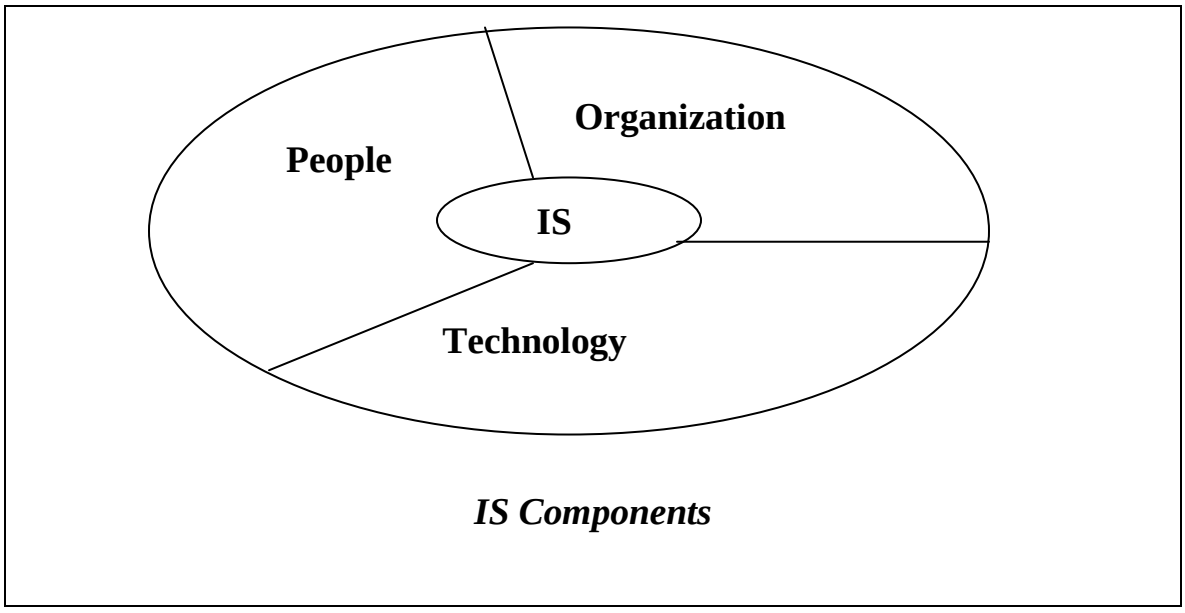
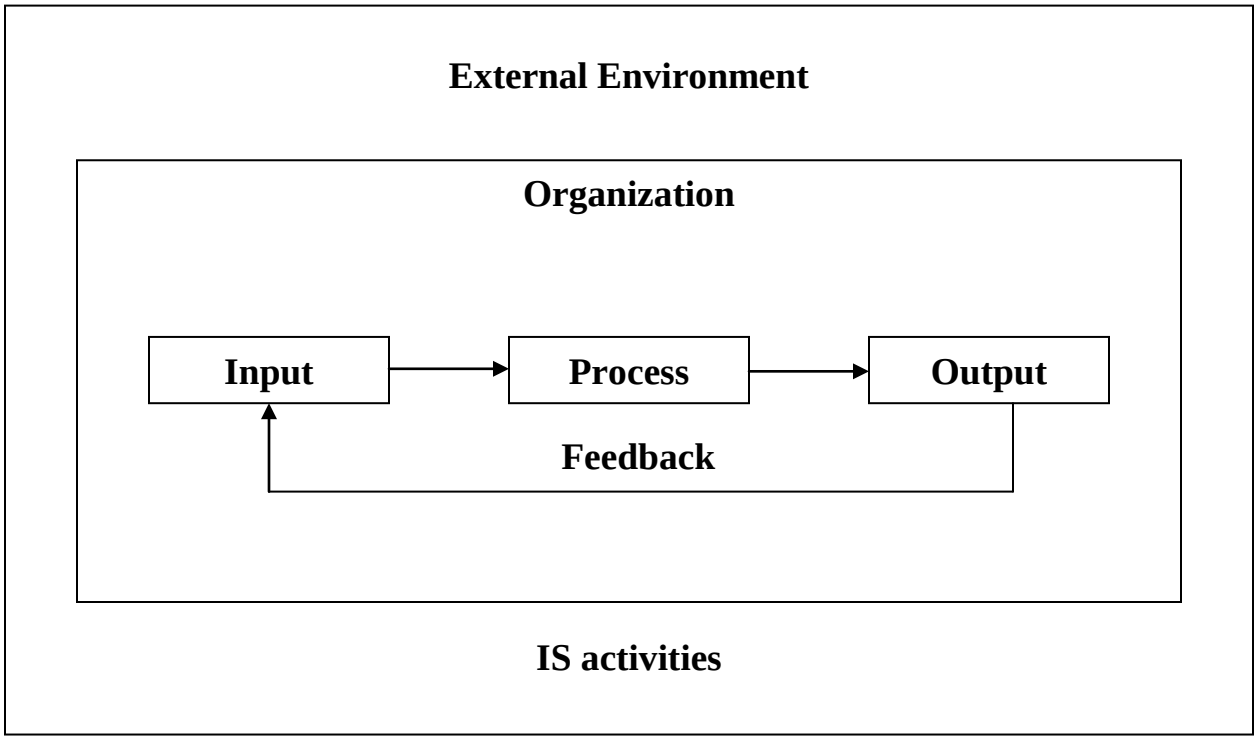
Information systems Definition

I.S is a set of interrelated components work together to collect, retrieve, process, store and disseminate information for the purpose of facilitating planning , control , analysis ,coordination and decision making in business and other organizations .



IS Components



IS activities

Overview of information systems

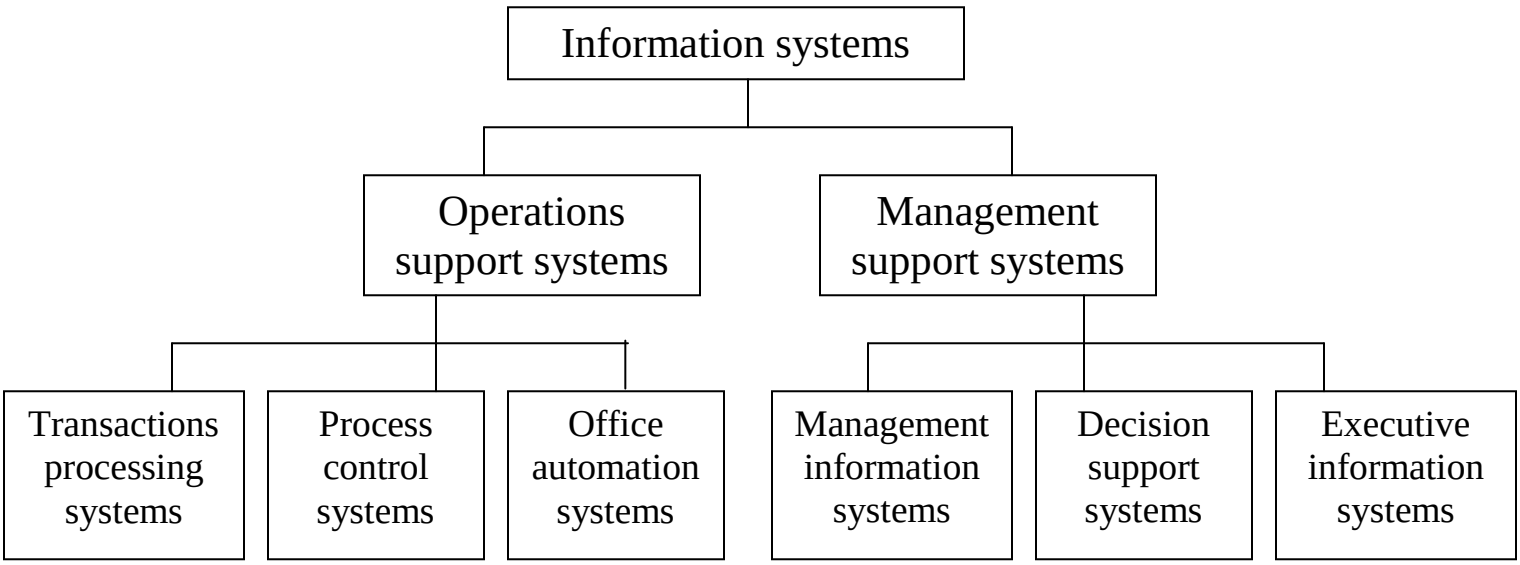
There are many types of information systems in the real world. All of them use hardware, software, network, and people resources to transform data resource into information products. Some are

1) **Manual information systems**, where people use simple tools such as pencils and paper, or even machines such as calculators and typewriters.

