NETWORK

- Server is a central computer that provides processing services or data to an interconnected group of computers. A server acts as the core of a client-server network. The other computers, called clients, are connected to the server by communications cables. Client-server networks enable users to share information and resources easily. The clients and the server share the computer work, but there are several ways of distributing these tasks. In most client-server networks, the server performs three main functions: (1) It stores and provides access to files that everyone on the network uses. (2) It coordinates communication between the client computers. (3) It controls shared resources, such as printers. Both the clients and the server are capable of performing computing tasks. In some cases, the clients do all of their own computing. In others, the server takes responsibility for some of the computing. For example, if the organization has a central database on the server, the server might perform the computing necessary to manage and access the database. See DISTRIBUTED COMPUTING for more information on how computer networks share computing tasks.

- Online service is a business that provides access to the Internet, a global computer network, and also offers a wide range of content not available on the Internet. This content includes news, databases and software, games, and electronic publications. Computer users subscribe to online services and pay a fee for use. The services charge additional fees for the use of certain content. Online services also sell advertising space. Online services provide e-mail (electronic mail) features, including individual customer addresses and software that sends, receives, and stores messages. Subscribers can use bulletin boards to post or read messages on various topics. In chat rooms, individuals can discuss shared interests by exchanging messages instantly. Most services have technical experts available online or by telephone to help subscribers solve problems they encounter in using the service.

- World Wide Web is a system of computer files linked together on the Internet. The Internet connects computers and computer networks around the world. The portion of the Internet not on the World Wide Web (often called the Web, for short) contains only text information. The Web, however, has multimedia capabilities-that is, its files include illustrations, sounds, and moving pictures in addition to text. The Web is made up of electronic addresses called Web sites, which contain Web pages that hold the multimedia information. Web sites and their pages reside in computers connected to the Internet. Tim Berners-Lee, an English computer scientist at the European Organization for Nuclear Research (CERN) physics laboratory near Geneva, The introduction of the Web helped make the Internet popular and easier to use. Many computer users find the Web's multimedia content more attractive than text-only content. In addition, Web browsers make the Web easy to use. A Web browser is a software package used to locate and display information on the Web. To find information on other parts of the Internet requires complex software and knowledge of specific computer commands. A Web browser is easier to use because it employs a graphical user interface-a way of interacting with a computer using pictures as well as words. The pictures represent commands in a manner that is easy to understand. For example, a small picture of a printer represents the command to print a document. By clicking the computer's mouse on an element, the user gives the computer command represented by that element. Another major feature of the Web is hypertext. Hypertext enables a user to jump from one document to another-even if the documents are stored on different parts of the Internet. For example, in a Web site concerning space exploration, the words space shuttle might be highlighted. Clicking on these words would bring information about the shuttle to the screen. Pictures, too, can be used as hyperlinks (hypertext links). Words and pictures that hyperlink to other documents are called hot spots. Hot spots and their hyperlinks are created by the author of a Web page.

Internet is a vast network of computers that connects many of the world's businesses, institutions, and individuals. The Internet, which is short for interconnected network of networks, links tens of thousands of smaller computer networks. It enables users of computers and other networked devices throughout the world to send and receive messages, share information in a variety of forms, and even play computer games with people thousands of miles or kilometers away. Computers linked to the Internet range from simple and inexpensive personal computers, often called PC's, to huge mainframe computers used by government institutions, educational institutions, and businesses. Other devices linked to the Internet include sophisticated telephones and televisions. Computers and other devices require special hardware and software to connect to the Internet. Necessary hardware includes a modem or an adapter. A modem is a device that translates a computer's digital (numerical) information into signals that can be transmitted over telephone lines, over cable, or through the air as wireless communications (see MODEM). An adapter links a computer to a high-speed communication system designed to carry data in digital form. Adapters are often called modems, though they are not true modems. Required software includes a communications program that allows the transmission and receipt of messages. Many computers and computing devices come with modems and communications software installed. The Internet, often called simply the Net, began as a collection of text-only documents intended for scientists, universities, and some parts of government. But the development and rapid growth of the World Wide Web (also known as the Web) transformed the presentation of information on the Net. The Web is a worldwide system of interconnected computer files linked to one another on the Net. It enables the use of multimedia-which includes photographs, moving pictures, and sound as well as text. Multimedia presentations on the Web approach the visual quality of television and the audio (sound) quality of recorded music. The Web consists of millions of Web sites, collections of information at specific electronic addresses. Web sites in turn contain Web pages that hold multimedia or text-only information. Web sites and their pages reside in computers connected to the Internet.

Uses of the Internet
- Today, tens of millions of people and businesses use the Net and the Web daily. The major uses include communications, research, publishing, business transactions, and push technology, which employs the Web for the broadcast of video and audio programming.
- Communication. Probably the most popular use of the Internet and the Web is sending and receiving e-mail (electronic mail). The number of e-mail messages

sent each year far exceeds the number of pieces of traditional mail carried by the world's postal systems.

- Individuals, companies, and institutions have e-mail addresses that enable the sending and receipt of mail, just as a street address or post office box provides directions for traditional mail delivery. Users generally acquire e-mail addresses through an Internet service provider (ISP) or an online service. Both of these types of businesses provide access to the Internet. An ISP maintains its customers' e-mail addresses, routes e-mail and requests for Internet-based information to and from its users, and manages high-speed communications lines that quicken the transfer of data over the Internet. An online service resembles an ISP, but it provides a wide range of exclusive content in addition to Internet access. Most ISP's and online services allow customers to have several different e-mail addresses.

- Many e-mail users attach illustrations, sound files, and even videos to their e-mails. An e-mail recipient whose computer system contains the required software can then view and listen to attachments as well as read the text message. Attachments may include charts and graphs, and even the text of entire books.

- The Internet easily enables multiple mailings, the sending of the same e-mail to many addresses. Businesses advertise products and services via e-mail. Newsgroups-loose organizations of people who share a common interest-also use multiple mailings. They send their members copies of e-mail on the subject of interest. Members can respond to those e-mails and may introduce new topics. Because much e-mail contains financial and other private information, most e-mail software includes encryption technology-programs that convert private e-mail into secret code for transmission. Similar software decrypts (translates back into readable language) the code when it reaches its intended destination.

- Research. Much of the Internet resembles a vast library, containing as much information on every subject as might be held in tens of millions of books. Information may appear as files consisting only of text or as multimedia displays.

- Special types of programs called search engines help people sort through the vast amounts of information on the Internet. Web users can choose from many search engines available on Web pages. A search engine allows a user to enter a topic for search, then finds Web pages that match that topic.

- Because of the ease with which computers store information, and the speed with which computer users can access it, the Internet serves as a popular first stop for many people investigating a particular topic. A businessperson might

search Internet resources for help in developing sales or product information. Students can access databases to find material related to homework assignments. Physicians can use the Net to compare medical treatments and to review advances in medical science. Scientists can share research data on the Net.

- Publishing. Publishers increasingly use the Internet as a medium for presenting the contents of newspapers, magazines, and books. Because information on the Net is electronic, the publisher saves the costs of paper, printing, and distribution. More importantly, the publisher can update information almost instantly, making it possible to distribute far more current news than could be provided on paper.

- Electronic versions of newspapers and magazines often contain more information than a paper publication could include. Web-based publications can also present interactive features. For example, a news story may contain links (interactive connections) to related stories or background information. If a reader wishes to explore the linked material, he or she simply clicks on a highlighted word to connect to a Web page containing that information.

- The Internet also serves as a distribution system for e-books (electronic books). An e-book consists of digital files formatted so that when a reader downloads (transfers) them to a special handheld device-or to a computer with special software-the words and pictures appear much as they would on a printed page. A customer can buy e-books at the publisher's Web site or at a site owned by a bookstore. Some electronic library sites include text-only e-books. These e-books can be viewed without the use of special devices or software.

- Business transactions. Many companies use the Internet to carry out business transactions commonly referred to as e-commerce. Retailers sell nearly every type of product over the Internet. Users generally pay for such purchases with credit cards. Software publishers view the Net as a convenient and inexpensive way to distribute their products. Over the Internet, users can buy new computer programs, sample programs before purchasing them, or receive upgrades to programs they already own. Music publishers sell copies of songs as downloadable digital files. Transactions between companies and consumers are commonly known as B2C (business to consumer) transactions. Additionally, many companies use the Internet to engage in B2B (business to business) transactions. By linking together in a vast network, buyers and sellers can share

information, keep track of inventories, assess needs, and compare products far more efficiently than they could using traditional business communications.

- The Internet has important uses within the financial community. Many banks and stockbrokers offer their customers software to make and track investments from their computer. Consumers can use similar software to pay many types of bills. Individuals can also file tax returns and pay taxes over the Internet. Economic transactions over the Internet use encryption technology to protect the privacy and security of the users.

- A popular type of Internet business is the online auction. Online auctions enable people to post descriptions of items they wish to sell, along with a suggested opening bid. Visitors to the auction site may place a bid on any posted item. Consumer auction sites offer almost every imaginable type of item. But most forbid the sale of dangerous or illegal materials. Business auction sites, also called trading exchanges, have captured a large share of B2B transactions. Such sites may, for example, offer manufacturers the chance to bid on raw materials.

- Push technology, also known as Webcasting or Netcasting, takes advantage of the ability of the Internet and the Web to deliver high-quality digital audio or video signals. Push technology enables producers to distribute their presentations to PC's and other devices capable of receiving and playing them. Push technology programs have no fixed schedules. A producer can offer audio or video presentations to anyone who subscribes to them. The user might either download the entire video to his or her computer for later playback or play it in real time over the Internet. Real-time play is possible through a technology called streaming. Many radio stations stream their programming in real time so that people throughout the world may listen over the Web. Many also offer downloads of previous programming. Television networks and movie producers often use push technology to promote their products and to present clips from programs and motion pictures. Some television producers have created programming specifically for the Web. Such programs are often called Webisodes. Some television news organizations use the Web to post additional stories, constantly updating the news. They also offer extended versions of interviews and other features. Popular offerings include weather reports, global financial information, sports scores, and breaking news.

- The Net is a popular showcase for short independent films. Many independent and amateur filmmakers create films using digital video cameras, which store

video in digital format suitable for transmission over the Internet. They can then use special software to edit their films and to add professional-quality special effects.

- Other uses. Yet another popular feature of the Net is chat. Using special software, users can gather in electronic "chat rooms" and send typed messages back and forth, discussing topics of common interest. The Internet also features many Web-based games with animation, sound effects, and music. Game players can challenge others in distant countries to tournaments.

- The creation of personal Web pages is a particularly popular use of the Web. Individuals create and maintain these pages. Some people use such pages to share personal information or to promote particular ideas and theories. One type of page, called a Weblog or blog, is a personal journal of thoughts and ideas for other users to read. A Weblog may also contain links to an individual's favorite Web sites. Most ISP's and online services provide space on a resource so called a server, or host, for hosting (storing) Web pages for individuals. Many services include the use of this space in the subscription price. But some charge the individual separately for the use of server space.

- Advertisers often place messages on frequently visited Web pages. Links join these messages electronically to the advertiser's own Web site. In effect, advertisers can invite Internet users to view commercials on their computer. Additionally, a user can supply the advertiser with his or her e-mail address to get further information, or such incentives as discount coupons.

How the Internet works Computer networks enable computers to communicate and share information and resources. The simplest networks consist of a user's computer, known as the client, and a server. The client makes requests of the server, which, in turn, provides the requested resources, such as information or software. The Internet works in much the same way, on a far vaster scale. To connect to the Net, a user logs on by instructing his or her computer's communications software to contact the ISP or online service. To protect the user's security, this process usually requires a secret password. The Internet was built around telephone connections that were, for the most part, the same as those used for voice communications. But the ever-increasing volume of Internet traffic, and the large size of video and sound files, require faster communications links. High-speed links, often called broadband connections, can deliver large amounts of information more quickly than traditional telephone lines can. Among the most common broadband connections are

(1) cable television connections,

(2) fiber-optic telephone lines, (

3) ISDN (integrated services digital network) and DSL (digital subscriber line), and (4) satellite connections. Cable television connections use the same cables that deliver television signals to carry Internet traffic. They require the use of a special cable modem. Fiber-optic telephone lines employ thin, high-capacity fibers to transmit vast amounts of information as patterns of light. ISDN and DSL use new technologies to increase the information-carrying capacity of traditional copper phone lines. Satellite connections use wireless communications with orbiting satellites. They enable people to use the Internet even in locations with no land-based communications lines.

