time saved during software installation and configuration. If you install the software only once on a server and configure it in a standard way, you will spend much less time than if you had to install it on multiple client computers.

Workgroup computing and groupware

A workgroup is a collection of individuals working on a task. Workgroup computing occurs when all the individuals have computers connected to a network that allows them to send email to one another, share data files and schedule meetings.

Groupware is the software that supports workgroup computing. It provides facilities to collaborate among users on both local area and wide area networks. Groupware includes following types of software. E-mail: After basic printer and file sharing, electronic messaging is the networking product that people encounter and increasingly rely on. Modern email programs do more than simply transmit formatted files, voice, annotations, animations and other attachments.

Email or Groupware application is a database that manages users, file and an internal messaging facilities that lets application components communicate with one another. Groupware applications is used to work smoothly in a collaborative environment, they should all support the same messaging and directory standards.

Scheduling and contact management groupware enable users to share and update group schedules across networks.

Document sharing and document management groupware involve the online creation, sharing, editing, and distribution of documents, from letters to business forms. These programs let you easily see changes made by others and some groupware allows two or more people to work on the same document at the same time.

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Teleconferencing software combines audio, video application sharing and shared electronic chalkboards in collaborative computing.

Basic Network Terminologies

1. Data 2.Data rate 3.Baudrate 4.Peak data rate 5.Bursty Data

1. Data

Raw facts and figures or unorganized form (such as alphabets, numbers, or symbols) that refers to, or represents, conditions, ideas, or objects. Computer's Symbols or signals that are input, stored, and processed by a computer, for output as usable information.

2. Data Rate

The speed at which data is transferred within the computer or between a peripheral device and the computer, measured in bytes per second.

The speed at which audio and video files are encoded (compressed), measured in bits per second (see bit rate).The transmission speed of a network. For example, 100Base-T Ethernet is rated at 100 Mbps (megabits per second). Also called "bit rate."

3. Baud Rate

In telecommunication and electronics, baud is the unit for symbol rate or modulation rate in symbols per second or pulses per second. It is the number of distinct symbol changes (signaling events) made to the transmission medium per second in a digitally modulated signal or a line code. Digital data modem manufacturers commonly define the baud as the modulation rate of data transmission and express it as bits per second. Baud is related to gross bit rate expressed as bits per second.

4. Peak Data rate

Peak data rate is the fastest data transfer rate for a device, typically available in short bursts during transfer activity, and not sustainable for long periods of time.

5. Bursty Data

Burst is a term used in a number of information technology contexts to mean a specific amount of data sent or received in one intermittent operation. It can be contrasted with streamed, paced, or continuous.

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Generally, a burst operation implies that some threshold has been reached that triggers the burst. Depending on the particular technology, a burst operation can be intermittent at a regular or an irregular rate.

WHAT IS TOPOLOGIES? Explain its types.

TOPOLOGIES

The physical layout of a local area network is called topologies. Or the wiring scheme of a local area network is called topologies.

The term topology, or more specifically, network topology, refers to the arrangement or physical

layout of computers, cables, and other components on the network.

The two simplest are point-to-point lines and multi drop lines.

Point-to-point

Point-to-Point lines are used, when each terminal is connected by its own line to a computer system.

Multidrop

Multidrop lines are used, when several terminals share each data communications line to a computer. Point-to-point lines are more expensive than multidrop lines: All of the communications capacity and equipment of a communications line is being used by a single terminal. Therefore, point-to-point are used only if there will be continuous communications between a computer a terminal or other computer system. A multidrop line decreases communication costs, because each line is shared by many terminals. Communications processor such as multiplexers and concentrators help many terminals share the same line.

TYPES OF TOPOLOGIES

There are four types of topology

1.Bus Topology 2.Star Topology 3.Ring Topology 4-Mesh

1-Bus topology

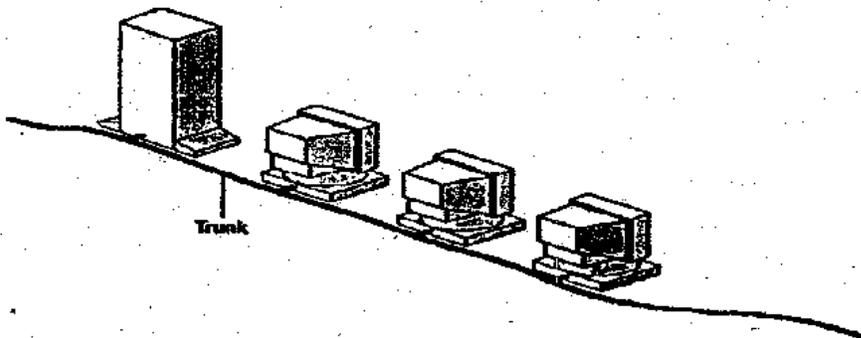
Bus Topology:- A topology that connects each computer, or station, to a single cable. At each end of the cable is a terminator. A transmission is passed back and forth along the cable, past the stations and between the two terminators, carrying a message from one end of the network to the other. As the message passes each station, the station checks the message's destination address. If the address in the message matches the station's address, the station

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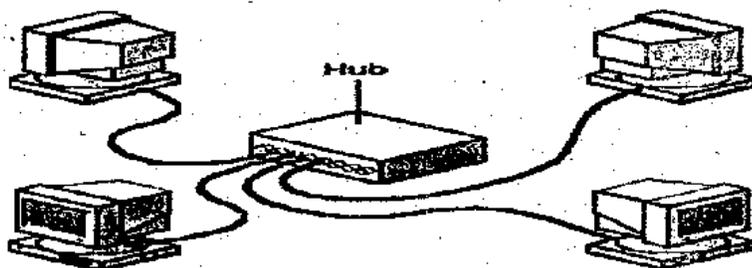
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receives the message. If the addresses do not match, the bus carries the message to the next station, and so on.



