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SYLLABUS

COMPUTER FUNDAMENTAL

SECTION A

Information Concepts & Processing

Definition of information, data vs information, introduction to information system, information representation digital media, images, graphics, animation, audio, video etc. Need a value & quality of information the concept of information entropy & numericals.

SECTION B

Computer Appreciation

Definition of electronic computer, history, generation, characteristics & application of computers, classification of computers, RAM,ROM, computer hardware, CPU, various I/O devices, peripherals , storage media, software definition and concepts.

SECTION C

Data Communication & Networks

Computer networks , networking of computers, introduction to LAN, WAN, MAN, network topologies , basic concepts in computers computer networks, introduction to GPRS, CDMA,GSM & FM technologies.

SECTION D

Introduction to Internet Technologies

HTML, DHTML,WWW,FTP, TELINET, web browser, net surfing , search engines, e-mail, ISP, e-commerce, public key, private key, safety of business transaction on web.

Concepts in Operation System

Elementary concepts in operation system, GUI, introduction to DOS, MS windows,

classification of computers, RAM, ROM, computer hardware, CPU, various I/O devices, peripherals, storage media, software definition and concepts.

SECTION C

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Computer networks, networking of computers, introduction to LAN, WAN, MAN, network topologies, basic concepts in computers computer networks, introduction to GPRS, CDMA, GSM & FM technologies.

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Elementary concepts in operation system, GUI, Introduction to DOS, MS windows.



SEMESTER-I

INTRODUCTION TO IT (DCS-140P)

Maximum Time : 3 Hrs.

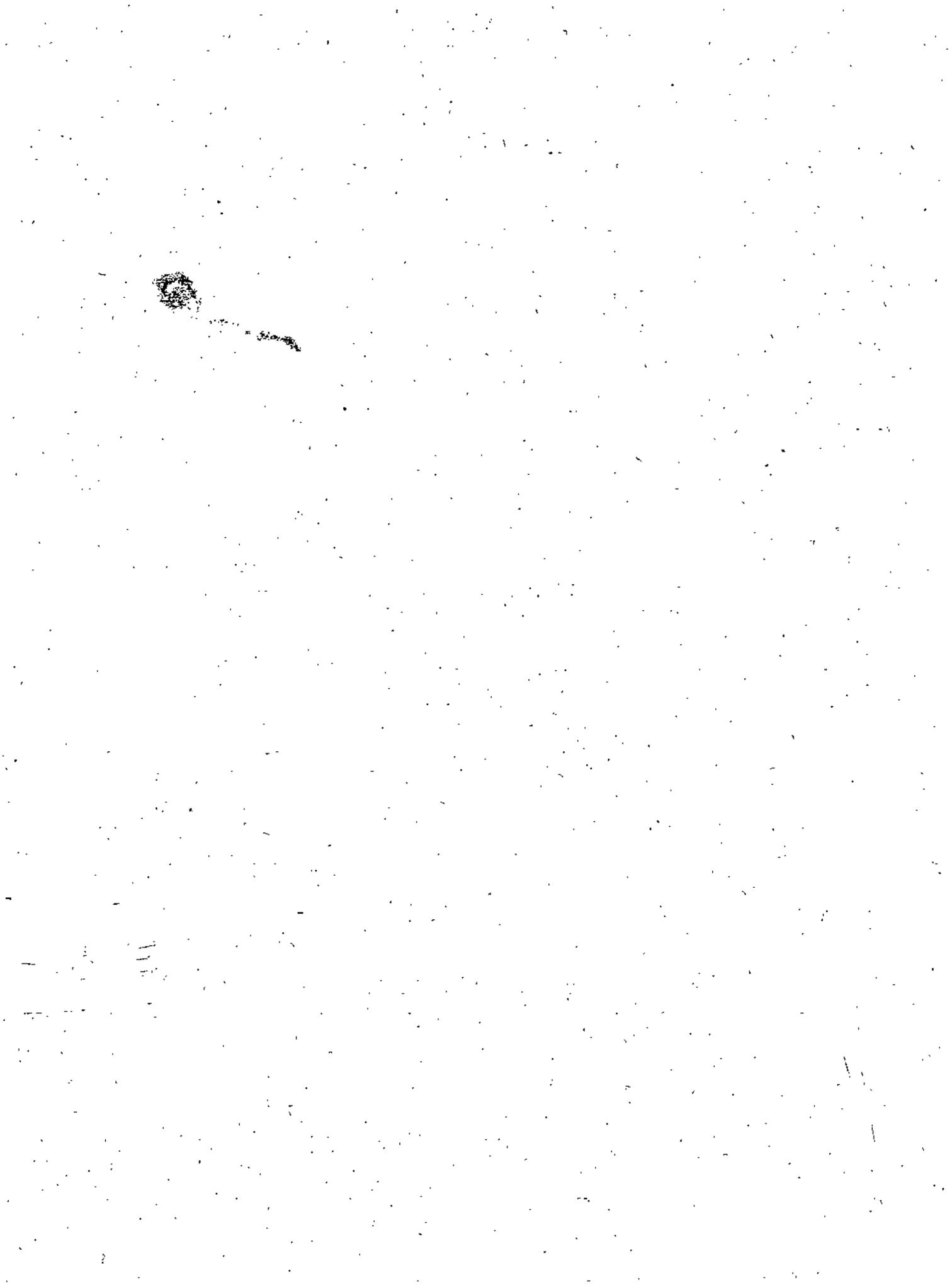
Total Marks : 50

Minimum Pass Marks : 40%

University Examination : 35 Marks

Continuous Internal Assessment : 15 Marks

1. Familiarity with operation of computers, booting the system from floppy and hard disk.
2. Internal and External commands of DOS (changing drives, changing files, copying files, directories, path command etc.)
3. Understanding and changing Autoexec.bat, config.sys files.
4. Using PC Tools, Norton utilities and anti virus programs.
5. Preparation & representation of documents.



INFORMATION CONCEPTS AND PROCESSING

LEARNING OBJECTIVES

After going through this chapter, you should appreciate the following:

- Definition of Information
- Data vs Information
- Introduction to Information System
- Information Representation Digital Media
- Need for Value & Quality of Information
- The Concept of Information Entropy & Numericals

1.1 DEFINITION OF INFORMATION

Information is the result of processing, manipulating and organizing data in a way that adds to the knowledge of the receiver. In other words, it is the context in which data is taken.

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Information as a concept bears a diversity of meanings, from everyday usage to technical settings. Generally speaking, the concept of information is closely related to notions of constraint, communication, control, data, form, instruction, knowledge, meaning, mental stimulus, pattern, perception, and representation.

Many people speak about the Information Age as the advent of the Knowledge Age or knowledge society, the information society, and information technologies, and even though informatics, information science and computer science are often in the spotlight, the word "information" is often used without careful consideration of the various meanings it has acquired.

1.2 DATA VS INFORMATION

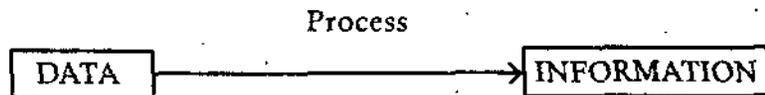
Data in everyday language is a synonym for information. In the exact sciences there is a clear distinction between data and information, where data is a measurement that can be disorganized and when the data becomes organized it becomes information. Data can be about reality, or fiction such as a fictional movie. Data about reality consists of propositions. A large class of practically important propositions are measurements or observations of a variable. Such propositions may comprise numbers, words, or images.

Data are raw facts whereas Information is the processed data.

If the raw data is processed as per certain rules or policy, the result obtained is called information. It means that when we process data to achieve meaningful results, it becomes information. For example:

- Results summary of an examination
- Purchase and sales of any goods items.
- The number of employees works in HR department, etc.

This can be physically represented as:



Thus, information is the processed data.

1.3 INTRODUCTION TO INFORMATION SYSTEM

Information System (IS) is the system of persons, data records and activities that process the data and information in a given organization, including manual processes

or automated processes. Usually the term is used erroneously as a synonym for *computer-based information systems*, which is only the Information technologies component of an Information System. The computer-based information systems are the field of study for Information technologies (IT); however these should hardly be treated apart from the bigger Information System that is always involved in.

The IT Department partly governs the information technology development, use, application and influence on a business or corporation. A computer based information system, following a definition of Langefors, is a technologically implemented medium for recording, storing, and disseminating linguistic expressions, as well as for drawing conclusions from such expressions. Information systems are also social systems whose behaviour is heavily influenced by the goals, values and beliefs of individuals and groups, as well as the performance of the technology.

In information systems, an information system consists of three components: human, technology, organisation. In this view, information is defined in terms of the three levels of semiotics. Data which can be automatically processed by the application system corresponds to the syntax-level. In the context of an individual who interprets the data they become information, which correspond to the semantic-level. Information becomes knowledge when an individual knows (understands) and evaluates the information (e.g., for a specific task). This corresponds to the pragmatic-level.

In general systems theory, an information system is a system, automated or manual, that comprises people, machines, and/or methods organized to collect, process, transmit, and disseminate data that represent user information.

In rough set theory, an information system is an attribute-value system.

In telecommunications, an information system is any telecommunications and/or computer related equipment or interconnected system or subsystems of equipment that is used in the acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of voice and/or data, and includes software, firmware, and hardware.

In computer security, an information system is described by five objects (Aceituno, 2004):

Structure:

- Repositories, which hold data permanent or temporarily, such as buffers, RAM, hard disks, cache, etc.
- Interfaces, which exchange information with the non-digital world, such as keyboards, speakers, scanners, printers, etc.
- Channels, which connect repositories, such as buses, cables, wireless links, etc. A Network is a set of logical or physical channels.

Behaviour:

- Services, which provide value to users or to other services via messages interchange.
- Messages, which carries a meaning to users or services.

In the mathematical area of domain theory, a Scott information system (after its

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inventor Dana Scott) is a mathematical structure that provides an alternative representation of Scott domains and, as a special case, algebraic lattices.

1.3.1 Fields of Information Systems

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Information systems deal with the development, use and management of an organization's IT infrastructure. In the post-industrial, information age, the focus of companies has shifted from being product oriented, to knowledge oriented, in a sense that market operators today, compete on process and innovation, rather than product : the emphasis has shifted from the quality and quantity of production, to the production process itself, and the services that accompany the production process.

The biggest asset of companies today, is their information, represented in people, experience, know-how, innovations (patents, copyrights, trade secrets), and for a market operator to be able to compete, he/she must have a strong information infrastructure, at the heart of which, lies the information technology infrastructure. Thus, the study of information systems, focuses on why and how technology can be put into best use to serve the information flow within an organization.

Information Systems has a number of different areas of work:

- Information Systems Strategy
- Information Systems Management
- Information Systems Development

Each of which branches out into a number of sub disciplines, that overlap with other science and managerial disciplines such as computer science, pure and engineering sciences, social and behavioral sciences, and business management.

1.4 INFORMATION REPRESENTATION DIGITAL MEDIA

Usually the data is represented in terms of characters. But now-a-days this information is being converted to other forms such as graphics, images, animation, audio and video. The transformation of an Analog signal to Digital information via an Analog-to-digital converter is called sampling. According to information theory, sampling is a reduction of information. Most digital media are based on translating analog data into digital data and vice-versa.

As opposed to analog data, digital data is in many cases easier to manipulate, and the end result can be reproduced indefinitely without any loss of quality. Mathematical operations can be applied to arbitrary digital information regardless of its interpretation (you can add "2" to the data "65" and interpret the result either as the hexadecimal number "43" or the letter "C"). Thus, it is possible to use, e.g., the same compression operation onto a text file or an image file or a sound file. The foundations of operation on digital information are described in digital signal processing.

1.4.1 Images

In common usage, an image or picture is an artifact that reproduces the likeness of some subject—usually a physical object or a person.

Images may be two dimensional, such as a photograph, or three dimensional such as in a statue. They are typically produced by optical devices—such as a cameras, mirrors, lenses, telescopes, microscopes, etc. and natural objects and phenomena, such as the human eye or water surfaces.

The word image is also used in the broader sense of any two-dimensional figure such as a map, a graph, a pie chart, or an abstract painting. In this wider sense, images can also be produced manually, such as by drawing, painting, carving, by computer graphics technology, or a combination of the two, especially in a pseudo-photograph.

A volatile image is one that exists only for a short period of time. This may be a reflection of an object by a mirror, a projection of a camera obscura, or a scene displayed on a cathode ray tube. A fixed image, also called a hardcopy, is one that has been recorded on a material object, such as paper or textile.

A mental image exists in an individual's mind: something one remembers or imagines. The *subject of an image need not be real*; it may be an abstract concept, such as a graph, function, or "imaginary" entity. For example, Sigmund Freud claimed to have dreamt purely in aural-images of dialogues. The development of synthetic acoustic technologies and the creation of sound art have led to a consideration of the possibilities of a sound-image comprised of irreducible phonic substance beyond linguistic or musicological analysis.

1.4.2 Graphics

Graphics are visual presentations on some surface, such as a wall, canvas, computer screen, paper, or stone to brand, inform, illustrate, or entertain. Examples are photographs, drawings, Line Art, graphs, diagrams, typography, numbers, symbols, geometric designs, maps, engineering drawings, or other images. Graphics often combine text, illustration, and color. Graphic design may consist of the deliberate selection, creation, or arrangement of typography alone, as in a brochure, flier, poster, web site, or book without any other element. Clarity or effective communication may be the objective, association with other cultural elements may be sought, or merely, the creation of a distinctive style.

Graphics can be functional or artistic. Graphics can be imaginary or represent something in the real world. The latter can be a recorded version, such as a photograph, or an interpretation by a scientist to highlight essential features, or an artist, in which case the distinction with imaginary graphics may become blurred.

1.4.2.1 Drawing

Drawing generally involves making marks on a surface by applying pressure from a tool, or moving a tool across a surface. Common tools are graphite pencils, pen and ink, inked brushes, wax color pencils, crayons, charcoals, pastels, and markers. Digital tools which simulate the effects of these are also used. The main techniques used in drawing are line drawing, hatching, crosshatching, random hatching, scribbling, stippling, blending, and shading.

1.4.2.2 Painting

In the Middle Ages, paintings were very distorted; for example, people on a castle wall appeared disproportionately large because they were the painting's focus. Later, realism and perspective became more important, characterized by the

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technique of looking through a wire mesh to precisely copy dimensions onto a corresponding grid drawn on canvas. During the Renaissance, artists took a non-mathematical approach to drawing. Giotto di Bondone and Duccio di Buoninsegna made great advancements in perspective drawing, using symmetry, converging lines and foreshortening. Many renaissance painters also used fresco - painting directly onto walls - a technique which finds its prototype in cave and rock art. Graphics of this kind, from 30-40,000 years ago, have survived in Australia and France. A modern day equivalent is the mural.

1.4.2.3 Printmaking

Printmaking originated in China after paper was invented (about A.D. 105). Relief printing first flourished in Europe in the 15th century, when the process of papermaking was imported from the East. Since that time, relief printing has been augmented by the various techniques described earlier, and printmaking has continued to be practiced as one of the fine arts.

1.4.2.4 Line art

Line art is any image that consists of distinct straight and curved lines placed against a (usually plain) background, without gradations in shade (darkness) or hue (color) to represent two-dimensional or three-dimensional objects. Line art is usually monochromatic, although lines may be of different colors.

1.4.2.5 Etching

Etching is an intaglio method of printmaking in which the image is incised into the surface of a metal plate using an acid. The acid eats the metal, leaving behind roughened areas, or, if the surface exposed to the acid is very thin, burning a line into the plate. The process is believed to have been invented by Daniel Hopfer (circa 1470-1536) of Augsburg, Germany, who decorated armour in this way, and applied the method to printmaking.

Etching is also used in the manufacturing of printed circuit boards and semiconductor devices.

1.4.2.6 Illustration

An illustration of a character from a story; also, an illustration of illustrations. An illustration is a visualisation such as a drawing, painting, photograph or other work of art that stresses subject more than form. The aim of an illustration is to elucidate or decorate a story, poem or piece of textual information (such as a newspaper article), traditionally by providing a visual representation of something described in the text. The editorial cartoon, also known as a political cartoon, is an illustration containing a political or social message.

Illustrations can be used to display a wide range of subject matter and serve a variety of functions, such as:

- giving faces to characters in a story
- displaying a number of examples of an item described in an academic textbook (e.g. A Typology)
- visualising step-wise sets of instructions in a technical manual
- communicating subtle thematic tone in a narrative

- linking brands to the ideas of human expression, individuality and creativity
- making a reader laugh or smile
- for fun (to make laugh) funny

1.4.2.7 Graphs

A graph or chart is a type of information graphic that represents tabular, numeric data. Charts are often used to make it easier to understand large quantities of data and the relationships between different parts of the data.

1.4.2.8 Diagrams

A diagram is a simplified and structured visual representation of concepts, ideas, constructions, relations, statistical data, etc, used to visualize and clarify the topic.

1.4.2.9 Symbols

A symbol, in its basic sense, is a conventional representation of a concept or quantity; i.e., an idea, object, concept, quality, etc. In more psychological and philosophical terms, all concepts are symbolic in nature, and representations for these concepts are simply token artifacts that are allegorical to (but do not directly codify) a symbolic meaning, or symbolism.

1.4.2.10 Maps

A map is a simplified depiction of a space, a navigational aid which highlights relations between objects within that space. Usually, a map is a two-dimensional, geometrically accurate representation of a three-dimensional space.

1.4.2.11 Photography

One difference between photography and other forms of graphics is that a photographer, in principle, just records a single moment in reality, with seemingly no interpretation. However, a photographer can choose the field of view and angle, and may also use other techniques, such as various lenses to distort the view or filters to change the colours. In recent times, digital photography has opened the way to an infinite number of fast, but strong, manipulations. Even in the early days of photography, there was controversy over photographs of enacted scenes that were presented as 'real life' (especially in war photography, where it can be very difficult to record the original events). Shifting the viewer's eyes ever so slightly with simple pinpricks in the negative could have a dramatic effect.

The choice of the field of view can have a strong effect, effectively 'censoring out' other parts of the scene, accomplished by cropping them out or simply not including them in the photograph. This even touches on the philosophical question of what reality is. The human brain processes information based on previous experience, making us see what we want to see or what we were taught to see. Photography does the same, although the photographer interprets the scene for their viewer.

1.4.2.12 Engineering drawings

An engineering drawing is a type of drawing that is technical in nature, used to fully and clearly define requirements for engineered items. It is usually created in accordance with standardized conventions for layout, nomenclature, interpretation, appearance (such as typefaces and line styles), size, etc.

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1.4.2.13 Computer graphics

There are two types of computer graphics: raster graphics, where each pixel separately defined (as in a digital photograph), and vector graphics, where mathematical formulas are used to draw lines and shapes, which are then interpreted at the viewer's end to produce the graphic. Using vectors results in infinitely sharp graphics and often smaller files, but, when complex, vectors take time to render and may have larger file sizes than a raster equivalent.

3D graphics became more popular in the 1990s in gaming, multimedia and animation. In 1996, Quake, one of the first fully 3D games, was released. In 1995, Toy Story, the first full-length computer-generated animation film, was released in cinemas worldwide. Since then, computer graphics have become more accurate and detailed due to more advanced computers and better 3D modelling software applications such as Cinema 4D.

Another use of computer graphics is screensavers, originally intended to prevent the layout of much-used GUIs from 'burning into' the computer screen. They have since evolved into true pieces of art, their practical purpose obsolete; modern screens are not susceptible to such 'burning'.