Once connected to the ISP or online service, the user has several options. The user's communications software alone may provide access to such functions as e-mail and newsgroups. Most such software also includes a simple word processing program that enables a user to compose, revise, or read messages. A piece of software known as a browser enables a user to gain access to millions of Web sites. Each site has a separate electronic address, known as a uniform resource locator (URL). Many search engines and other programs throughout the Internet maintain and constantly update directories of addresses.

The addresses themselves are organized into various top level domains (major categories). In a URL, the top level domain takes the form of a of an extension of two or more letters, such as .ca for Canada, .com for commercial, .edu for educational, or .museum for museum. An organization called The Internet Corporation for Assigned Names and Numbers (ICANN) coordinates the assignment of top level domains. In the United States, a domain name includes a top level domain and a second level domain. In the domain name worldbook.com, for example, world book is the second level domain. By typing an address, or by clicking on a link, a user transmits a request through the ISP or online service and onto the larger Internet. When the request arrives at the desired destination, the server responds by sending the user the requested information. This information is often in the form of a starting page called a home page, which often resembles the table of contents of a book or magazine. From a home page, the user can search for further information by using links to other pages within the same Web site or to other Web sites. Most browsers include systems for bookmarking (recording) the addresses of favorite or frequently visited sites. A user who has bookmarked a site simply clicks on the appropriate bookmark to visit the site again. Many individuals maintain personal Web sites under domain names that include their own names. Several companies register domain names. Many ISP's and online services also register domain names for their customers for an added charge. Many files, especially illustration, motion-picture, and sound files, travel over the Internet in compressed form. One compression technique stores data that represent a less precise version of an image or sound than the original file does. Another technique saves space by removing

image or sound data that are repeated, then merging all the repeated sections together into a separate file. When the original file is decompressed, the repeated sections return to their proper places.

Concerns about uses of the Internet

The Internet and the Web have revealed only a fraction of their potential as tools for education, research, communications, news, and entertainment. Most people believe that the benefits of the Internet far outweigh its challenges. However, some people have serious concerns over the use of the Internet.

- Concerns about material. Among concerns over use of the Internet are doubts about the accuracy and appropriateness of information. Much information posted on the Internet may be misleading, inaccurate, or even fraudulent. Many teachers teach their students how to evaluate the information they find on the Internet and identify which Web sites are reputable sources.

- Many parents worry about violent or pornographic material available on the Net. Criminals may lurk in chat rooms, seeking to arrange face-to-face meetings with unsuspecting victims. Special programs known as parental control software, also called Internet filters, can help parents restrict access to sites that may be unsuitable for children.

In the United States, the Children's Internet Protection Act requires that public schools using federal funds to provide students access to the Internet install such filters by July 2002. Schools that fail to comply with the act could lose federal education aid.

- Security is an important concern for those who use the Internet. Mischievous programmers known as hackers often try to break into large computer systems. Some damage databases stored in these systems or attempt to steal information or electronic funds. Others may seek access to personal financial information. Many people feel concerned about the security and confidentiality of credit card numbers used to make purchases over the Internet. To protect themselves and their services from unwanted intruders, many ISP's and online services, corporations, and even individuals erect software and hardware barriers called firewalls. Such barriers seal off a server or other computer from intrusion.

- Software itself can become a danger on the Internet. Programs known as viruses, e-mail bombs, Trojan horses, and worms have spread across the Internet and can cause damage to data on systems that receive them. Some of these programs have spread to computers around the world in a matter of hours. Many companies produce software designed to protect users from viruses and

other such destructive programs. Most publishers of virus protection software update their programs when new types of viruses are detected. Customers can often download these updates over the Internet.

- Legal issues. The distribution of e-books, digital music, and digital video poses important legal questions, particularly because digital files can be so easily pirated-that is, copied and distributed without permission or payment. Web users can e-mail copies of e-books and digital recordings anywhere. Unauthorized Web sites offer pirated e-books, recordings, or videos. Some Internet companies provide sites where people can freely share digital copies of music. At first, this sharing was free, and the traditional music industry claimed that the practice was illegal. Several music distributors participated in lawsuits against the companies. As a result, these companies have begun to charge customers for downloads and pay fees to music publishers.

- Internet availability. As the Internet and Web have become more popular and powerful, concern has grown about equality of access to their resources. Computers are costly, as are ISP and online service subscriptions. To ensure more equal access to the Net, many public libraries and schools provide Internet-capable computers for individual use. In many cities around the world, establishments known as Internet cafes offer people the use of Internet-ready computers for a fee based on time of use. Such establishments are especially popular in areas of the world where many people do not have computers or even telephones.

History of the Internet

Early development. The Internet began to take shape in the late 1960's. The United States Department of Defense was concerned at the time about the possibility of devastating nuclear warfare. It began investigating means of linking computer installations together so that their ability to communicate might withstand a war. Through its Advanced Research Projects Agency (ARPA), the Defense Department initiated Arpanet, a network of university and military computers. The network's operating protocols (rules) laid the groundwork for relatively fast and error-free computer-to-computer communications. Other networks adopted these protocols, which in turn evolved as new computer and communications technologies became available. Throughout the 1970's, Arpanet grew at a slow but steady pace. Computers in other countries began to join the network. Other networks came into existence as well. These included Unix to Unix Copy (UUCP), which was established to serve users of the UNIX operating system, and USENET (user network), a medium for posting text-based articles on a variety of subjects. By 1981, just over 200 computers were connected to

Arpanet. The U.S. military then divided the network into two organizations-Arpanet and a purely military network. During the 1980's, Arpanet was absorbed by NSFNET, a more advanced network developed by the National Science Foundation, an independent agency of the federal government. Soon, the collection of networks became known simply as the Internet. One of the reasons for the slow growth of the early Internet was the difficulty of using the network. To access its information, users had to master complex series of programming commands that required either memorization or frequent reference to special manuals. The World Wide Web. The Internet's breakthrough to mass popularity occurred in 1991 with the arrival of the World Wide Web. The Web was developed by Tim Berners-Lee, a British computer scientist at the European Organization for Nuclear Research (CERN). One feature that helped popularize the Web was its ability to deliver multimedia. The programming language that the Web used, called hypertext markup language (HTML), made it far easier to link information from computers throughout the world. This development effectively created an interactive index that enabled users to jump easily from the resources of one computer to another, effortlessly following an information trail around the world. The arrival of browsers in 1993 further simplified use of the Web and the Internet, and brought about staggering growth in the Internet. In the 1990's, many businesses were created on the Internet. Some were considered among the most valuable businesses in the world. But their values often rested in their potential, or the excitement people felt about this new way of doing business, and few actually made a profit. By 2000, many of these companies had gone out of business. Companies that operated traditional retail businesses in addition to ones on the Internet were, on the whole, more successful. New technologies continue to increase the importance of the Internet. Handheld computers and Internet-capable cellular telephones take advantage of satellite communications to enable people access the Internet from any location. Dedicated devices often called Internet appliances or network computers provide e-mail and Web browsing ability to people who do not require the greater capabilities of a PC. Manufacturers increasingly add computer features to television sets, and many of these sets provide Internet capabilities. The Web has moved rapidly from inception to global acceptance. Most computer experts expect the Web to continue its rapid growth. New technologies will aid its growth by adding such features as spoken-word commands, instantaneous translation, and increased availability of historical and archival material.

Communication is the sharing of information. People communicate both interpersonally (between individuals) and through communications systems that transmit messages

between large numbers of people. Individuals communicate using many different modes-that is, in many different ways. For example, they may communicate through gestures and facial expressions as well as by speaking and writing. Communications systems, also called media, range from long-used systems, such as books, to new systems, such as the Internet, a worldwide network of computers. Other major media include newspapers and magazines, sound recordings, film, telephone and telegraph networks, radio, and television. Together, the communications media form a vast industry of great social importance.

How people communicate

- Interpersonal communication. No one knows how human communication began, but most scholars believe that communication through language began at least 150,000 years ago. The emergence of language was a decisive factor in the growing ability of early human beings to work together to make and use tools, shelters, and other products. People communicate using not only language, but also other modes, such as gesture and body position, mathematics, and music. Modes of communication also include visual images, such as works of art. They vary in their use from culture to culture and from person to person. Individuals are often better at using one mode than another. Acts of communication often employ more than one mode. Communication using language requires both a physical component-the central nervous system and muscle coordination-and cultural learning. Beginning early in life, human beings develop a basic understanding of several forms of communication. For example, babies about six months old begin to use hand gestures and distinct syllables simultaneously to express themselves. Face-to-face interaction with other people during the first three years of life is essential for a child to form the ability to communicate.

  Communications systems are widely used in schools, businesses, government agencies, and households. Some communications systems, such as the telephone system, are networks through which users mainly exchange messages one-to-one. Others, such as magazines and radio or television broadcasting operations, transfer messages to many people at once. The Internet is an example of a hybrid system, capable of communicating both one-to-one and one-to-many. Millions of people around the world work in the communications industry. Many kinds of workers are needed to make a communications system function. The television industry, for example, relies on writers, camera operators, technicians, and on-air talent. It also employs salespeople to sell advertising time, market researchers to study audience habits, and many other specialists. Communications systems are organized differently in different

countries. In the United States, electronic communications system developed as private businesses whose main goal was to earn profits. In most other countries, they began as government services financed primarily through service revenues and taxes. Most telephone systems originally operated as parts of national postal services. In some countries, government subsidies helped support newspapers. Economic forces shape and limit communications systems. For example, in many areas, television networks develop programs and services to help advertisers target desired audiences. Telecommunication systems are well developed in wealthy countries, but they have only begun to expand into developing regions.

The development of communications systems

- Prehistoric times. After language developed, people exchanged news chiefly by word of mouth. Runners carried spoken messages over long distances. People also used drumbeats, fires, and smoke signals to communicate with other people who understood the codes they used.
- Early writing systems. Around 8000 B.C., people in southern Mesopotamia began using clay tokens that had different shapes and markings. They probably used these tokens originally for such functions as counting and record keeping. These crude numerical notations gradually combined with pictures. Sometime before 3000 B.C., this combination emerged as the writing system known as cuneiform, which used wedge-shaped characters. Many scholars believe cuneiform was the first writing system.
- Other people probably invented their own writing systems independently, based on other principles and using other materials. For example, early systems of writing developed in Egypt, China, the Indus Valley (now part of India and Pakistan), and Central America.

WORD PROCESSING SOFTWARE:

A word processor is a program that enables you to perform word processing functions. Word processors use a computer to create, edit, and print documents. Of all computer applications, word processors the most common. To perform word processing, you need a computer, the word processing software and a printer. A word processor enables you to create a document, store its electronically on a disk, display it on a screen, modify it by entering commands and characters from the keyboard, and print it on a printer. The greatest advantage of word processing over using a typewriter is that you can make changes without retyping the entire documents. If you make a typing mistake, you simply back up the cursor and correct your mistake. If you want to delete a paragraph, you simply remove it, without leaving trace. It is equally easy to insert a word, sentence, or a paragraph in the middle of a document. The word processors also make it easy to move sections of text from one place to another within the document, or between documents. When you have made all the changes you want, you can send the file to a printer to get a hardcopy.