2-Star Topology

In the star topology, cable segments from each computer are connected to a centralized component called a *hub*. Figure 1.21 shows four computers and a hub connected in a star topology. Signals are transmitted from the sending computer through the hub to all computers on the network. This topology originated in the early days of computing when computers were connected to a centralized mainframe computer.



3. Ring Topology:

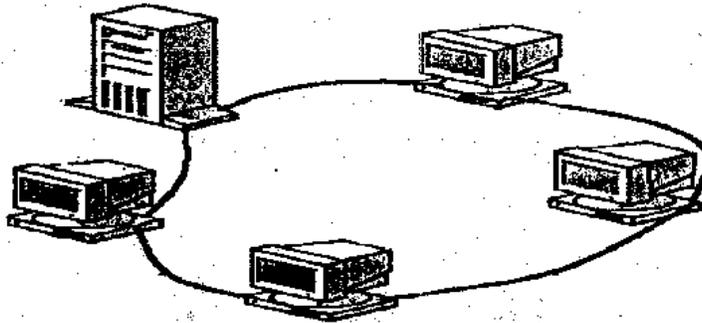
The ring topology connects computers on a single circle of cable. Unlike the bus topology, there are no terminated ends. The signals travel around the loop in one direction and pass through each computer, which can act as a repeater to boost the signal and send it on to the next computer. The failure of one computer can have an impact on the entire network.

Star, ring, and bus networks differ in their performances, reliabilities, and costs. A pure star network is considered less reliable than a ring network, since the other computers in the star are heavily dependent on the central host computer. If it fails, there is no backup processing.

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and communications capability, and the local computers will be cut off from the corporate headquarters and from each other. Therefore, it is essential that the host computer be highly reliable. Having some type of

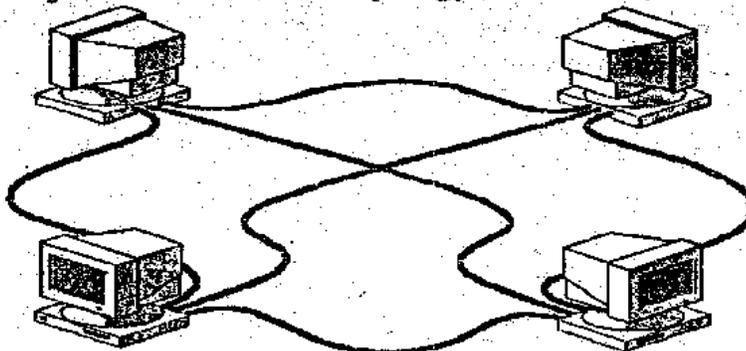


multiprocessor *architecture* to provide a *fault tolerant* capability is a common solution.

Star network variations are common because they can support the chain of *command* and hierarchical structures of most organizations. Ring and bus network are most common in local area networks. Ring networks are considered more reliable and less costly for the type of communications in such networks. If one computer in the ring goes down, the other computers can continue to process their own work as well as to communicate with each other.

4-MESH (Multi point)

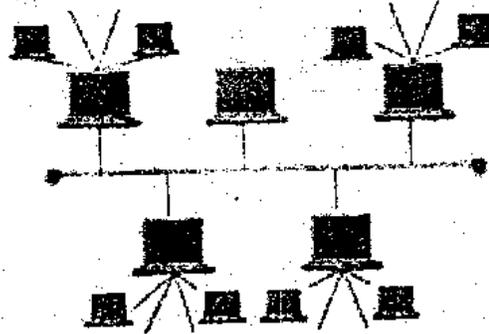
In a mesh topology, each computer is connected to every other computer by separate cabling. This configuration provides redundant paths throughout the network so that if one cable fails, another will take over the traffic. While ease of troubleshooting and increased reliability are definite pluses, these networks are expensive to install because they use a lot of cabling. Often, a mesh topology will be used in conjunction with other topology to form a hybrid topology



5. Hybrid topology

Hybrid networks use a combination of any two or more topologies in such a way that the resulting network does not exhibit one of the standard topologies (e.g., bus, star, ring, etc.).

A hybrid topology is always produced when two different basic network topologies are connected. Two common examples for Hybrid network are: star ring network and star bus network.

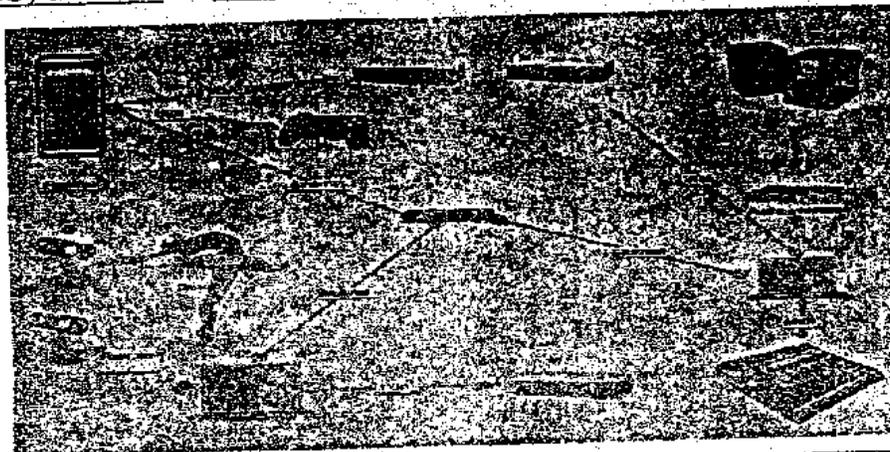


Networking Devices (Internetwork Processor)

1-Node 2-NIC 3-Modem 4-Access point 5-Hub (active Hub, Passive Hub) 6-Bridge 7-Switch 8-Router

1- NODE

A node is any devices connected to a computer network. A node can be a computer or some other device, such as a printer. Every node has a unique network address, sometimes called a Data Link Control (DLC) address or Media Access Control (MAC) address.



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2-NIC (Network Interface Card)

Network Interface Card (NIC)

To connect to a LAN, a computer must be available with special hardware and software. In hardware category, a computer needs a network interface card (NIC) to work with a LAN. Some NICs are designed to work with a specific type of LAN cabling and protocol, but others work with more than one type.