2) **Computer-based information systems** that rely on a variety of computer systems to accomplish their information processing activities.

Types of information systems

Conceptually, information systems in the real world can be classified several different ways. For example, several types of information systems can be classified as either ***operations or management*** information systems. Figure bellow illustrates this conceptual classification of information systems.



Operation and management classification of Information systems

1) Operations support systems

Information systems have always been needed to process data generated by and used in business operations. Such operations support systems produce a variety of information product for internal and external use. However they do not emphasize producing the specific information product that can best used by manager. Further processing by management information systems is usually required. The role of a business firm's operations support systems is to efficiently process business transactions,

control industrial process, support office communications and productivity, and update corporate databases.

a) Transactions processing systems are an important example of operations support systems that record and process data resulting from business transactions. They process transactions in two ways:-

1) **Batch processing**, transactions data is accumulated over a period of time and processed periodically.
2) **Real-time (or online)** processing, data is processed immediately after a transaction occurs.

b) Process control systems monitor and control physical process. For example, a petroleum refinery uses electronic sensors linked to computers to continually monitor chemical processes and make instant (real-time) adjustments that control the refinery process.

c) Office automation systems enhance office communications and productivity. For example, a corporation may use word processing for office correspondence, and electronic mail to send and receive electronic messages.

2) Management support systems

When information systems focus on providing information and support for effective decision making by managers, they called management support systems .Providing information and support for decision making by all levels of management (from top executives to middle manager to supervisors) is a complex task. Conceptually, several major types of information systems support a variety of managerial end user responsibilities:-

a) Management information systems provide information in the form of reports and displays to manager. For example, sales managers may use their computer workstations to get instantaneous displays about the sales results of their products and to access weekly sales analysis reports that evaluate sales made by each salesperson.

b) Decision support systems give direct computer support to mangers during the decision-making process.

c) Executive information systems provide critical information in easy to use displays to top and middle management. For example, top executives may use touch screen terminals to instantly view

text and graphics displays that highlight key areas of organizational and competitive performance.

Difference between Management information systems(MIS) and Decision support systems(DSS)

	MIS	DSS
Decision support	Provide information about the performance of the organization.	Provide information and decision support technique to analyze specific problem.
Information processing methodology	Information produced by extraction and manipulation of business data.	Information produced by analytical model of business data.
Types of decision supported	Structured for operational and tactical planning and control.	Semistructured, unstructured for tactical strategic planning and control.
Types of decision maker	Prespecified, fixed format	Flexible, adaptable format

Information System Resources

Our basic IS model shows that an information system consists of five major resources:-

1) **People Resources**:-people are required for the operation of all information systems. These people resources include

   a) **End users** (also called users or clients) are people who use an information system or the information it produces. They can be sales persons, engineers or managers.

   b) **IS specialists** are people who develop and operate information systems. They include systems analysts, or programmers.

2) **Hardware Resources :-**the concept of hardware resources includes all physical devices and materials used in information processing Examples of hardware resources in computer based information system are

   a) **Computer systems**, which consists of central processing units (CPUs) and a variety of interconnected peripheral devices. Examples are large mainframe computer systems and microcomputer systems.

b) **Computer peripherals**, which are devices such as a keyboard or electronic mouse for input of data and commands, a video screen or printer for output of information, and magnetic or optical disks for storage of data resource.

3) Software Resources

The concept of software resources includes all sets of information processing instructions. The following are examples of software resources:

a) **System software**, such as an operating system program , which controls and supports the operations of a computer system

b) **Application software**, which are programs that direct processing for a particular use of computers by end users. Example is a word processing program.

c) **Procedures**, which are operating instructions for the people who will use an information system. Example is using a software package.

4) Data resources

The concept of data resources has been broadened by managers and information systems professionals. They realize that data constitutes a valuable organizational resource. Thus, you should view data ad data resources that must be managed effectively to benefit all end users in an organization.

The data resources of information systems are typically organized into:

a) **Databases** that hold processed and organized data.

b) **Knowledge bases** that hold knowledge in a variety of forms such as facts and rules of inference about various subjects.

5) Network Resources

Telecommunication network have become essential to the successful operations of modern organizations and their computer based information systems. Telecommunication network consists of computers, end user terminals, communications processors and other devices interconnected by communications media and controlled by communications software.Net work resources include:-

a) **Communication media**: examples include twisted-pair wire, coaxial cable, fiber optic cable, microwave systems, and communications satellite systems.

b) Network support: this generic category includes all of the people, hardware, software, and data resources that directly support the operation and use of a communication network.

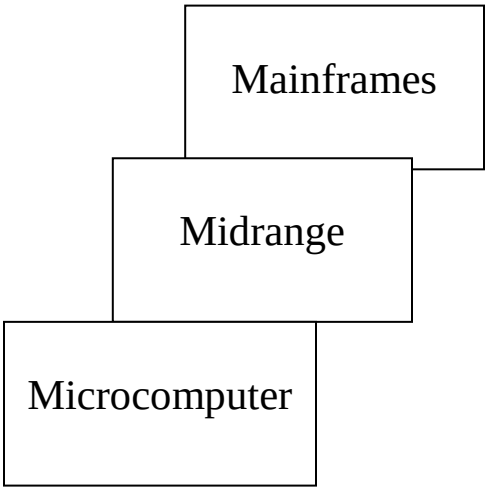
Information System Hardware

-Computer categories

Computer systems are typically classified as

1) Microcomputers
2) Midrange computers
3) Mainframe computers

Figure bellow illustrates computer classification



1) Microcomputer systems:-

Microcomputers are the smallest but most important category of computer systems for end users. However, microcomputer have become much more than small computers used by individual persons. Their computing power now

exceeds that of mainframe at a fraction of their cost. For this reason, they have become powerful professional workstations for use by end users in business and other organizations.

Most microcomputers are single user computers designed to support the work activities of a variety of end users.

2) Midrange computers

Also called minicomputers are larger and more powerful than most microcomputers but are smaller and less powerful than most large mainframes computer systems. In addition, midrange systems cost less to buy and maintain than mainframe computers. They can function in ordinary operating environment and do not need special air conditioning.

Midrange computers are being used for many business and scientific applications such as

a) They become popular as minicomputers for scientific research, instrumentation system, engineering analysis and industrial process monitoring and control.

b) They become popular as powerful network servers to help manage large interconnected local area networks that tie together many end user microcomputer workstations and other computer devices in departments, offices and other work sites.

3) Mainframe computer systems

They are large, powerful computers that are physically larger than micros and minis and usually have one or more central processors with faster instruction processing speeds. For example, they typically process hundreds of millions instruction per second (MIPS).They have large primary storage capacities. Many mainframes models have the ability to service hundreds of users at once, For example, a single large mainframe can process hundreds of different programs and handle hundreds of different peripheral devices (disk, printers) of hundreds of different users at the same time.