1.4.2.14 Web graphics

Another example of signature art used on web forums. In the 1990s, Internet speed increased, and Internet browsers capable of viewing images were released, the first being Mosaic. Websites began to use the GIF format to display small graphics such as banners, advertisements and navigation buttons, on web pages. Modern web browsers can now display JPEG, PNG and increasingly, SVG images in addition to GIFs on web pages. Plugins expand the web browser functions to display animated, interactive and 3-D graphics contained within file formats such as SWF and X3D.

Most modern web graphics are made with either Adobe Photoshop, the GIMP, or Corel Paint Shop Pro. However, users of Microsoft Windows mostly have MS Paint, which many find to be lacking in features.

Numerous websites have been created to host communities for web graphics artists. A growing number of people use Photoshop, GIMP and Paint Shop Pro to create internet forum signatures - generally appearing after a user's post - and other digital artwork, such as photo manipulations and large graphics.

1.4.3 Animation

Animation is the rapid display of a sequence of images of 2-D artwork or model positions in order to create an illusion of movement. It is an optical illusion of motion due to the phenomenon of persistence of vision. This could be anything from a flip book to a motion picture film.

Animation techniques are incredibly varied and difficult to categorize. Techniques are often related or combined. The following is a brief on common types of animation. Again, this list is by no means comprehensive.

1.4.3.1 Traditional animation

An example of traditional animation, a horse animated by rotoscoping from Edward Muybridge's 19th century photos. Also called cel animation, the frames of a

traditionally animated movie are hand-drawn. The drawings are traced or copied onto transparent acetate sheets called cels, which are then placed over a painted background and photographed one by one on a rostrum camera. Nowadays, the use of cels (and cameras) is mostly obsolete, since the drawings are scanned into computers, and digitally transferred directly to 35 mm film. The "look" of traditional cel animation is still preserved, and the character animator's work has remained essentially the same over the past 70 years. Because of the digital influence over modern cel animation, it is also known as tradigital animation. Examples: The Lion King, Spirited Away, Les Triplettes de Belleville

Full animation: The most widely-known style in animation, known for its realistic and often very detailed art. Examples: All Disney feature length animations, The Secret of NIMH, The Iron Giant.

Limited animation: A cheaper process of making animated cartoons that does not follow a "realistic" approach. Examples: The Flintstones, Yellow Submarine.

Rubber hose: The characters are usually very "cartoony", and the animators have a lot of artistic freedom as rubber hose doesn't have to follow the laws of physics and anatomy to the same degree as the other main styles of animation. Examples: Early Mickey Mouse cartoons, Popeye, Ren and Stimpy.

Rotoscoping: A technique where animators trace live action movement, frame by frame, either by directly copying an actors outlines into an animated drawing (e.g. Ralph Bakshi), or use rotoscoped material as a basis and inspiration for a more fluid and expressive animation (e.g. Disney). Examples: Snow White and the Seven Dwarfs, Gulliver's Travels, American Pop.

1.4.3.2 Computer animation

Like stop motion, computer animation encompasses a variety of techniques, the unifying idea being that the animation is created digitally on a computer.

2D animation: Figures are created and/or edited on the computer using 2D bitmap graphics or created and edited using 2D vector graphics. This includes automated computerized versions of traditional animation techniques such as of tweening, morphing, onion skinning and interpolated rotoscoping. Examples: A Scanner Darkly, Jib Jab, Analog computer animation, Flash animation and PowerPoint animation.

3D animation: Figures are created in the computer using polygons. To allow these meshes to move they are given a digital armature (sculpture). This process is called rigging. Various other techniques can be applied, such as mathematical functions (gravity), simulated fur or hair, effects such as fire and water and the use of motion capture to name but a few. Examples: The Incredibles, Shrek, Finding Nemo., Cel-shaded animation, Morph target animation, Skeletal animation, Motion capture and Crowd simulation.

1.4.4 Audio

Sound recording and reproduction is the electrical or mechanical inscription and re-creation of sound waves, usually used for the voice or for music.

The invention of digital sound recording and the compact disc in 1983 brought significant improvements in the durability of consumer recordings. The CD initiated another massive wave of change in the consumer music industry, with vinyl records effectively relegated to a small niche market by the mid-1990s.

The most recent and revolutionary developments have been in digital recording, with the invention of purely electronic consumer recording formats such as the WAV digital music file and the compressed file type, the MP3. This generated a new type of portable solid-state computerised digital audio player, the MP3 player.

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Another invention, by Sony, was the minidisc player, using ATRAC compression on small, cheap, re-writeable discs.

This was in vogue in the 1990s, and is still popular, especially in a newer, longer playing and higher fidelity version: New technologies such as Super Audio CD, DVD-A, Blu ray Disc and HD DVD continue to set very high standard in evolution of digital audio storage.

This technology spreads across various associated fields, from hi-fi to professional audio, internet radio and podcasting.

Technological developments in recording and editing have transformed the record, movie and television industries in recent decades. Audio editing became practicable with the invention of magnetic tape recording, but the use of computers has made editing operations faster and easier to execute, and the use of hard-drives for storage has made recording cheaper. We now divide the process of making a recording into tracking, mixing and mastering.

Multitrack recording makes it possible to capture sound from several microphones, or from different 'takes' to tape or disc with maximum headroom and quality, allowing maximum flexibility in the mixing and mastering stages for editing, level balancing, compressing and limiting, and the addition of effects such as reverberation, equalisation, flanging and many more.

1.4.5 Video

Video is the technology of capturing, recording, processing, transmitting, and reconstructing moving pictures, typically using celluloid film, electronic signals, or digital media, primarily for viewing on television or computer monitors. The term video commonly refers to several storage formats for moving pictures: digital video formats, including DVD, QuickTime and MPEG-4 and analog videotapes, including VHS and Betamax.

Video can be recorded and transmitted in various physical media; in celluloid film when recorded by mechanical cameras, in PAL or NTSC electric signals when recorded by video cameras, or in MPEG-4 or DV digital media when recorded by digital cameras. Quality of video essentially depends on the capturing method and storage used. Digital television (DTV) is a relatively recent format with higher quality than earlier television formats and has become a standard for television video.

1.5 NEED FOR VALUE & QUALITY OF INFORMATION

Information helps you take decision for current action which you are performing. So much emphasis should be given to the quality of the information. If you given the wrong information, naturally, the net result would be wrong too. For example, if the meter reading of electric supply is wrongly noted, then the billing would be wrong

oo. There are some factors which contribute towards value of information are: timeliness, availability, accuracy, presentation and its completeness.

Characteristics of the levels of information, these levels of management which use this kind of information.

Top Level Management

- Top levels are heavily focus on planning.
- It deals with complex and some uncertain activities.
- Deals with fewer people.
- Concentrate with strategic decisions.

Middle Level Management

- Middle levels lesser focus on planning but more than low level management.
- It deals with less complying but better defined variable.
- Number of people involved are more than top level but less than lower level.
- Concerned with tactical decisions.

Low or Supervisory Level Management

- Minimum focus on planning.
- Very large number of people involved in it.
- It deals with straight forward activities.
- Concerned with operation decisions.

1.6 CONCEPT OF INFORMATION ENTROPY & NUMERICALS

The main concepts of information theory can be grasped by considering the most widespread means of human communication: language. Two important aspects of a good language are as follows: First, the most common words (e.g., "a," "the," "I") should be shorter than less common words (e.g., "benefit," "generation," "mediocre"), so that sentences will not be too long. Such a tradeoff in word length is analogous to data compression and is the essential aspect of source coding. Second, if part of a sentence is *unheard or misheard due to noise*—e.g., a passing car—the listener should still be able to glean the meaning of the underlying message. Such robustness is as essential for an electronic communication system as it is for a language; properly building such robustness into communications is done by channel coding. Source coding and channel coding are the fundamental concerns of information theory.

Note that these concerns have nothing to do with the importance of messages. For example, a platitude such as "Thank you, come again" takes about as long to say or write as the urgent plea, "Call an ambulance!" while clearly the latter is more important and more meaningful. Information theory, however, does not involve message importance or meaning, as these are matters of the quality of data rather than the quantity of data, the latter of which is determined solely by probabilities.

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Information theory is generally considered to have been founded in 1948 by Claude Shannon in his seminal work, "A Mathematical Theory of Communication." The central paradigm of classical information theory is the engineering problem of the transmission of information over a noisy channel.

The most fundamental results of this theory are Shannon's source coding theorem, which establishes that, on average, the number of bits needed to represent the result of an uncertain event is given by its entropy; and Shannon's noisy-channel coding theorem, which states that reliable communication is possible over noisy channels provided that the rate of communication is below a certain threshold called the channel capacity. The channel capacity can be approached by using appropriate encoding and decoding systems.

Information theory is closely associated with a collection of pure and applied disciplines that have been investigated and reduced to engineering practice under a variety of rubrics throughout the world over the past half century or more: adaptive systems, anticipatory systems, artificial intelligence, complex systems, complexity science, cybernetics, informatics, machine learning, along with systems sciences of many descriptions. Information theory is a broad and deep mathematical theory, with equally broad and deep applications, amongst which is the vital field of coding theory.

Coding theory is concerned with finding explicit methods, called codes, of increasing the efficiency and reducing the net error rate of data communication over a noisy channel to near the limit that Shannon proved is the maximum possible for that channel. These codes can be roughly subdivided into data compression (source coding) and error-correction (channel coding) techniques. In the latter case, it took many years to find the methods Shannon's work proved were possible. A third class of information theory codes are cryptographic algorithms (both codes and ciphers). Concepts, methods and results from coding theory and information theory are widely used in cryptography and cryptanalysis.

Information theory is also used in information retrieval, intelligence gathering, gambling, statistics, and even in musical composition

Information theory is based on probability theory and statistics. The most important quantities of information are entropy, the information in a random variable, and mutual information, the amount of information in common between two random variables. The former quantity indicates how easily message data can be compressed while the latter can be used to find the communication rate across a channel.

The choice of logarithmic base in the following formulae determines the unit of information entropy that is used. The most common unit of information is the bit, based on the binary logarithm. Other units include the nat, which is based on the natural logarithm, and the hartley, which is based on the common logarithm.

1.6.1 Joint Entropy

The joint entropy of two discrete random variables X and Y is merely the entropy of their pairing: (X, Y) . This implies that if X and Y are independent, then their joint entropy is the sum of their individual entropies.

For example, if (X, Y) represents the position of a chess piece — X the row and Y

the column, then the joint entropy of the row of the piece and the column of the piece will be the entropy of the position of the piece. Despite similar notation, joint entropy should not be confused with cross entropy.

1.6.2 Conditional Entropy (equivocation)

The conditional entropy of X given random variable Y (also called the equivocation of X about Y) is the average conditional entropy over Y . Because entropy can be conditioned on a random variable or on that random variable being a certain value, care should be taken not to confuse these two definitions of conditional entropy, the former of which is in more common use. A basic property of this form of conditional entropy is that:

1.6.3 Mutual Information

Mutual information can be expressed as the average Kullback–Leibler divergence (information gain) of the posterior probability distribution of X given the value of Y to the prior distribution on X :

In other words, this is a measure of how much, on the average, the probability distribution on X will change if we are given the value of Y . This is often recalculated as the divergence from the product of the marginal distributions to the actual joint distribution:

Mutual information is closely related to the log-likelihood ratio test in the context of contingency tables and the multinomial distribution and to Pearson's χ^2 test: mutual information can be considered a statistic for assessing independence between a pair of variables, and has a well-specified asymptotic distribution.

1.6.4 Other Quantities

Other important information theoretic quantities include Rényi entropy (a generalization of entropy) and differential entropy (a generalization of quantities of information to continuous distributions.)

1.6.5 Pseudorandom Number Generation

Cryptographically secure pseudorandom number generators need effectively random seeds, which can be obtained via extractors. The measure of sufficient randomness for extractors is min-entropy, a value related to Shannon entropy through Rényi entropy; Rényi entropy is also used in evaluating randomness in cryptographic systems. Although related, the distinctions among these measures mean that a random variable with high Shannon entropy is not necessarily satisfactory for use in an extractor.

A cryptographically secure pseudo-random number generator (CSPRNG) is a pseudo-random number generator (PRNG) with properties that make it suitable for use in cryptography.

Many aspects of cryptography require random numbers, for example:

- Key generation

- Nonces

- Salts in certain signature schemes, including ECDSA, RSASSA-PSS.

- One-time pads

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The "quality" of the randomness required for these applications varies. For example creating a nonce in some protocols needs only uniqueness. On the other hand, generation of a master key requires a higher quality, such as more entropy. And in the case of one-time pads, the information-theoretic guarantee of perfect secrecy only holds if the key material is obtained from a true random source with high entropy.

Ideally, the generation of random numbers in CSPRNGs uses entropy obtained from a high quality source, which might be a hardware random number generator or perhaps unpredictable system processes — though unexpected correlations have been found in several such ostensibly independent processes. From an information theoretic point of view, the amount of randomness, the entropy that can be generated is equal to the entropy provided by the system. But sometimes, in practical situations, more random numbers are needed than there is entropy available. Also the processes to extract randomness from a running system are slow in actual practice. In such instances, a CSPRNG can sometimes be used. A CSPRNG can "stretch" the available entropy over more bits.

When all the entropy we have is available before algorithm execution begins, we really have a stream cipher. However some crypto system designs allow for the addition of entropy during execution, in which case it is not a stream cipher equivalent and cannot be used as one. Stream cipher and CSPRNG design is thus closely related.

SUMMARY

1. Information is the result of processing, manipulating and organizing data in a way that adds to the knowledge of the receiver.
2. Data in everyday language is a synonym for information.
3. Information System (IS) is the system of persons, data records and activities that process the data and information in a given organization, including manual processes or automated processes.
4. In information systems, an information system consists of three components: human, technology, organisation.
5. Information Systems has a number of different areas of work: Information Systems Strategy; Information Systems Management and Information Systems Development.
6. Usually the data is represented in terms of characters. But now-a-days this information is being converted to other forms such as graphics, images, animation, audio and video.
7. In common usage, an image or picture is an artifact that reproduces the likeness of some subject—usually a physical object or a person.
8. Graphics are visual presentations on some surface, such as a wall, canvas, computer screen, paper, or stone to brand, inform, illustrate, or entertain.
9. Drawing generally involves making marks on a surface by applying pressure from a tool, or moving a tool across a surface.
10. Line art is any image that consists of distinct straight and curved lines placed against a (usually plain) background, without gradations in shade (darkness) or hue (color) to represent two-dimensional or three-dimensional objects.
11. Etching is an intaglio method of printmaking in which the image is incised into the surface of a metal plate using an acid.
12. An illustration is a visualisation such as a drawing, painting, photograph or other work of art that stresses subject more than form.
13. A graph or chart is a type of information graphic that represents tabular, numeric data..
14. A diagram is a simplified and structured visual representation of concepts, ideas, constructions, relations, statistical data, etc, used to visualize and clarify the topic.

15. A symbol, in its basic sense, is a conventional representation of a concept or quantity; i.e., an idea, object, concept, quality, etc.
16. A map is a simplified depiction of a space, a navigational aid which highlights relations between objects within that space.
17. One difference between photography and other forms of graphics is that a photographer, in principle, just records a single moment in reality, with seemingly no interpretation.
18. An engineering drawing is a type of drawing that is technical in nature, used to fully and clearly define requirements for engineered items.
19. There are two types of computer graphics: raster graphics, where each pixel is separately defined (as in a digital photograph), and vector graphics, where mathematical formulas are used to draw lines and shapes, which are then interpreted at the viewer's end to produce the graphic.
20. Animation is the rapid display of a sequence of images of 2-D artwork or model positions in order to create an illusion of movement.
21. Computer animation encompasses a variety of techniques, the unifying idea being that the animation is created digitally on a computer.
22. Sound recording and reproduction is the electrical or mechanical inscription and re-creation of sound waves, usually used for the voice or for music.
23. Multitrack recording makes it possible to capture sound from several microphones, or from different 'takes' to tape or disc with maximum headroom and quality, allowing maximum flexibility in the mixing and mastering stages for editing, level balancing, compressing and limiting, and the addition of effects such as reverberation, equalisation, flanging and many more.
24. If you given the wrong information, naturally, the net result would be wrong too.
25. The main concepts of information theory can be grasped by considering the most widespread means of human communication: language.

NOTES

TEST YOURSELF

1. Describe information.
2. What is the difference between data and information.
3. Write a short note on Information System.
4. What are the various fields of information?
5. Describe the various means of representing information on digital media.
6. Describe animation.
7. What is Web graphics?
8. What is Etching?
9. What is the need for quality information?
10. What is joint entropy?

Multiple Choice Questions

1. IS :
a) Information System b) Information Study c) Information Sale
2. PRNG is:
a) pseudo-random numeric generator
b) pseudo-random number generator
c) pseudo-random number genes
3. DTV is:
a) Data Television b) Direct Television c) Digital Television
4. CSPRNG is:
a) cryptographically secure pseudo-random number generator
b) cryptographically secure pseudo-random numeric generator
c) cryptographically secure pseudo-random number goods

NOTES

True/False Questions

1. Data in everyday language is a synonym for information.
2. Information Systems has a number of different areas of work: Information Systems Strategy; Information Systems Management and Information Systems Development.
3. Graphics are visual presentations on some surface, such as a wall, canvas, computer screen, paper, or stone to brand, inform, illustrate, or entertain.
4. Etching is an intaglio method of printmaking in which the image is incised into the surface of a metal plate using an acid.
5. A graph or chart is not a type of information graphic that represents tabular, numeric data..
6. A symbol, in its basic sense, is a conventional representation of a concept or quantity; i.e., an idea, object, concept, quality, etc.
7. One difference between photography and other forms of graphics is that a photographer, in principle, just records a single moment in reality, with seemingly no interpretation.
8. Animation is not the rapid display of a sequence of images of 2-D artwork or model positions in order to create an illusion of movement.
9. Sound recording and reproduction is the electrical or mechanical inscription and re-creation of sound waves, usually used for the voice or for music.
10. If you given the wrong information, naturally, the net result would be wrong too.
11. The main concepts of information theory can be grasped by considering the most widespread means of human communication: language.

Short Questions with Answers

1. What is information?
Ans. Information is the result of processing, manipulating and organizing data in a way that adds to the knowledge of the receiver. In other words, it is the context in which data is taken.
2. Which are the different area of work of information Systems?
Ans. Information Systems has a number of different areas of work:
 - Information Systems Strategy
 - Information Systems Management
 - Information Systems Development
3. How are computer graphics generated?
Ans. Most modern web graphics are made with either Adobe Photoshop, the GIMP, or Corel Paint Shop Pro. However, users of Microsoft Windows mostly have MS Paint, which many find to be lacking in features.
4. What is animation?
Ans. Animation is the rapid display of a sequence of images of 2-D artwork or model positions in order to create an illusion of movement. It is an optical illusion of motion due to the phenomenon of persistence of vision. This could be anything from a flip book to a motion picture film.

ANSWERS

Multiple Choice Questions

- | | | | |
|------|------|------|------|
| 1. a | 2. b | 3. c | 4. a |
|------|------|------|------|

True False Questions

- | | | | |
|------|-------|-------|------|
| 1. T | 2. T | 3. T | 4. T |
| 5. F | 6. T | 7. T | 8. F |
| 9. T | 10. T | 11. T | |

COMPUTER APPRECIATION

LEARNING OBJECTIVES

After going through this chapter, you should appreciate the following:

- Definition of Electronic Computer
- History
- Computer Generations
- Characteristics of Computers
- Applications of Computers
- Classification of Computers
- RAM
- ROM
- Computer Hardware
- CPU
- Peripherals
- Input and Output Devices
- Storage Media
- Software Definition and Concepts

2.1 DEFINITION OF ELECTRONIC COMPUTER

There is a story that five blind men came across an elephant. Each one of them touched the different parts of its body. The one who touched the trunk said that the elephant was like a snake; the one who held the tail, said that it was like a rope. The ones holding other parts of its body said different things. Like elephant, a computer is made of different parts which when looked at from any user angle will give different definition. We should just remember that a computer:

1. Cannot think
2. It has vast capabilities of calculations like addition, subtraction, etc. and
3. It is totally under the control of the user.