Word processors vary considerably, but all word processors support the following basic features:

- **Insert text** – Allows you to insert text anywhere in the document.
- **Delete text** – Allows you to erase characters, words, lines, or pages as easily as you can cross them out on paper.
- **Cut and Paste** – Cut and paste allows you to remove (cut) a section of text form one place in a document and insert (paste) it somewhere else. To cut means to remove an object from a document and place it in a buffer. In word processing, for example, cut means to move a section of text from a document to a temporary buffer. This is one way to delete text. However, because the text is transferred to a buffer, it is not lost forever. You can copy the buffer somewhere else in the document or in another document, which is called pasting. To move a section of text from one place to another, therefore, you need to first cut and then paste it. This is often called cut-and-paste.
- **Copy** – Allows you to duplicate a section of text. When you copy a piece of data, it is moved to a temporary location. In word processing, for example, copying refers to duplicating a section of a document and placing it in a buffer (sometimes called a clipboard). The term copy differs from cut, which refers to actually removing a section of a document and placing it in a buffer. After cutting or copying, you can move the contents of the buffer by pasting it elsewhere.
- **Page Size and Margins** – Allows you to define various pate sizes and margins, and the word processor will automatically readjust the text so that it fits.

- **Search and Replace** – This is a feature supported by most word processors, which lets you replace a character string (a series of characters) with another string wherever the first string appears in the document. Most word processors have two searches and replace modes. In the first mode, the word processor automatically makes all the replacements in the file. In the second mode, the word processor requires you to approve each replacement. This is safer because you may not want to make the change everywhere. Search and replace is sometimes called find and replace.

- **Word Wrap** – In word processing, word wrap is the feature that causes the word processor to force all text to fit within the defined margins. When you fill one line with text, the word processor automatically jumps to the next line so that you are not required to keep track of line lengths and to press the return key after split between two lines (unless the word processor supports hyphenation). Word wrap also occurs if you change the margins. In this case, the word processor readjusts all the text so that if fits within the new margins. Some word processors allow you to turn off the word-wrap features. This is useful for writing programs and other types of formatted text where you want complete control over new lines.

- **Print** – Allows you to send a document to printer to get hardcopy.

Word processors that support only these features (and may be a few others) are called text editors. Most word processors, however, support additional features that enable you to manipulate and format documents in more sophisticated ways. These more advanced word processors are sometimes called full-featured word processors. Full-featured word processors usually supports following features:

- **File management** – Many word processors contains file management capabilities that allow you to create, delete, move and search for files.

- **Font specifications** – Allows you to change fonts within a document. For example, you can specify bold, italics, and underlining. Most word processors also let you change the font size and even the typeface.

- **Footnotes and cross-reference** – Automates the numbering and placement of footnotes and enables you to easily cross-reference other sections of the documents.

- **Graphics** – Allows you to embed illustrations and graphs into a document. Some word processors let you create the illustrations within the word processor; others let you insert an illustration produced by a different program.

- **Headers and footers** – Header is a line or lines of text that appears at the top of each page of a document. Once you specify the text that should appear in the header, the word processor automatically inserts it. Most word processors allow you to use special symbols in the header that represent changing values. For example, you can enter a symbol for the page number, and the word processor will automatically replace the symbol with the

correct number on each page. If you enter the data symbol, the word processor will insert the current date, which will change if necessary each time you print the document. Most word processors allow you to specify different headers, for example, one for odd numbered pages (odd headers) and another for even numbered page (even headers). Headers are also called running heads. Footers are one or more lines of text that appears at the bottom of every page of a document. All features available for headers are available for footers also. Footers are sometimes called a funning foot.

- **Page numbering –** The word processor automatically keeps track of page numbers so that the correct number appears on each page.
- **Layout –** Allows you to specify different margins within a single document and to specify various methods for indenting paragraphs.
- **Macros –** A macro is a character or word that represents a series of keystrokes. The keystroke can represent text or commands. The ability to define macros allows you to save yourself a lot of time by replacing common combinations of keystrokes.
- **Merges –** Allows you to merge text form one file into another file. This is particularly useful for generating many files that have the same format but different data. Generating mailing labels is the classic example of using merges.
- **Spell checker –** A utility that allows you to check the spelling of words. It will highlight any words that it does not recognize.
- **Tables of contents and indexes –** Allows you to automatically create a table of contents and index based on special codes that you insert in the documents.
- **Thesaurus –** A built-in thesaurus that allows you to search for synonyms without leaving the word processor.
- **Windows –** Allows you to edit two or more documents at the same time. Each document appears in a separate window. This is particularly valuable when working on a large project that consists of several different files.
- **WYSISYG (what you see is what you get) –** With WYSIWYG, a document appears on the display screen exactly as it will look when printed.
- **Mail merging –** This is a feature supported by many word processors that enables you to do mass mailings or mailing campaigns. To use a mail-merge system, you first store a set of information, like a list of names and addresses, in one file. In another file, you write a letter, substituting special symbols in place of names and addresses (or whatever other information will come from the first file). When you execute the merge command, the word processor automatically generates letters by replacing symbols in the second file with the appropriate data from the first file. The power and flexibility of mail merge systems varies considerably from one word processor to another. Some word processors support a full set of logical operators that enable you to specify certain conditions under which information should be merged. Also, some merge systems allow you to merge data from several files at once. Mail merge is sometimes called print merge.

For example: ms-word, AmiPro, word star, word perfect etc.

- **Modem,** pronounced MOH duhm or MOH dehm, is a device that enables computers to transmit and receive information over the telephone network. The word modem stands for modulator-demodulator. A modem modulates (translates) a computer's digital electrical signals into tones that can travel over telephone lines. A modem at the other end demodulates (retranslates) the tones back into computer information. Modems can send and receive not only text information, but also sound, still pictures, and moving pictures. Modems and telecommunications software make it possible for computer users throughout the world to communicate with each other. To begin this communication, a modem first sends a signal representing a telephone number. The telephone network directs the transmission to the device represented by that number. Communication can take place directly with another computer's modem, or through the vast computer network called the Internet (see INTERNET). The faster a modem works, the easier it is to receive complex information. Modem speed is measured in units called bits per second (bps). Speedy, inexpensive modems available to home computer users helped bring about an explosion of online communications in the middle and late 1990's.

Output device:

- **Inkjet printer** is a device used to print text and illustrations created using a computer. It uses a high-speed nozzle to spray a thin jet of fast-drying ink onto paper that is fed through the printer. Before spraying the ink, the printer separates it into droplets by heating or vibrating it. The printer responds to instructions from software in the computer. This software instructs the printer to rapidly turn the jet on and off and controls the jet's direction in order to form the desired printed output. Most inkjet printers can print in either black or full color. To produce a full range of color, printers usually have separate tanks holding black, red, blue, and yellow inks. Some printers use only red, blue, and yellow inks. In such printers, a mixture of the three inks produces black. Most inkjet printers produce the sharpest images when used with special paper. However, inkjet printers can print on a variety of papers, and even on fabric. Inkjet printers can produce detailed, colorful images, yet they are relatively inexpensive to buy and operate. Thus, many users of home computers own inkjet printers. The printers are also used in business applications and desktop publishing (the use of personal computers to design and edit publications).

INPUT DEVICES:

- Scanner is a machine that translates printed pages, photographs, and other materials into digital (numeric) code for use by computers. The machine scans the material one tiny area at a time. An electronic device called a charge-coupled device measures the amount of light reflected from each area. The scanner then translates the measurement into digital code. Most scanners can digitally reproduce both black-and-white and color materials. A flat bed scanner scans material through a plate of glass on which the material lies flat. A drum scanner scans material that has been mounted on a rotating cylinder. A scanner usually separates color images into the four colors used to produce a full-color effect in printing. These colors are yellow, magenta (purplish red), cyan (blue), and black. The scanner is programmed to produce the yellow, magenta, and cyan components. The computer creates the black component using the color information. One common use of scanners is to convert text that was not produced on computers into a form that computers can process and store. If scanned text is to be edited, special computer software is used to convert individual letters, numbers, and other symbols. This software uses a technique known as optical character recognition. Printing companies use scanners in the production of printing plates and cylinders. The digital files produced by a scanner can be output to digital printers, or to plate making machines called image setters or plate setters.

STORAGE DEVICES:

- **Smart card** is a plastic card embedded with at least one computer chip. Such chips store information and may also perform mathematical calculations. Smart cards are used with many electronic devices, including automated teller machines (ATM's), cellular telephones, and handheld computers. Some people refer to cards that store information on a magnetic stripe as "smart" cards. However, the International Organization for Standardization (ISO), an association that sets standards of quality to help world trade, regards only cards with a computer chip as smart cards. Smart cards can store much more information than magnetic-stripe cards can. A magnetic-stripe identification card might hold a person's name, address, social security number, and insurance information. A smart identification card could also store a person's fingerprints and keep track of drug prescriptions. Some smart cards store a money value that can be used for purchases. Such cards can then have value returned to them by electronic transfers from a bank account. Smart cards used with handheld computers might

hold an electronic dictionary, a tiny modem that enables the computer to communicate with other computers, or a specialized computer program. Some smart cards are used as security devices. They are used along with another code or password to enable a person to use an ATM or other electronic device.

- **Memory chip** is a device that stores information in a computer. The device consists of electric circuits built into a chip-usually made of silicon-no larger than a fingernail. Memory chips store information that is needed immediately by a microprocessor in the computer. A microprocessor is a chip that controls computer systems and processes. A computer may have several microprocessors or only one. Information not in immediate demand is saved on any of various kinds of storage devices, including hard disks, floppy disks, CD-ROM's (Compact Disc Read-Only Memory units), and tape drives. There are two basic kinds of memory chips:

(1)   read-only memory
(2) Random-access memory (RAM).

A ROM chip holds its memory even when the computer power is turned off. However, the computer user cannot change the memory. A RAM chip holds its memory as long as power is on, and the user can change the memory. Memory chips can store a tremendous amount of data. A single RAM chip can store tens of millions of units of information called bits. A letter, numeral, or other symbol consists of eight bits.

- **Computer storage disk** is the standard medium for storing data. There are two main kinds of storage disks
  (1) Magnetic disks and
  (2) Optical disks.

Magnetic disks are either removable or fixed. The primary kind of removable magnetic disk is the floppy disk, sometimes called a diskette. This disk consists of a circular piece of flexible plastic film covered with magnetic particles and enclosed in a rigid plastic housing. The computer user inserts the housing and disk into the computer. A machine called a disk drive spins the disk past a device known as a read/write head.

Inside the computer, all data are encoded as electric charges representing the numbers 0 and 1. To store data on the disk, the head orients the magnetic particles in patterns representing 0's and 1's. To copy data from the disk, the head uses the patterns of magnetism to produce charges representing 0's and 1's. The main kind of fixed magnetic disk is the hard disk that is permanently installed inside virtually every personal computer. Many computers have a stack of disks, each with its own read/write head. The primary type of optical disk is the CD-ROM (Compact Disc-Read Only Memory). To store data on a CD-ROM, a laser beam cuts tiny pits into the disk. The pits and flat spaces represent 0's and 1s. To copy data, a laser beam shines on the pits and flat spaces. The intensity of

the reflected light changes as the light enters and leaves the pits. The reflected light strikes a device that translates these differences into electric charges.