-Central processing unit (CPU)

The CPU is the most important hardware component of a computer system. It is also known as the central processor or instruction processor, and the main microprocessor in a microcomputer. Conceptually, the CPU can be subdividing in to two major subunits: the arithmetic logic unit and the control unit. The CPU also includes specialized circuitry and devices such as registers for high speed.

1) **The control unit (CU)** obtains instruction from those stored in the primary storage unit and interprets them .Then it transmits directions to the other components of the

computer system, ordering them to perform required operation.

2) **The Arithmetic logic unit (ALU)** performs required arithmetic and comparison operations. A computer can make logical changes from one set of program instruction to another based on the results of comparisons made in the ALU during processing.

Multiple processors

Many current computers use multiple processors for their processing functions. Instead of having one CPU with single control unit and arithmetic logic unit, the CPUs of these computers contain several types of processing unit as illustrated:-

1) **A support processor** design relies on specialized microprocessors to help the main CPU perform a variety of functions. These microprocessors may be used for input/output, memory management and arithmetic computations, thus freeing the main processor to do the primary job of executing program instructions.

2) **A coupled processor** design uses multiple CPUs or main microprocessors to do multiprocessing, that is, executing more than one instruction at the same time. Some configurations provide a fault tolerant capability in which multiple CPUs provide a built in back up to each other should one of them fail.

3) **A parallel processor** design uses a group of instruction processors to execute several program instructions at the same time .Sometimes, hardware or thousands of processors are organized in clusters or network in Massively Parallel Processor (MPP) computers. Other parallel processor designs arte based on simple models of the human brain called neural networks. All of these systems can execute many instructions at a time in parallel.

Data bus

Is a system of wires, or strings of conductive material, etched on the surface of a computer board. It is a communications channel that allows the transmission of a whole byte or more in one pass.

Multiprocessing

The mode in which a computer uses more than one processing unit simultaneously to process data.

Memory characteristic and functions

No step in the machine cycle can be taken without a place for the CPU to store the instructions and data needed for a particular process. Primary memory is that place. Because primary memory must exist in a computer for the CPU to do its job, many consider it to be another part of the CPU.

External storage consists of media that allow permanent storage of programs and data. Such media include magnetic disks, magnetic tapes, and optical disks.

Primary memory is used in the actual processing of data inside the computer all data and instructions must be copied to RAM for the CPU to execute them two types of storage space compose a computer's primary memory:-

1) Random Access Memory (RAM) is where instructions and data are stored before the CPU fetches them for processing. The CPU does not deal directly with external storage devices, only with RAM. So, for a program to run, all instructions and data first must be entered into RAM, either from a keyboard or other input device, or from an external storage device , such as a magnetic disk or CD.

Every RAM location has a unique address called a memory address; that is how the CPU fiends instructions and data. As soon as an instruction is copied into RAM, it is placed in a location with its memory address where it stays until other instructions or data replace it. Replacement occurs if the program sends another instruction to that address, or if the computer finishes executing an entire program and loads another.

2) Cache Memory virtually all new microcomputer models offer cache memory as a part of RAM. Cache memory is made up of fast memory semiconductor chips. The CPU can access cache memory faster than the rest of RAM. Cache memory stores the most frequently used instructions of the programs the computer runs, allowing faster retrieval and execution.

3) Read Only Memory A small part of primary memory consists of chips called read-only memory or (ROM).These chips hold instructions that let you communicate with the computer until operating system program, such as windows take control .ROM also holds ASCII codes for a character set: the 26 capital and lowercase letters, the digits 0 through 9, punctuation marks and other symbols such as $ and.

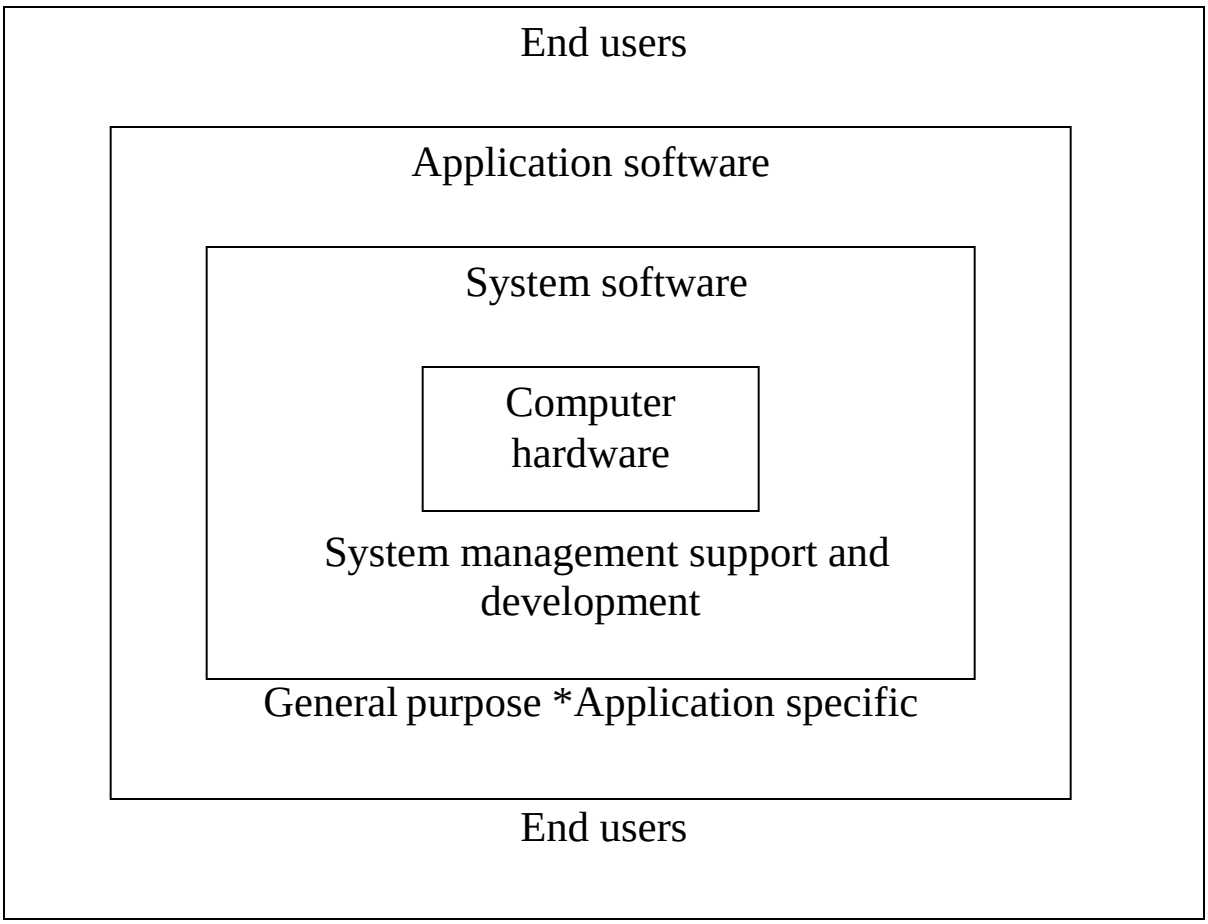
Information System Software

System software consists of programs that manage and support a computer system and its information processing activities. These programs serve as a vital software interface between computer system hardware and the application programs of end users. See figure bellow. We can group such programs into three major functional categories:-

1) **System management programs**:-programs that manage the hardware, software, and data resources of the computer system during its execution of the various information process jobs of users. The most important system management programs are operating systems and operating environments.

2) **System support programs**:-programs that support the operation and management of a computer system by providing a variety of support services. Major support programs are system utilities, performance monitors, and security monitors.

3) **System development programs**:-programs that help users develop information system programs and procedures and prepare user programs for computer processing .major development programs are language translators and programming tools.