So, we can say that a computer is a machine, totally at the command of the user which can perform operations at a much higher speed than a human being.

So many times you have seen or heard that a telephone bill or an electricity bill has been wrongly prepared and the amount charged is enormous. It is not because of a computer's mistake but it is so since the meter reading given to the computer was wrong, possibly the reading was wrongly taken by the meter reader who had gone to the house to read and record the meter reading.

Therefore, we understand that there is nothing magical about a computer. It is actually a friendly machine which is totally at your command. Do you remember the story of Aladdin and the Magic Lamp? Just like the Genie of the magic lamp, a computer will obey your command. If you make a mistake in giving commands to the computer it will carry out these commands giving wrong results.

2.1.1 Computer Age

Though the first fully operational electronic computer was introduced to the world in 1946, but the historian assumes the starting of a computer age from 1951, when the first commercial computer UNIVAC was introduced. The remarkable thing about the computer age is that so much has happened in so much short time. We have leapfrogged four generations of technology in about 50 years - a span of time whose events are within the memories of many people today. The first three computer generations are pinned to three technological developments:

1. vacuum tube
2. transistor and
3. integrated circuit

Each has drastically changed the nature and size of computers. We define the timing of each generation according to the beginning of commercial delivery of the hardware technology. Defining subsequent generations has become more complicated because the entire industry has become more complicated.

2.2 HISTORY

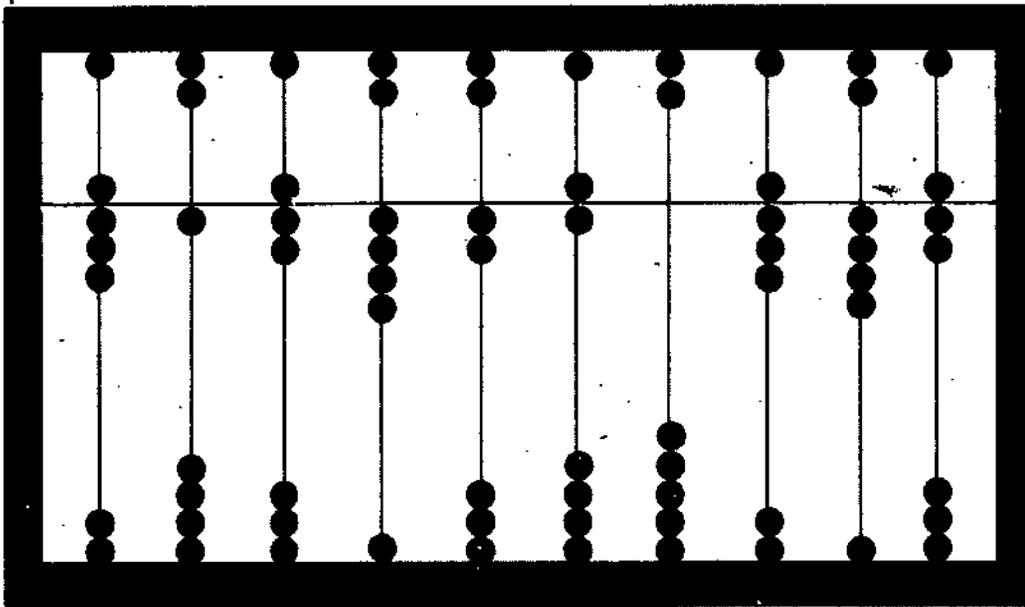
In the early days people started exchanging goods and in this process they felt the need of counting. This was done with the help of stones. Each stone represented a single unit. Stones could be counted before giving or taking the things.

Next, they started drawing lines on wall or on sand before selling or purchasing the goods. It was a simple but a lengthy process for large numbers. So even this was abolished later.

Then in 3000 B.C., Abacus was invented by the **Chinese**. Later it was modified by **Egyptians** and **Indians**. Let us see how this Abacus looks like.

2.2.1 Abacus

It is a rectangular wooden frame with rods and rounded moveable beads which are used for counting. It has **10 rods** with **7 beads** in each. Each rod has 2 sections, upper and lower. In lower section there are 5 beads representing a single unit. Upper section has 2 beads representing number 5 each. The beads move on the rods from one end to other end and the resultant number is represented by the beads at the centre.



After this lots of developments took place. This is mentioned here year wise.

2.2.2 Other Computer Developments

- 1617- John Napier invented a machine which consisted of a set of numbered rods for doing multiplications. Each rod contained digits from 1 to 9.
- 1642- A famous French mathematician **Blaise Pascal** developed the first mechanical calculating machine. This machine had a number of teeth and wheels connected together by chains. Numbers were fed into the machine by dialing them on the wheels. It could add and do multiplications.
- 1671- Ad Gofried Leibrietzi – Modified or improved the Pascal's machine.
- 1792 – 1871 Charles Babbage, an English Mathematician, designed a machine, named **Difference Engine**. In 1833- 34, Babbage invented another machine with an automatic computing

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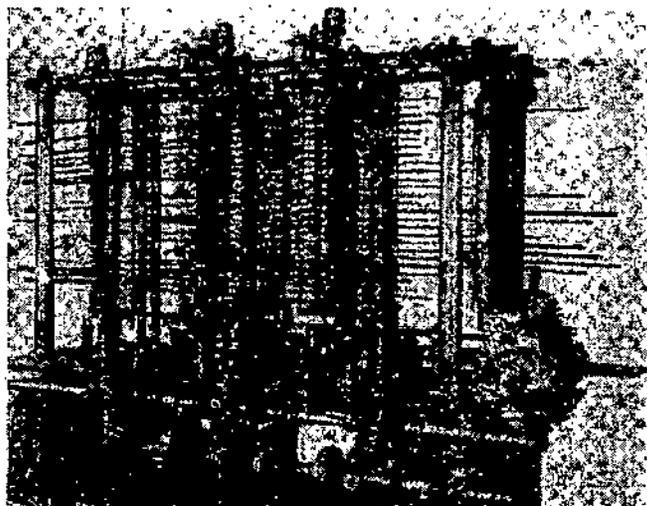
mechanism. He named it **Analytical Engine**. This machine could store the data in **Memory**, which became the base of **Modern Computers**. This is why he is known as the **Father of Computers**.



1880-

Herman Hollerith, a mathematician, invented a **Tabulating Machine** by using punch cards for the census (calculation of population) in **U S A**.

The cards used to have holes for different answers. When these cards passed through this machine,



the machine could detect holes on cards, recognize numbers and it could make required calculations.

1930-1939

During the **IIInd World War**, Computers were utilized in military operations for decoding secret messages and creating designs for aircrafts. They were nicknamed **Z1** and **Z2** machines.

1940-

IBM had made a computer and named it **Harvard Mark-I**. It worked electro mechanically without any manual efforts. It could perform three addition operations and one subtraction operation



per second. As multiplication, it could perform one operation per second. It was a first computer and was also called Automatic Sequence Controlled Computer (ASCC).

1946- ENIAC computer was developed in 1946. This was based on Mark 1, which was developed by Howard Aitken and Grace Hopper in 1930.

From this point onward computers developed can be classified into various generations.

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2.3 COMPUTER GENERATIONS

Computer generations can be derived on the basis of the various methods used in the making of the computer.

<i>Generations</i>	<i>Based on</i>	<i>Period</i>
(i) First Generation	Electronic Valves	1950
(ii) Second Generation	Transistors	1960
(iii) Third Generation	Integrated Circuits	1965
(iv) Fourth Generation	Microprocessors	1975
(v) Fifth Generation	Large Scale Integrated Systems	1980

2.3.1 Various Generations and their Computers

2.3.1.1 First Generation Computers

J.P. Eckert and J.W. Muchly developed the first electronic computer known as ENIAC. The other computers which come into this category are NIVAC, EDVAC, UNIVAC etc.

2.3.1.2 Second Generation Computers

Second Generation Computers were based on transistor (transfer resistor) technology which replaced the vacuum tubes. Examples of second generation computers are: UNIVAC 1108, IBM 700, 1401, CDC-1604, 3600.

2.3.1.3 Third Generation Computers

The transistors used in second generation were then replaced with Integrated Circuits (ICs) or chip. Example: IBM -360, 370, ICL-1900.

2.3.1.4 Fourth Generation Computers

These computers were based upon the development of Large Scale Integration (LSI). Examples: INTEL 4004 Apple Series I and II, Spectrum 7.

2.3.1.5 Fifth Generation Computers

Fifth Generation Computers focused on connectivity. This method of connecting of computers is called Networking.

2.3.2 Personal Computers

Personal Computers were introduced by International Business Machine (IBM) in

1981. IBM has brought out different versions/models with variations of floppy disks, hard disks, chips etc. making them faster and faster. The various versions of IBM PC computers are:

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Model	RAM Chip	Type of Chip	Floppy Drive 5¼"	Floppy Drive 3½"	Hard Disk
PC	640 K	8088	2	Nil	Nil
PC-XT	640 K	8088	1	Nil	20 MB
PC-AT/286	1028 K	80286	1	1	40 MB
PC-AT/386	4 MB	80386	1	1	120 MB
PC-AT/486	8 MB	80486	1	1	260 MB
PC-Pentium	16 MB	Pentium	Nil	1	720 MB
PC-PIII	32 MB	Pentium-III	Nil	1	4.3 GB

To understand the various terms used in the table, it is important to know the following terms:

- 1 byte = 1 character (0 to 9 or a to z or a special character like \$)
- 1 Kilobyte (KB) = 1,000 Bytes approx.
- 1 Megabyte (MB) = 1,000 Kilobytes approx.
- 1 Gigabyte (GB) = 1,000 Megabytes approx.

2.3.3 Apple Computer

In 1977, this computer was developed by two young men in their twenties, named **Steve Wozniak** and **Steve Jobs**. This computer became very popular for home and small business use. The company which they formed, **Apple Computers**, manufactured more small computers than any other computer manufacturer of the time. Over the years the company has grown tremendously and has Macintosh brand of computers available throughout the world. Their computers are, according to some users, better than those manufactured by IBM.

2.4 CHARACTERISTICS OF COMPUTERS

A computer can be judged by various factor, among them are:

2.4.1 Speed

Computers provide the processing speed essential to our fast-paced society. The quick service we have come to expect - for bank withdrawals, telephone calls, and travel reservations, to name a few - is made possible by computers. Businesses depend on the speedy processing computers to handle high volume activities such as balancing ledgers and designing products.

The smallest unit of time in the human experience is, realistically, the second. Computer operations - for example, the execution of an instruction, such as multiplying pay-rate with numbers of hours worked - are measured in milliseconds,

microsecond, nanoseconds and picoseconds (one thousandth, one millionth, one billionth, and one trillionth of a second respectively).

Although all computers are fast, but there is a wide diversity of computer speeds. The execution of an instruction on a very slow computer may be measured in less than a millisecond. Most computer can execute an instruction measured in microseconds range, but still to be broken in the picosecond barrier.

A computer speed is generally expressed in megahertz (MHz), millions of machine cycles per second. Thus a PC (Personal Computer) listed at 100 MHz has a processor capable of handling 100 million machine cycles per second. Another measure of computer speed is MIPS (one million instructions per second). MIPS is often a more accurate measure than clock speed, because some computers can use each tick of the clock more efficiently than others.

A third measure of speed is the megaflops (MFLOPS), which stands for one million floating point operations per second. It measures the ability of the computer to perform complex mathematical operations.

2.4.2 Reliability

Computers are extremely reliable. Where reliability is the measurement of the performance of a computer, measured against some predetermined standard for operation without the failure of it.

Reliability Of Computer = $\frac{\text{Serviceable Time}}{\text{Serviceable Time} + \text{Down Time}}$

where serviceable time is the total time during which a computer is in a state where it can operate normally, including time when the computer is idle, but not the time when it is unattended. Down time is the time when a computer is inoperable due to a machine fault.

Computer systems are particularly adept at repetitive tasks. They donot take sick leave and tea breaks, and they seldom complain anything below 99.9% serviceable time, the time when the computer system is in operation, is usually unacceptable. For some companies, any down time is unacceptable. These companies provide backup computers that take over automatically if the main computer fails.

2.4.3 Accuracy

Errors do occur in computer based information systems, but precious few can be directly attributed to the computer system itself. The vast majority can be traced to a program logic error, a procedural error, or erroneous data. These are human errors. High accuracy implies small error, but accuracy is contrasted with precision e.g. three places of decimals properly computed are less precise but more accurate than four places of decimals containing an error. The accuracy of the results obtained from computer-mainly depends on the method of programming and the way the results are interpreted.

2.5 APPLICATIONS OF COMPUTERS

There are lots of applications of computers. In fact, in our everyday life it is used in almost every step. Some of the places where it is used is listed below. I have listed them alphabetically.

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Airlines booking	Now you can book your ticket for a flight leaving New York while sitting in Melbourne. All the airlines are interconnected through computers. The same goes for Railways but it is restricted to individual countries only.
Banks	Computers in Banks have made it possible that you can get your account information while sitting at home only. For this your bank must be an e-bank, which most of them are. ATMs are another computer applications of banks.
Business	For most of the companies, all the work relating to accounts is now done on computers, for accuracy and speediness. You can even have your correspondence on it.
Cartoons	There are various programs available in computers which allow you to create animations. By learning about them you can become an expert animator. You may even make a movie of your own.
Cinema	Now a days most of the film editing is done by computers. You can add and delete film clips at a snap using computers. In fact, some movies are totally made using computers. Films like Toy Story are made using computers.
Defence	America has used the computers in defence for the fullest with pin pointing the position of enemy targets. Most of the missiles these days are computer controlled.
DTP	It has revolutionized how composing for printing used to be done. Now every book for printing is composed on computer since it is very easy to edit and read on screen.
Education	Computers can help in teaching too. In fact this books on computers was created using computers. Most of the schools now use computers for accounting, students record management, papers preparation and even results compilation.
Home	At home it has become an additional entertainment media. You can use it for playing games, watching movies, listening to songs, writing letters; creating your own database of friends, etc., the options are unlimited.
Library	Maintaining the records in library manually used to be a very cumbersome method. Computers have dramatically changed the way the cataloging is done in libraries.
Medicine	Lots of research in medicine is done using computers. Doctors now a days can see the complete inside of the human beings using the computers.
Space Technology	All the movements of the satellites are controlled using computers.
Weather	Using computers and satellites you can predict the weather for the next few days. In fact, the biggest computer in India is with the Meteorological Department of India, at New Delhi.

2.6 CLASSIFICATION OF COMPUTERS

Generally, computers can be divided into 3 types.

1. Analog Computers
2. Digital Computers
3. Hybrid Computers

2.6.1 Analog Computers

In this type of computers, numerical magnitudes are represented by physical quantities such as electric current, voltage, or resistance, mechanical movements, etc. These are machines which are designed to perform arithmetical functions upon numbers where the numbers are represented by physical quantity.

Analog computers are widely used in manufacturing units where temperatures, pressures or flow of liquids are to be monitored continuously. It is also used at petrol pump where petrol pump contains an analog processor that connects fuel flow measurements into quantity and price values.

Among the various drawbacks of using Analog computers are: They do not have the ability to store data in large quantities; They do not have the logical facilities; They can perform only arithmetical functions but are more costlier.

2.6.2 Digital Computers

A digital computer operates on data in the form of digits, rather than the physical quantities used in analog computers. That is, its input must be discrete rather than continuous and may consist of combinations of numbers, characters and special symbols, written in appropriate programming language. Digital computers can be classified into two parts:

2.6.2.1 General Purpose Digital Computers

They are also known as all purpose digital computers. Theoretically they can be used for any type of applications, e.g., computers that are used for payroll, graphs, analysis, etc.

2.6.2.2 Special Purpose Digital Computers

A digital computer is designed to solve problems of a restricted type. That is, special-purpose digital computer is designed to be especially efficient in a certain class of applications, e.g., computers installed in washing machines.

2.6.3 Hybrid Computers

This type of computers are hybrid of the above two types. A hybrid computer may use or produce analog data or digital data. It can be obtained either by interconnecting a digital and analog computer via a hybrid interface or the analog unit is integrated as a part of central processor of a digital computer which ultimately helps in getting input/output directly.

Hybrid computers are generally used in scientific applications or in controlling industrial processes, in both situations the user is able to exploit the machine's

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ability to process both discrete and continuous data using accurate digital subroutines where necessary and the analog machines for fast integration functions.

2.6.4 Classification by Size

If we classify the computers by their sizes, we would have the following classification.

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- Super Computers
- Mainframe Computers
- Super Mini Computers
- Mini Computers
- Micro Computers or Personal Computers

Let us read about each one of them in brief.

2.6.4.1 Super Computers

A supercomputer contains a number of processing units which operate in parallel to make it faster. They are in fact, very large computers and are thus used for bigger applications. In India, there is only one such computer which is used by the Metrological department in weather forecasting.

2.6.4.2 Mainframe Computers

It is again a large computer but where it differs from super computer is that it can be connected to various computers to share facilities. For example, a System/370 can be attached to several personal computers so that they can share programs and data. Mainframe computers are used in research organizations, large industrial banks, airlines, and railway reservations where large data base is required.

2.6.4.3 Super Mini Computers

These are cross between minicomputers and super computers. They are commonly used as dedicated computers, for one processing function at a time.

2.6.4.4 Mini Computers

They are inferior to mainframe computers both in speed and storage. They can also support various terminals. In fact, they can support upto 100 terminals. Minicomputers have operating systems with multitasking and network capabilities enabling them to serve more than one user.

2.7 RAM

RAM or random access memory, is used in the PC for its primary memory. RAM is where all active programs and data are stored so that they are readily available and easily accessed by the CPU and other components of the CPU. When you execute a program on your PC, a copy of the program is copied into RAM from whatever secondary storage it is on, usually the hard disk.

Once it is in RAM, the instructions that make up the program are passed one at a time to the CPU for execution. Any data the program accepts or reads from a disk is also stored in RAM. There are several reasons that RAM is used in a PC but

perhaps the most important is that RAM can transfer data to and from the CPU much faster than all secondary storage devices. Without RAM, all programs instructions and data would be read from the disk drive, slowing the computer to a crawl. With RAM speeds as fast, if not faster, than the speed of the CPU, the entire PC operates much more efficiently.

RAM is a group of integrated circuits (ICs or chips) that contain small electronic components (called capacitors) that store binary 1s and 0s. A variety of memory chips can be used for RAM, but some are better suited to storing large amounts of data, fit better in the space available in the PC and are less expensive. However, not all memory applications in the PC need to store a large amount of data, so most PCs use three different layers of memory: primary memory, level 1 (L1) cache and level 2 (L2) cache. RAM in its common usage refers to the primary memory layer of the PC's memory.

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2.8 ROM

It's logical then that data stored on read-only memory (ROM) cannot be changed, as its name implies. ROM also has the added feature of being nonvolatile, which means that it can keep its contents even without a power source. This makes it ideal for storing the PC's startup instructions and system BIOS (Basic Input/Output System). While virtually all ROM chips are packed in a DIP (dual inline packaging) form, there are three types of ROM used in a PC:

2.8.1 PROM (programmable read-only memory)

This type of ROM chip is programmed using a special type of programming device called a PROM burner (a.k.a. PROM programmer), which permanently stores machine language (binary instructions) code on the PROM chip. A PROM chip is also referred to as OTP (One Time Programmable) memory.

2.8.2 EPROM (erasable programmable read-only memory)

This type of ROM, pronounced "e-prom," is erasable and can be reprogrammed. Unlike a PROM chip that cannot be reused and can only be thrown out when it becomes obsolete, an EPROM chip can be reprogrammed and reused. An EPROM has a quartz window on the face of the chip that exposes the chip's interior circuits.