- ♣ **DVD** is a round, flat platter on which motion pictures, computer programs, or other information is stored in the form of digital (numeric) code. A DVD is the same size as a standard compact disc (CD)-about 4 3/4 inches (12 centimeters) in diameter-but it can store much more information than a CD can. Each side of a DVD can contain two data layers, one beneath the other. A single DVD can store up to 17 gigabytes (billion bytes) of information. DVD is often said to stand for Digital Versatile Disc or Digital Videodisc. However, many people involved in the production of DVD's insist the letters have no specific meaning. There are several types of DVD's. DVD-Video (often simply called DVD) stores materials that combine visuals and sound, such as motion pictures and concert performances. The discs are played using a DVD-Video player connected to a television set. DVD-Audio stores six channels of sound and can be played on a DVD-Audio player. A universal player can play DVD-Video, DVD-Audio, and audio CD's. DVD-ROM (Read-Only Memory) stores computer data or programs for use with a computer's DVD-ROM drive. Computer users can employ DVD-R (Recordable) and DVD-RW (Read/Write) drives to store their own data on special DVD's. An international group of electronics **manufacturers developed DVD. Products that use DVD's first became available in 1996.**

- ♣ **PROCESSING:**

- ♣ **Microprocessor is the device that does the actual computing in a computer. A microprocessor consists of electronic switches called transistors and other parts built into a chip--usually made of silicon--no larger than a postage stamp. Some microprocessors have more than 1 million transistors. In a typical microprocessor, most of the parts are arranged into two groups of circuits: (1) the control unit and (2) the digital logic unit. The control unit directs the operation of the entire computer. The digital logic unit performs the computations. The remaining parts make up memory devices that hold information for the control and digital logic units. Some personal computers have more than one microprocessor--a primary processor and one or more co-processors to handle special kinds of work. Some computers, for example, have sound co-processors. Much less powerful microprocessors operate such devices as digital wristwatches, microwave ovens, and the ignition systems of automobiles.**

- ♣ **Transistor** is a tiny device that controls the flow of electric current in radios, television sets, computers, and almost every other kind of electronic equipment. Transistors vary in size from about a thousandth of a millimeter to a few centimeters across. Transistors replaced electronic components called vacuum tubes almost completely in the 1950's and 1960's because they have a number of advantages over vacuum tubes. For example, transistors are smaller, lighter, less expensive to produce, cheaper to operate, and more reliable than vacuum tubes. See VACUUM TUBE. Transistors are the main components built into computer chips, devices that carry out computer programs and store programs and other data. Some chips no larger than a fingernail contain millions of transistors. See COMPUTER CHIP. Large, individual transistors are called discrete transistors. Because of their size, these units can handle many times the power of transistors in chips. Uses of discrete transistors include providing the power for the speakers of high-fidelity sound systems, the transmitters of citizens band radios, and the motors of small appliances; turning lights on and off; and controlling energy flow through electric power lines.

- ♣ **What transistors do** A transistor has two basic functions:
  (1) to switch electric current on and off and
  (2) to amplify (strengthen) electric current. A weak voltage called the input signal controls both switching and amplification.
  Transistors in computers perform rapid switching operations to manipulate electric charges that represent information as the 0's and 1's of the binary numeration system. As the transistors move the charges about, electronic circuits carry out calculations, solve problems in logic, form words and pictures on monitors, control printers, and perform all the other operations that we have come to associate with computers. See COMPUTER (Parts of computers).
  Their ability to amplify signals makes transistors essential parts of radios and television sets. The broadcast waves that travel through the air generate weak currents in a radio or TV antenna. Transistors in electronic circuits amplify these signals. Other components-including additional transistors-use the resulting strong currents to produce sound and pictures.

Accounting Information Systems Explained

Accounting Information Systems (AIS) collect, record, store, and process data to produce information for decision makers. *Accounting information systems are* a set of interrelated components, that interact, to achieve a goal. Most **accounting information systems** are composed of smaller subsystems and vice-versa, every organization has goals. Accounting Information Systems can use advanced technology, be a simple paper-and-pencil system or be something in between. Technology is simply a tool to create, maintain, or improve a system. An accounting information systems topics impact corporate strategy and culture.Accounting information systems offers value and is a very important part of the value chain. Although "adding value" is a commonly used buzzword, in its genuine sense, it means making the value of the finished component greater than the sum of its parts. It can mean, making it faster, making it more reliable, providing better service or advice, providing something in limited supply, providing enhanced features or customizing it. Value is provided by performing a series of activities referred to as the value chain which includes primary activities and support activities. These activities are sometimes referred to as "line" and "staff" activities respectively.Information technology can significantly impact the efficiency and effectiveness with which the preceding activities are carried out. An organization's value chain can be connected with the value chains of its customers, suppliers, and distributors.The functions of Accounting Information Systems are to:

- Collect and store data about events, resources, and agents.
- Transform that data into information that management can use to make decisions about events, resources, and agents.
- Provide adequate controls to ensure that the entity's resources (including data) are:
  - Available when needed
  - Accurate and reliable

Accounting information systems are the structures and architecture on which accounting information is captured, processed and reported. They happen to be computer-oriented in this day and age. To understand and create useful systems you must understand business, business processes, accounting, and a bit of technology.

- The subsystems should be designed to maximize achievement of the organization's goals.
- Even to the detriment of the subsystem itself.
- For Example: The production department (a subsystem) of a company might have to forego its goal of staying within its budget in order to meet the organization's goal of delivering product on time. Goal conflict occurs when the activity of a subsystem is not consistent with another subsystem or with the larger system. Goal congruence occurs when the subsystem's goals are in line with the organization's goals. The larger and more complicated a system, the more difficult it is to achieve goal congruence. The systems concept encourages integration (i.e., minimizing the duplication of recording, storing, reporting, and processing). Data are facts that are collected, recorded, stored, and processed by an information system. Organizations collect data about, events that occur, resources that are affected by those events and agents who participate in the events. Information is different from data, information is data that has been organized and

processed to provide meaning to a user. Usually, more information and better information translates into better decisions. However, when you get more information ([Site Financial](#)) than you can effectively assimilate, you suffer from information overload.
 When you've reached the overload point, the quality of decisions declines while the costs of producing the information increases.

Accounting Information Systems Characteristics

Characteristics that make information useful:

- Relevance
- Reliability
- Completeness
- Timeliness
- Understand-ability
- Verifiability
- Accessibility

1. *Basic Concepts:*

   *Computers:*A computer is often understood to be a device that computes of calculates numbers. A computer however, does more than that It can edit text, generate pictures or graphs, translate language and even play games.It can be defined as an electronic device with the ability to

- Accept data supplied by the user
- Input, store and execute instructions
- Perform mathematical and logical operations
- Output results according to the user requirements.

   The modern computer can be defined as an electronic machine that is designed to accept, store data and instructions, and process the data according to the instructions to produce desired results.

   Any computer perform these fundamental steps:

INPUT

PROCESS

OUTPUT

♣ *Kind of Computer in respect of size and function:*

There are different types of computers depending on the size:

- **Microcomputers** are the smallest computer systems. Their size ranges from calculator to desktop size. Microcomputers can perform the same operation and use the same type of instructions as any other computer. The microcomputer CPU is a microprocessor. The microprocessor manufactured by a company named Intel Corporation was extensively used in microcomputers. Some of Intel's popular brand names of microprocessor is Intel 80586 known as Pentium.Microcomputers are also referred to as Personal Computers, Desk Top Computers or Lap Top Computers or Home Computers.

- **Minicomputers** are also small general-purpose systems, but most micros they typically serve multiple users. Such systems are called multi-user systems. They are usually more powerful and more expensive than micros. Microprocessor manufactured by a company named, Motorola is popularly used in minicomputers – MC68000 series.

- **Mainframe** computers are systems that offer faster processing speeds and greater storage capacity than a typical mini. There is quite a bit of overlap possible in the performance of large minis and smaller mainframes. Mainframe computers are also multi-user systems.

- **Supercomputers,** designed to process scientific jobs like weather forecasting, artificial intelligence research etc. They are the largest, fastest and most expensive system in the world.The company named 'Control Data Corporation', marketed Cyber series of supercomputers and another company named 'Cray Research Incorporation' marketed the Cray series of supercomputers.

Today, however, due to the technological advances being made, the different computer models emerging have the capacity for equal functions. For example, a powerful Micro can perform the task of a Mini and so on.There are different types of computers depending on the size

- **Analog Computers:** A computer which measures continuously changing conditions, such as temperature and pressure and converts them into quantities. These computers are used in scientific and engineering fields because they deal with quantities that vary constantly. They give only approximate results.

- **Digital Computers:** A computer which measures digital data and performs arithmetic and logical operations on such data. These are the most popularly used computers. Special purpose digital computers can be fixed permanently in the machine. General-purpose digital computers can be used in different applications since they can store different sets of instructions and programs.
- **Hybrid Computers:** Computer systems that combine features of both analog and digital computers.

o *History of computers:*

The computer that we use today is the result of man's long search for a device to help in performing computations. The search dates back to the 17th century. A series of scientific breakthroughs by many persons have contributed to produce this electronic machine, the computer.

The word *'Computer'* is derived form the word *'Compute'*, which means to *'Calculate'*.

o If we look at the history of computers, it can be traced back to 3000 B.C. The Stone Age man used small found stones (pebbles) for counting cattle.
o Later, a device called Abacus was developed by the Chinese. This is supposed to be the first mechanical computing device.
o In 1617, John Napier, a Scottish mathematician developed a device which is called Napier's bones. With the help of this device, multiplication and addition were possible.
o In 1642, Blaise Pascal, a French mathematician invented the first mechanical calculator.
o In 1673, Gottfried Wilhelm Leibniz, a German invented the Leibniz calculator which was used for addition, subtraction and multiplication.
o A French weaver's son named Joseph Marie Jacquard made the next significant contribution in 1804. After observing his father making different weaving patterns on the loom, he thought of storing these patterns for future use. So he developed a plate with multiple holes to control the weaving patterns, not knowing that one day his idea of storing the weaving patterns would be used to store data and would be called the Punch Card.

o A punch card is a thin rectangular card divided into 80 columns and 12 rows in which the various characters could be represented by punching holes in different rows and columns. On one card it is possible to punch 80 characters – one character per column, thus it is possible to store 80 characters of data.

o Around 1822, Charles Babbage a professor of mathematics at the Cambridge University devised an automatic calculating machine called difference Engine.

o The next significant invention came from Dr. Herman Hollerith, an American. Hollerith built a computer to analyze the Census data of the United States of America in 1890. This computer was electro-mechanical and was named the Census machine of Hollerith Statistical Tabulator. Using this machine Hollerith announced the results of the census in 2½ years as compared to 7½ years when the processing was done manually. Herman Hollerith founded a company named *"The Computing Tabulating Recording Company"* which today is the IBM Corporation.

o Howard Aiken, built the first fully electro-mechanical computer named MARK-1.

o In 1945, a significant contribution was made by John Von Neumann, a Frenchman working for IBM. He designed the basic structure of a computer to include the capacity to:

o **I Generation Computers (1945-1955):** The main components in use were the vacuum tubes (like those in the old radios, which warmed up after a minute or son, and glowed red). The vacuum tubes were also called as valves. The first computer used 17000 vacuum tubes, weighted 30 tons and occupied an area of a big hall. Vacuum tubes or valves took ages to warm up and consumed massive amounts of electricity. Some of the computers of this generation are ENIAC, UNIVAC-1.

o **II Generation Computers (1955-1965):** The real breakthrough in computers started with the discovery of the transistor (one can find three legged transistors inside all transistor radio). Transistor is a tiny semi-conductor device; the size is about 1/50th of a valve, which can perform the same function as that of a large valve. Transistors replaced valves in computers. The use of transistors has:

o Reduce the size of the computer.

o Reduce manufacturing and running costs.

o Improved reliability and processing power of the computer. Computers, which were built using transistors, became the Second Generation computers. Some of the computers of this generation are IBM 7000 series, IBM 1620, IBM 1401. Second generation computers were significantly faster than the first generation computers. But things did not stop there.

o **III Generation Computers (1965-1970):** As the next step, functions of a number of transistors were put together on a single chip (wafer) of silicon. These chips are

called Integrated Circuit (IC) chips. A small chip, the size of a fingernail could have the equivalent of 200 to 2000 transistors. The chip is a small silicon wafer with very minute transistors, which can do logical comparisons and calculations. Some chips have been developed for the purpose of data storage. These constitute the memory chips. The use of chip technology reduced the size of computers. Computers, which were built using ICs, became the Third Generation Computers. Some of the computers of this generation are IBM 360, IBM 370.