3-Modems

Modem is an electronic device that performs a modulation-demodulation process that converts digital signals to analog and back. Modem is the most common type of communications processor. They convert the digital signal from a computer or transmission terminal at one end of a communications link into analog frequencies, which can be transmitted over ordinary telephone lines. A modem at the other end of the communications line converts the transmitted data back into digital form at a receiving terminal. This process is known modulation and demodulation and the word modem is a combined abbreviation of these two words.

A modem is a device that makes it possible for computers to communicate over a telephone line.

Digital Pulse Modem



Analog
over
Channels



Frequencies
Communications

Three types of modems are generally used for preparing data for transmission over telephone lines.

- 1- External Direct connect modems
2. Internal Direct connect modems
- 3- Acoustic coupler modems

1- External Direct connect modems:- are housed in separate external cabinets

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2- Internal Direct connect modems are placed on circuit boards and plugged into expansion slots inside a PC. Since internal modems draw their power from the PC and need fewer cables, it's a less expensive and neater alternative. Both types of modems are equipped with microprocessors, storage chips and specialized communications perform dial in, answering and disconnecting functions.

3- Acoustic coupler modem differs from the above two types of direct connect modes in that it is used with a standard telephone receiver. The receiver of the telephone is placed on two cups built into the mode; the digital pulses produced by the terminal are converted into audible tones that are picked up by the handset receiver. The signals modem converts them back to digital pulses.

4-ACCESS POINT

An access point is a device, such as a wireless router, that allows wireless devices to connect to a network. Most access points have built-in routers, while others must be connected to a router in order to provide network access. In either case, access points are typically hardwired to other devices, such as network switches or broadband modems.

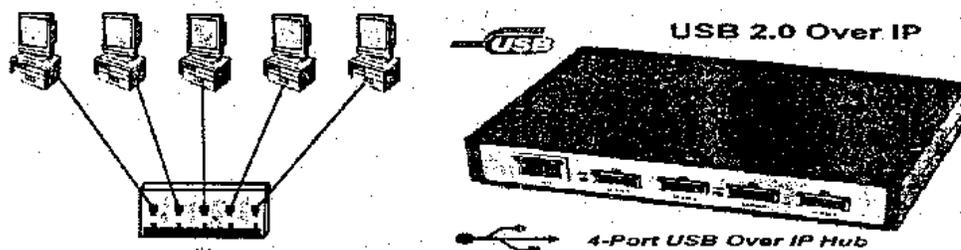
Access points can be found in many places, including houses, businesses, and public locations. In most houses, the access point is a wireless router, which is connected to a DSL or cable modem. However, some modems may include wireless capabilities, making the modem itself the access point. Large businesses often provide several access points, which allows employees to wirelessly connect to a central network from a wide range of locations. Public access points can be found in stores, coffee shops, restaurants, libraries, and other locations. Some cities provide public access points in the form of wireless transmitters that are connected to streetlights, signs, and other public objects.

5- HUB

A common connection point for devices in a network. Hubs are commonly used to connect segments of a LAN. A hub contains multiple ports. When a packet arrives at one port, it is copied to the other ports so that all segments of the LAN can see all packets.

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What Hubs Do

Hubs and switches serve as a central connection for all of your network equipment and handle a data type known as frames. Frames carry your

data. When a frame is received, it is amplified and then transmitted on to the port of the destination PC.

In a hub, a frame is passed along or "broadcast" to every one of its ports. It doesn't matter that the frame is only destined for one port. The hub has no way of distinguishing which port a frame should be sent to. Passing it along to every port ensures that it will reach its intended destination. This places a lot of traffic on the network and can lead to poor network response times.

Passive HUB

A *passive hub* serves simply as a conduit for the data, enabling it to go from one device (or segment) to another.

Active (Intelligent) HUB

So-called *intelligent hubs* include additional features that enables an administrator to monitor the traffic passing through the hub and to configure each port in the hub. Intelligent hubs are also called *manageable hubs*.

A third type of hub, called a *switching hub*, actually reads the destination address of each packet and then forwards the packet to the correct port.

6- BRIDGE:- A device used to connect the same type network. Bridge can be used to increase the length or number of nodes for a network. The Bridge makes connections at the data-link layer of the OSI reference model.

Bridges connect network segments. The use of a bridge increases the maximum size of your network. Unlike a repeater, which simply

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passes on all the signals it receives, a bridge selectively determines the appropriate segment to which it should pass a signal. It does this by reading the address of all the signals it receives. The bridge reads the physical location of the source and destination computers from this address.

This process acts like this

A bridge receives all the signals from both segment A and segment B.

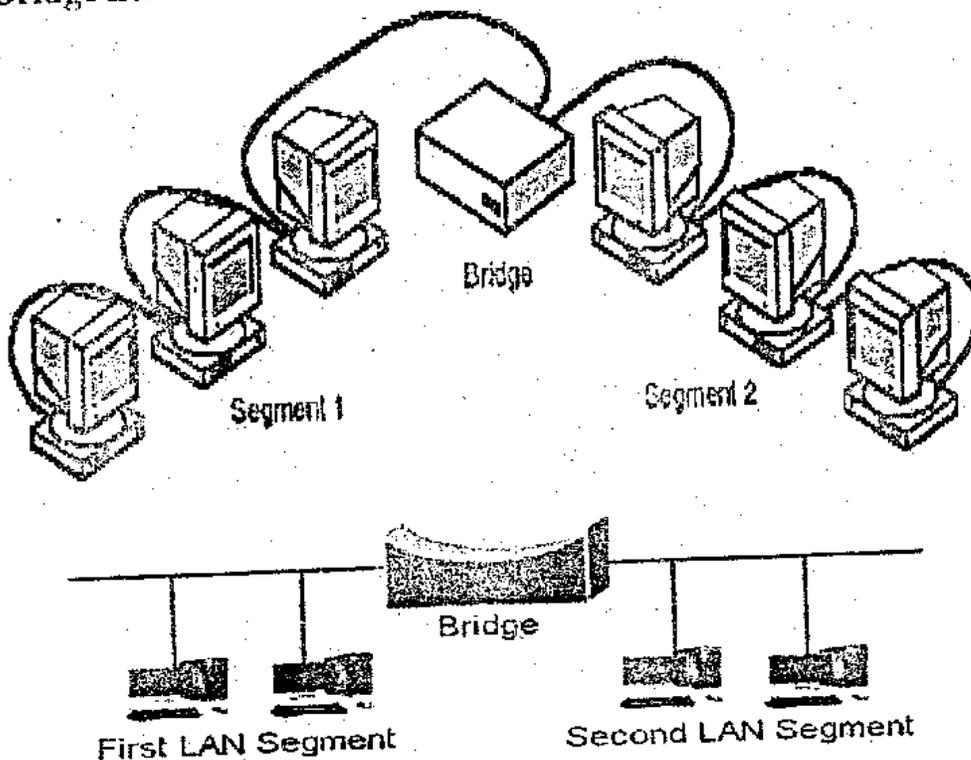
The bridge reads the addresses and discards(filters) all signals from segment A that are addressed to segment A, because they do not need to cross the bridge.