When ultraviolet (UV) light is shined through this window, it causes a chemical reaction that erases the EPROM. In order to reprogram an EPROM, it must be removed from the computer, erased with UV light and then reprogrammed on a PROM programmer.

2.8.3 EEPROM (electronically erasable programmable read-only memory)

Most newer PCs now include an EEPROM (pronounced "e-e-prom") that can be reprogrammed like an EPROM, but unlike the EPROM doesn't need to be removed from the PC to be reprogrammed. An EEPROM can be reprogrammed, a process called flashing, using specialized software that runs on your PC. An EEPROM is also referred to as flash ROM.

Flashing lets you upgrade your computer's BIOS easily without removing and replacing the ROM chip. One thing that all DIP chips suffer from including removable

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and replaceable PROMs and EPROMs is a condition called chip creep. DIP chips are inserted into what are called through-hole sockets and can and do squirm out of their sockets. Should a ROM chip creep out of its socket, it can cause startup problems. If you have an older motherboard that includes removable DIP ROM or memory chips, you should check them occasionally for creep.

2.9 COMPUTER HARDWARE

Hardware is a term used to describe the physical components of the computer, any computer part which you can see and touch, such as Computer Monitor, Keyboard, Mouse, etc., is hardware. Any accessory or device connected to the computer, such as the printer is also hardware.

If you see, the computer is physically divided into 3 main parts:

- Monitor
- Central Processing Unit
- Keyboard

You will read about them in the later part of the chapter.

2.10 CPU

It is actually the main brain of the computer system. It is here that the whole processing takes place. It consists of 4 main units:

- Primary Storage
- Arithmetic Logic Unit
- Control Unit
- Output Unit

Let us read about them one by one.

2.10.1 Primary Storage Unit

This is main storage area, which is also called the main memory area. Its main functions are listed below:

1. Holding the data in its memory till it is required to be processed.
2. Holding the result of the processed data.
3. Holding program instructions which are required for processing.

2.10.2 Arithmetic Logic Unit

This is used for the most of the logical processing, for example, for calculations or comparisons. The arithmetic operations like, +, -, *, and / are performed here. The logical operations like, <, >, =, <=, >=, and <> are also performed here. In most of the arithmetical operations the result is in numerical form while in the case of logical operations the result can be YES/NO or TRUE/FALSE.

2.10.3 Control Unit

This unit controls the flow and manipulation of data and information. It also controls the flow of data from input devices to memory and from memory to output devices.

2.10.4 Output Unit

The output unit consists of the output devices attached to the computer. These devices take machine-coded output results from the processor and convert them into a form that can be understood by the user.

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2.11 PERIPHERALS

A peripheral is a piece of computer hardware that is added to a host computer in order to expand its abilities. More specifically, the term is used to describe those devices that are optional in nature, as opposed to hardware that is either demanded or always required in principle.

The term also tends to be applied to devices that are hooked up externally, typically through some form of computer bus like USB. Typical examples include joysticks, printers and scanners. Devices such as monitors and disk drives are not considered peripherals when they are not truly optional.

Some people do not consider internal devices such as video capture cards to be peripherals because they are added inside the computer case; for them, the term peripherals is reserved exclusively for devices that are hooked up externally to the computer. It is debatable however whether PCMCIA cards qualify as peripherals under this restrictive definition, because some of them go fully inside the laptop, while some, like WiFi cards, have external appendages.

In computer hardware, a peripheral device is any device attached to a computer in order to expand its functionality. Some of the more common peripheral devices are printers, scanners, disk drives, tape drives, microphones, speakers, and cameras. A device can also refer to a non-physical item, such as a pseudo-tty, a RAM drive, or a network adapter.

Before the advent of the personal computer, any connected device added to the three base components—the motherboard, CPU and working memory (RAM, ROM, or core)—was considered to be a peripheral device.

The personal computer has expanded the sense of what devices are needed on a base system, and keyboards, monitors, and mice are no longer generally considered to be peripheral devices.

2.12 INPUT AND OUTPUT DEVICES

This section is divided into two parts: Input Devices and Output Devices.

2.12.1 Input Devices

These are devices which are used to give information to the computer.

2.12.1.1 Keyboards

One look at it and you would be reminded of the old typewriter keypad. Well yes, the placing of alpha keys is exactly the same. This is called the QWERTY type of keyboard. This has been done specially keeping in mind the migration of people from typewriter to keyboard.

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It is the most important part of the computer. I am yet to see a computer without it. It is there in each computer. There are some software available in the market which teach you how to master the keyboard, but the old asdf method of typing would be sufficient. If one does not have speed for typing, it is ok but, the placement of keys is very important before you sit down on computer.

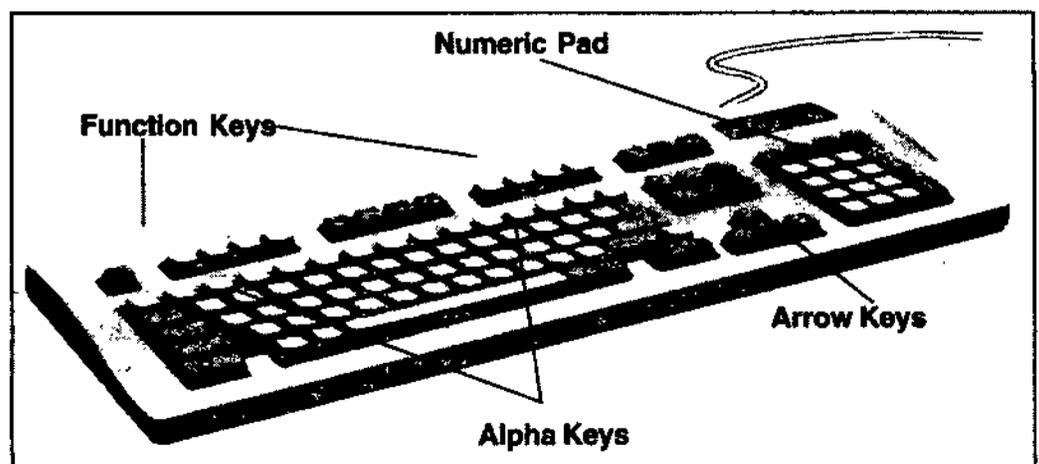
Let us see how the various keys are placed on the keyboard.

Keyboard Keys: Most keyboard layouts are still a variation of the key layout of a typewriter, at least for the alphabetic, numerical and special character keys. Keyboards are available for various other languages than English too, but, for our purposes we would stick to the English one. There are mostly 101 keys on the keyboard. The important keys are as follows:

Alpha Keys: Alphabet keys are marked from a to z. As in typewriter, you can use S to make them capital, i.e., ABCDE, etc. So if you press a b c d e etc., with S key already pressed, you will get A B C D E etc. Similar results can be obtained by putting CAPS LOCK key ON. For typing capital A, you press S key and then while keeping S key pressed, press the "a" key. Otherwise for typing a, you don't need to press the S key, just press the a key.

Numeric Keys: The numeric keys (with the characters 0 to 9) are located on the computer's keyboard at two places. You can see them in the top row above the alpha keys (as in typewriter). A second set of these keys is provided on the right-hand side of the keyboard. The numeric keys in the top row can be used straightaway to type in numeric characters. By simultaneously holding down the Shift key (as in the typewriter), you can also type in special upper characters like ! % \$ *, etc. However, to type numeric characters by using the keys on the right side, you will need to press the Num Lock key ON.

Function Keys: These keys are marked ! to +. These keys are used for specific purposes as defined in the computer (a computer program is a set of instructions given to a computer to perform a specific task) which you may be using. For example,



in BASIC programming (BASIC is a computer language used for writing programs) # will load the program, ! will list the program after loading and @ will run the program.

Arrow Keys: On 101 keys keyboard these are placed at two places. The first is called the cursor pad which works independently. The other is the numeric-cum-cursor pad. It is similar to the one on the 84 key keyboard. When the Num Lock key is not in the ON position, pressing the key of the numeric keypad moves the cursor in the direction shown on each key. Otherwise, this portion is used to enter numbers.

Special Keys including Spacebar: There are several other keys which serve some definite purposes. Some of these keys are available on the typewriter too. The special keys are:

-  **Shift Key** It is used for typing capital letters and special characters. In combination with both Control and Alternate keys, it is sometimes used to execute a particular command too.
-  **Control Key** On its own, this key does not have any purpose. However, combined with different keys, it performs some useful operations. For example, in WordStar software, Control if pressed alongwith B, will make the character Bold.
-  **Backspace** It allows the cursor to go back by one character. Some types of computer programs allow the backspace to delete the last character. A cursor is usually a blinking line (|), on the screen, which shows where the character you type on your keyboard will appear.
- Spacebar** As in the typewriter, the Spacebar is used to leave space between words.
-  **Enter Key** It informs the computer that the line of the matter, you are typing, has come to an end. After that you begin typing from a new line. It is also used, while programming, to tell the computer to execute certain commands which you give. Thus, while writing a computer program, you can also use this key to indicate the end of a given command.
-  **Del Key** If, by mistake, you have typed in something which you did not want to, you can erase the wrong character by pressing the DEL (short for Delete) key.

The Numeric Pad: As mentioned earlier the numeric pad is used for entering the numeric data, from 0 to 9. But, there are other keys too, which are shown here.

- NUM LOCK** As mentioned you need to put this ON for typing the numeric data. When you put on the computer system, this key is put on.
- Arithmetic operators** The number pad includes keys for the four standard arithmetic operators, / (divide), * (multiply), - (subtract) and + (add).
- Numbers/cursor keys** When the Num Lock key is off, the various keys here act differently. They act as they are mentioned on the keys. For example, there is Home on the 7 key, there is Up Arrow

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INSERT/DELETE

at the 8 key. So while the Num Lock key is off, you can use the numeric pad for other purposes.

These two keys are the zero and period of the number pad when it is in number mode; in cursor control mode, they duplicate the actions of the INSERT key and the DELETE keys.

ENTER

This is a second ENTER key that remains an ENTER KEY regardless of the number pad's mode.

Special-Purpose Keys: These keys are used for some special purposes. Each key has a special purpose attached to it and can be used for it:

Esc

The Escape key is typically enabled as an exit key by most software applications. It is used to cancel out of a command or to exit an application. It is also used in combination with other keys to create special key values and to indicate other actions. For example, in Windows the ESC key can be used to close a context menu.

Print Screen/SysRq

The PRINT SCREEN mode of this key got its name back in the MS-DOS days, when pressing it sent the image of the display to the printer. On a Window system, the image of monitor's display is sent to the Windows Clipboard.

Pause/Break

In its default mode (PAUSE), this key will, if enabled by software, pause the display or the action of an application program. If used in combination with the CTRL key, the alternate mode of this key interrupts or halts some software programs, primarily MS-DOS commands and applications. Using the CTRL and BREAK keys together is the same as using the CTRL and C keys to break an action.

2.12.1.2 Mouse

These days even the mouse has become a very important part of a computer. It has become an integral part of a computer since Windows has become the operating system for computers. It is in fact a pointing device. With this you can point at any place on the monitor and start the typing or clicking from that point. All Windows-based programs use a mouse, making working with computers easier as you are not required to type commands.

Types of Mouse: There are three basic types of Mouse

1. Mechanical Mouse
2. Optomechanical Mouse
3. Optical Mouse

Mechanical Mouse: A mechanical mouse has a rubber or metal ball on its underside that can roll in all directions. Mechanical sensors within the mouse detect the direction of the rolling ball and make a movement of the screen pointer accordingly.

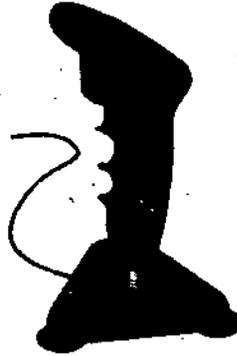


Optomechanical Mouse: Optomechanical mouse is also similar to a mechanical mouse except that it uses optical sensors to detect the movement of the ball on the Mouse Pad.

Optical Mouse: Optical mouse uses a laser beam to detect the movement of mouse on specially designed Mouse Pad. We must move the mouse along a special mat with a grid so that optical mechanism has a frame of reference. This type of mouse has no mechanical moving parts. Optical mouse respond more quickly and precisely than any other mouse. These are expensive than the other two.

2.12.1.3 Joysticks (or Paddle)

You must have seen a joystick with a video game at various video game parlours. Well the same joystick can be attached to the computer too. For playing game obviously. It consists of a small, vertical lever (called the stick) mounted on a base that is used to steer the screen cursor around. Some joysticks are mounted on a keyboard, others function as stand- alone units. The joystick can be moved left or right, forward or backward, springs are often used to return the joystick to its home center position.



2.12.1.4 Optical Recognition Input

There are two types of optical recognition input devices.

1. Optical Character Recognition (OCR) and
2. Optical Mark Reading (OMR)

Optical Character Recognition (OCR): A special kind of devices called scanners use the principle of OCR to input the printed matter on the paper or any other object. This matter can be in the coded form (bar codes) or simple text/ graphics (pictures). Bar Code Readers and Scanners come into this category of devices. OCR is a technique which permits the direct reading of printed character. Optical character recognition readers or scanners typically examine each character as if it were made up of a collection of minute spots. Once the whole character has been scanned, the pattern detected is matched against a set of patterns stored in the computer. Whichever pattern it matches, or nearly matches is considered to be the character read. Patterns which can not be identified are rejected.

Optical Mark Recognition: It is an automatic optical sensing of marks recorded on a data medium. In this method special preprinted forms are designed with boxes which can be marked with a dark pencil or ink. These documents are applicable in areas where responses are one out of a small number of alternatives and the volume of data to be processed is large. Thus they are used for

1. Objective type answer papers in examinations (e.g., in UPSC) in which large number of candidates appear.
2. Market surveys, population surveys etc., where responses can be restricted to one or more out of a few possibilities.
3. Order forms containing a small choice of items.

These preprinted documents filled by user are passed under a light source and presence of mark is detected by measuring very accurately the infra-red light levels. A mark reader may be able to detect coloured marks. It can also be designed to be

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insensitive to certain colours. Now these particular colours could be safely used in the pre-printing of the documents without the risk of their being read as marks intended for recognition.

2.12.1.5 Scanners

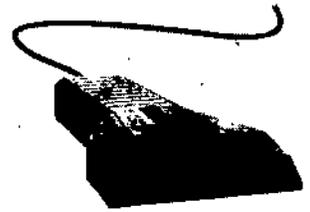
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Whereas a keyboard, mouse or trackball requires manual input of data, scanners allow input of printed data. A scanner reads text, photographs and graphics from paper which are then converted into bit patterns for processing, storage or output. Scanner is a device that examines a spatial pattern one part after another and generate analog or digital signals corresponding to the pattern. Scanners are often used in mark sensing, pattern recognition or character recognition.

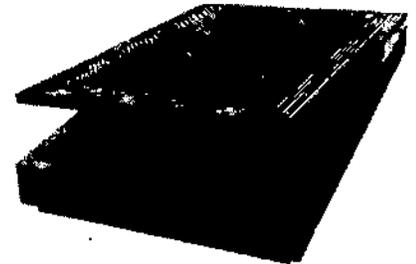
Practically scanner uses light for examining the spatial patterns. In a scanner, as the image is scanned, it is converted into light and dark picture elements, or pixels, similar to newspaper photo. Colour scanners can assign a specific colour to a pixel. The pixel are then stored as bit patterns. This technique makes the images usable by word processing, desktop publishing, and graphic packages.

There are two types of scanners, Hand-held scanner and Flat-bed scanner

Hand-Held Scanner: These devices read data on price tags, shipping labels, inventory part number, book ISBNs, and the like. Hand-held scanner, sometimes called wand scanners, use either contact or laser technology. It has a set of light emitting diodes. It is placed over the material to be scanned and slowly dragged from the top to the bottom. The light emitted by the diodes are not reflected by black lines and are reflected by whole areas. The material is converted and stored in a bitmap. Typical applications are to store images and reproduce them in publications.



Flat-bed Scanner: It consists of a box with glass plate on top, which is used for placing the document to be scanned. The light beam is situated below the glass plate and is moved from left to right horizontally. After scanning one line the beam moves up little and scans the next line. The scanner can also store colour images.



2.12.1.6 Bar Codes

These represent alphanumeric data by varying the width and combination of adjacent vertical lines. These zebra strips can be sensed and read by a bar code reader, a photoelectric device that reads the code by means of reflected light. When a bar code is scanned, the light source is reflected off the spaces between the marked bars. This returned light is then converted into bit patterns. A decoder in the scanning system translates the bit patterns into meaningful letters and numbers. The bar code merely identifies the product to the store's computer; the code does not contain the price, which may vary. The price is stored in a file that can be accessed by the computer. This is because of the reason that it is easier to change the price once in the computer than to have to restamp the price on each book. The computer automatically tells the point-of-sale terminal what the price is; a printer prints the item description and price on a paper tape for the customer.

2.12.1.7 Digital Camera

A digital camera can store many more pictures than an ordinary camera. Pictures taken using a digital camera are stored inside its memory and can be transferred to a computer by connecting the camera to it. A digital camera takes pictures by converting the light passing through the lens at the front into a digital image.



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2.12.1.8 MICR

Its full form is Magnetic Ink Character Reader. This process is used by a special machine which reads coded numbers you see on your bank cheques. These days most cheques issued and used bear MICR numbers to speed up clearing of cheques. It is a technology related to the recording of information on document by means of magnetized ink characters and automatic recognition of such characters by means of machines. In this technology the magnetic ink contains particle of magnetizable material (viz., iron oxide), which can be energized to facilitate automatic reading of printed characters. Magnetic ink document reader helps in translating the information read into a coded format usually for direct insertion into an input area of a computer's core storage in an order according to the digits recorded in a specified field, i.e., account number, etc.

2.12.1.9 Card Reader

In 1960s when IBM 1401 & 360s were the main computers in the market, the input media was punched cards. These cards were made of thick brownish paper. A special machine called Card Punch was used to punch these cards, in turn making holes in the cards. When this card was fed into the computer, the current would pass from the holes and thus forming the characters which was punched on the card. Sometimes even the output was also taken on these cards. Since these cards could be used only once, the medium turned out to be quite costly affair.

2.12.1.10 Web Cameras

It is fast becoming an integral part of the computer specially for those who use Internet quite often. With this you can take an instant picture of the object to whom you focus it. It is very useful specially for those who have to show their designs, products, etc., on the computer to the clients. The picture transfer is almost instant.

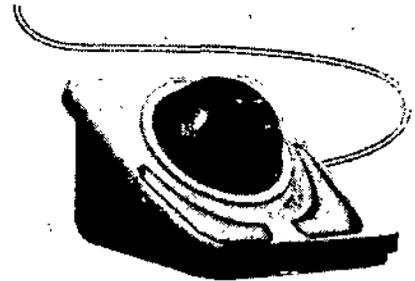
2.12.1.11 Light Pens

A light pen is a small pen-shaped wand, which contains light sensors. The light pen is used to choose objects or commands on the screen either by pressing it against the surface of the screen or by pressing a small switch on its side. This sends a signal to the computer, which then works out the light pen's exact location on the screen. The advantage of a light pen is that pen is that unlike a touch screen it doesn't need a special screen on screen coating. Used like an ordinary writing pen, this electronic pen is used to enter data by writing on the screen. The data you write is displayed on the monitor.

2.12.1.12 Trackball

Trackball is a pointing device that works like an upside-down mouse. You rest your thumb on the exposed ball and your fingers on the buttons. To move the cursor

around the screen, you roll the ball with your thumb. Because you do not move the whole device, a trackball requires less space than a mouse. It is particularly used in notebook and laptop computers.