- o **IV Generation Computers (1970 onwards):** From 1970 onwards, we are in the era of Fourth generation computers, in which the electronic component was further miniaturized through Large Scale Integrated (LSI) of circuits on the silicon chip. Now the advancement of chip technology has come to be known as Very Large Scale Integration (VLSI), where millions of transistors are packed in a single chip. The VLSI chips are getting refined every day. The size of the chip is shrinking and the components, which are packed in a chip, are multiplying, as a result the size of the computer reducing. What used to be a room-sized computer at one time is now available as desktop computer or Laptop computer with much more computational power. Along with the reduction in size, there is significant reduction in prices too.
- o **V Generation Computers:** From 1982 onwards, research is on to develop a Fifth generation computer that will have the thinking power just like that of the human brain. These computers, which are based on Artificial Intelligence (AI), are designed to be 'Thinking" computers capable of storing large amount of data to be retrieved as and when required to solve a problem.

Network Concept

A network is a group of various components connected together in such a way that, it is possible to distribute or collect information over the entire group. As in case of other tools of communication, computers too need to be networked for any group activity to function effectively and efficiently. Though they started as tools of computing, computers have developed into powerful tools of communication. Computer networks in addition to exchange of information, can carry out another important function – **sharing of resources.**A computer network thus is a collection of hardware and software that enables a group of computers communicates and provides users with access to shared resources. These shared resources include data files, application, and hardware and other related resources. A network is basically a communication system for computers. Just as the telephone system allows two people to talk to one another, networks allow computers to communicate. Any communication system requires one or more transmitters and receivers, a message and a communication channel.

Objective of Computer Networks: Networks satisfy a broad range of purposes and meet various requirements. Some of the common objectives of Computer Communication networks are:

o To provide sharing of geographically distant resources such as information, databases or processors (CPUs). Resource sharing is perhaps the most common objectives for providing networks, within the constraints of cost and reliability of transmission links.
o To provide communication among users. Network users geographically far apart from each other can converse in an interactive session or send messages to each other.
o To increase the reliability of processing capacity through back up and redundancy. If one processing unit breaks down, another physically distant processor (which is back up of this unit) can take over.
o To provide distributed processing capability, which means taking the processing out of a single large computer and distributing it to the place where the data is generated or where most of the operations are done. It is cost effective as it eliminates most of the expensive large processors, and also saves on transmission cost.
o To provide centralized management and allocation of resources.
o To enable modular enhancement of computing resources we can at any time add (or remove) and extra smaller and inexpensive computer and connect it to the network to increase the total computing capacity of the network. Doing the same thing in a big central computer is difficult and expensive.
o Superior price/performance ratio. It is important to note that there are still some applications which require a tremendous amount of processing capacity and are best handled by a powerful central computer and not by a large number of distributed small computer present on the network and the results of processing can be obtained over the network.
o **Advantage of Networking:** A network can convert a group of isolated users into coordinated multi-user system. A network-connected user can easily and legally share

copies of software packages with other users, as well as access network connected peripherals. A network is ideal for database systems in which multiple users need to access as well as modify the database frequently. Computer networks thus, can help any organization run more efficiently economically and effectively. The benefits of networking are:

o Program and File Sharing
o Network Resource Sharing
o Database Sharing
o Economical Expansion of the PC Base
o Ability to use Network Software
o Ability to use Electronic Mail
o Creation of Workgroup
o Centralized Management
o Security
o Access to more than one Operating System
o Enhancement of the Corporate Structure

♣ **Component of a Network:** A network is a combination of different components. The most essential components of a simple network are:

↓ **Servers:** Servers are the faster computers to run various software, store and process information and to provide a human interface for the users to be able to use the networked computers.These services include file storage, security, user management, network commands and options for users etc. depending on the type of server. The most common type of server is the **File Server**. The file server does not need any special hardware. It is just a computer with one or more hard disks. Users access files stored on the file server as if they were using their own hard disks.

File servers can be:

1. **Dedicated Server:** In a dedicated server, one or more computers are set aside as file servers and not used for anything else. Users' access shared directories and resources on the dedicated server, but not on each other's systems.
2. **Non dedicated Server:** A server can operate in a non-dedicated mode. Here, the machine used as server can also operate as a workstation. Some amount of memory is kept aside for the local mode.

↓ **Notes:** Nodes are the computers on the network, which are provided to the users to carry out their tasks using the network. A node, which is more powerful and

can handle local information processing or graphics processing is called workstation.

The workstation works only for the person sitting in front of it, whereas a server serves all the people on the network to share its resources. A workstation usually has an inexpensive, small hard disk to carry out local tasks. Some workstations, called diskless workstations, have no disk drive of their own. Such workstation also called dumb terminals; rely completely on the LAN for their access. The network operating system lets the nodes work as if all the resources at the server belong to the node itself.

- **LAN Cables:** This is the medium over which the information travels from computer to computer. From the computer onto the medium (cable) and to take up the information from the medium and make it available to the computer in the form it can read.
- **Network Operating System Software (NOS):** To control the movement of information on the network. Networks, which are more complex, require components like Hubs, Switches and Routers to carry out different network functions.

On the network, each computer is called a node or a workstation unless there are certain computers designed as servers. Each computer contains a network interface card. LAN cables connect all the nodes and servers together to form the network. In addition to its local disk operating system, each node requires networking software that enables the nodes to communicate with the servers. In return, the file servers run network software that communicates with the nodes.

- **Network Interface (NIC) Card:** This is card used to connect the cables to the computers. These cards help the computer to transfer the data at a faster rate and in the form of packets. These cards are plugged into the computer motherboard. These cards are generally called as Ethernet cards.

Types of Network

One which has all the computers connected to the network such a way that each computer can behave as a server as well as a node. The other type of network has one or more computers designated as servers and the remaining computer function only as nodes. Networks are classified upon the geographical area they span into the following categories:

- **Local Area Network (LAN):** A private network within a range of 10 kilometers owned and controlled by single organization. A LAN is a Local Area Network, within a single building or a specific confined space. LAN enables you to connect a group of computers. People using the networked computers can share

information and resources. A LAN is so called, mainly because the network is confined to a specific area which is called the Local Area.People working in the local area network used to carry the information from one place to the other by the use of floppy disks. This way of transportation has certain limitation like; the size of the file cannot exceed the capacity of the floppy disc and many a time the floppy disk drives may not function properly, because of the usage of old floppies already used in the drive, making it not to function.

LAN has three main characteristics:

1. A diameter of not more than three kilometers
2. A total data rate at least several mbps
3. Complete ownership by a single organization

- **Wide Area Network (WAN):** A public network connecting different cities and towns mostly through telephone links or microwave links through a satellite. As the LAN of a company grows and expands to computers and users in other locations, it becomes a wide area network (WAN). By geographical scopes WAN is different tram a WAN. WAN can transmit devises plant nits, cities and nations WAN provides lay distance transmission and data, voice etc. They use public, private and leased communication devices and no can be used to transmit manages over long distances. In this transmitting and receiving equipments are geographically distributed.

  The features of WAN are:

1. It is typically spans entire countries
2. It has data rate below 1 mbps
3. It is owned by multiple organizations

- **Metropolitan Area Network (MAN):** A public or private network used to connect various locations including suburbs in a metropolitan city. The MAN is in between a LAN and WAN. A MAN is a network that covers an entire city, but uses LAN technology. MAN is a network and computers and other related devices which may cover hear by corporate offices or a city and might be either private or public. A MAN can support both data and voice.

  Types of LAN Cables: LAN cables, also called the Ethernet media is the lifeline of a network. All the communication between the servers and node takes place over this media. There are four major types of cables in use today:

1. Thick coax (100 base 5) AUI
2. Thin coax (10 base 2) BNC
3. Unshielded Twisted Pair – UTP (10 base –T) RJ45
4. Fiber Optic (10 base – FL) SC or ST type

1. **Coaxial Cable:** Coaxial cable is easily identified in your every day life. You always find it connected to the television sets and audio equipment. Thick and thin refer to the

diameter of the coaxial cable. Standard Ethernet cable (thick coax) is over a centimeter in diameter. The thin coax is about half of thick coax in diameter. The thick coax has a greater degree of noise immunity and is quite strong. This requires a vampire tap (a piercing connector) and a drop cable to connect to the network. Though thin coax carries signal over the shorter distance, it is preferred over thick coax, because thin coax needs simple BNC connector (bayonet locking Connector) and is very flexible and is cheaper than the thick coax and more flexible and soft and ideal for office cabling environment.

2. **Unshielded Twisted Pair Cable (UTP):** Twisted pair cable is just what its name implies: Insulated wire with a minimum number of twisted per foot. Twisting the wires reduces the electrical interference. Unshielded twisted pair is very familiar type of cable. It is often used as the telephone cable.

    UTP cables comes in variety of grades called level 5, level 4 and level 3, offering better performance than an ordinary telephone cable. Level 5 cable is the highest, most expensive grade, meant for100 mbps networks. Level 4 and level 3 cables are less expensive, but cannot support the same data throughput speeds. Level 4 cables can support up to 20 mbps and level 3 up to only 16 mbps. This wide variety of cables shows the evolution of the Ethernet technology. Thick coax was one of the cabling systems used in the Ethernet but was difficult to work with an expensive. This lead to the development of the thin coax, which is easier to work with and less expensive. Today the most popular cable is Unshielded Twisted Pair (UTP) cable. This looks like a telephone cable but comes in variety of grades.

3. **Fiber Optic Cable:** Fiber optic cables are used for specialized applications. Fiber optic cable is more expensive, but it is invaluable for situations where large amount of interference is present, such as on a factory floor. Fiber optic cable is often used in inter-building applications to insulate networking equipment form electrical damage caused by lightning because it does not conduct electricity. Fiber optic cable can be used over distances up to 2 kilometers.

    Fiber optic cable as the name implies, uses light rather than electricity to carry information. Fiber can send data over very long distances at very high speed. It is expensive and difficult to work with. Splicing the cable to install connectors itself is a quite tough job. Also diagnostic tools for finding cable fault are very few and difficult to use. Fiber optic cable consists of a core of glass fiber, whose diameter is measured in microns, surrounded by a glass cladding. This in turn is covered by a protective sheath. The first fiber optic cables were made of glass fiber, whose diameter is measured in microns, surrounded by glass cladding. This in turn is covered by a protective sheath. The light source for fiber optic cable is a light emitted diode (LED) which encodes the information by varying the intensity of light. A detector at the other end of the cable is senses the intensity variations and converts them back into electrical signals.

    The kind of cable you use depends mostly one kind of network interface card you choose. The cables are connected to the computers through the connectors. There are basically two types of connectors: BNC and UTP

Comparison of MNC and UTP cable

BNC cabling	UTP cabling
1. Derived from the Thick Ethernet coaxial cable	1. Derived from the telephone cable
2. Flexibility of adding nodes	2. Decided by the HUB ports
3. Lower Price and no need of HUB	3. Needs HUB
4. Difficult to locate faults	4. Introduction of HUM makes fault finding much easier
5. Terminators needed	5. Terminators not needed
6. The cabling is comparatively less reliable	6. Inherently more reliable
7. Single segment length (node to node) up to 180 meters	7. Single segment length up to 200 meters

4. **HUBS:** Consider a thin wire segment with the bus terminators and fixed 8 taps. Imagine that the thin wire is miniaturized using silicon technology. Also 8 fixed taps are taken through 8 pin of the silicon. This miniaturized segment can be housed in a box. Each tap is provided with reliable RJ 45 connector. This is what we term as the HUB. But internally it is same as the wire segment with fixed taps.
5. **Stackable Hubs:** As the hubs become popular, the network reliability and manageability improved. Thus the workgroup size increased and higher port density Hubs were needed. Thus one could have used many be 48 or 64 port Hub. But scalable and modular approach was desirable. The developments in silicon technology made this possible.