The system and application software interface between end users and computer hardware

Operating system

The most important system software packages for any computer its operating system. An operating system is an integrated system

of programs that manages the operational of the CPU, control the input/output and storage resources and activities of the computer system, and provides various support services as the computer executes the application programs of users.

Operating system functions

An operating system performs five basic functions in the operation of a computer system as

1) **User interface**

The user interface is the part of the operating system that allows you to communicate with it so you can load programs, access files, and accomplish other tasks. The trend is toward in easy to use graphical user interface (GUI) that uses icons, bars, buttons, boxes, and other images .GUI rely on pointing devices like the electronic mouse to make selections that help you get things done.

2) **Resource management**

An operating system uses a variety of resources management programs to manage the hardware resources of a computer system, including its CPU, memory, secondary storage devices, and input/output peripherals. For example, memory management programs keep track of where data and programs are stored. They may also subdivide memory in to a number of sections and swap parts of programs and data between memory and magnetic disks or other secondary storage devices.

3) File management

An operating system contains file management programs that control the creation, deletion, and access of files of data and programs. File management also involves keeping track of the physical location of files on magnetic disks and other secondary storage devices.

4) Task management

The task management programs of an operating system manage the accomplishment of the computing tasks of end users. They give each task a slice of a CPU's time and interrupt the CPU operation to substitute other tasks.

5) System support programs

System support programs are a category of software that performs routine support functions for the users of a computer system. Utility programs, or utilities, are an important example .The programs perform miscellaneous housekeeping and file conversion functions .For example, sort programs are important utility programs that perform the sorting operations on data required in many information processing applications. Utility programs also clear primary storage , load programs, record the contents of primary storage, and convert files of data from one storage medium to another.

Other system support programs include performance monitor and security monitors.

Performance monitors are programs that monitor the performance and usage of computer systems to help its efficient use.

Security monitors are packages that monitor and control the use of computer systems and provide warning messages and record evidence of unauthorized use of computer resources.

Applications software

Application software consists of programs that direct computers to perform specific information processing activities for end users. These programs are called application packages because they direct the processing required for a particular use, or application, that end users want accomplished. Application software can be classified as:-

1) General purpose programs

General purpose application programs are programs that perform common information processing jobs for end users and GPP can divide into

a) **Word processing packages** are programs that computerize the creation, editing, and printing of documents (such as letters, and reports) by electronically processing text data (words, phrases, sentences, and paragraphs).

b) **Database management packages** such as access by Microsoft allow end users to setup databases of files and records on their personal computer systems and quickly store data and retrieve information .Most DBMS packages can perform four primary tasks

c) **Graphics packages**. Convert numeric data into graphics displays such as line charts and bar graph. Many other types of presentation graphics displays are possible .Draw and paint graphics packages support freehand drawing.

2) Application specific programs

Thousands of application software package are available to support specific applications of end users. Major categories of such application specific programs are:-

a) **Business application programs**. Programs that accomplish the information processing tasks of important business functions or industry requirements.

b) **Scientific application programs**. Programs that perform information processing tasks for the natural, physical, and behavioral sciences, and for mathematics, engineering, and all other areas

involved in scientific research, scientific analysis, engineering design, and monitoring of experiments.

c) **Other application programs**. There are so many other application areas of computers that we lump them all into this category. Thus, we can talk of computer applications in education, music, art ,law, medicine, and so on.

Programming languages

A programming language allows a programmer or end user to develop the sets of instruction that constitute a computer program. Many different programming languages have been developed, each with its own unique vocabulary, grammar, and users. Programming languages can be grouped into the five categories as:-

1) Machine languages (or first generation languages) are the most basic level of programming languages. In the early stages of computer development, all program instructions had to be written using binary codes unique to each computer. This type of programming involves the difficult task of writing instruction in the form of strings of binary digits (ones and zeros) or other number systems. Programmers must have a detailed knowledge of the internal operations of the specific type of CPU they are using .They must write long series of detailed instructions to accomplish even simple processing tasks.

2) Assembler languages (or second generation languages) are the next level of programming languages. They were developed to reduce the difficulties in writing machine language programs. The use of assembler language requires language translator program called assembler that allows a computer to convert the instructions of such languages into machine instructions. Assembler languages are frequently called symbolic languages because symbols are used to represent operation codes and storage locations

3) High level language (or third generation languages) uses instructions, which are called statements, that closely resemble language or standard notation of mathematics. Individual high level language statement are actually macroinstructions, that is ,each individual statement generates several machine instructions when translated into machine language by high level language translator.

4) Forth generation languages most forth generation languages are non procedural languages that encourage users and programmers to specify the result they want, while the computer determines the sequence if instructions that will accomplish those result. Users and programmers no longer have to spend a lot of time developing the sequence of instructions the computer must follow to achieve a result. Thus, 4GLs have helped simplify the

programming process. Natural languages are 4GLs that are very close to English or other human languages.

Example

Machine language		High level language
1010	11001	Basic
1011	11010	Z=5 , Y=3
1100	11011	X=Y+Z

Assembler languages	Forth generation languages
LOD Y	Sum the following numbers
ADD Z	Z AND Y
STR X	put the result in X

5) Object oriented languages

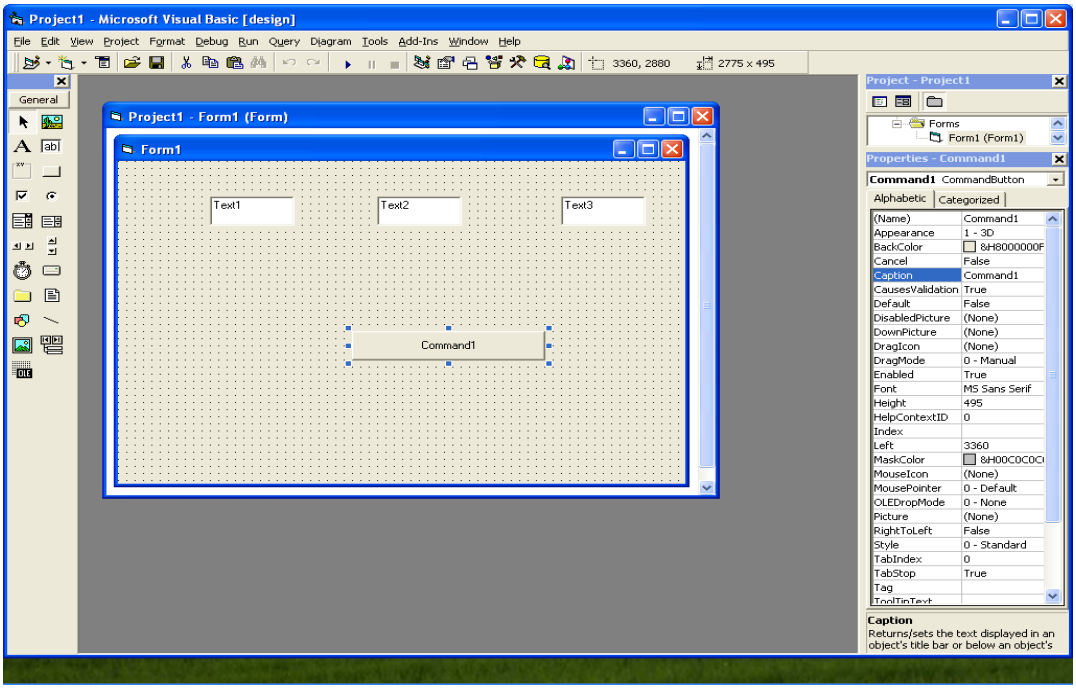
Object-oriented programming languages are among the newest types of programming languages. Instead of separating variables, procedures, and data, as in traditional programming languages, object-oriented programs group all pieces together into "objects." An example of an object might be employee identification and payroll information and a set of corresponding rules for calculating monthly payroll for a variety of job classifications and tax rules. This process of grouping the data and instructions together into a single object is called ***encapsulation***. By encapsulating the instructions and data together, programs are easier to maintain because the things that are grouped together are protected or isolated from other parts of the program.