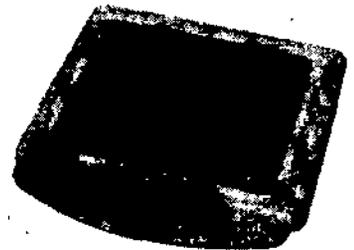
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2.12.1.13 Touch Screens

Similar in use to the light pen is the touch-screen, which enables users to input instructions by merely touching on-screen prompts. The edges of the monitor of a touch-screen emit horizontal and vertical beams of light that criss-cross the screen. When a finger touches the screen, the interrupted light beams can pinpoint the location selected on the screen. Such screens are especially helpful when people are unfamiliar with computers. Information systems in shopping malls, airports, and amusement parks are now being developed using touch-sensitive screens as the only input hardware.

2.12.1.14 Touch Pad

A small, touch-sensitive pad is used as a pointing device on some portable computers. By moving a finger or other object along the pad, we can move the pointer on the display screen. The touch pad is related to the touch screen, but activated by different means. The touch pad uses pressure sensitive materials to record data at the point where the pad is touched. Many appliances around the home, such as microwave ovens, use touch pads for programming time or temperature.



2.12.1.15 Digitizer

A digitizer, or graphics tablet, is similar to a light pen; however, instead of drawing on the screen, a separate tablet is used on which a special stylus is moved. Input tablets or digitizer tablet are typically found in CAD terminals or engineering workstations, etc. Digitizers are also called Digitizing Tablets, Graphics Tablets, Touch Tablets or simply Tablets.

2.12.1.16 Voice Input

Speaking to a computer, known as voice input or speech recognition, is another form of source input. Voice recognizers accept the spoken word through a microphone and convert it into binary code (0s and 1s) that can be understood by the computer. Most voice recognizer systems are speaker dependent - that is, they must be separately trained for each individual users. Therefore, a database of words must be created for each person using the system. To create this database, each person using the system must repeat - a minimum of 20 times - each word to be interpreted by the system. This training is necessary because we seldom say a word the same way each time.

2.12.1.17 Voice Recognizers

Voice recognizers are used in some graphic workstations as input devices to accept voice commands. The voice-system input can be used to initiate graphics operations or to enter data. These systems operate by matching an input against a predefined dictionary of words and phrases.

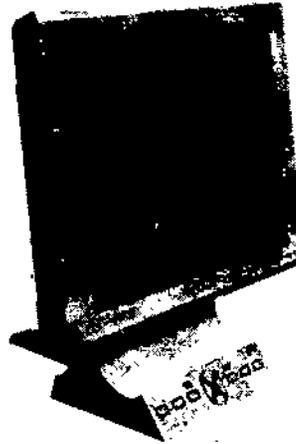
2.12.2 Output Devices

The success of business today can depend to a large extent on how meaningful and timely the information a computer can produce, i.e., the output. So the two most important requirements of computer output are that it is meaningful and convenient to use.

2.12.2.1 Monitors and Displays

There would be no What You See Is What You Get (WYSIWYG) on PCs, if there were no monitors or displays on which to see what you get. The PC must produce outputs that can be handled by the senses of humans and so far, technology is limited to sight and sound. Given a choice, most of us still prefer sight over sound. You can accomplish a lot on a PC without sound, but not much would get done without the ability to see what you are working on.

The two general categories of PC visual presentation are the monitor and the display. A monitor has a CRT (cathode ray tube) and look something like a traditional television set (without the controls, of course). On the other hand, a display is a flat-panel device that can be attached to a portable PC or hung on the wall. A monitor is largely desk or table-bound, but a display can get up and move about. A flat-panel display is really an adaptation of the monitor, but because it uses different technology, they are treated as two different components.



The PC Monitor: With personal computer technology advancing as fast as it is, it is hard to believe that any part of a PC could be considered an investment. However, the PC monitor is the only part of the personal computer that actually hold its value and has some durability. A good quality monitor will last for years through several generations of the PC systems.

Video Cards: In general, the video card processes the graphics data produced by software running on the PC and prepares it for use by the monitor for converting it from digital data to an analog signal. The video card also sends out the data needed by the monitor to refresh the image or renew it as it changes.

Video cards, graphics cards and accelerator cards are all names for the adapter card inside the PC that is responsible for generating the signals that tell the monitor what to display. The relationship between the video card and the monitor should be carefully matched. These two device must be compatible in terms of the signal used to communicate to the monitor, the type of connector used to connect them together, the video display standards they support and their speed.

Dumb Terminal: It has been named as such since it is really dumb. It has no memory or processing unit, just a keyboard and the monitor. It takes everything else from the computer which it is attached.

Smart Terminal: If you add microprocessor to dumb terminal, then it becomes a smart terminal. But, it still depends upon the main computer for programming and other jobs.

Intelligent Terminal: First we add microprocessor, now we add everything else. It

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is full-fledged computer in itself but connected to a large computer. It can be programmed and has processing power. Most of the work can be done at the terminal itself. Only for jobs that require large processing and storage facility, the main computer is used.

2.12.2.2 Computer Output on Microfilm

If only this method was adopted was adopted by Government offices, their stores would have become non existent. In this each record is made into a small film image and thus the volume of data becomes very very small. Sometimes the reduction is to the tune of about 50 times. This means that an A 4 size paper is reduced to a film of about 1 square inch. This is done with the help of high speed cameras. Since the process is costly and takes time, it is usually taken up for large volumunus type of jobs.

2.12.2.3 Multimedia Projector

As the name suggests it is used for presentations of multimedia projects. Instead of displaying the presentation on small computer monitor screen it is displayed on large screen which is usually mounted on a wall. This way the projection can be seen by many instead of few. It is not only possible to enlarge the image but you can give audio effect too. Since multimedia presentaion has become the most common way of presentation, this device is quite in use.

2.12.2.4 Speech Synthesizer

If one hand you have microphones which convert your text to the format which the computer understands, the reverse has also been made possible. This method converts data from the computer to the spoken words or sentences. You can then convert this into speech and broadcast it over the speakers. Take for example, you cannot speak but can listen, then this becomes a big boom. Whatever you have to say write it on computer terminal and convert it to speech which others can listen. Even those have problems with seeing the text can also listen to it.

2.12.2.5 Printers

Once considered an expansive luxury for any PC, especially for home or small office systems, a printer is now virtually a necessity on any PC system. Technology has advanced to the point that good quality, color printers are available for less than Rs.8,000 and it is common for PC sale bundles to include one.

When software was still fairly unsophisticated and applications that produced output worth saving were few, the printer was a true luxury. Electronic spreadsheet and word processing applications allowed the user to prepare budgets, reports, letters and other documents prepared for the sole purpose of being physically shared. Even in today's networked environments, where documents can be shared and collaborated on electronically, the need to produce a printed paper copy of a document is still a necessity for a significant portion of documents produced on the PC. The printer has definitely become a necessity for today's PC user.

The printers can be divided into two distinct categories:

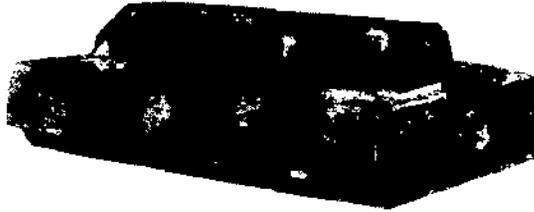
1. Impact Printers
2. Non-impact Printers

Impact Printers: A printer in which printing is the result of mechanically striking the

printing medium. An impact printer makes contact with the paper to produce an image. The impact may be produced by a print hammer character, like that of a typewriter key striking a ribbon against the paper or by a print hammer hitting paper and ribbon against a character.

An impact printer must be used if printing a multiple copy report so that the duplicate copies will receive the imprint. Impact printers are of following types:

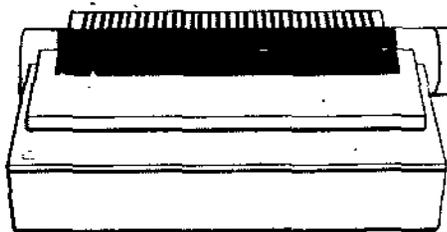
Dot-Matrix Printer: In it the individual characters are formed by a matrix of wires or styluses. Dot-matrix printers are also called serial printers. The images are formed by a print head that is composed of a series of little print hammers that look like the heads of pins. The print head usually has nine pins or 24 pins. The bottom 2 pins are used to form the descenders of lower case letters, viz., p, q, g and y. Many expensive dot-matrix printers do not provide descenders, but print quality is improved when they are used.



Features common to most dot-matrix printers include boldface, underline, subscript and superscript and compressed print (narrowed letters). Optional features include proportional spacing (using more or less space, depending on the width of the character) and italics. Dot matrix printers are very versatile since the character set can be changed by software or firmware such as a PROM for different styles, alphabets or graphic symbols. Dot-matrix printers are comparatively inexpensive and one of the fastest types of character-at-a-time printers available. The speed ranges from 50 cps to 400 cps (character per second).

Their abilities to use different type fonts, different line densities and different types of paper are also important.

Daisywheel Printers: A serial impact printer in which the printing element is a plastic hub that has a large number of flexible radial spokes, each spoke having one or more different raised printing characters, the wheel is rotated as it is moved horizontally step by step under computer control, and stops when a desired character is in a desired print position so a hammer can drive that character against an inked ribbon.



Daisy Wheel Printers are slower than dot-matrix printers, but they produce a high-resolution output. This high-resolution output is often called letter quality printing because it is suitable for business letters and memos. You can print in as many type fonts or foreign languages on a daisywheel printer as there are print wheels to fit your particular model of machine.

It is also called as a smart printer because of its bi-directional printing and built-in microprocessor control features.

Line Printers: It prints an entire line in a single operation without necessarily printing one character at a time. These are generally electro-mechanical devices which print complete lines of print, up to 160 characters in width, at speeds about 300 to 2000 lines per minute. Line printers are used primarily in the mini/mainframe processing environment.

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Examples of line-at-a-time impact printers are:

1. Chain Printers
2. Band Printers and
3. Drum Printers

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Non-Impact Printers: Printers that do not strike characters against ribbon or paper when they print, are non-impact printers. Example of non-impact printers include

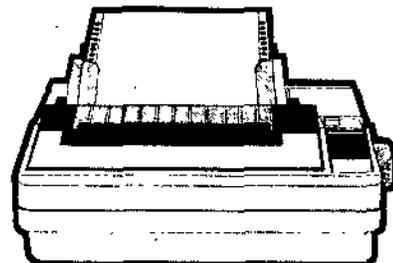
1. Ink-jet printers
2. Laser printers

These printers makes much less noise than impact printers.

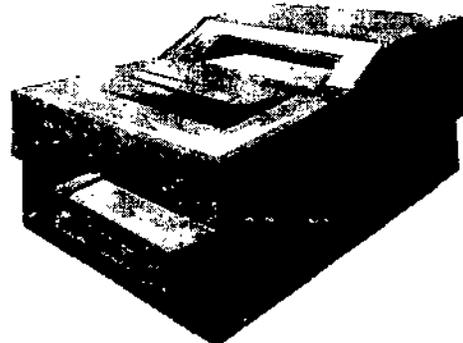
If you are using a non-impact printer, do not try to print on multiple-part carbon forms: because no impact is being made on the paper you will end up with no copies.

Ink-jet Printers: It uses a technique of projecting droplets of ink at paper to form the required image. Ink-jet printer create an image directly on paper by spraying ink through as many as 64 tiny nozzles.

It provides a print resolution of around 360 dots per inch.



Laser Printers: The physical properties of LASERS (Light Amplification by Stimulate Emission of Radiation) allows for the very precise positioning of narrow beam of light, transferring a high energy source to a very small area. This property is used to control printing, i.e., laser printers, to read information from bar codes and to read and write information in optical storage devices.



Laser printer is a non-impact printer that creates, by means of a laser beam directed on a photosensitive surface, a latent image which is then made visible by a toner and transferred and fixed on paper. A separate computer is built into the printer to interpret the data that it receives from the computer and to control the laser. Just as electron gun in a graphic monitor can target any pixel, the laser in a laser printer can aim at any point on a drum creating an electrical charge.

The resolution of laser printers is 600 DPI both horizontally and vertically; some high-end models have resolution of 1200 DPI.

2.12.2.6 Graphics Output Devices

Business people have found that sophisticated and colourful graphics add an aura of professionalism to any report or presentation. This demand for presentation graphics has created a need for corresponding output devices. Computer-generated graphic images can be re-created on paper and transparency acetates with printers and plotters. Graphic images also can be captured on 35-mm slides, or they can be displayed on a monitor or projected onto a large screen.

The main popular graphic output device is the plotter, which can draw hard-copy

graphics output in the form of maps, bar charts, engineering drawings and even two or three-dimensional illustration. Plotters often come with a set of four pens in four different colours. Most plotters also offer shading features.

2.12.2.7 Plotters

It is an output unit that directly produces a hardcopy record of data on a removable medium, in the form of a two-dimensional graphic representation. Plotters are designed to produce large drawings or images such as construction plans for buildings or blueprints for mechanical objects.

There are two major types of pen plotters:

1. Flatbed plotters
2. Drum plotters

Flatbed Plotters: It uses a bed or tray to hold paper in a fixed position. A movable pen is usually held by a single arm that can move the pen both horizontally and vertically. The computer instructs the flatbed plotter by directing the pen to x-y position on the page.

Drum Plotters: It has a single arm that can only move across the drum horizontally. The drum itself moves the paper forward or backward to enable the pen to draw in any vertical direction.

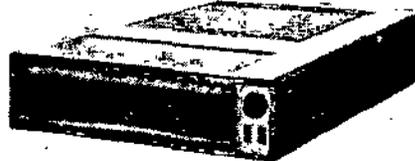
Any type of diagonal line is drawn by combining a horizontal movement of the pen arm with a vertical page movement via the drum. Drum plotters are used to produce continuous output, such as plotting earthquake activity, or for long graphic output, such as the structural view of a 'skyscraper'.

2.13 STORAGE MEDIA

Memory is not the only place where you store the data or program, since it is volatile. So you need to have storage devices which can store your data and programs permanently. For this we use so called storage units. These can be used for storing the data and then, maybe, transferring it to another computer or storage media.

2.13.1 Hard Disk Drives

Hard disks have been there since the time of mainframe systems of 3rd generation computers. The only difference is that the disks at that time were removable and were of very small capacity. However, the basic technology used in the earliest hard disks has not changed all that much over the years, although the size and capacity of the drives has.



2.13.2 Floppy Disk Drives

Although manufacturers have been trying for years to replace the floppy disk, with a device that holds more data, the 3.5 inch floppy disk drive is still very common on most PCs sold today.



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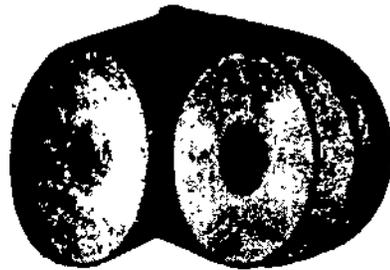
The floppy disk has survived well beyond what anyone expected. It has changed in size over the years and is available in drives that fit inside the system case as well as outside. The floppy disk has come in a variety of sizes over its lifetime, but for about the past ten years the most popular size has been the 3.5 inch diskette.



2.13.3 CD-ROMs and DVDs

The CD-ROM and its comparatively huge storage capacity (over 600 floppy disks) has been very attractive to software and multimedia producers and soon virtually all software, including databases, books encyclopedias and other materials not available to the PC in the past suddenly became very available and accessible for the PC.

A CD-ROM drive is as common on PCs today as floppy drives were only a few years ago. In fact, some manufacturers now replace the floppy disk drive with a single CD-ROM on their latest PC models. The CD-ROM is by far the most common method of software distribution and data storage due to their combination of high capacity and easy, inexpensive manufacturing. A PC without a CD-ROM drive simply is not able to install the vast majority of PC software available on the market today. Some CD-ROM software even requires that your PC's drive meet a specific minimum requirement. For example, if you have an older CD-ROM drive, such as a 4X, in your system, it may need to be replaced before it can run some newer CD-ROM titles that require at least a 12X drive.



CD-ROM Technology: The CD-ROM uses compact disc (CD) technology, the same technology used to record the music on your favorite audio CDs. The physical media used for recording data, programs, music and multimedia on a CD-ROM is the same as that used to record music. In fact, the physical disc is the same for both.

Video CD (VCD): The video CD (VCD) is used to store compressed video information using a standard also defined in the White Book. VCDs use MPEG (Motion Picture Experts Group) compression to store 74 minutes of full-motion video in the same space used by CD-DA audio. To play a video CD requires a CD-ROM drive or video CD player that is video CD-compatible. The compression algorithm used for VCD does not produce a high quality video; this format will likely give way to the DVD.

CD-Recordable: Each of the CD types covered to this point have been CD-ROMs or read-only discs, which means that except for during their manufacturing processes, data cannot be stored to them and they cannot be modified, other than to be destroyed. To take advantage of its large storage space, methods have been developed, along with special CD media that allow data to be written to a CD.

A CD Recordable (CD-R) disc is manufactured essentially the same as a CD-ROM disc, with some slight variations. In place of the substrate is a layer of organic dye, over which is placed a reflective gold-colored metallic coating. Over this is the protective lacquer layer, just like a CD-ROM.

Two general types of CDs that can be modified in a special CD-R are:

CD Media: Like other computer storage, such as discs and floppy disks, a CD stores data in digital form, which means that it actually stores only two values: 1s and 0s. However, where the hard disk and diskette stored data in magnetic form, data on a CD recorded in a physical recording technique. A CD starts out as a round piece of polycarbonate substrate about 4.75 inches in diameter and 1.2 millimeters (approximately) 1/20th of an inch) thick. A metal stamp, made from a master of a finished disc, is then used to stamp indentations into the substrate, a process called mastering. A CD-ROM produced this way is said to have been mastered.

The indentations are referred to as pits, and the flat, unpitted surfaces are referred to as lands. The substrate surface and its pits are then covered with a shiny, reflective silver or aluminum coating, which plays a very important part in reading and playing the contents of the CD. A clear plastic cover is then placed over the silver coating on which a paper or silk-screened label is applied. A disc manufactured in this way is called a single-session disc.

Reading the CD: When a CD is loaded into a player or CD-ROM drive, it spins and laser moves over the lands and pits, sensing thousands of them per second. When the laser hits a land, its light reflects off the metallic coating to a sensor. A pit on the CD surface does not reflect the laser back to the sensor. When it hits a pit, the light does not reflect back to the sensor.

Whether the sensor sees a reflection or not is how it knows if the bit on the CD is a 1 or a 0. Unlike a floppy or hard disk, a CD is recorded on a single long (about three miles long, in fact) spiral rather than in discrete tracks. The spiral is wound onto the disc in a pattern that is the equivalent of about 16,000 tracks per inch on a hard disk drive.

The first sector on the CD is located at two minutes, no seconds and no hundredths of seconds (00:02:00) or 600 blocks. On a CD-ROM using 512-byte blocks a minute of data contains 18,000 blocks, which means that there are 300 in a second and 600 in the first two seconds. This also means that Logical Block 0 is at 00:02:00 as well.

2.14 SOFTWARE DEFINITION AND CONCEPTS

Software is a program which cannot be seen but tell the computer what results to produce and a program is a set of instructions given to the computer to perform a certain task. There are two main types of software, namely:

(i) Application Software and (ii) System Software

2.14.1 Application Software

The computer does different type of jobs and for these different jobs, different applications are used. Each application needs to have its own set of programs and these programs combine together to form an Application Software. For example railway-ticketing, telephone-bill printing, salary and wages calculation, etc.