Signals from segment A addressed to a computer on segment B are retransmitted to segment B.

The signals from segment B are treated in the same way.

Note: Bridges operate at the Data Link layer of the OSI model.

Bridge network. A network that is connected by Bridge



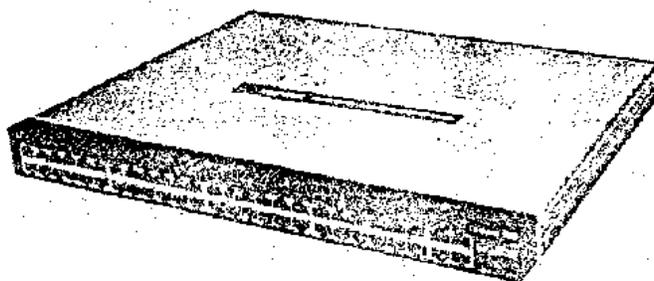
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7- SWITCH

A **network switch** is a computer networking device that connects devices together on a computer network, by using a form of packet switching to forward data to the destination device. A network switch is considered more advanced than a (repeater) hub because a switch will only forward a message to one or multiple devices that need to receive it, rather than broadcasting the same message out of each of its ports

A network switch (also called **switching hub**, **bridging hub**, officially **MAC bridge**) is a multi-port network bridge that processes and forwards data at the data link layer (layer 2) of the OSI model. Switches can also incorporate routing in addition to bridging; these switches are commonly known as *layer-3* or multilayer switches.^[3] Switches exist for various types of networks including Fibre Channel, Asynchronous Transfer Mode, InfiniBand, Ethernet and others. The first Ethernet switch was introduced by Kalpana in 1990.



8-ROUTER:-

A device used to connect networks of different types, such as those using different architectures and protocols. Router is a special computer that directs communicating messages when several networks are connected together. Router work at the network layer of the OSI reference model. This means they can switch and route packets across multiple networks which they do by exchanging protocol-specific information between separate networks. Router determines the best path for sending data and filter broadcast traffic to the local segment.

They consist of a combination of hardware and software. The hardware can be a network server, a separate computer, or a special

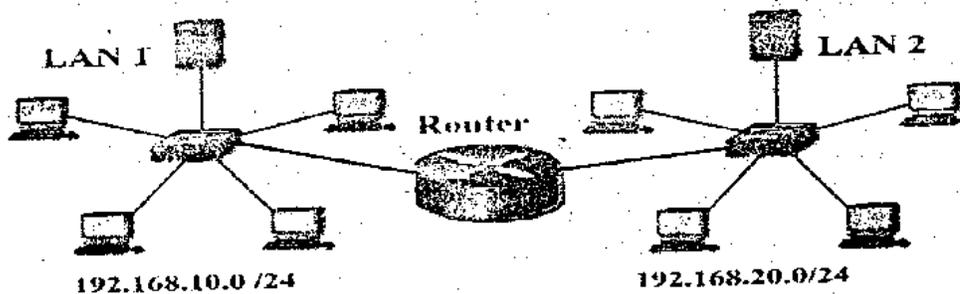
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black box device. The two main pieces of software in a router are the operating system and the routing protocol. Management software can be another software component of a router.

Routers use logical and physical addressing to connect two or more logically separate networks. The network address allows routers to more accurately and efficiently calculate the optimal path to a workstation or computer. Routers perform a function similar to that of a bridge, but routers keep the network separate.

Because they must check both the device address and the network address, router processing is generally slower than the bridge processing. However, routers are more "intelligent" than the bridges because they use algorithms to determine the best path to send a packet to a network.



Transmission media/Telecommunications Media/Channel.
Discuss its different types.

Transmission media/Telcommunications Media/channels (also called communications lines or links) is the path that connects sender and receiver to transfer data between sending and receiving devices in a telecommunications network.

There are different types of telecommunication media/channel, which are the following.

BOUNDED/GUIDED MEDIA

1) TWISTED PAIR WIRING

Twisted pair wire consists of two strands of insulated copper wire, twisted around each other in pair. They are then covered by another layer of plastic insulation. Twisted pair cabling is the same type of

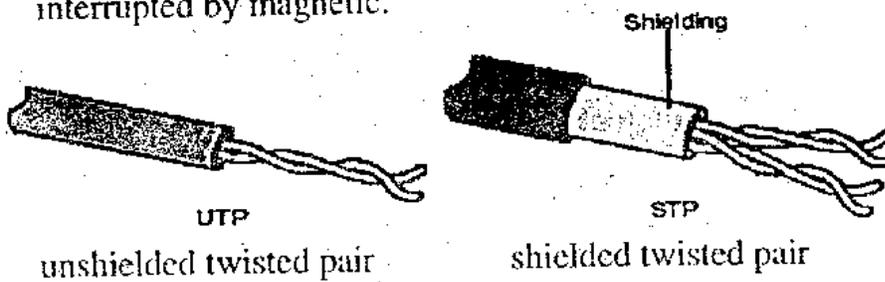
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cabling system used for home and office telephone system and local area networking.