A second characteristic of object-oriented languages is ***inheritance,*** which means that all lower-level, or children, nodes in an inheritance hierarchy inherit the characteristics of the parent node. In addition to being object-oriented, programs and programming languages can also be ***event-driven***. Unlike programs written in procedural programming languages, programs written with the event-driven approach do not follow a sequential logic. The programmer does not determine the sequence of execution for the program. The user can press certain keys and click on various buttons and boxes presented to her.

6) Visual Programming Languages

Visual programming languages make programming easier and more intuitive. They allow the programmer to create the graphics-intensive applications that today's business user's demand. For example, to make a button appear for the user on a particular screen at a particular point in time, a programmer using a visual programming language only needs to bring up the screen where the button is to appear, choose the button from a palette of choices, drag and drop the button to the proper location, size and style the but ton with a few mouse clicks, and click on the button's pop-up menu to set the properties that will control its behavior (see Figure

bellow



Programming languages translator (PLT)

PLT are programs that translate other programs into machine language instruction codes that computers can execute and can be divided into the following:-

1) **An assembler** translates the symbolic instructions codes of program written in an assembler language into machine language instructions.
2) **A compiler** program that translate a high level programming language into machine language program.
3) **An interpreter** program that translates and executes each source language statement before translating and executing the next one.

Data management module

Data management module is a database that allows a decision maker to conduct the intelligence phase of decision making .For example, an investment consultant always need access to current stock prices and those from at least the preceding few year. A data management module accesses the data and provides a mean for decision system to select data according to certain criteria: type of stock, range of years, and so on.

Traditional approach for data management

A data file is a collection of logically related records. Therefore, in a file management environment, each application has a specific data file related to it, containing all data records needed by the application. Over time, organizations developed numerous applications, each with associated, application specific data file. For example, a university has many computer based applications involving students. These applications include course registration, fee payment, and grades among others. In a file management environment, each of these applications would have its own student data file. This approach to data management, where the organization has multiple applications with related data files, is considered the traditional approach.

Problems with traditional file approach

The traditional file approach led to many problems:-

1) Corporate applications typically share some common core functions, such as input, report generation, querying, and data browsing. However, these common functions typically were designed, coded, documented, and tested, at great expense, for each application.

2) Data redundancy: As applications and their data files were created by different programmers over a period of time, the same piece of information could be duplicated in several places. In the university example, each data file will contain records about students, many of whom will be represented in other data files. Therefore, student file in the aggregate will contain some amount of duplicate data.

3) Data inconsistency: Data inconsistency means that the various copies of the data no longer agree. For example, if a student changes his or her address, the new address must be changed across all applications in the university that require the address.

4) Data isolation: With applications uniquely designed and implemented, data files are likely to be organized differently, stored in different formats and often physically inaccessible to other applications. In the university example, an administrator who wanted to know which students taking advanced courses were also starting players on the football team would most likely not be able to get the answer from the computer based file system.

5) **Security: security** is difficult to enforce in the file environment, because new applications may be added to the system.

6) **Data integrity**: Data values must often meet integrity constraints that are; they must be accurate and fit for their intended use. For example, the students Social Security data field should contain no alphabetic characters, and the students' grade point average field should not be negative. It is difficult to place data integrity constraints across multiple data files.

7) **Data independence**: In the file environment, the applications and their data files are dependent on each other. Storing data

in files that were tightly linked to their applications eventually led to organizations having hundreds of applications and data files, with no one knowing what the applications did or what data they required.

Database approach for data management

A database, which is a logical group of related files, can eliminate many of the problems associated with a traditional file environment. With the database approach, all the data are typically contained in the same storage location, rather than residing in many different files across the organization. Unlike the traditional approach, in which different programs access the different data files, the database is arranged so that one set of software programs the database management system provides access to all the data. Therefore, data redundancy, data isolation, and data inconsistency are minimized, and data can be shared among all users of the data. In addition, security and data integrity are increased, and applications and data are independent of one another.

Database definition

A database is a collection of several related files, the program used to build database, populate them with data, and manipulate the data.

Database approach versus traditional file approach

If you wanted to access data from files that were stored in a traditional file approach, the records would have to be organized in a very specific way, and you would have to know exactly how many characters were designed for each type of data.

If you are using a database, you want to be able to move rapidly from one record to another, sort by different criteria, create different types of reports, and analyze the data in different ways.

Database advantages

Database systems provide many advantages to the organization:

1) Improved strategic use of corporate data

2) Reduced complexity of the organization's information systems environment

3) Reduced data redundancy and inconsistency

4) Enhanced data integrity

5) Application data independence

6) Improved security

7) Reduced application development and maintenance costs

8) Improved flexibility of information systems

9) Increased access and availability of data and information

Logical and Physical organization of data

The physical organization deals with the actual, physical arrangement and location of data in direct access storage devices (DASD).Database specialists use the physical organization to make efficient use of storage and processing resources. Users, however, may wish to see differently from how they are stored, and they do not know all the technical details of physical storage.

The logical organization a database represents data in a format that is meaningful to a user and to the software programs that process that data. That is, the logical organization tells the user what is in the database.

Keys and attributes

To retrieve records from a database, or to sort them, you must use a key. A key is a field whose values identify records either for display or for processing. You may use any field as a key. For example, you could ask the database for record of pupil Ali from the student table by using the L.Nme field as a key. That is, you enter a query, a condition that instructs the database to retrieve a record with the value of L.Name as “Ali”. A key is unique if the value (content) in that field appears only in one record. Sometimes a key is composed of several fields so that their combination provides a unique key.

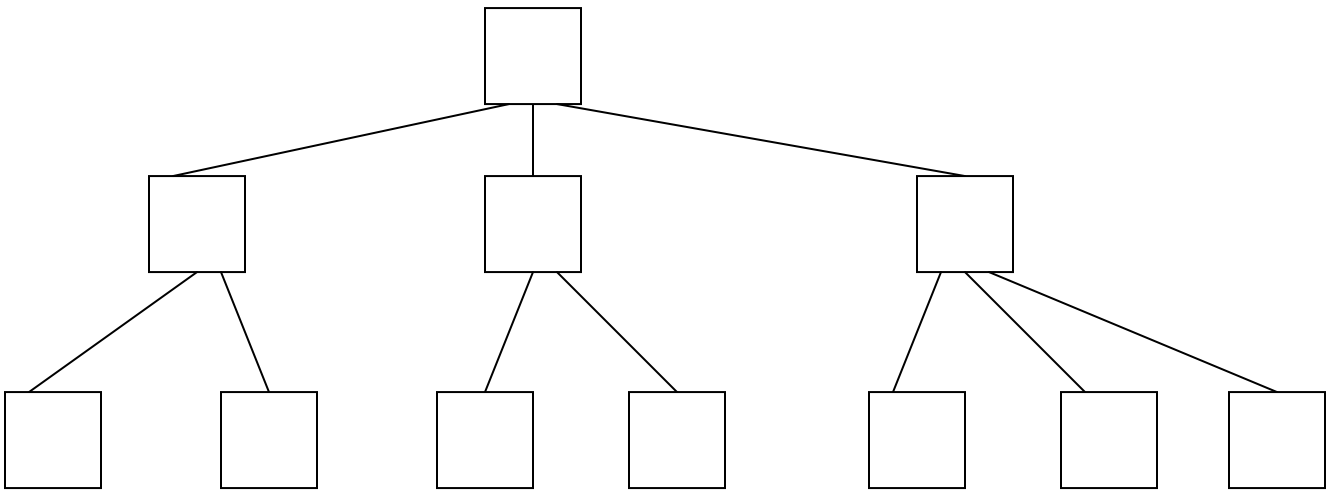
Figure 1 Attributes of Student object
Stud ID
Stud Last Name
Stud First Name
Stud Dept
Stud Office Address
Stud Telephone

Data structure of database

A database model is the general logical structure in which records are stored within a database and the method used to establish relationships among the records. There are several database structures:-

1) Hierarchical data structure

To understand the various models, consider a database for storing university data: there are records about colleges, departments, proffers, and students. Logically, these four types of university records are hierarchical, meaning that each category is a subcategory of the next level. The highest level is college; each college has several departments; each department consists of several professors; and each professor has several students. The hierarchical structure follows the pattern of upside-down tree and is sometimes referred to as the tree model. Therefore, if the university chose to follow a hierarchical model, the records would be stored as indicated in figure bellow.