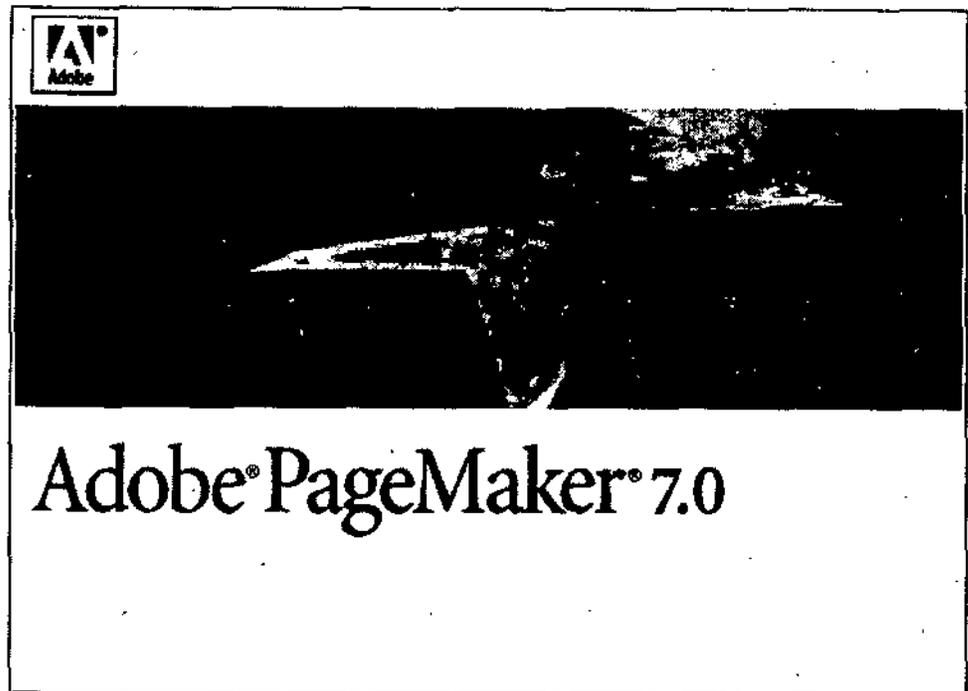
Application Software are of two types: Ready Made Software and Customized Software.

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2.14.2 Ready Made Software

These are the ones which are available from the computer showrooms and are capable of performing jobs when loaded into computers. Softwares like **Microsoft Office**, **Pagemaker**, **CoreIDRAW** etc.

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2.14.3 Customized Software

Software which is needed by any individual company. Programmers study the requirements of this company and prepare software which is made exactly to the need of the company. This may or may not run by any other company. This type of software is known as Customized Software.

2.14.4 System Software

The software used to operate and maintain a computer system and also used by a programmer to develop application software is known as **System Software**. It is written in a language which handles the computer hardware directly, whereas the application software works through the system software.

The Operating Systems like DOS, Windows fall into this category. Their job is not only to run the system but also to maintain it. Every computer system must have system software to make it work, without system software a computer cannot work.

SUMMARY

1. A computer is made of different parts.
2. Computer is a machine, totally at the command of the user.
3. The computer is physically divided into 3 main parts: Monitor, Central Processing Unit and Keyboard.
4. CPU consists of 4 main units: Primary Storage, Arithmetic Logic Unit, Control Unit and Output Unit.
5. Computers provide the processing speed essential to our fast-paced society.
6. Computers are extremely reliable.
7. Computer systems can store tremendous amounts of data.
8. A PC's memory is made up of electronic components in which the PC temporarily stores data and instructions.
9. Data stored on read-only memory (ROM) cannot be changed.
10. RAM is a group of integrated circuits that contain small electronic components that store binary 1s and 0s.
11. Input device is used to input data into computer.
12. Output device is used to get result from the computer.
13. Keyboard has 101 keys.
14. Alpha keys are there for typing alphabets A to Z.
15. Numeric keys are there for typing numerals 0 to 9.
16. Function keys are used in programming.
17. Arrow keys are used for moving the cursor on the screen.
18. Special keys are used for special purposes.
19. Numeric pad has other keys too besides the numeric ones.
20. Mouse is basically a pointing device.
21. There are three basic types of Mouse: Mechanical Mouse; Optomechanical Mouse and Optical Mouse.
22. Joystick is used for playing games.
23. There are two types of optical recognition input devices: Optical Character Recognition (OCR) and Optical Mark Reading (OMR).
24. A scanner reads text, photographs and graphics from paper which are then converted into bit patterns for processing, storage or output.
25. A digital camera can store many more pictures than an ordinary camera.
26. MICR is a technology related to the recording of information on document by means of magnetized ink characters.
27. A light pen is a small pen-shaped wand, which contains light sensors.
28. Trackball is a pointing device that works like an upside-down mouse.
29. Voice recognizers accept the spoken word through a microphone and convert it into binary code.
30. Monitor is like a TV and is used to display output.
31. The printers can be divided into two distinct categories: Impact Printers and Non-impact Printers.
32. Dot matrix printers use hammers to print characters.
33. Line printer prints an entire line in a single operation without necessarily printing one character at a time.
34. Laser printer is a non-impact printer that creates a laser beam transfers the same on the paper for printing.
35. Card Readers were used in earlier computers but not now.
36. Web cameras are used for sending and receiving pictures on the Internet.
37. Dumb terminals have only keyboard and monitors.
38. Smart terminals have microprocessors too.

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39. Intellignet terminals have everything except big storage capacity.
40. Data can be stored on the micro films too.
41. Various storing units of memory are: Bit (One binary digit); Byte (Eight bits); Word (16 to 64 bits); Kilobyte (KB) (1 thousand bytes); Megabyte (MB) (1 million bytes); Gigabyte (GB) 1 billion bytes; Terabyte (TB) (1 trillion bytes); Petabyte (PB) (1 quadrillion bytes).
42. Accessing data from a hard disk drive takes from 8 to 16 milliseconds.
43. A storage device is used to store the data in the computer.
44. Floppy disks of 3½" are used these days.
45. CD-ROMs are now used as media for computers.
46. CDs can be used as recording media too.

TEST YOURSELF

1. Describe the various type of keys on the keyboard.
2. Describe the various types of mouse available.
3. Describe the various types of optical recognition devices.
4. What is a trackball?
5. What is the difference between Impact and Non-impact printers?
6. Describe the working of joystick.
7. What are OCRs? How do they work?
8. What is the difference between hand held and flat bed scanners?
9. What are bar codes?
10. What is digital camera used for?
11. Describe the working of Light pens.
12. What is a trackball?
13. What is a touch screen?
14. What is a touch pad?
15. How would you enter data into computer by speaking?
16. Describe the various types of terminals available.
17. How are microfilms used for keeping data?
18. What is multimedia projector used for?
19. How is speech synthesizer used?
20. Describe the working of Dot Matrix Printer.
21. How do the daisywheel printers print?
22. Describe the working of Line printers.
23. What is an inkjet printer?
24. Describe the working of laser printer.
25. Describe the working of various type of plotters.
26. What is a hard disk?
27. Which type of Floppy Disks are in use?
28. Describe the various types of CDs available.
29. How a CD is read?
30. What is the difference between software and hardware?
31. Describe what you mean by application software.
32. Define system software. Why is it required?
33. What is the difference between application software and system software?
34. List some of the uses of application software.
35. How are fourth generation computers different from third generation computers?
36. Describe the various vesions of IBM PCs available.
37. What are Analog Computers?
38. What are Mainframe Computers?

39. What are Super Computer

40. Describe the followings:

Byte	Kilobyte
Gigabyte	Tetraybyte
Terabyte	Megabyte

Multiple Choice Questions

- Herman Hollerith invented a tabulating Machine which used:
 - Punch cards
 - Memory
 - Teeth and wheels
- Tabulating machine was invented in
 - 1940
 - 1880
 - 1671
- First generation computers was developed by
 - J.P.Eckert
 - J.W.Muchly
 - Both
- Second generation computers were based on
 - Transistors
 - Integrated Circuits
 - Electronic Valves
- Pascal's machine was modified by
 - John Napier
 - Charles Babbage
 - Ad-Gofried Leibrietzi
- John Napier's machine contained digits from
 - 1 - 9
 - 0 - 9
 - 1 - 10
- ENIAC computer was developed in
 - 1930
 - 1946
 - 1940
- Fifth generation computers were based on
 - Microprocessors
 - Integrated Circuits
 - Large Scale Integrated Systems
- ENIAC computers was based on
 - Mark - 1
 - Memory
 - Z2 machines
- Personal Computers were introduced by
 - IBM
 - Apple Computers
 - Grace Hooper
- RAM stands for:
 - Random Allowed Memory
 - Ready Access Memory
 - Random Access Memory
- RAM consists of binary numbers 1s and :
 - 0s
 - 2s
 - 3s
- CPU contains Primary Storage, Arithmetic Logic Unit and
 - Control Unit
 - Data Unit
 - Alpha Unit
- For seeing the output, you use:
 - Monitor
 - Keyboard
 - Mouse
- In programming, you use the following keys:
 - Arrow keys
 - Function keys
 - Alpha keys
- Keyboard has _____ number of keys.
 - 100
 - 88
 - 101
- With CD you can:
 - Read
 - Write
 - Both
- Printer is an _____ device.
 - Input
 - Output
 - Both
- Mouse is a _____ device.
 - Input
 - Output
 - Both
- A scanner scans
 - Pictures
 - Text
 - Both

NOTES

NOTES

21. Laser printer is an _____ device.
(a) Input (b) Output (c) Both
22. With digital camera, you can store:
(a) text (b) pictures
23. In MICR, C stands for:
(a) Colour (b) Code (c) Character
24. Trackball has a
(a) ball (b) track (c) football
25. Cards for Card Reader were made from
(a) Plastic (b) Paper (c) Rubber
26. Dumb terminals have terminals and
(a) mouse (b) speakers (c) keyboard
27. Dot matrix printers uses _____ for printing
(a) hammers (b) slugs (c) mouse
28. Floppy disk popular these days is of size:
(a) 3½" (b) 5¼" (c) 5½"
29. CDs are of which shape:
(a) round (b) square (c) rectangular
30. Hard disks has
(a) cubicles (b) platters (c) keys
31. _____ Software is used to operate and maintain a computer system.
(a) System (b) Application (c) Readymade
32. Your application software is good only in the presence of _____ software.
(a) System (b) Application (c) Readymade

True/False Questions

1. Abacus was invented by Egyptians.
2. Abacus has 7 rods and 10 beads in each rod.
3. Analytical Engine stored its data in Memory.
4. Mark - 1 was made by IBM.
5. Blaise Pascal developed the first mathematical calculating machine.
6. Charles Babbage was an English mathematician.
7. Tabulating machine was used for census in USA.
8. During 11nd World War computer were utilized in Military Operations.
9. The first Apple Computer was developed in 1977.
10. The ALU contains the electronic circuitry that executes all arithmetic and logical operations.
11. The control unit of computer contains electronic circuit .
12. Computers provide the processing speed essential to our fast-paced society.
13. Computers can store tremendous amounts of data.
14. A PC's memory temporarily stores data and instructions.
15. Data stored on read-only memory (ROM) can be changed.
16. RAM is a group of integrated circuits that contain small electronic components that store binary 1s and 0s.
17. Accessing data from a hard disk drive takes from 8 to 16 milliseconds.
18. A storage device is used to store the data in the computer.
19. Floppy disks of 5½" are used these days.
20. CD-ROMs are now used as media for computers.
21. CDs can be used as recording media too.
22. Keyboard has 100 keys.
23. Function keys are used in programming.
24. Numeric pad has other keys too besides the numeric ones.

25. Mouse is basically a pointing device.
26. There are three basic types of Mouse: Mechanical Mouse; Optomechanical Mouse and Optical Mouse.
27. Joystick cannot be used with computers.
28. A scanner reads text, photographs and graphics from paper which are then converted into bit patterns for processing, storage or output.
29. A digital camera can store many more pictures than an ordinary camera.
30. MICR is a technology related to the recording of information on document by means of magnetized ink characters.
31. A light pen does not contain light sensors.
32. Trackball is not a pointing device.
33. Voice recognizers accept the spoken word through a microphone and convert them into binary code.
34. Monitor is like a TV and is used to display output.
35. There are two type of printers: Impact Printers and Non-impact Printers.
36. Dot matrix printers use hammers to print characters.
37. Line printer prints an entire line in a single operation without necessarily printing one character at a time.
38. Laser printer does not use laser beam for printing.
39. Card Readers used cards made up of plastics.
40. Web cameras are used for sending and receiving pictures on the Internet.
41. Dumb terminals have only keyboard and monitors.
42. Smart terminals have microprocessors too.
43. Data can be stored on the micro films too.
44. Software is a program which cannot be seen.
45. Hardware and software are two types of computers.
46. You can see software but you cannot see hardware.
47. Application software helps us make our computer do book-keeping write letters and draw pictures.
48. The floppy disk is a software, whereas a floppy drive is a hardware.

NOTES

Short Questions with Answers

1. What is a computer?

Ans. So, we can say that a computer is a machine, totally at the command of the user, which can perform operations at a much higher speed than a human being.

2. Which were the first three generation of computers?

Ans. The first three computer generations are pinned to three technological developments:

1. vacuum tube
2. transistor and
3. integrated circuit

3. What is an abacus?

Ans. It is a rectangular wooden frame with rods and rounded moveable beads which are used for counting. It has **10 rods** with **7 beads** in each.

4. Which are the various types of computers?

Ans. Generally, computers can be divided into 3 types.

1. Analog Computers
2. Digital Computers
3. Hybrid Computers

5. Which are the various classifications of computers?

Ans. If we classify the computers by their sizes, we would have the following classification.

- Super Computers
- Mainframe Computers

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- Super Mini Computers
 - Mini Computers
 - Micro Computers or Personal Computers
6. Which are the main parts of computer?

Ans. The main parts of computer are:

- Monitor
- Central Processing Unit
- Keyboard

7. Which are the main units of CPU?

Ans. CPU consists of 4 main units:

- Primary Storage
- Arithmetic Logic Unit
- Control Unit
- Output Unit

8. What is a peripheral?

Ans. A peripheral is a piece of computer hardware that is added to a host computer in order to expand its abilities. More specifically, the term is used to describe those devices that are optional in nature, as opposed to hardware that is either demanded or always required in principle.

ANSWERS

Multiple Choice Questions

- | | | | |
|-------|-------|-------|-------|
| 1. a | 2. b | 3. c | 4. a |
| 5. c | 6. a | 7. b | 8. c |
| 9. a | 10. a | 11. a | 12. a |
| 13. a | 14. a | 15. b | 16. c |
| 17. c | 18. b | 19. a | 20. c |
| 21. b | 22. b | 23. c | 24. a |
| 25. b | 26. c | 27. b | 28. a |
| 29. a | 30. b | 31. a | 32. a |

True False Questions

- | | | | |
|-------|-------|-------|-------|
| 1. F | 2. T | 3. T | 4. F |
| 5. T | 6. T | 7. T | 8. T |
| 9. T | 10. T | 11. T | 12. T |
| 13. T | 14. T | 15. F | 16. T |
| 17. T | 18. T | 19. F | 20. T |
| 21. F | 22. F | 23. T | 24. T |
| 25. T | 26. T | 27. F | 28. T |
| 29. T | 30. T | 31. F | 32. F |
| 33. T | 34. T | 35. T | 36. T |
| 37. T | 38. F | 39. F | 40. T |
| 41. T | 42. T | 43. T | 44. T |
| 45. T | 46. F | 47. T | 48. T |

DATA COMMUNICATION AND NETWORKS

LEARNING OBJECTIVES

After going through this chapter, you should appreciate the following:

- Computer Networks
- Networking in Computers
- Introduction to LAN, WAN, MAN
- Network Topologies
- Basic Concepts in Computer Networks
- Introduction to GPRS
- Introduction to CDMA
- Introduction to GSM
- Introduction to FM Technologies

3.1 COMPUTER NETWORKS

When more than two computers are connected to each other and sharing information, resources and remote systems then this is called Networking.

NOTES

Technical definitions:

"A network of data processing nodes that are interconnected for the purpose of data communication"

"An interconnection of three or more communicating entities"

3.1.1 Classification of Computer Networks

3.1.1.1 Network Layer

In this computer networks follow the industry standards of OSI reference model and TCP/IP model. Where as OSI is of seven layers and TCP/IP is defined in five layers.

3.1.1.2 Scale

It can be classified as:

- Local area network (LAN)
- Campus area network (CAN)
- Metropolitan area network (MAN)
- Wide area network (WAN).
- Personal area network (PAN)

3.1.1.3 Connection Method

The connection methods available are:

- Ethernet
- Power line communication
- Wireless LAN
- HomePNA

3.1.1.4 Functional Relationship

This exists between the network elements:

- Peer-to-peer
- Client-server

3.1.1.5 Network Topology

It is a logical layouts of the network. Topologies are:

- Star network
- Ring network

- Bus network
- Tree network
- Star-bus network
- Mesh network

3.1.1.6 Services

It provides following services:

- Wireless community network
- Server
- Storage area networks
- Process control networks
- Value-added network

3.1.1.7 Protocol

On network protocols are used as communication language. Several types of protocols are available:

- TCP/IP
- Network IPX/SPX

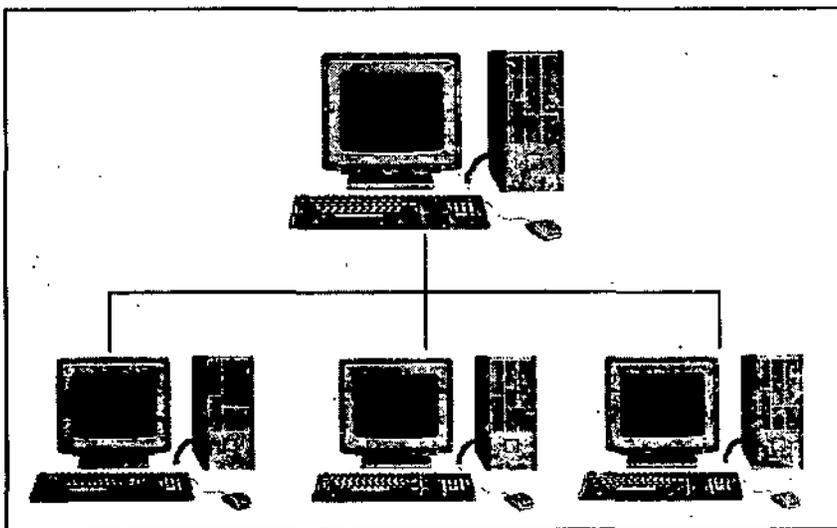
3.1.2 Types of Networks

Following is the list of the most common types of computer networks in order of scale.

3.1.2.1 Personal Area Network (PAN)

PAN is used for communication among the personal devices (intrapersonal communication), or for connecting to a higher level network and Internet. The reach of a PAN is typically a few meters.

A personal area network (PAN) is used for communication among computer devices. For example,



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- Telephones
- Personal digital assistants

Personal area networks may be wired with computer buses such as USB and FireWire. A wireless personal area network (WPAN) can also be made possible with network technologies such as IrDA and Bluetooth.

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3.1.2.2 Local Area Network (LAN)

A network covering a small geographic area, like a home, office, or building. Current LANs are most likely to be based on Ethernet technology. The defining characteristics of LANs, in contrast to WANs (wide area networks), include their much higher data transfer rates, smaller geographic range, and lack of a need for leased telecommunication lines.

3.1.2.3 Campus Area Network (CAN)

A network that connects two or more LANs but that is limited to a specific (possibly private) geographical area such as a college campus, industrial complex, or a military base. A CAN, may be considered a type of MAN (metropolitan area network), but is generally limited to an area that is smaller than a typical MAN.