Advantage:- It is inexpensive and easy to install.

Disadvantage:- It create noise and its transmission is easily interrupted by magnetic.



Unshielded twisted pair (UTP)

UTP short for unshielded twisted pair, a popular type of cable that consists of two unshielded wires twisted around each other. Due to its low cost, UTP cabling is used extensively for local-area networks (LANs) and telephone connections. UTP cabling does not offer as high bandwidth or as good protection from interference as coaxial or fiber optic cables, but it is less expensive and easier to work with.

Categories of Unshielded Twisted Pair

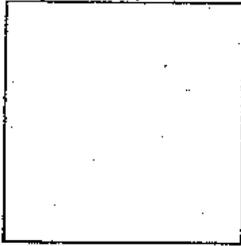
Type	Use
Category 1	Voice Only (Telephone Wire)
Category 2	Data to 4 Mbps (LocalTalk)
Category 3	Data to 10 Mbps (Ethernet)
Category 4	Data to 20 Mbps (16 Mbps Token Ring)
Category 5	Data to 100 Mbps (Fast Ethernet)

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Shielded Twisted Pair (STP)

Often abbreviated STP, a type of copper telephone wiring in which each of the two copper wires that are twisted together are coated with an insulating coating that functions as a ground for the wires. The extra covering in shielded twisted pair wiring protects the transmission line from electromagnetic interference leaking into or out of the cable. STP cabling often is used in Ethernet networks, especially fast data rate Ethernets.



Advantages.

- It is a thin, flexible cable that is easy to string between walls
- More lines can be run through the same wiring ducts.
- Electrical noise going into or coming from the cable can be prevented.

Disadvantages.

- Twisted pair's susceptibility to electromagnetic interference greatly depends on the pair twisting schemes (usually patented by the manufacturers) staying intact during the installation. As a result, twisted pair cables usually have stringent requirements for maximum pulling tension as well as minimum bend radius.
- In video applications that send information across multiple parallel signal wires, twisted pair cabling can introduce signaling delays known as skew which cause subtle color defects and ghosting due to the image components not aligning correctly when recombined in the display device.

2) COAXIAL CABLE

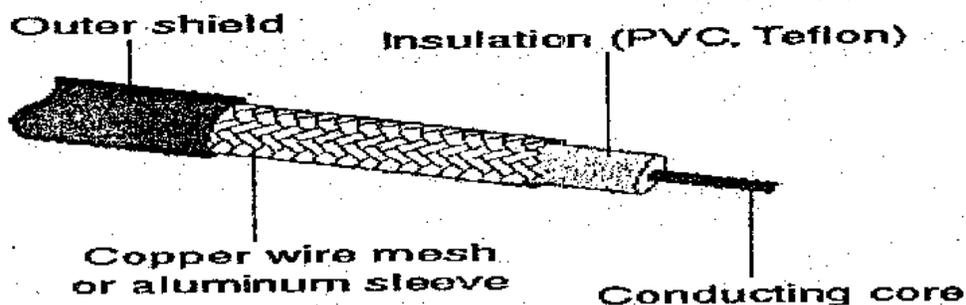
Coaxial cable consists of insulated copper or aluminum wire covered by insulating material. The insulated copper wire is covered by copper mesh. It is widely used for cable television and local area network.

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Advantage:- The extra insulation makes coaxial cable much better resisting noise than twisted pair wiring. These can transmit data much faster than twisted pairs.

Disadvantage:- It is expensive than twisted pair.



10Base2

An Ethernet term meaning a maximum transfer rate of 10 Megabits per second that uses baseband signaling, with a contiguous cable segment length of 100 meters and a maximum of 2 segments.

10Base5

An Ethernet term meaning a maximum transfer rate of 10 Megabits per second that uses baseband signaling, with 5 continuous segments not exceeding 100 meters per segment.

10BaseT

An Ethernet term meaning a maximum transfer rate of 10 Megabits per second that uses baseband signaling and twisted pair cabling.

Advantages

- Sufficient frequency range to support multiple channel, which allows for much greater throughput.
- Lower error rates. because the inner conductor is in a Faraday shield, noise immunity is improved, and coax has a lower error rates and therefore slightly better performance than twisted pair.
- Greater spacing between amplifiers coax's cable shielding reduces noise and crosstalk, which means amplifiers can be spaced farther apart than with twisted pair.

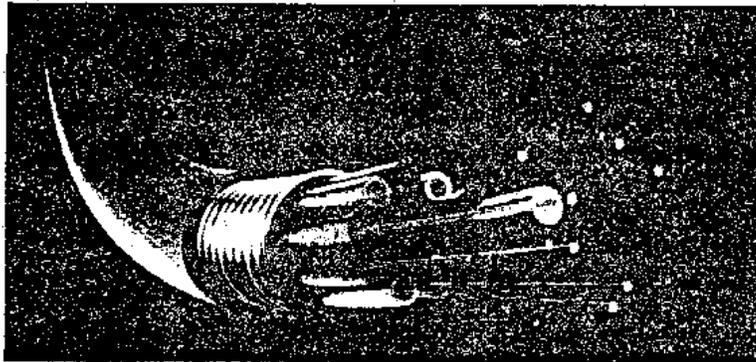
Disadvantages

- More expensive to install compare to twisted pair cable.
- The thicker the cable, the more difficult to work with.

3) FIBER OPTIC CABLE

A fiber-optic cable consists of hundreds or thousands of thin strands of glass that transmit pulsating beams of light instead of electricity. It is thinner than a human hair. Data transfer rate of fiber optics is very fast. There is no chance of data loss. Light pulse is not affected by random electromagnetic interference in the environment. They have much lower error rates than normal telephone twisted pair or coaxial cable.