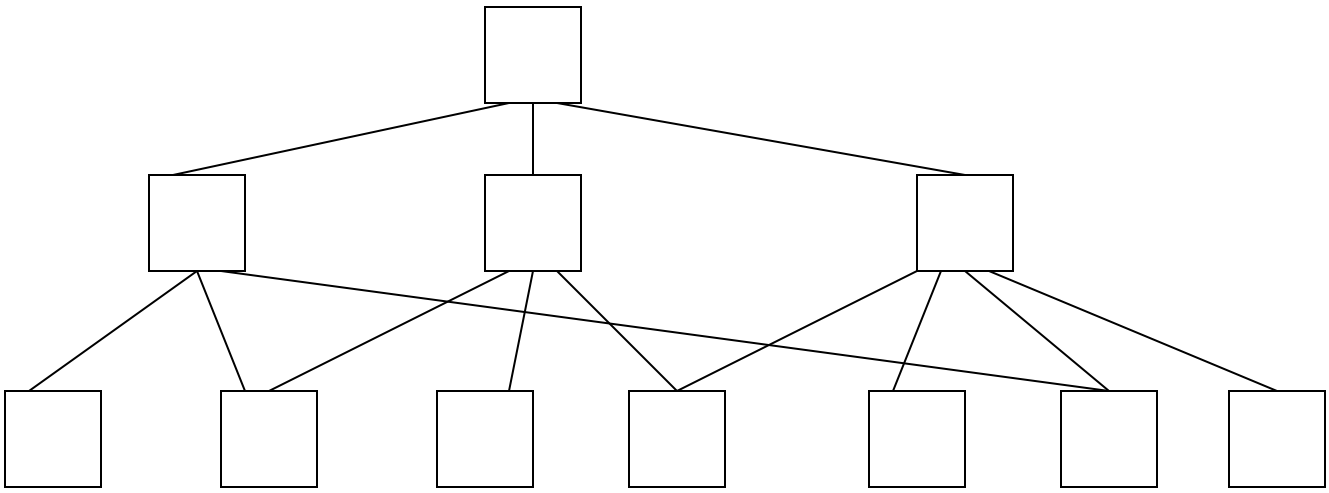


The advantage of hierarchical database is their suitability for maintaining data on hierarchical environments. But hierarchical databases also have several disadvantages. To retrieve a certain record, uses must start the search at the root, which is the set of records at the very top level, and then navigate the hierarchy until they find the desired record. If for some reason, a link is broken, the entire branch that was connected through that pointer to the other records is lost. And because child records can have only one parent, hierarchical database require considerable data redundancy.

2) Network data structure

The reverse of the last disadvantage of the hierarchical structure is the greatest advantage of the network structure: the ability to store a record only once in the entire database while creating links that establish relationships with several records of another type of entity. Remember that in the hierarchical structure there was data redundancy because separate repetitive records for student had to be maintained in two different student files.

The network structure on the other hand, would allow the same record to be linked to more than one parent as illustrated in figure bellow



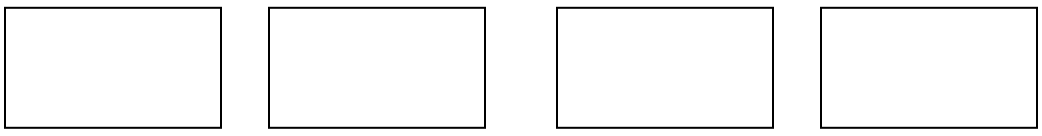
Network database create significantly less data redundancy than hierarchical databases, but they are complicated to build and difficult to maintain. While the user does not have to start a search at the root, it is difficult to navigate in the database. The complex network of relationships creates a "**spaghetti**" that is hard to follow. For this reasons, the network structure is least popular mode.

3) Relational structure

A relational model database has all the advantages of a network database without the complications. The relational model consists

of table. Its roots are in relational algebra, although you do not have to know relational algebra to build and use relational databases. In relational database, a record is called a ***tuple,*** a column of fields is called an attribute, and a table is called a relation. Relational databases are easier to conceptualize and maintain than hierarchical and network models. To build a relational database, you only need to have a clear idea of the different entities and how they relate. In our example, the entities are college, department, professor, and student. A single table is built for each object. Remember that entity in our context refers to a record structure of all the occurrence of a subject. Thus, when database designers think of “professor,” they know the professor table may include records of many professors.

Retrieving a desired record is easy. To find a record of a certain professor, you need to access the professor table and make an inquiry. Maintenance is easy because the user does not have to recall any relationships. Each table stands alone. To add a student record, the user accesses the student table. Similar actions take place to change or delete a record figure bellow illustrated.



A manger's view of telecommunications networks

Why telecommunications is important?

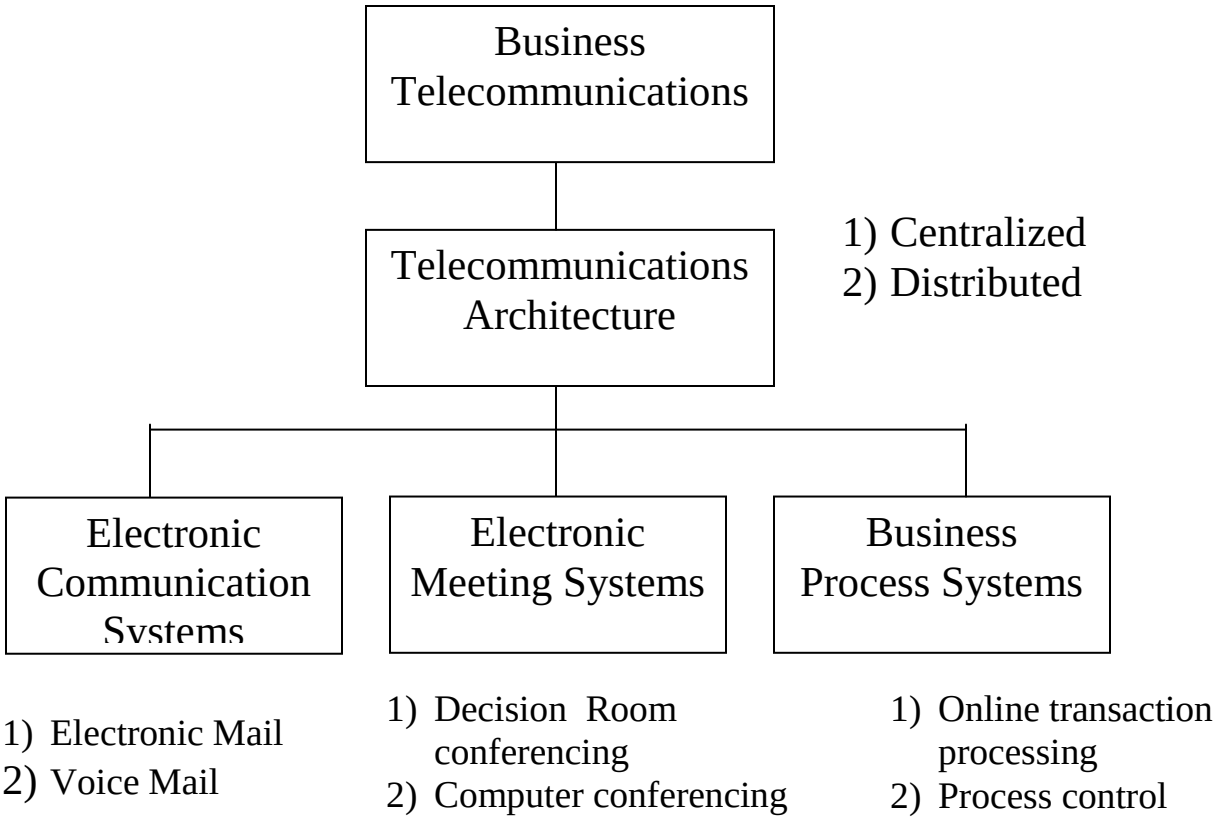
End users need to communicate electronically to succeed in today's global information society.