3.1.2.4 Metropolitan Area Network (MAN)

A network that connects two or more Local Area Networks or CANs together but does not extend beyond the boundaries of the immediate town, city, or metropolitan area. Multiple routers, switches & hubs are connected to create a MAN

3.1.2.5 Wide Area Network (WAN)

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

3.1.2.6 Internetwork

Two or more networks or network segments connected using devices that operate at layer 3 (the 'network' layer) of the OSI Basic Reference Model, such as a router. Any interconnection among or between public, private, commercial, industrial, or governmental networks may also be defined as an internetwork.

3.1.2.7 Internet

A specific internetwork, consisting of a worldwide interconnection of governmental, academic, public, and private networks based upon the Advanced Research Projects Agency Network (ARPANET) developed by ARPA of the U.S. Department of Defense – also home to the World Wide Web (WWW) and referred to as the 'Internet' with a capital 'I' to distinguish it from other generic internetworks.

3.1.2.8 Extranet

A network or internetwork that is limited in scope to a single organization or entity but which also has limited connections to the networks of one or more other usually, but not necessarily, trusted organizations or entities (e.g., a company's customers may be provided access to some part of its intranet thusly creating an extranet

while at the same time the customers may not be considered 'trusted' from a security standpoint). Technically, an extranet may also be categorized as a CAN, MAN, WAN, or other type of network, although, by definition, an extranet cannot consist of a single LAN, because an extranet must have at least one connection with an outside network.

Extranets may not have connections to the Internet.

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If connected to the Internet, the intranet or extranet is normally protected from being accessed from the Internet without proper authorization. The Internet itself is not considered to be a part of the intranet or extranet, although the Internet may serve as a portal for access to portions of an extranet.

3.1.3 Basic Hardware Components

All networks are made up of basic hardware building blocks to interconnect network nodes, such as Network Interface Cards (NICs), Bridges, Hubs, Switches, and Routers. In addition, some method of connecting these building blocks is required, usually in the form of galvanic cable (most commonly Category 5 cable). Less common are microwave links (as in IEEE 802.11) or optical cable ("optical fiber").

3.1.3.1 Network Interface Cards

A network card, network adapter or NIC (network interface card) is a piece of computer hardware designed to allow computers to communicate over a computer network. It provides physical access to a networking medium and provides a low-level addressing system through the use of MAC addresses. It allows users to connect to each other either by using cables or wirelessly.

3.1.3.2 Bridges

A network bridge connects multiple network segments at the data link layer (layer 2) of the OSI model. Bridges are similar to repeaters or network hubs, devices that connect network segments at the physical layer, however a bridge works by using bridging where traffic from one network is managed rather than simply rebroadcast to adjacent network segments.

3.1.3.3 Hubs

A hub is a piece of hardware which provides the connectivity of a segment of a network by directing traffic through the network. It does this in a rudimentary way, it simply copies the data to all of the Nodes connected to the hub. Hubs are commonly used to connect segments of a LAN. A hub contains multiple ports. When a packet arrives at one port, it is copied to the other ports so that all segments of the LAN can see all packets.

3.1.3.4 Switches

Switches are the device of networking that directs traffic to the correct node by filtering and forwarding packets between Nodes. Switches operate at the data link layer (layer 2) and sometimes the network layer (layer 3) of the OSI Reference Model and therefore support any packet protocol. LANs that use switches to join segments are called switched LANs or, in the case of Ethernet networks, switched Ethernet LANs. In a circuit-switched data network, a switch is used to create a virtual circuit between the pairs of endpoints. This means that it creates a path to the destination node from the source node.

3.1.3.5 Routers

Routers are the networking device that forwards data packets along networks by using headers and forwarding tables to determine the best path to forward the packets. Routers also provide interconnectivity between like and unlike devices on the network. This is accomplished by examining the Header of a data packet. They use protocols such as ICMP to communicate with each other and configure the best route between any two hosts. A router is connected to at least two networks, commonly two LANs or WANs or a LAN and its ISP's network.

Routers are usually found at gateways, the places where two or more networks connect. Many household DSL and Cable Modems are also routers.

3.1.4 Building a Simple Computer Network

A simple computer network may be constructed from two computers by adding a network adapter (Network Interface Controller (NIC)) to each computer and then connecting them together with a special cable called a crossover cable. This type of network is useful for transferring information between two computers that are not normally connected to each other by a permanent network connection or for basic home networking applications. Alternatively, a network between two computers can be established without dedicated extra hardware by using a standard connection such as the RS-232 serial port on both computers, connecting them to each other via a special crosslinked *null modem* cable.

Practical networks generally consist of more than two interconnected computers and generally require special devices in addition to the Network Interface Controller that each computer needs to be equipped with. Examples of some of these special devices are hubs, switches and routers.

3.2 NETWORKING IN COMPUTERS

One other important benefit of layering is that it makes it possible for technologies defined by different groups to interoperate. For this to be possible, it is necessary for everyone to agree on how layers will be defined and used. The most common tool for this purpose is a *networking model*. The model describes what the different layers are in the network, what each is responsible for doing, and how they interact. A universally-accepted model ensures that everyone is on the same page when creating hardware and software.

The most common general model in use today is the Open Systems Interconnection (OSI) Reference Model, which consists of seven distinct layers.

These range from the Physical Layer (layer one) at the bottom, which is responsible for low-level signaling, to the Application Layer (layer seven) at the top, where application software is implemented. Understanding the OSI model is essential to understanding networking as a whole. I explain models and layers in more detail, as well as providing a complete description of the OSI Reference Model, in its own dedicated section.

3.2.1 Networking Architectures

Closely related to the concept of a model is that of an *architecture*. An architecture is essentially a set of rules that describes the function of some portion of the hardware and software that constitute a stack of layers. Such a rule-set usually takes the form of a specification or standard that describes how equipment and programs using the technology must behave. A networking architecture is designed to implement the functions associated with a particular contiguous set of layers of the OSI Reference Model, either formally or informally.

Here, we are, interested in the TCP/IP protocol suite, which runs the Internet, and a complex set of technologies that spans many layers of the OSI model. It is by examining the various components of TCP/IP and how they implement different OSI model layers that we will really learn how TCP/IP works. For starters, the name of the suite, TCP/IP, comes from the Transmission Control Protocol (TCP), which operates at layer four of the OSI model, and the Internet Protocol (IP) that runs at OSI model layer three. IP provides services to layer four and uses services of layer two below it. TCP uses IP's functions and provides functions to the layers above it.

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3.3 INTRODUCTION TO LAN, WAN, MAN

A LAN (local area network) is a group of computers and network devices connected together, usually within the same building. By definition, the connections must be high speed and relatively inexpensive (e.g., token ring or Ethernet). Most Indiana University Bloomington departments are on LANs.

A MAN (metropolitan area network) is a larger network that usually spans several buildings in the same city or town. The IUB network is an example of a MAN.

A WAN (wide area network), in comparison to a MAN, is not restricted to a geographical location, although it might be confined within the bounds of a state or country. A WAN connects several LANs, and may be limited to an enterprise (a corporation or an organization) or accessible to the public. The technology is high speed and relatively expensive. The Internet is an example of a worldwide public WAN.

3.3.1 Local Area Network or LAN

A local area network (LAN) is two or more computers directly linked within a small well-defined area such as a room, building, or group of closely placed buildings. A LAN may be made up of only microcomputers or any combination of microcomputers and large systems. A LAN usually consists of the following:

1. Two or more computers
2. Peripheral devices such as printers and hard-disk drives
3. Software to control the operation of the computers or other devices connected to the LAN

4. Special cables, usually coaxial or fibre optic, to connect the computers and other devices
5. A plug-in board to handle the data transmissions.

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Some computers require that all the computers be of a certain brand, while others allow a variety of brands to be connected. The number of computers in a LAN varies from smaller LANs that typically connect 2 to 25 computers, to large LANs that can connect as many as 10,000 computers.

The length of the cable connecting a computer to a LAN also varies depending on the LAN. Most LANs allow cables of about 1,000 feet, but some allow cables of several miles to be used. The data transfer speeds range from several thousand bits per second to around 10 million bits per second.

Some programs allow the user of more than one operating system; others allow only one. On some LANs file access is limited to one user at a time; on others, more than one user can access a file simultaneously.

3.3.1.1 Hardware for LAN

The following are the major hardware components/devices for establishing LAN:

1. Transmission Channel
2. Network Interface Unit or NIU
3. Servers
4. Workstations

3.3.1.2 Server and Workstations

One of the major benefits of implementation of LAN is sharing expensive resources such as storage devices, printers, etc. This is achieved through providing servers on the LAN. It is a dedicated computer that controls one or more resources. This contains both hardware and software interface for LAN. Three major categories of services used in LANs are:

1. File Server
2. Printer Server
3. Modem Server

In networking, file server is used to share storage for files. Besides providing storage space for files in a LAN environment, it is used for taking periodical backup, and also to provide gateway to other servers with and between LANs. Similarly printer server is used to handle printing works of all workstation connected in the network. In LAN environment also modem is required to get connected to other network or simply to use a telephone. A modem server is used to share this expensive resource by all connected workstations in a network ring.

3.3.1.3 Software for LAN

LAN operating system is required to operate on the LAN system. It has basically two aspects:

1. Server Software
2. Workstation Software

LAN operating system facilitates :

1. Sharing of expensive resources, e.g., printer, storage space, etc.
2. Security for data
3. Connection to other network

There are various types of LAN operating system. Some popular LAN operating systems are :

- Novel Netware
- Ethernet
- Corvus
- ArcNet
- LAN Server
- Omni-Net
- PC Net
- IBM PC LAN
- Etherlink Plus, etc.

3.3.1.4 Features of Local Area Networks

- Typically connects computer in a single building or campus.
- Developed in 1970s.
- Medium : optical fibres, coaxial cables, twisted pair, wireless.
- Low latency (except in high traffic periods).
- High speed networks (0.2 to 100 Mb/sec).
- Speeds adequate for most distributed systems
- Problems : Multi media based applications
- Typically buses or rings.
- Ethernet, Token Ring

3.3.2 Wide Area Networks or WAN

A wide area network is two or more computers that are geographically dispersed, linked by communication facilities such as telephone system or microwave relays. This type of network is usually limited to use by large corporations and government agencies because of the high cost involved in building and maintaining them.



The main difference between a WAN and LAN is under the complete control of

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the owner, whereas the WAN needs the involvement of another authority like telecom department. LANs are successful and capable of handling very high data transfer rates at low cost because of the small area covered. Besides LANs have a lower error rate than WANs.

3.3.2.1 Hardware Requirements for WAN

There are mainly 4 hardware devices which are required to establish linkage between geographically separated computers. These are:

1. Bridges
2. Routers
3. Gateways
4. X.25 Standard Interface

These are explained below.

Bridges: These are used to connect two LANs that use the identical protocols over a wide area. The bridge acts as an address filter which picks up packets from one LAN that are intended for a destination on another LAN and passes these packets on the network. The amount of processing required at the bridge is minimal because all the devices use the same protocols. In case the distance between two LANs is very large then the user is required to employ two identical bridges at either end of the communication link.

Routers: It is a special type of device that can be used to connect networks that may not be similar. Such type of devices provide connectivity between two LANs and two WANs over large geographical distances. These devices operate at the Network Layer of the OSI model. These devices participate in a routing protocol to access the network topology, and on the basis of this information routers compute the best route from a sender to the receiver.

Gateways: These are used to connect two dissimilar LANs. The terms Gateways and Routers are used interchangeably, though there is discriminating difference between the two. A router operates at the network layer whereas a gateway operates on the application layer of the OSI model. A gateway is required to convert data packets from one protocol format to another before forwarding it, as it connects two dissimilar networks.

X.25 Standard Interface: X.25 is a protocol for interfacing to a Public Packet Switched Network. It is not a protocol used for implementing a network. Two systems that support X.25 can't necessarily be connected back-to-back. They can only be connected through a DCE in a Public Packet Switched. International Telegraph and Telephone Consultative Committee (ITTCC) developed X.25 as the standard interface between the Data Terminal Equipment (DTE) and Data Circuit Terminating Equipment (DCTE). This recommendation has been widely accepted as the industry standard for public packet switched networks.

3.3.2.2 Types of Wide Area Networks

There are mainly two types of WAN:

Public Networks: These are those networks which are installed and run by the telecommunication authorities and are made available to any organization or individual who go for their subscription.

Private Networks: The basic technique used in all forms of private WAN is to use private circuits to link the locations to be served by the network. Between these fixed points the owner of the network has complete freedom to use the circuits in any way they want. They can use the circuits to carry large quantities of data or for high speed transmissions. Private wide area networks can be built using whatever standard technology is available.

3.3.2.3 Features of Wide Area Networks

- Developed in 1960s.
- Generally covers large distances (states, countries, continents).
- Medium : communication circuits connected by routers.
- Routers forwards packets from one to another following a route from the sender to the receiver. Store-and-Forward
- Hosts are typically connected (or close to) the routers.
- Typical latencies : 100ms - 500ms.
- Problems with delays if using satellites.
- Typical speed : 20 - 2000 Kbits/s.
- Not (yet) suitable for distributed computing.
- New standards are changing the landscape.

3.3.3 Metropolitan Area Network or MAN

It is a larger network that usually spans several buildings in the same city or town. The IUB network is an example of a MAN.

3.3.3.1 Features of Metropolitan Area Networks

- Generally covers towns and cities (50 kms)
- Developed in 1980s.
- Medium : optical fibres, cables.
- Data rates adequate for distributed computing applications.
- A typical standard is DQDB (Distributed Queue Dual Bus).
- Typical latencies : < 1 msec.
- Message routing is fast.

3.4 NETWORK TOPOLOGIES

Network topology is the study of the *arrangement or mapping* of the elements (links, nodes, etc.) of a network, especially the physical (real) and logical (virtual) interconnections between nodes. A local area network is one example of a network that exhibits both a physical and a logical topology. Any given node in the LAN will have one or more links to one or more other nodes in the network and the mapping of these links and nodes onto a graph results in a geometrical shape that determines the physical topology of the network. Likewise, the mapping of the *flow of data* between the nodes in the network determines the logical topology of the network. It

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is important to note that the physical and logical topologies *might* be identical in any particular network but they also may be *different*.

Any particular network topology is determined only by the graphical mapping of the configuration of physical and/or logical connections between nodes - Network Topology is, therefore, technically a part of graph theory. Distances between nodes, physical interconnections, transmission rates, and/or signal types may differ in two networks and yet their topologies may be identical.

The arrangement or **mapping** of the elements of a network gives rise to certain basic topologies which may then be combined to form more complex topologies (hybrid topologies). The most common of these basic types of topologies are:

- Bus (Linear, Linear Bus)
- Star
- Ring
- Mesh
- Tree
- Hybrid

3.4.1 The Bus Topology

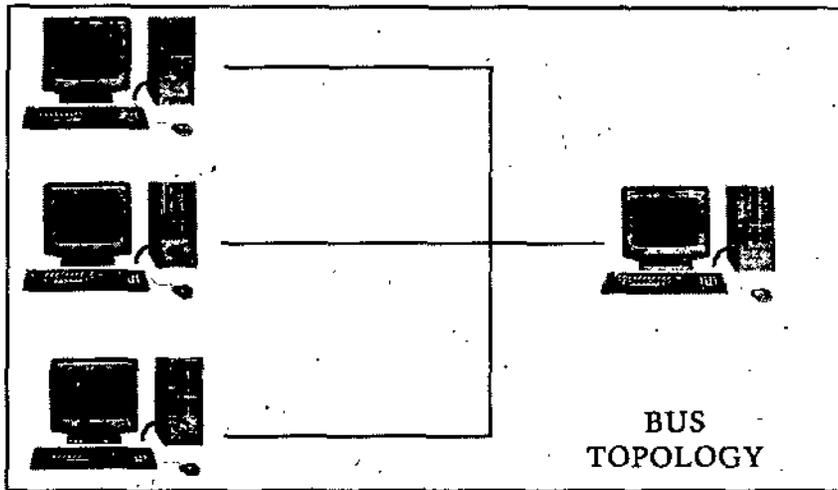
In this case all the server/nodes share a common bus of connecting cables. Every computer can communicate directly with every other computer or device in the network. Each node is given an address. To access a particular, a user just needs to know its address. This topology is frequently used with local area networks. Going through a hierarchy of nodes is not necessary.

3.4.1.1 Advantages of the Bus Network

1. **Short cable length and simple wiring layout:** Because there is a single common data path connecting all nodes, the bus topology allows a very short cable length to be used. This decreases the installation cost and also leads to a simple, easy to maintain, wiring layout.
2. **Resilient architecture:** The bus architecture has an inherent simplicity that makes it very reliable from a hardware point of view. There is a single cable through which all data passes and to which all nodes are connected.
3. **Easy to extend:** Additional nodes can be connected to an existing bus network at any point along its length. More extensive additions can be achieved by adding extra segments connected by a type of signal amplifier known as a repeater.

3.4.1.2 Disadvantages of the Bus Network

1. **Fault diagnosis is difficult:** Although the simplicity of the bus topology means that there is very little that can go wrong, fault detection is not a simple matter. In most LANs based on a bus, control of the network is not centralized in any particular node. This means that detection of a fault may be performed from many points in the network.
2. **Fault isolation is difficult:** In the star topology, a defective node can easily be isolated from the network by removing its connection at the center. If a



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node is faulty on a bus, it must be rectified at the point where the node is connected to the network. Once the fault has been located the node can simply be removed. In the case where the fault is the network medium itself, an entire segment of the bus must be disconnected.

3. **Repeater configuration:** When a bus-type network has its backbone extended using repeaters, reconfiguration may be necessary. This may involve tailoring cable lengths, adjusting terminators, etc.
4. **Nodes must be intelligent:** Each node on the network is directly connected to the central bus. This means that some way of deciding who can use the network at any given time must be performed in each node. It tends to increase the cost of the nodes irrespective of whether this is performed in hardware or software.

Linear Bus: The type of network topology in which all of the nodes of the network are connected to a common transmission medium which has exactly two endpoints (this is the 'bus', which is also commonly referred to as the backbone, or trunk) – all data that is transmitted between nodes in the network is transmitted over this common transmission medium and is able to be received by all nodes in the network virtually simultaneously (disregarding propagation delays).

The two endpoints of the common transmission medium are normally terminated with a device called a terminator that exhibits the characteristic impedance of the transmission medium and which dissipates or absorbs the energy that remains in the signal to prevent the signal from being reflected or propagated back onto the transmission medium in the opposite direction, which would cause interference with and degradation of the signals on the transmission medium.

Distributed Bus: The type of network topology in which all of the nodes of the network are connected to a common transmission medium which has more than two endpoints that are created by adding branches to the main section of the transmission medium – the physical distributed bus topology functions in exactly the same fashion as the physical linear bus topology (i.e., all nodes share a common transmission medium).

1. All of the endpoints of the common transmission medium are normally terminated with a device called a 'terminator' (see the note under linear bus).

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2. The physical linear bus topology is sometimes considered to be a special case of the physical distributed bus topology – i.e., a distributed bus with no branching segments.
3. The physical distributed bus topology is sometimes incorrectly referred to as a physical tree topology – however, although the physical distributed bus topology resembles the physical tree topology, it differs from the physical tree topology in that there is no central node to which any other nodes are connected, since this hierarchical functionality is replaced by the common bus.

3.4.2 The Star Topology

In this case all the computers and the main server form a star like shape. All the computers are connected to a single main host. All communication first goes through the centralized computer allowing it to control the operation, work load, and resource allocation of the other computers in the network.