It is latest technology according to a research if half population of the world is on one side of a single fiber optics cable and the other half on the other side of the same fiber optics cable, then they can communicate with each other if proper multiplexing technique are used.



Advantages

- System performance
- Greatly increased bandwidth and capacity
- Lower signal attenuation (loss)
- Immunity to electrical noise
- Immune to noise (electromagnetic interference and radio Frequency interference)
- Less restrictive in harsh environments
- Overall system economy

Disadvantages

- Fiber optic component are expensive
- Fiber optic transmitters and receivers are still relatively expensive compared to electrical interfaces

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- The lack of standardization in the industry has also limited the acceptance of fiber optics.

UNBOUNDED/UNGUIDED MEDIA OR WIRELESS MEDIA

4-Terrestrial Microwave or Microwave

Microwaves are radio waves that are used to provide high-speed transmission. Microwave system transmit high-speed radio signals in a line-of-sight path between relay stations placed approximately 30 miles apart each other. Microwave antennas are usually placed on top of building, towers, hills, and mountain peaks. They are still a popular medium, for both long-distance and metropolitan area networks. There is no cable involve.

5-Communications Satellites

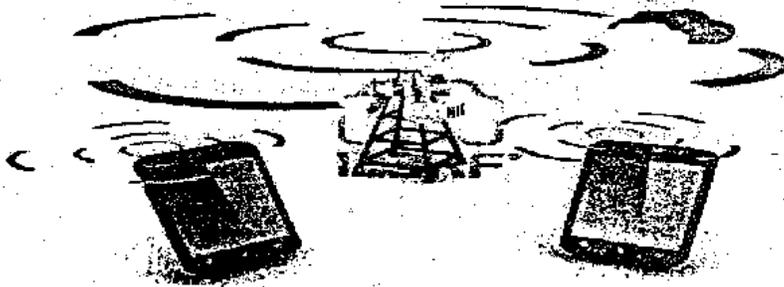
Communication satellite is a space station. It receive microwave signal from earth station. It amplifies the signal and retransmits them back to earth. Communication satellite is established in space about 23,300 miles above earth. The data transfer speed of communication satellite is very high. The transmission from earth station to satellite is called uplink. The transmission from satellite to earth station is called downlink. There is no insight path problem.

6-Cellular radio

Cellular Radio is the use of Technology using low powered radio transmission for transmission and receiving voice or data to a telephone network. Users can be stationary or mobile. It means users are no longer constrained to place to place as it is a "wireless" system.

Cellular radio has become an important communications medium for mobile voice and data communications. The integration of cellular and other mobile radio technology is expected to accelerate in the next few years.

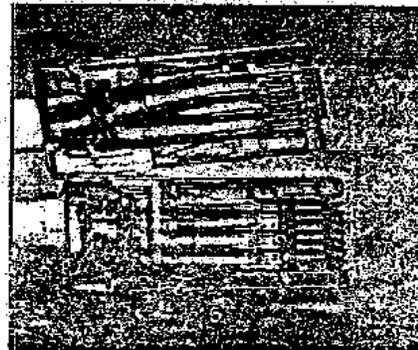
Personal Communications Service (PCS) is set of technologies used for digital cellular devices. Handheld computer, cellular telephones, and fax machine use PCS.



Types of Connector

RJ-45

RJ-45 connectors are normally used in network cables. Occasionally they are used for serial network connections. When the RJ-45 connectors first came into use, they were primarily used for telephones. The great advances in technology created a need for another size connector and the RJ-45 was adapted to fit. Today there are 2 different RJ-45 connector sizes available, 1 for Cat 5 cable and 1 for Cat 6 cable. The user has to make sure they have the one suited to their job. The easiest way to tell them apart is to compare them side by side. The Cat 6 connector is larger than the Cat 5 connector. Below are instructions for crimping RJ-45 connectors to a cable.



RJ-11

More commonly known as a modem port, phone connector, phone jack or phone line, the RJ-11 is short for Registered Jack-11 and is a four or six wire connection primarily used for telephones and computer modem connectors.

RJ-11 cable and connection



BNC

The BNC (Bayonet Neill-Concelman) connector is a miniature quick connect/disconnect radio frequency connector used for coaxial cable. It features two bayonet



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lugs on the female connector; mating is fully achieved with a quarter turn of the coupling nut. BNC connectors are used with miniature-to-subminiature coaxial cable in radio, television, and other radio-frequency electronic equipment, test instruments, and video signals. The BNC was commonly used with 10BASE2 computer networks. BNC connectors are made to match the characteristic impedance of cable at either 50 ohms or 75 ohms. They are usually applied for frequencies below 4 GHz and voltages below 500 volts.

The OSI MODEL

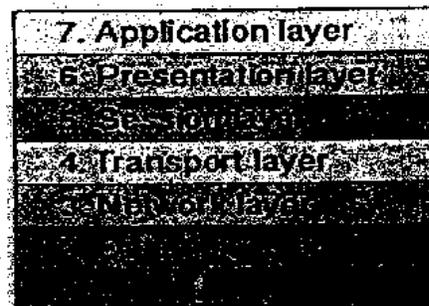
The international organization for standardization (ISO) began developing open system interconnection (OSI) reference model in 1977. It has since become the most widely excepted model for understanding network communication.

The OSI model is nothing tangible; it is simply a conceptual framework you can use to better understand the complex interactions taking place among the various devices on a network. The OSI model doesn't perform any function in the communication process.

The actual work is done by the appropriate software and hardware. The OSI model simply defines which tasks need to be done and which protocols will handle those tasks at each of the seven layers of the OSI model.

Layers of OSI model

OSI model consist of seven layers
1 Physical 2.Data link 3.Network
4.Transport 5.Session
6. Presentation 7. Application



1- Physical Layer:

The physical layer is simply responsible for sending bits from one computer to another. The physical layer is not concerned with the meaning of the bits; instead it deals with the physical connection to the network and with transmission and reception of signals.