*Central Processing Unit (CPU):*The computer has a control unit, which controls the computer's action, i.e. all the input from input devices and output-to-output devices and a memory unit where the computer stores things to be remembered. The control unit of the computer controls the data and instruction that is to be stored or retrieved from its memory unit. It has an Arithmetic and Logic Unit (ALU), which does all the calculations and logical functions. The control unit, Arithmetic Logic unit and Memory unit together form the Central Processing Unit (CPU) or the computer. The memory unit of the computer is further divided into Random Access Memory (RAM), Read Only Memory (ROM) and Cache memory. Random Access Memory (RAM) is used to store the data and instructions that are currently being processed. This memory can be randomly accessed and is called the immediate access memory. The RAM however, is volatile, i.e. the memory is erased when the power supply is cut off. The CPU of a modern computer is fully electronic i.e. it dies not contain any moving parts. It is made up of

millions of electronic components etched on to a number of silicon chips. These chips are all assembled on a printed circuit board called motherboard.

Function of CPU:

- To store data and instruction
- To control the sequence of operations
- To carry out processing

The CPU fetches the instruction from memory, decodes the instruction and executes the instruction by communicating with the Input/output devices and the memory. The figure shows the basic architecture of a computer. This architecture was developed by John Von Neumann, referred to as the Neumann Architecture.

Introduction to computer Architecture

It consists of three main sections: Arithmetic & Logic Unit (ALU), Timing & Control Unit and registers.

- **Arithmetic Logic Unit (ALU):** The arithmetic logic unit performs a set of arithmetic and logic operations. The arithmetic operations of the ALU include ADDITION, SUBSTRACTION, INCREMENT, DECREMENT and COMPARE.. The logical operations of the ALU include AND, OR, EX-OR, NOT, SHIFT/ROTATE, CLEAR and COMPLEMENT.While the accumulator holds on of the operands, the temporary register is used to hold the other data temporarily during arithmetic and logic operations. The result is stored in the accumulator and the flags are set or reset according to the result of the operation. As the flags are affected by the arithmetic and logic operations, the flags generally reflect the data conditions in the accumulator and are as follow:

Sign Flag(S): When an arithmetic or a logical operation in executed, if the MBS (most significant bit) of bit D7 of the accumulator is 1, the sign flag is set. This flag is SET(1) or RESET(0), according to the condition of the 7th bit of the accumulator. This is useful when signed binary operations are being performed. In a given byte, if D7 = 1, the number is considered to be negative and if D7 = 0, then number is considered to be positive. The remaining 7 bits indicates the magnitude of the number.

Zero Flag(Z): This flag is set (1) if the ALU operation results in the accumulator being equal to 0 else the flag will be reset (0), if the result is not 0. This flag is modified by the results in the accumulator as well as in the other registers.

Auxiliary Carry Flag (AC): In an arithmetic operation, when a carry is generated from bit D3 to bit D4, the auxiliary carry flag is set(1) otherwise it will be reset (0). This flag is very useful for binary coded decimal operations. This flag is mainly for internal microprocessor operations and is not available for the programmer to change the sequence of the program with a jump instruction.

Parity Flag (P): This flag indicates whether the total number of 1's in the accumulator after the execution of arithmetic or a logical operation is odd or even. If the total number of 1's is even, the flag will be set (1), so as to indicate even parity. If the total number of 1's is odd, the flag will be reset (0), so as to indicate odd parity.

Carry Flag (C): The 7th bit of an accumulator indicates whether the result of any operation has over flown. If there is any overflow from 7th bit, the carry flag will be set (1) otherwise it will be reset (0). The carry flag also serves as a borrow flag for subtraction.

1. **Timing of the Control Unit:** This unit controls and synchronizes all the operations inside and outside of the microprocessor in the system. The timing and control signals that regulate the transfers and transformations in the system associated with each instruction are derived from the master clock (CLK). The control unit also accepts the control signals generated by other devices associated with the microprocessor system. These control signals generated from outside of the microprocessor also alters the state of the microprocessor. Most of the microprocessor utilizes an external quartz crystal to determine the clock frequency (CLK) form which other timing and control signals are developed. The speed of the microprocessor is related directly to the clock speed, since most of the internal functions are timed by the reference signal.

2. **Registers:** A register is a very small storage area. Most of the 8085A store only byte of data. It is used for temporary storage of instructions, data or address. In most of the 8 bit microprocessors, the registers are either 8-bit for data storage or 16-bit for address storage. Every microprocessor is provided with a set of registers for temporary storage of information at various stages of instruction execution. The number and types of registers available for temporary storage of operands or address affects the following:

- Memory space occupied by the program
- Time of execution of the program
- Ease of programming

The registers available inside the microprocessor can be classified into: registers accessible to user and registers not accessible to the user. The registers available to the user can be further classified into: general purpose registers and special purpose registers.

Computer InstructionThe data in the 8085 is in the form of a 8-bitintiger called byte. The data word format isIn the above format, bit D0 refers to the least significant bit (LSB) while bit D7 refers to the most significant bit (MSB). An instruction must convey the information of the type of operation to be preformed, indicated by the opcode and the address of the memory locations or registers containing the data (operand) on which the operation is to be performed. Thus the instruction format of 8085 can be further classified into single byte instructions, two byte instructions and three byte instructions.

Single Byte Instructions: The single byte instructions had only one field called the opcode field. Ex: MOV A, C. This instruction is decoded as the hexadecimal number 79H with the least significant bit being 9 and the most significant bit being 7, together forming 79H. Other examples of single byte instructions include DCR B, INR D, ADD E etc.

Two Byte Instructions: The two byte instruction have 2 fields i.e.; the opcode field and the data or address field. Ex: MVI A, 05. In the above example, the first byte is the opcode, which when decoded will be in the hexadecimal form of 3E while the 2nd byte is the data byte 05. Other two byte instructions include OUTPORT ADDRESS, INPORT ADDRESS.

Three Byte Instructions: The three byte instructions also have only two fields i.e. the opcode field and the address/data field. Ex: LXIH 8000. In the above example, the hexadecimal equivalent for this instruction is 21, 00 and 80 H. The 1st byte 21 H is the opcode byte. The 2nd byte 00H is the lower order address while the 3rd byte 20H is the higher order address byte. Other three byte instructions include LXIB 8050, STA 9000, LHLD 9050 etc.

Instruction Set: The instruction set can be divided into five categories based on the function, the instructions carry out. They are:

1. **Data Transfer Operations:** The programming operations involve the movement of data between locations that hold the data. The 8085 instruction set features a number of instructions that facilitate data movement.

   1. Move form a register to another register
   2. Move from a memory location and a register
   3. Move immediate instruction
   4. Direct load and store instruction
   5. Load accumulator indirect i.e., **LDAX B, LDAX D**
   6. Store accumulator direct i.e., **STAX B, STAX D**
   7. Load H and L pair direct i.e., LHLD address i.e., **LJLD 8050**
   8. Store H and L direct i.e., SHLD address i.e., **SHLD 8050**

2. **Arithmetic Operations:** The arithmetic operations involve adding, subtracting, incrementing or decrementing numbers. The instruction set provides us with a number of instructions for arithmetic operations.

1. Adding the content of a register i.e., ADD register-name i.e., **ADD B**
2. Adding the content of a memory location i.e., **ADD M**
3. ADD immediate i.e., **ADI 66**
4. Subtract the content of register i.e., SUB register i.e., **SUB B**
5. Subtract the content of a memory location i.e., **SUB M**
6. Subtract immediate i.e., **SUI 55**
7. Increment/Decrement the content of the register i.e., INR register, DCR register i.e., **INR B, DCR C**
8. Increment/Decrement the content of the register pair i.e., INX register-pair, DCX register-pair i.e., **INX H, DCX D**
9. Add register pair to HL register pair i.e., DAD register i.e., **DAD B**
10. Add register content to accumulator with carry i.e., ADC register i.e., **ADC B**
11. Subtract register content with borrow i.e., SBB register i.e., **SBB C**

3. **Logical Operations:** The 8085 instruction set includes logical operations like AND, OR, EX-OR and not operations. The above logical operations have some common features like
   o They assume that the accumulator has one of the operands
   o The result is always stored in the accumulator
   o The zero, parity and sign flags are affected according to the result

1. Logical AND the content of the register i.e. ANA register i.e., **ANA B**
2. Logical OR the contents or the register i.e. ORA register i.e., **ORA B**
3. Exclusive-OR (EX-OR) the contents or the register i.e., SRA register i.e., **SRA B**
4. Complement the accumulator i.e. **CMA A**
5. Rotate accumulator content left i.e., **RLC**
6. Rotate accumulator content right i.e., **RRC**
7. Rotate accumulator content left through carry i.e., **RAL**
8. Rotate accumulator content right through carry i.e. **RAR**

9. Compare register i.e., **CMP B**

4. **Branching Operations:** The flexibility and versatility of the stored program concept on which computers are based, however results primarily from the computer's ability to transfer control or branch to an instruction, which in not in a sequential order. This is achieved with instructions from the branching group. All these instructions act on the program counter and it is possible to execute a block of instructions many times.

Unconditional Jump: A jump instruction is used to break the normal sequential execution and branch to a different part of the program. This is accomplished by loading the address of the next our-of-sequence instruction into the program counter, thus forcing the processor to fetch the contents of this new location as its next instruction. The new address is usually specified in the jump instruction. When the jump instruction is executed, no flag is affected.

Use of labels: During the course of writing the program for a particular problem, if the program needs to jump to an instruction, which appears in the later part of the program, then instead of giving the address, a label or name can be given in the jump instruction. Later when that part of the program is written, the same label can be referred at the statement to which the execution has to jump.

Conditional Jumps: Conditional jumps allow the processor to make decisions on certain conditions indicated by the flags. After every logic and arithmetic operation, flags are set or reset to reflect the status of result. The conditional jump instructions check the flag status and make decisions about the sequence of the program. The 8085 has five flags of which auxiliary carry flag, zero flag, sign flag and parity flag. All conditional jump instructions in the 8085 are three type instructions, quite similar to the unconditional jump instructions.

Storage Devices and types of computer memory:

Secondary storage devices are used to store the data and instructions permanently. They are also used in most computer systems to supplement the limited storage capacity of the RAM. Secondary storage devices can be in direct connection with the processor. They accept data and/or program instructions from the processor, retain them, and then return them to the processor as required to complete a processing task.There are two types of secondary storage devices:

I. Direct Access Storage Devices – E.g., Disk Drives where data is stored on circular disks made of magnetizable material.

II. Sequential Access Storage Devices – E.g., Tape Drives where data is stored on tapes made of magnetizable material.

+ **Direct Access Storage Devices (DASD):** The data stored in the direct access storage unit can be accessed by the processor directly, i.e. to access the 100th record, it can position itself directly over the 100th record. Data stored in a disk can be directly accessed. Every disk has a directory of what is stored in the disk. The directory contains the name given to the data file and its disk address (storage location). When data is needed by the processor, the read/write head of the disk drive identifies the disk address of that data file and moves to the specified track and then onto the proper sector, where the data is stored. Magnetic disk drives and optical disk drives are examples of some direct access storage device. **Access Time:** The time taken to position the read/write head on the proper track is called seek-time. The time required spinning and position the required data is called search-time or rotational delay. The time required to read the data into main memory is called data transfer time.Data Access Time = Seek Time + Rotational Time + Data Transfer Time.

+ **Sequential Access Storage Device (SASD):** The data store in the sequential access storage units can be accessed by the processor sequentially, i.e. to access the 100th records; it has to read the previous 99 records. Magnetic tape drives are sequential access storage devices. These devices store data on magnetic tapes.

Magnetic Disks: All magnetic disks are round platters coated with magnetizable recording material. They can be of different sizes and storage capacities. The disks are made of rigid material (hard disk) or flexible plastic material (floppy disk)

- Data is stored on all disks in a number of invisible concentric circles called tracks. The tracks begin at the outer edge of the disk and continue towards the center, independent of each other. Each track has a designated number.
- The number of tracks per inch varied depending on the capacity of the disk.
- Each track in the disk is divided into sectors and each sector is given a unique identification number.
- The number of sectors per track varies depending on the capacity of the disk.