Telecommunications is the sending of information in any form (e.g., voice, data, text, and images) from one place to another using electronic or light emitting media.

Application of telecommunications

Telecommunications networks provide valuable 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. Other networks let a company process sales transaction 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 system of business so their computing power can be shared by end users throughout an enterprise. And, of course, telecommunications networks enhance collaboration and communications among individuals both inside and outside an

organization. Figure bellow shows the application of telecommunications.



Tools for telecommunication

Tools for telecommunication are:-

1) Telephone related communication services

Telephone is the process that occurs when two people who wish to contact each other by telephone repeatedly miss each other phone calls. Telephone can be divided in to four types

a) Fax messages

Dedicated fax machine are specialized devices that do nothing except send and receive copies of document over transmission lines to and from other fax machines.

b) Fax modems

Which is installed as circuit board inside a computer's system cabinet, is a modem with fax capability? It enables you to send and receive signals directly between your computer and some one else fax machine or fax modem.

c) Voice mail

A variation of electronic mail where digitized voice messages rather than electronic text are accepted, stored, and transmitted.

d) Electronic mail

Electronic mail likes computers by wired or wireless connection and allows users, through their keyboard to post and read responses on their display screen.

2) Video/Voice communication

Video/Voice communication can be divided in to

a) Video conferencing also called teleconferencing is the use television video and sound technology as well as computers to enables people in different locations to see, hear, and talk with one another.

b) Picture phone: - this device is a telephone with a TV like screen and built in a camera.

Basic telecommunication signals

Communication is any transfer of data within a computer, between a computer and another device, or between two computers.

Modems

(Modulator –Demodulator) a device that converts the digital signals from input/output devices into appropriate frequencies at a transmission terminal and convert them back into digital signals at a receiving terminal.

Data transmission

Data can be transmitted in two basic modes: a whole byte at a time, which is feasible only over very short distances, or a single bit at a time, currently the only practical mode for communicating over long distances. Within the computer and between the computer and its peripheral equipment (such as its printer and external hard disk).

Direction of data transmission

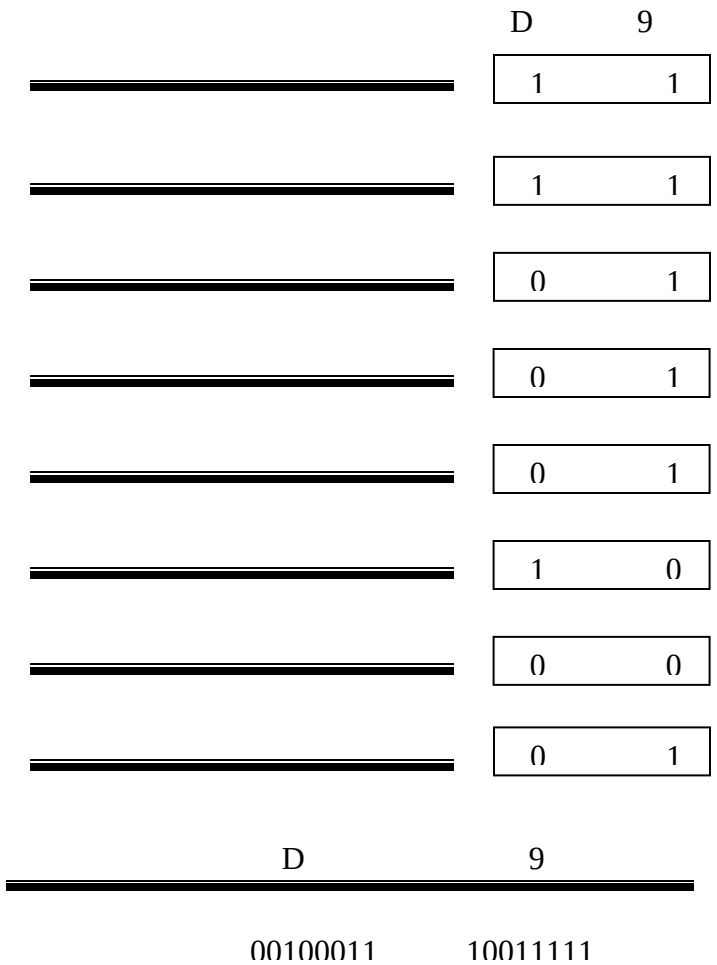
The transmission can take the form of:-

1) Parallel transmission, each byte is transmitted in its entirely. The electrical impulses representing the bits of a byte are transmitted

along a bundle of parallel lines, one bit through each line. These lines are often called bus.

2) Serial transmission, on the other hand, data is transmitted one bit at a time through a single line.

Parallel and serial transmission characters 9 and D



Parallel and serial data transmission require different types of wiring .In the back of a computer are several outlets or ports for

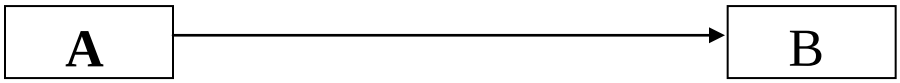
ports for connecting different cables. An outlet that can accepts a parallel device cable is a parallel port. An outlet that can accepts a serial device cable is a serial port.

Communication channels

The three modes of communication between devices:-

1) Simplex

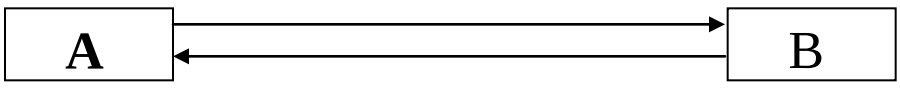
In simplex communication, device A can transmit to device B, but device B cannot transmit to device A. An example of simplex communication is commercial radio transmission. Your car radio can receive signals from a radio station, but cannot transmit back to it.



Only transmits Only receives

2) Half-duplex

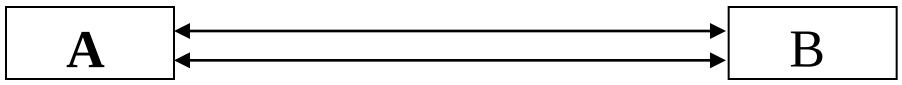
In half duplex mode, device A can transmit to device B while device B receives the signal. Device B can transmit to device A while device A receives the signal. However, the two devices cannot transmit to each other at the same time, and one device can transmit to other only when the other device is in reception mode. Half duplex may take place when you use a computer terminal to communicate with a mainframe computer.