This level defines physical and electrical details, such as what will represent a 1 or a 0, how many pins a network connector will have,

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how data will be synchronized, and when the network adapter may or may not transmit the data.

Note: - Passive hubs, simple active hubs, terminators, couplers, cables and cabling connectors repeaters, multiplexers, transmitters, receivers, and transceivers are devices associated with the physical layer.

2. Data Link Layer: -

The data link layer is responsible for the flow of data over a single link from one device to another. It accepts packets from the network layer and packages the information into data units called frames to be presented to the physical layer for transmission. The data link layer adds control information, such as frame type, routing, and segmentation information, to the data being sent.

This layer provides error-free transfer of frames from one computer to another. A Cyclic Redundancy Check (CRC) added to the data frame can detect damaged frames, and the data link layer in the receiving computer can request that the information be present. The data link layer can also detect when frames are lost and request that those frames be sent again.

Note: - The Bridges are working at this level of the OSI model.

3. Network Layer: -

The network layer makes routing decisions and forwards packets for devices that are farther away than a single link. In larger networks there may be intermediate systems between any two end systems, and the network layer makes it possible for the transport layer and layers above it to send packets without being concerned about whether the end system is immediately adjacent or not.

The network layer translates logical network addresses into physical machine addresses. This layer also determines the quality of services and the route a message will take if there is several ways a message can get to its destination.

The network layer also may break large packets into smaller chunks if the packets are larger than the largest data frame the data link layer will accept. The network reassembles the chunks into packets at the receiving end.

Note: - The Routers work at the network layer of OSI model.

4-Transport Layer: -

The transport layer ensures that packets are delivered error free, in sequence and with no losses or duplications. The transport layer breaks large messages from the session layer into packets to be sent to the destination computer and reassembles packets into messages to be presented to the session layer.

The transport layer typically sends an acknowledgment to the originator for messages received.

5. Session Layer: -

The session layer allows applications on separate computers to share a connection called a session. This layer provides services such as name lookup and security to allow two programs to find each other and establish the communications link. The session layer also provides for data synchronization and check pointing so that in the event of a network failure, only the data sent after the point of failure need be re-sent.

This layer also controls the dialog between two processes, determining who can transmit and who can receive at what point during the communication.

6. Presentation Layer: -

The presentation layer translates data between the formats the network requires and the formats the computer expects. The presentation layer does protocol conversion, data translation, compression and encryption, character set conversion, and the interpretation of graphics commands.

The network redirector operates at this level. The network redirector is what makes the files on a file server visible to the client computer. The network redirector also makes remote printers act as though they are attached to the local computer. The network redirector is an important part of networking.

7. Application Layer: -

The application layer is the topmost layer of the OSI model, and it provides services that directly support user applications, such as database access, e-mail, and file transfers. It also allows applications to communicate with applications on other computers as though they were on the same computer. When a programmer writes an

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application program that uses network services, this is the layer the application program will access.

IP Addresses

An **Internet Protocol address (IP address)** is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network that uses the Internet Protocol for communication. An IP address serves two principal functions: host or network interface identification and location addressing. Its role has been characterized as follows: "A name indicates what we seek. An address indicates where it is. A route indicates how to get there. The designers of the Internet Protocol defined an IP address as a 32-bit number and this system, known as Internet Protocol Version 4 (IPv4), is still in use today. However, due to the enormous growth of the Internet and the predicted depletion of available addresses, a new version of IP (IPv6), using 128 bits for the address, was developed in 1995. IPv6 was standardized as RFC 2460 in 1998 and its deployment has been ongoing since the mid-2000s. IP addresses are binary numbers, but they are usually stored in text files and displayed in human-readable notations, such as 172.16.254.1 (for IPv4), and 2001:db8:0:1234:0:567:8:1 (for IPv6).

Ipv4

Class A, Class B, Class C, Class D, and Class E

The Internet community has defined IP address classes: A, B, C, D, and E. To accommodate varying network sizes, each address class handles network addressing for a network of a unique size. The class defines the possible number of networks and the number of hosts for each network. Each class also defines which bits of the IP address are used for the network identifier and which bits are used for the host identifier. The following illustration shows the IP address settings for the five IP address classes.

In the early days of the Internet, the IANA (Internet Assigned Numbers Authority) defined five classes of public IP addresses as shown below.

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Ipv4 Classes	Address Theoretical Address Range	Theoretical Address Range	Binary Start	Used for
Class A	0.0.0.0 to 127.255.255.255	0 to 127	0	Very large networks
Class B	128.0.0.0 to 191.255.255.255	128 to 191	10	Medium networks
Class C	192.0.0.0 to 223.255.255.255	192 to 223	110	Small networks
Class D	224.0.0.0 to 239.255.255.255	224 to 239	1110	Multicast
Class E	240.0.0.0 to 247.255.255.255	240 to 247	1111	Experimental

Class A (used for very large network)

Assigned to networks with a large number of hosts. The high-order bit in a class A address is always set to 0. The next seven bits, completing the first octet, complete the network identifier. The remaining 24 bits — the last three octets — represent the host identifier. This accommodates 126 networks, 128 minus two reserved addresses, and over 16 million hosts for each network.

Class B (used for medium network)

Assigned to networks with a medium to large number of hosts. The two high-order bits in a class B address are always set to 10. The next 14 bits — completing the first two octets — complete the network identifier. The remaining 16 bits — the last two octets —

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represent the host identifier. This accommodates 16,384 networks and more than 65,000 hosts for each network.

Class C (used for small network)

Assigned to networks with a small number of hosts, specifically, local area networks (LANs). The three high-order bits in a class C address are always set to 110. The next 21 bits — completing the first three octets — complete the network identifier. The remaining 8 bits — the last octet — represent the host identifier. This accommodates more than 2 million networks and 254 hosts for each network.

Class D (used for Multicast)

Used for multicasting to a number of hosts. Packets are passed to a selected subset of hosts on a network. Only those hosts registered for the multicast address accept the packet. The four high-order bits in a class D address are always set to 1110. The remaining bits are for the address that registered hosts will recognize. Windows Embedded CE supports class D addresses for applications to multicast data to hosts.