- The storage capacity of a disk system also depends on the bits per inch of the track and tracks per inch (TPI) on the surface. That is the storage capacity depends on the number of bits that can be stored on an inch of track and the number of tracks that can be placed on an inch of surface.
- A motor rotates the disk at a rapid speed, measured in terms of rotations per minute (rpm). Data is recorded on the track of the spinning disk surface and is read form the surface by the read/write head of the disk drive.

   - **Hard Disk:** A hard disk consists of several platters mounted on a spindle. This unit of multiple disks is made to rotate at speeds of 3000 rpm and more. When multiple disks are packaged together, a number of read/write heads are used, to write or retrieve data. The heads fly on a cushion of air above the surface as they access the disks. Hard disks are of two types: Fixed Disk (Winchester Disk) and Removable Disk (Disk pack).
   - **Cylinder:** Cylinder refers to all tracks on magnetic disks that are accessible by a single movement of the access mechanism. The access mechanism, which has multiple read/write heads, will position itself on the same track of different disks surfaces. This area, which is accessible to the various read/write heads form a cylinder.
   - **Floppy Disk:** The flexible (or floppy) disks are the most popular secondary storage medium used in the micros. The floppy disk is made to rotate at speeds of 300 rpm and more. The read/write head is in contact with the spinning disk.

   Data is written as tiny magnetic spots on the disk surface. Writing new data on a disk erases data previously stored at that location, but otherwise magnetic spots remain indefinitely. Reading of recorded data is accomplished by the magnetized spots passing under read/write head and inducing electric pulses in it.

Size (inches)	Description	Capacity (Bytes)
5.25	Double-sided High-density (DSHD) This floppy has 96 track per inch and 15 sectors	1.2 MB
3.5	Double-sided	1.44 MB

   - **Magnetic Tape:** Magnetic tapes are used where sequential processing and accessing is required. It is a medium to store large files and for backup purposes. In large organizations, tapes are used as back-up storage. Data is stored as tiny spots on the magnetizable material that coats one side of a plastic tape. Since tape is a continuous length medium, to differentiate between different data records gaps or spaces are left in between records called Inter Record Gap (IRG). Several records are combined

together and written as one block – blocking of records – to avoid wastage due to IRG. The records are read sequentially, one at a time, until the file ends. Magnetic tapes are of two broad types – Streamer tapes and Cartridge tapes. Cartridge tapes are well suited for use in small computers. Cartridge tape capacity is 120 MB, 350 MB etc.

- **Optical Disk:** On an optical disk, data is recorded by burning a permanent pattern onto the surface of the disk by means of a high precision laser beam. Data is read by using the laser at a lower intensity. Optical disks have a very large storage capacity and are more reliable than magnetic disks. Once data has been recorded to an optical disk, it cannot be erased but it can be read any number of times. Therefore, they are sometimes referred to as WORM – Write Once Read Many disks.

- **Primary Memory/Storage:** The memory unit of the computer is made up of RAM, ROM and Cache.

  - **Random Access Memory (RAM):** The RAM of a computer can be compared to the sorting shelf in a large post office. The sorting shelf is divided into a number of pigeon holes and each one is uniquely numbered. The letters that is placed in each pigeon hole goes on changing but the pigeon hole number remains the same. The person, who is sorting, automatically knows where the pigeon hole for a particular place is and he can directly access that pigeon hole. Similarly, the RAM of the computer is divided into numerous locations, which are uniquely numbered or addressed. Information and data are stored in these unique memory locations and are retrieved as required from these locations at random (without sequential search for the particular location) by the operating system. Random Access Memory chip is a Dynamic Memory Chip (DRAM). Hence, this memory is referred to as Random Access Memory.

    RAM Features:

- Data that needs to be processed and the instructions, which are used for processing, are held in the RAM.
- RAM is a cluster of semiconductor devices. The elements or RAM changes with the proper application (changes) of the electric current.
- Each element of RAM is a memory location in which data can be stored. Each location has a unique address. Using this address data can be directly retrieved or stored.
- Since RAM must hold both – the Data to be processed and the instructions for processing, its size or capacity is one of the measures of the power of the computer. The

capacity of the memory is measured in kilobytes of KB (1024 bytes), Megabytes or MB (1024 Kilobytes), Gigabytes or GB (1024 megabytes).

- The contents of RAM need to be stored periodically on to a secondary memory since power failure will erase the contents of RAM because of which this memory is called volatile memory.

- **Read Only Memory (ROM):** The storage elements in the ROM are not available to the user. These elements contain certain per-coded instructions, which are used by the computer. These storage locations are only read and cannot be erased or changed. Now, certain ROM chips are available which can be erased.

- **PROM:** Programmable Read Only Memory; these ROMs may be programmed once, after which they become permanent.
- **EPROM:** Erasable Programmable Read Only Memory; these ROMs can be erased by a special and elaborate process of exposing it to ultra-violet rays.
- **Cache Memory:** Some computer contains memory chips, which are faster than main memory. The cache memory is used to store operating instructions and data that are likely to be needed next or instructions that are frequently required. This increases the speed of processing. Cache Memory chip is a static memory chip. Cache size varies form 64 KB to 32 MB.

Operating system is the most important program that runs on a computer. Every general-purpose computer must have an operating system to run other programs. Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.

Windows version 1.0 first appeared in 1985. In this version, the windows were tiled, or presented next to each other rather than overlapping. Windows version 2.0, introduced in 1987, was designed to resemble IBM's OS/2 Presentation Manager, another GUI operating system. Windows version 2.0 included the overlapping window feature. The

more powerful version 3.0 of Windows, introduced in 1990, and subsequent versions 3.1 and 3.11 rapidly made Windows the market leader in operating systems for personal computers, in part because it was prepackaged on new personal computers. It also became the favored platform for software development.In 1993 Microsoft introduced Windows NT (New Technology). The Windows NT operating system offers 32-bit multitasking, which gives a computer the ability to run several programs simultaneously, or in parallel, at high speed. This operating system competes with IBM's OS/2 as a platform for the intensive, high-end, networked computing environments found in many businesses.In 1995 Microsoft released a new version of Windows for personal computers called Windows 95. Windows 95 had a sleeker and simpler GUI than previous versions. It also offered 32-bit processing, efficient multitasking, network connections, and Internet access. Windows 98, released in 1998, improved upon Windows 95. In 1996 Microsoft debuted Windows CE, a scaled-down version of the Microsoft Windows platform designed for use with handheld personal computers. Windows 2000, released at the end of 1999, combined Windows NT technology with the Windows 98 graphical user interface.

Features of modern Operating systems

Some features of modern Operating systems are as follows:

- *Multi-user:* Allows two or more users to run programs at the same time.
- *Multiprocessing:* Supports running a program on more than one CPU.
- *Multitasking:* Allows more than one program to run concurrently.
- *Multithreading:* Allows different parts of a single program to run concurrently.
- *Real time:* Responds to input instantly.

As a user, you normally interact with the operating system through a set of commands. For example, the DOS operating system contains commands such as COPY and RENAME for copying files and changing the names of files, respectively. The commands are accepted and executed by a part of the operating system called the command processor or command line interpreter. Graphical user interfaces allow you to enter commands by pointing and clicking at objects that appear on the screen.

V   **Functions of an Operating System**

An operating system performs these services for applications:

- ➢ In a multitasking operating system where multiple programs can be running at the same time, the operating system determines which applications should run in what order and

how much time should be allowed for each application before giving another application a turn.

- ➢ It manages the sharing of internal memory among multiple applications.
- ➢ It handles input and output to and from attached hardware devices, such as hard disks, printers, and dial-up ports.
- ➢ It can offload the management of what are called batch jobs (for example, printing) so that the initiating application is freed from this work.
- ➢ On computers that can provide parallel processing, an operating system can manage how to divide the program so that it runs on more than one processor at a time.
- ➢ **Introduction to computers**

  Computer is a device that processes information with astonishing speed and accuracy. Computers process information by helping to create it and by displaying it, storing it, reorganizing it, calculating with it, and communicating it to other computers. Computers can process numbers, words, still pictures, moving pictures, and sounds. The most powerful computers can perform trillions of calculations per second.

  The computer has changed the way we work, learn, communicate, and play. Virtually every kind of organization throughout the world uses computers to conduct business. Students, teachers, and research scientists use the computer as a learning tool. Millions of individuals and organizations communicate with one another over a vast network of computers called the Internet. Computer games entertain people of all ages. Almost all computers are electronic digital computers. They are electronic in their use of electric current (a flow of electric charge) to carry information. They are digital in that they process information as distinct units of electric charge representing numbers. The word digital means having to do with numbers.

  To enable a computer to process information that is not numerical-such as words, pictures, or sounds-the computer or some other device must first digitize that information. A device digitizes information by translating it from its original form into electric charges that represent numbers. After the computer processes the digitized information by working with the numbers, the computer or a device connected to it translates the results back into their original form.

  For example, an artist might use a machine called a scanner to digitize a photograph. He or she might then process the photograph on a computer to change it-perhaps to remove an unwanted element. The artist could then use a printer connected to the computer to produce a copy of the altered photo. Digital computers are one of two general kinds of computers. The other kind consists of calculating devices called analog computers. An analog computer represents amounts with continuously varying physical quantities-such as voltages, flows of fluids, or distances along a scale-rather than with numbers. The remainder of this article deals with digital computers. The technology of

computer hardware (the physical parts of computer systems) has advanced tremendously since 1946, when the first electronic digital computer was built. That machine filled a large room. Today, a fingernail-sized computing device called a microprocessor can do much more work than that pioneering machine, and do it in a shorter time. The technology of software (computer programs, or sets of computer instructions and information) has also advanced rapidly. Early computer users wrote their own software because little or no software was commercially available. Today, most users buy programs created by companies that specialize in writing software, though anyone with proper training can create their own programs. Hundreds of thousands of different programs are available for businesses and individuals. Because of advances in hardware and software, the price of computing has dropped sharply. As a result, the number of computers in operation has risen rapidly ever since the first commercial digital computers were manufactured in the 1950's. Today, several hundred million computers are in operation worldwide.

Kinds of computers

➢ Computers vary greatly in size, speed, and ability. They may be grouped into four categories:
➢ (1) personal computers,
➢ (2) mainframes and supercomputers,
➢ 3) dedicated computers, and
➢ (4) embedded computers.

personal computers : Personal computers are used by one person at a time. The largest personal computers, or PC's, can fit on a desktop. Some of these machines have more than one microprocessor. In addition to one or more primary processors, a computer may have one or more co-processors to handle special types of work. For example, math co-processors help speed up complex numerical calculations. Graphics co-processors help process photographs and other illustrations, or they speed up operations involving the display of information. Sound co-processors perform the mathematical calculations to process digitized sound. Large and middle-sized businesses commonly use PC's in networks. A network consists of a group of computers connected by telephone lines or other communications lines. In a client-server network, a powerful central computer distributes information to a number of PC's. The central computer is called the server. The PC's are the clients but are usually referred to as workstations or simply PC's. The central computer may be a PC, a machine like a PC with extra storage capacity, or an even larger type of computer.

- The server also stores all the network's essential information. In a typical network, individuals operating the workstations obtain copies of information from the server. The workers process this information, then send copies of the processed information back to the server. In most cases, the employees work in the same office as the server. But a large company may have a network that connects its branch offices to the main office. In addition, some employees work on computers at home and send their processed data to the company server. This use of computers is known as telecommuting.

- Office workers also use PC's that are not connected to a network. These machines are used for such tasks as word processing, performing financial calculations, and organizing and sorting bodies of information called databases. Home users of computers do some of the same kinds of work. They use word-processing programs for private correspondence, financial software for household budgets, and database management programs for address lists and recipes. Individuals also use their home computers to play games and to communicate over the Internet.

- Individual computer users may connect several computers, as well as other appliances, into a home network, which may be either a client-server network or a peer-to-peer network. A peer-to-peer network has no central server, but computers connected to the network can share files (bodies of processed information), printers, and other resources.