Transmits when B receives Transmits when A receives

3) Full-duplex

In full duplex communication, either device can transmit to the other device while simultaneously receiving signals from the other device. This is device A can transmit to B and receive from B at the same time, and vice versa. Telephony is an example of full-duplex: both parties can talk and listen at once. Full duplex data communication is often used between computers.



Transmits and receives while B transmits and receives

Transmits and receives while A transmits and receives

Bandwidth

A communication medium is the physical medium, such as telephone lines or television cables, through which data can be communicated. The capacity of the medium is the speed at which data are communicated, which is also called the transmission rate (Note that the numbers are approximate .They are actually power of 2.Thus 1 kbps is actually 1024 bps and 1 Gbps is actually 1,048,576 bps.) It is often called “bandwidth”. Bandwidth is measured in bits per second (bps); the greater the capacity, the faster transmission.

Transmission speed measurement units
bps=Bits per second kbps=Thousand bps Mbps=Million bps(mega bps) Gbps=Billion bps(giga bps) Tbps=Trillion bps(tera bps)

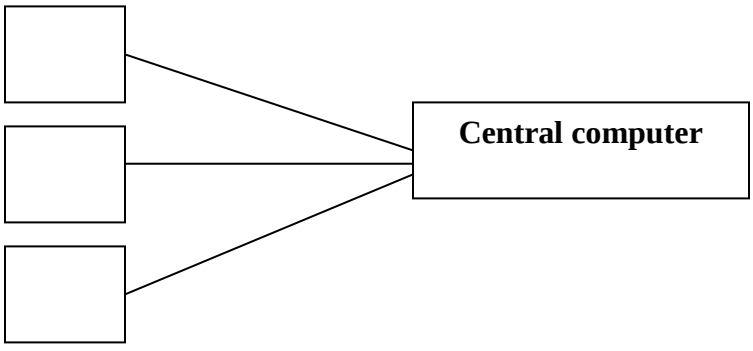
Telecommunication Network topologies

There are several basic types of network topologies, or structure, in telecommunications networks as:-

1) point to point lines

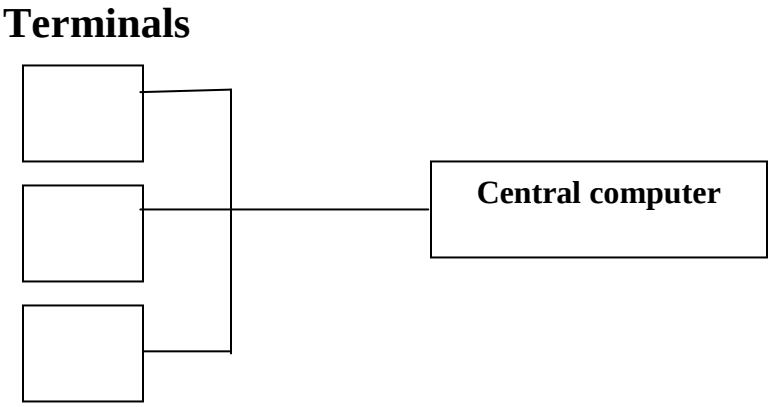
When point to point lines are used, each terminal is connected by its own line to a computer system.

Terminals



2) Multidrop lines

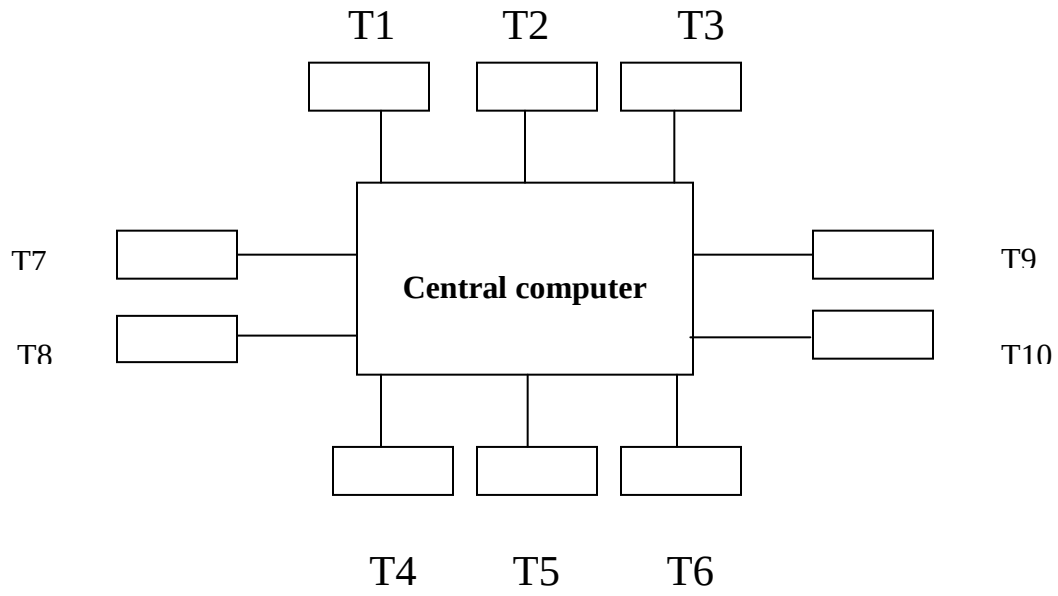
When multidrop lines are used, several terminals share each data communications line to a computer.



Obviously 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 single terminal. Therefore, point to point lines are used only if there will be continuous communications between a computer and terminal or other computer system. A multidrop line decrease communications costs, because each line is shared by many terminals. Communications processors such as multiplexers help many terminals share the same line.

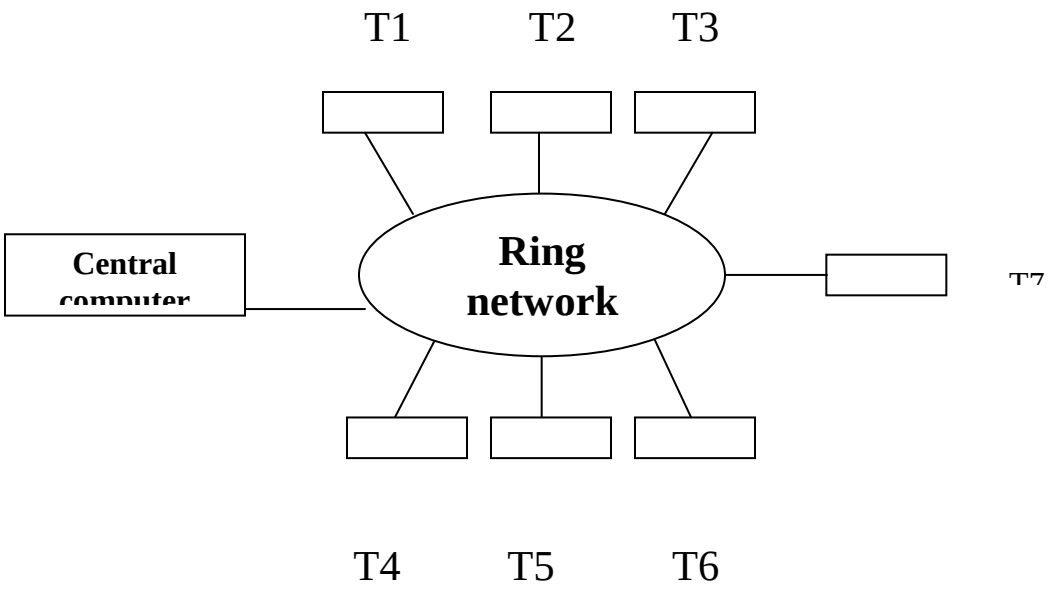
3) star network

A star network ties end user computers to a central computer.



4) ring network

A ring network ties local computer processors together in a ring on more equal basis.



5) bus network

A bus network is a network in which local processors share the same bus, or communications channel. In many cases, star network take the form of hierarchical networks.