Class E (used for Experimental)

Reserved for future use. An experimental address. High-order bits in a class E address are set to 1111.

Ipv6 Address

Internet Protocol version 6 (IPv6) is the latest version of the Internet Protocol (IP), the communications protocol that provides an identification and location system for computers on networks and routes traffic across the Internet. IPv6 was developed by the Internet Engineering Task Force (IETF) to deal with the long-anticipated problem of IPv4 address exhaustion.

IPv6 is intended to replace IPv4, which still carries more than 94% of Internet traffic worldwide as of December 2014. As of December 2014, the percentage of users reaching Google services with IPv6 surpassed 5% for the first time.

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Every device on the Internet is assigned an IP address for identification and location definition. With the rapid growth of the Internet after commercialization in the 1990s, it became evident that far more addresses than the IPv4 address space has available were necessary to connect new devices in the future. By 1998, the Internet Engineering Task Force (IETF) had formalized the successor protocol. IPv6 uses a 128-bit address, allowing 2^{128} , or approximately 3.4×10^{38} addresses, or more than 7.9×10^{28} times as many as IPv4, which uses 32-bit addresses and provides approximately 4.3 billion addresses. The two protocols are not designed to be interoperable, complicating the transition to IPv6. However, several IPv6 transition mechanisms have been devised to permit communication between IPv4 and IPv6 hosts.

IPv6 provides other technical benefits in addition to a larger addressing space. In particular, it permits hierarchical address allocation methods that facilitate route aggregation across the Internet, and thus limit the expansion of routing tables. The use of multicast addressing is expanded and simplified, and provides additional optimization for the delivery of services. Device mobility, security, and configuration aspects have been considered in the design of the protocol.

IPv6 addresses are represented as eight groups of four hexadecimal digits separated by colons, for example 2001:0db8:85a3:0042:1000:8a2e:0370:7334, but methods of abbreviation of this full notation exist.

SUBNET

subnetwork, or **subnet**, is a logical, visible subdivision of an IP network.^[1] The practice of dividing a network into two or more networks is called **subnetting**.

Computers that belong to a subnet are addressed with a common, identical, most-significant bit-group in their IP address. This results in the logical division of an IP address into two fields, a network or routing prefix and the rest field or host identifier. The rest field is an identifier for a specific host or network interface.

The routing prefix is expressed in CIDR notation. It is written as the first address of a network, followed by a slash character (/), and ending with the bit-length of the prefix. For example, 192.168.1.0/24 is the prefix of the Internet Protocol Version 4 network starting at the given address, having 24 bits allocated for the network prefix, and the remaining 8 bits reserved for host addressing. The IPv6 address specification 2001:db8::/32 is a large address block with 2^{96} addresses, having a 32-bit routing prefix. For IPv4, a network is also characterized by its **subnet mask**, which is the bitmap that when applied by a bitwise AND operation to any IP address in the network, yields the routing prefix. Subnet masks are also expressed in dot-decimal notation like an address. For example, 255.255.255.0 is the network mask for the 192.168.1.0/24 prefix.

Traffic is exchanged (*routed*) between subnetworks with special gateways (routers) when the routing prefixes of the source address and the destination address differ. A router constitutes the logical or physical boundary between the subnets.

The benefits of subnetting an existing network vary with each deployment scenario. In the address allocation architecture of the Internet using Classless Inter-Domain Routing (CIDR) and in large organizations, it is necessary to allocate address space efficiently. It may also enhance routing efficiency, or have advantages in network management when subnetworks are administratively controlled by different entities in a larger organization. Subnets may be arranged logically in a hierarchical architecture, partitioning an organization's network address space into a tree-like routing structure

ROUTED PROTOCOLS AND ROUTING PROTOCOL

Routed Protocols

A Routed Protocol is a network protocol which can be used to send the user data from one network to another network. Routed Protocol carries user traffic such as e-mails, file transfers, web traffic etc.

Routed protocols use an addressing system (example **IP Address**) which can address a particular network and a host (a computer, server, network printer etc) inside that network. In other words, the address which is used by a Routed Protocol (Example **IP (Internet Protocol)**) has a network address part and a host (a computer inside a network) part.

IP (Internet Protocol) is the most widely used Routed Protocol. Internet is using IP (IPv4 or IPv6) as its Routed Protocol. Other Routed protocols are vanishing from network industry.

A Routed Protocol is an integral part of network protocol suit and it is available in every device which is participating in network communication (Example, Routers, Switches, Computers etc).

Routing Protocol

A Routing Protocol learns routes (path) for a Routed Protocol and **IP (Internet Protocol)**, **IPX (Internetwork Packet Exchange)** and **Appletalk** are the examples of Routed Protocols.

Routing Protocols are network protocols used to dynamically advertise and learn the networks connected, and to learn the routes (network paths) which are available. Routing protocols running in different routers exchange updates between each other and most efficient routes to a destination. Routing Protocols have capacity to learn about a network when a new network is added and detect when a network is unavailable.

Routing Protocols normally run only in Routers, Layer 3 Swithes, End devices (firewalls) or Network Servers with

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Network Operating Systems. Routing Protocols are not available in a normal computer or a printer.

Examples of Routing Protocols are RIP (Routing Information Protocol) EIGRP (Enhanced Interior Gateway Routing Protocol) and OSPF (Open Shortest Path First).

Difference Between routed and routing Protocol.

A routed protocol is a protocol by which data can be routed. Examples of a routed protocol are IP, IPX, and AppleTalk. Required in such a protocol is an addressing scheme. Based on the addressing scheme, you will be able to identify the network to which a host belongs, in addition to identifying that host on that network. All hosts on an internetwork (routers, servers, and workstations) can utilize the services of a routed protocol.

A routing protocol, on the other hand, is only used between routers. Its purpose is to help routers building and maintain routing tables. The only two routed protocols you should worry about are IP and IPX.