- Small, battery-powered, portable PC's are popular with people who need to use a computer away from a desk. Such portables include laptop computers, which can be held on the lap; notebook computers, which are about the size of a loose-leaf notebook; and handheld or palmtop computers, which can be operated while held in the hand. Laptop and notebook computers are as powerful as desktop computers. Handheld computers are less powerful but still provide some advanced computing capabilities. People who deliver packages by truck use them for logging transactions or for obtaining signatures. Many people use handhelds called personal digital assistants (PDA's) to store addresses, keep daily calendars, send and receive e-mail (electronic mail) messages, and even use the Internet. Some wireless telephones can perform some of the same functions that handhelds do, including sending and receiving e-mail.

- Many users of personal computers do not use the term PC to refer to all such machines. Instead, they apply the term only to machines using technology originally developed by International Business Machines Corporation (IBM). This usage comes from the name of IBM's first personal computer, the PC, introduced in 1981. The usage distinguishes IBM machines and IBM clones (machines made by other companies using IBM technology) from Macintosh personal computers, made by Apple Computer, Inc. Macintoshes are often referred to as Macs.

mainframes and supercomputers

- Mainframes and supercomputers are the most powerful computers. They are also the largest computers. Most of them are housed in several large cabinets. Mainframes use the largest storage systems. As a result, they can solve more complex problems and handle more information than can the computers of any other category. Some mainframes do a single job, such as copying and storing the information generated by a laboratory experiment. Others perform many different tasks.
- Supercomputers are the fastest computers. These machines are used for major projects, such as the design of aircraft, the study of weather systems, and the design and analysis of drug molecules. Supercomputers are few in number because they are extremely expensive. Most supercomputer users are scientists and engineers at large scientific installations. The fastest supercomputers are parallel computers. They have dozens or even hundreds of processors that operate at the same time. Each processor works on a separate piece of a program.
- Minicomputers and superminis have many of the capabilities of mainframes. However, they are smaller, less expensive, and less powerful.
- Hundreds of people may be logged on to (running programs on) a large mainframe or a supermini at the same time. Such users are said to be time-sharing. During time-sharing, the computer seems to process information for all the users every instant. But it is actually switching rapidly from program to program, doing a small amount of work on one, then another.
- Personal computers today have more processing power than the mainframes and supercomputers of the 1960's and 1970's. The joint operation of many personal computers in a network can approach the capability of a modern mainframe at a fraction of the cost.

(3)dedicated computers Dedicated computers are special-purpose machines. They include video game units and word processors. Video game units come in a range of sizes. The smallest are handheld, battery-operated toys. A larger unit for home use sits on the floor or a table and is connected to a television set. A player generally controls a home unit through a lever called a joystick, which may include a trigger and one or more buttons. The largest units stand on the floor in game rooms called arcades and in other commercial establishment.

> Word processors were computers that resembled electronic typewriters. They were designed mainly for typing, editing, and printing letters and other documents. Since the 1980's, PC's with word-processing programs have almost entirely replaced dedicated word processors.

(4)embedded computers. Embedded computers are control units built into the devices they control. Virtually all embedded computers are single microprocessors. Such devices as digital wristwatches, telephones, videotape recorders, and automobile ignition systems contain embedded computers. In addition, embedded computers help control the flight of aircraft, maintain the orbits of artificial satellites, and guide missiles to their targets. They also control the movements of industrial robots. There are many more embedded computers than any other kind. For every personal computer, there are hundreds of embedded computers.

Bandwidth

Computers store all information as binary numbers. The binary number system uses two binary digits, 0 and 1, which are called bits. The amount of data that a computer network can transfer in a certain amount of time is called the bandwidth of the network and is measured in kilobits per second (kbps) or megabits per second (mbps). A kilobit is 1 thousand bits; a megabit is 1 million bits. A dial-up telephone modem can transfer data at rates up to 56 kbps; DSL and cable modem connections are much faster and can transfer at several mbps. The Internet connections used by businesses often operate at 155 mbps, and connections between routers in the heart of the Internet may operate at rates from 2,488 to 9,953 mbps (9.953 gigabits per second) The terms *wideband* or *broadband* are used to characterize networks with high capacity and to distinguish them from narrowband networks, which have low capacity.

Both cable modems and DSL connections are classified as broadband connections because they operate at higher speeds than dial-up connections. The chief difference between cable modems and DSL arises from their intended use. A DSL connection is dedicated to a single subscriber, and a cable modem connection is shared among many (possibly more than 100) subscribers. Sharing means that the amount of service a cable modem subscriber receives depends on how many of the subscribers who share the connection are using the Internet at the same time. If two subscribers use their modems at the same time, each modem operates at approximately half the maximum speed; if 100 subscribers use their modems at the same time, each operates at approximately 1/100 of the maximum speed. Therefore, to provide the same service as a dedicated DSL connection, a cable modem must have a much higher total capacity.

The computer industry

The manufacture, development, sales, and servicing of computer hardware and software make up one of the largest industries in the world.

- ❖ **Manufacturing**. From a few dozen companies in the early 1960's, the computer industry has grown to tens of thousands of firms throughout the world. These companies manufacture computers and such peripheral equipment as modems and printers. They also develop and publish software and provide computer supplies, such as magnetic disks. Many companies make computer components, including processors. Others make the circuit boards and cables used to create networks. The largest computer manufacturer in the United States-and the world-is International Business Machines Corporation (IBM). Other leading U.S. computer makers include Apple Computer, Inc.; Dell Computer; the Hewlett-Packard Company; and Sun Microsystems Incorporated. The largest computer manufacturers outside the United States are Fujitsu and NEC Corporation, both of Japan. The leading computer companies in Europe include Groupe Bull of France and Siemens AG of Germany. The largest software company in the United States and the world is Microsoft Corporation.
- ❖ **Research and development**. The constant increase in computer power is a major reason for the computer industry's success. This increase has resulted from research and development at businesses and universities throughout the world. Continuing research seeks to produce even faster processors, swifter means of communications, storage media that can hold more information, and better ways to encrypt or to compress information. Data are compressed through special coding techniques that reduce the number of bytes needed to carry information. Most data compression techniques are lossless, which means that a compressed file can be expanded back into its original form without any loss of information. But a few techniques are lossy, which means that some nonessential information is deliberately discarded to achieve greater compression.
- ❖ **Sales**. Computers are sold in a variety of ways. Large manufacturers of computers have teams of sales professionals. These teams contact corporations and institutions to sell combinations of hardware and software. Another method of selling computers involves a value-added reseller (VAR). A VAR buys computer systems and components from a variety of sources. It then assembles and sells finished products, often tailoring the equipment to a buyer's specifications. Most VAR's also include software with their computers. Retail outlets play an important role in the sale of personal computers. Computer specialty stores, mail-order houses, and general merchandise stores also sell many computers. Much hardware and software is sold over the Internet.

- ❖ **Service and repair.** Many computer manufacturers offer service contracts that provide for regular maintenance and prompt repair of their computers. Some large businesses and institutions have their own computer maintenance staffs.
- ❖ **Careers.** There are many career opportunities in the computer industry. Computer engineers are probably the most technically specialized computer experts. Hardware engineers design the circuits that are engraved on chips, and they develop the wiring that lets information flow smoothly through the computer. Engineers also contribute to the design of memory, storage, input, and output equipment.

Computer scientists do research into operating systems, computer languages, robotics, computer vision and image processing, artificial intelligence, numerical analysis, and the theory of computation. Computer programmers write the instructions that make computers operate properly. Systems analysts determine the most efficient use of computers for particular situations. Software publishers issue programs, write and edit instruction manuals, and provide technical services for customers. Many publishers write manuals for software produced by other developers.

Many career opportunities exist outside the computer industry itself. Data processors who work for companies that use computers enter information into those computers. Workers in many factories oversee computers that control machines. Computer training is also an important industry.

Some of the computer industry's most successful individuals are self-taught. But most computer careers call for a college degree. College courses that help prepare students for careers in computers include programming, electrical engineering, systems analysis, and data processing

User Interface

INTRODUCTION

User Interface, in computer science, components humans use to communicate with computers. A computer user directs the function of a computer with instructions called input. Input is entered by various devices, such as a keyboard, and is translated into electronic signals that a computer can process. These signals pass along circuit pathways known as buses and are coordinated and controlled by the central processing

unit (CPU) (the computer circuitry that performs arithmetic and logical functions), and software known as the operating system. Once the CPU has performed the commands directed by the user, it may communicate the results by sending electronic signals, called output, back along the bus to one or more output devices, such as a printer or video display monitor.

In addition to a computer's speed the usability of the software and the ergonomic design of the physical components are important considerations. Usability is the ease with which a person learns to use an application, as well as how efficient and effective it is. Ergonomics determines how people function in relation to their environment, and with respect to computers, how to make input and output devices easy, comfortable, and efficient to use. For example, curved ergonomic keyboards prevent wrists from bending at unnatural angles, making the user more comfortable and input faster.

INPUT AND OUTPUT DEVICES

A variety of devices are used to enter data. Most personal computers (PCs) include a keyboard because it is easy to use and efficient for everyday tasks such as word processing. A mouse, trackball, and joystick are other input devices that help the user point, select, and move objects on a video display monitor. Handwriting can be entered on a computer's screen using light pens, wands that contain sensors to translate the user's motions into data. Touch screens in which infrared light sensors detect a user's fingers are used in environments where keyboards are unsuitable, such as cash dispensing machines. Sound and speech recognition are popular for some applications, but these input devices are still imperfect and usually understand and respond to only a small vocabulary of commands.The most familiar output devices are printers and color video display monitors. Audio output is also common, as well as sophisticated connections to synthesizers that produce a wide range of musical sounds (*see* MIDI).

COMMAND AND GRAPHICAL INTERFACE :Dialog between the user   and   the computer is usually accomplished by command-line or graphical user interfaces (GUIs). Command-line interfaces require the user to type brief commands on a keyboard to direct the computer's actions. GUIs use windows to organize files and applications represented by icons (small pictures) and menus that list commands. The user directly manipulates these visual objects on the video display monitor by pointing, highlighting, and dragging or by moving them with a mouse or trackball. GUIs are easier to learn than command-line interfaces, since commands need to be memorized and tend to vary between different computer systems. Entering commands with a GUI is slower, however, so GUIs usually have optional command-line equivalents as a quick alternative for more experienced users.

SPECIAL SYSTEMS   Some users require special   interfaces. Visually   impaired

people, for example, use screen readers to translate individual lines of text from the screen into speech, and printers that produce text in the Braille system. Adopting graphical interfaces for the visually impaired is more difficult, although some word processors provide menus, windows, and icons with auditory properties that make sounds when the cursor passes over them, or when the cursor passes into off-screen areas. Some systems, however, have yet to be adequately developed for the visually impaired, such as web browsers, the visual interface system that accesses the global information database known as the World Wide Web.

Virtual reality (VR) provides users with the illusion of being in a three-dimensional (3D) world. There are two types of VR systems: immersive and non immersive. Immersive systems involve wearing a head-mounted display or helmet and data gloves that translate the user's hand motions into data the computer can process. This VR interface enables the user to directly experience a simulated environment. The user can turn, pick up, throw, or push computer-generated objects using gestures similar to those they would normally use. In VR, users are aware of the simulated environment and their actions through visual, auditory, and some tactile sensations. Immersive VR is used for applications such as pilot training systems, computer games, and medical training. No immersive VR systems display alternate environments for the user to navigate through but do not require users to wear specialized equipment. Instead, users rely on conventional devices such as video display monitors, keyboards, and a mouse to manipulate the simulated environment.

FUTURE INTERFACES A wealth of information is now available to computer users. However, not all of the information is useful, and finding exactly what is needed can be difficult. Two approaches being developed to deal with this information surplus are intelligent agents and empowering users. Intelligent agents (often portrayed as an animated helpful person or creature on the computer screen) act independently within a computer system to carry out a limited set of tasks. For example, an agent could be used to sift electronic mail and provide a signal when an important message has arrived. Empowering users puts powerful, easy-to-use browsing, searching, and sifting tools under the direct command of the user.

.