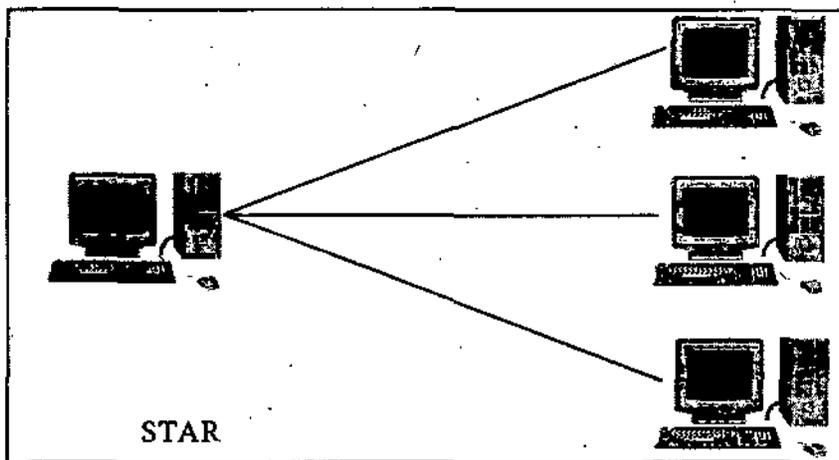
For example, a bank with branch offices would typically use a star network to control and coordinate those branches. The advantage is relative simplicity, but a problem exists with the single-point vulnerability of the network. If the central computer breaks down, none of the other computers can communicate with each other.

3.4.2.1 Advantages of the Star Network

1. **Ease of service:** The star topology has a number of concentration points, i.e. at the central node or at intermediate wiring closets. These provide easy access for service of reconfiguration of the network.
2. **One device per connection:** Connection points in any network are inherently prone to failure. In the star topology, failure of a single connection typically involves disconnecting one node from an otherwise fully functional network.
3. **Centralized control/ problem diagnosis:** The fact that the central node is connected directly to every other node in the network means that faults are easily detected and isolated. It is a simple matter to disconnect failing nodes from the system.
4. **Simple access protocols:** Any given connection in a star network involves only the central node and one peripheral node. In this situation, contention for who has control of the medium for transmission purposes is easily solved. Thus in a star network, access protocols are very simple.

3.4.2.2 Disadvantages of the Star Network

1. **Long cable length:** Because each node is directly connected to the center, the star topology necessitates a large quantity of cable. While the cost of the cable is often small, congestion in cable ducts and maintenance and installation problems can increase costs considerably.
2. **Difficult to expand:** The addition of a new node to a star network involves a connection all the way to the central node. Expansion is usually catered for by providing large numbers of redundant cables during the initial wiring. However, problems can arise if a longer cable length is needed or an unanticipated concentration of nodes is required.
3. **Central node dependency:** If the central node in a star network fails, the



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entire network is rendered inoperable. This introduces heavy reliability and redundancy constraints on this node.

Extended Star: A type of network topology in which a network that is based upon the physical star topology has one or more repeaters between the central node (the 'hub' of the star) and the peripheral or 'spoke' nodes, the repeaters being used to extend the maximum transmission distance of the point-to-point links between the central node and the peripheral nodes beyond that which is supported by the transmitter power of the central node or beyond that which is supported by the standard upon which the physical layer of the physical star network is based.

If the repeaters in a network that is based upon the physical extended star topology are replaced with hubs or switches, then a hybrid network topology is created that is referred to as a physical hierarchical star topology, although some texts make no distinction between the two topologies.

Distributed Star: A type of network topology that is composed of individual networks that are based upon the physical star topology connected together in a linear fashion – i.e., 'daisy-chained' – with no central or top level connection point (e.g., two or more 'stacked' hubs, along with their associated star connected nodes or 'spokes').

3.4.3 The Ring Topology

As the name suggests all the server/nodes are joined together to form a ring. There is no central server in this case. A ring may be unidirectional or bi-directional. A unidirectional ring moves data in one direction only; a bi-directional ring moves data in both directions, but only one direction at a time. In a unidirectional ring, if one computer breaks down, special software is required to keep the network functional. When one node malfunctions in a bi-directional ring, a message can usually be sent in the opposite direction still allowing the node to communicate with all the other active nodes in the network.

3.4.3.1 Advantages of the Ring Network

1. **Short cable length:** the amount of cabling involved in a ring topology is comparable to that of a bus and is small relative to that of a star. This means that less connections will be needed, which will in turn increase network reliability.

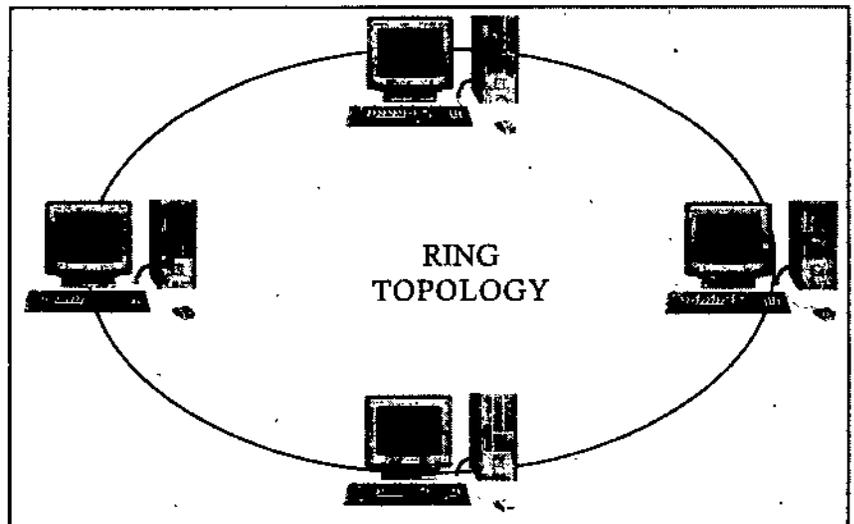
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2. **No wiring closet space required:** Since there is only one cable connecting each node to its immediate neighbours, it is not necessary to allocate space in the building for wiring closets.
3. **Suitable for optical fibers:** Optical fibers offer the possibility of very high speed transmission. Because traffic on a ring travels in one direction, it is easy to use optical fibers as a medium of transmission. Also, since a ring is made up of nodes connected by short segments of transmission medium, there is a possibility of mixing the types used for different parts of the network. Thus, a manufacturing company's network could use copper cables in the office area and optical fibers in the factory areas, where electrical interference may be a problem.

3.4.3.2 Disadvantages of the Ring Network

1. **Node failure causes network failure:** the transmission of data on a ring goes through every connected node on the ring before returning to the sender. If one node fails to pass data through itself, the entire network has failed and no traffic can flow until the defective node has been removed from the ring.
2. **Difficult to diagnose faults:** The fact that failure of one node will affect all other has serious implications for fault diagnosis. It may be necessary to examine a series of adjacent nodes to determine the faulty one. This operation may also require diagnostic facilities to be built into each node.
3. **Network reconfiguration is difficult:** The all or nothing nature of the ring topology can cause problems when one decides to extend or modify the geographical scope of the network. It is not possible to shut down a small section of the ring while keeping the majority of it working normally.
4. **Topology affects the access protocol:** Each node on a ring has a responsibility to pass on data that it receives. This means that the access protocol must take this into account. Before a node can transmit its own data, it must ensure that the medium is available for use.

Dual-ring: The type of network topology in which each of the nodes of the network is connected to two other nodes in the network, with two connections to each of



these nodes, and with the first and last nodes being connected to each other with two connections, forming a double ring – the data flows in opposite directions around the two rings, although, generally, only one of the rings carries data during normal operation, and the two rings are independent unless there is a failure or break in one of the rings, at which time the two rings are joined (by the stations on either side of the fault) to enable the flow of data to continue using a segment of the second ring to bypass the fault in the primary ring.

3.4.4 The Mesh Topology

A network topology featuring a direct path between two nodes. The backbone of this topology looks like this, where most major cities have a direct connection to most major cities.

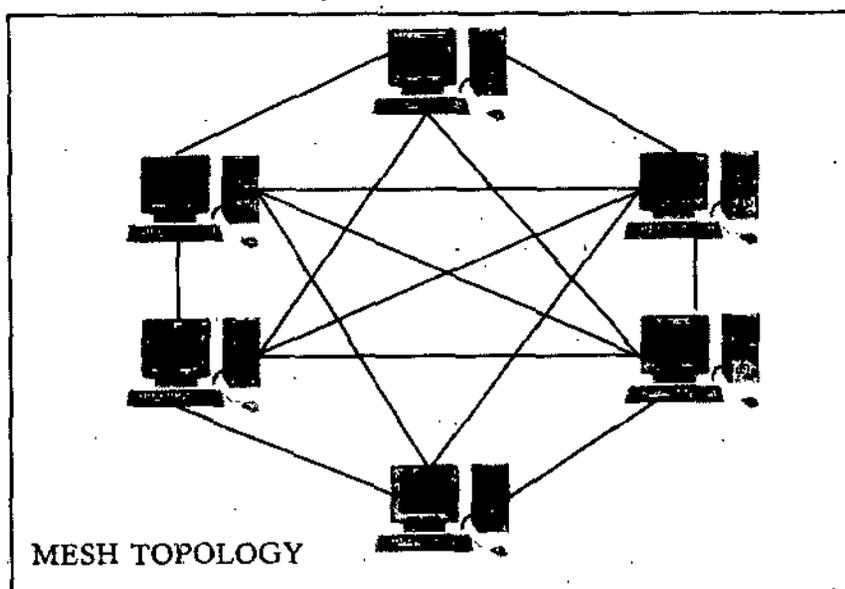
3.4.4.1 Advantages and Disadvantages of the Mesh Network

1. **Units affected by media failure:** Mesh topologies resist media failure better than other topologies.

Implementations that include more than two devices will always have multiple paths to send signals from one device to another. If one path fails, the transmission signals can be routed around the failed link. Theoretically, no units are affected by media failure.

However, if all paths normally use the maximum capacity of each link, some performance degradation will occur as signals are routed around a failed link.

2. **Ease of installation:** Mesh networks are relatively difficult to install because each device must be linked directly to all other devices. As the number of devices increases, the difficulty of installation increases geometrically.
3. **Ease of troubleshooting:** Mesh topologies are easy to troubleshoot because each medium link is independent of all others. You can easily identify faults and can isolate the affected link.
4. **Ease of reconfiguration:** Mesh topologies are difficult to reconfigure for the same reasons that they are difficult to install.



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3.4.5 The Tree Topology

From a purely topological viewpoint, this network resembles a interconnection of star networks. Individual peripheral nodes must transmit to and receive from one other node only, toward a central node. An advantage of a tree structure is that functional groupings can be created.

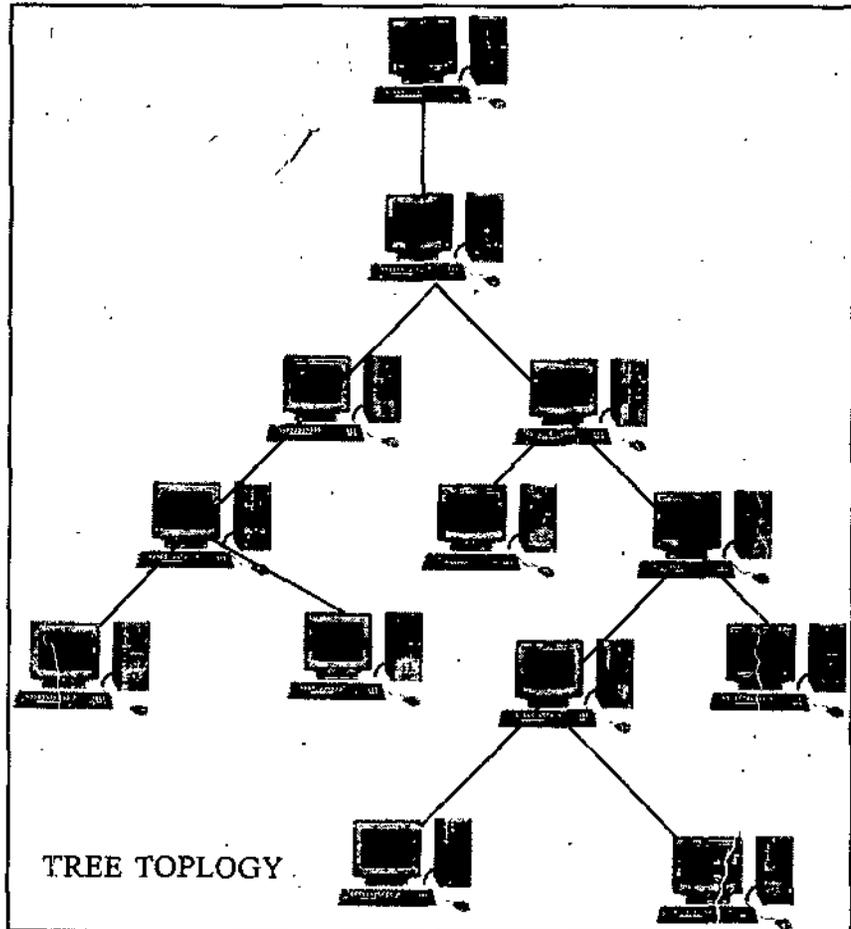
For example, one branch could contain all the general ledger terminals, another branch all the accounts receivable terminals, and so on. If one branch stops functioning, the other branches in a tree network are not affected. However, data movement through this network can be slow.

3.4.5.1 Advantages of the Tree Network

1. **Easy to extend:** Because the tree is of its very nature, divided into subunits, it is easier to add new nodes or branches to it.
2. **Fault isolation:** It is possible to disconnect whole branches of the network from the main structure. This makes it easier to isolate a defective node.

3.4.5.2 Disadvantages of the Tree Network

1. **Dependant on the root:** If the "headend" device fails to operate, the entire network is rendered inoperable. In this respect, the tree suffers from the same reliability problems as the star.



3.4.6 The Hybrid Topology

A combination of two or more network topologies. The resultant is a hybrid network. Although the backbone is mostly a mesh network, each local loop is a star network with the central office at each hub.

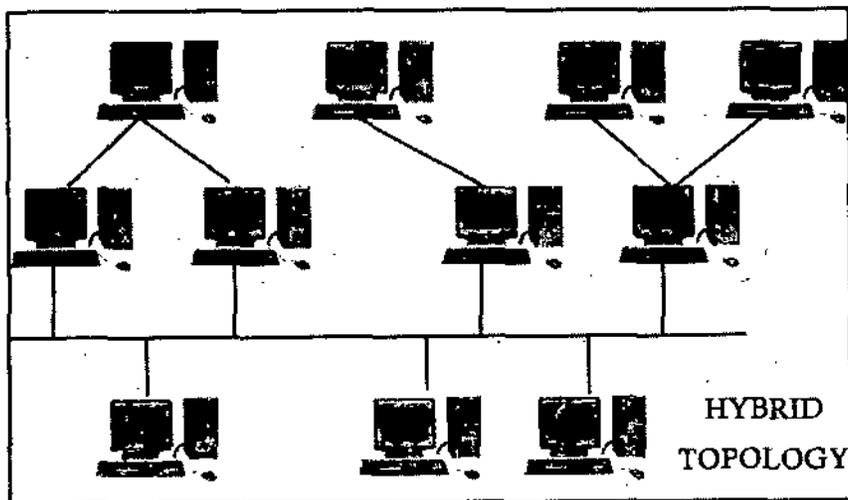
3.4.6.1 Advantages of the Hybrid Network

1. **Fault diagnoses and isolation:** The presence of concentration points in the network greatly eases fault diagnosis. If a fault is detected on the network, the initial problems to find out which concentration point in the ring is to blame. The fact that this ring is quite small in relation to the total size of the network makes this problem more manageable. The offending concentration point can be isolated easily, leaving the network in a fully functional state while further fault diagnosis is carried out.
2. **Ease of expansion:** The modular construction of a star-ring network means that new sections may be easily added. When designing the network originally, each concentration can have extra, unused lobes which can be called upon later, if needed. The next growth step involved adding a new concentration point and wiring it into the ring.
3. **Cabling:** The concentration points in a star-ring are connected via a single cable. This simplifies wiring between areas in an installation and cuts down on the congestion of cable ducts. Also, the wiring practices involved are very similar to that of telephone system installation. These techniques are well understood by building engineers and lend themselves well to the prewiring of buildings.

3.4.6.2 Disadvantages of the Hybrid Network

1. **Intelligent concentration points required:** Depending on the implementation used, the concentration points may need to have built-in intelligence/processing ability. This will be necessary if it is to assist in network fault diagnosis, node isolation or conversion from one form of transmission medium to another.
2. **Cabling:** The intercloset cabling in a star ring is critical to its operation. This may mean that redundant cabling in the form of one or more back up

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rings may be necessary to meet reliability requirements. The largest section of the network (i.e. between the concentration points and the nodes) is laid out in a star. This means that a considerable amount of cable may be required.

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3.5 BASIC CONCEPTS IN COMPUTER NETWORKS

Networking provides a lot of services. In fact, Internet is part of the services which are offered by networking. It would not have been possible to have Internet without networking. This is why Internet is called Network of Networks. Here are few of the services provided by networking.

3.5.1 Full-Duplex vs. Half-Duplex Communications

All network communications (including LAN and WAN communications) can be categorized as half-duplex or full-duplex. With half-duplex, communications happen in both directions, but in only one direction at a time. When two computers communicate using half-duplex, one computer sends a signal and the other receives; then they switch sending and receiving roles. Chances are that you are familiar with half-duplex communications. If you ever use a CB radio, you are communicating via half-duplex: One person talks, and then the other person listens.

When two computers communicate using half-duplex, one computer sends a signal and the other receives.

Full-duplex, on the other hand, allows communication in both directions simultaneously. Both stations can send and receive signals at the same time. Full-duplex communications are similar to a telephone call, in which both people can talk simultaneously.

3.5.2 Host, Workstation, and Server

You need a good understanding of the three primary components of a network: workstations, servers, and hosts. Each one of these items can be found on most networks.

3.5.2.1 Understanding Workstations

In the classic sense, a *workstation* is a powerful computer used for drafting or other math-intensive applications. The term is also applied to a computer that has multiple central processing units (CPUs) available to users. In the network environment, the term workstation normally refers to any computer connected to the network that is used by an individual to do work. *Workstation* can also refer to software, as in Windows NT Workstation.

It is important to distinguish between workstations and clients. A client is any network entity that can request resources from the network. A workstation is a computer that can request resources.

Workstations can be clients, but not all clients are workstations. For example, a printer can request resources from the network, but it is a client, not a workstation.

3.5.2.2 Understanding Servers

In the truest sense, a *server* does exactly what the name implies: It provides resources to the clients on the network ("serves" them, in other words). Servers are typically *powerful computers that run the software that controls and maintains the network*. This software is known as the *network operating system*. Servers are often specialized for a single purpose. This is not to say that a single server can't do many jobs, but, more often than not, you'll get better performance if you dedicate a server to a single task. Here are some examples of servers that are dedicated to a single task:

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File Server Holds and distributes files.

Print Server Controls and manages one or more printers for the network.

Proxy Server Performs a function on behalf of other computers (proxy means "on behalf of").

Application Server Hosts a network application.

Web Server Holds and delivers web pages and other web content using the Hypertext Transfer Protocol (HTTP).

Mail Server Hosts and delivers e-mail. It's the electronic equivalent of a post office.

Fax Server Sends and receives faxes (via a special fax board) for the entire network without the need for paper.

Remote Access Server Hosts modems for inbound requests to connect to the network. Remote access servers provide remote users (working at home or on the road) with a connection to the network.

Telephony Server Functions as a "smart" answering machine for the network. It can also perform call center and call-routing functions.

Notice that each server type's name consists of the type of service the server provides (remote access, for example) followed by the word "server," which, as you remember, means to serve.

Regardless of the specific role (or roles) these servers play, they should all have the following in common:

- Hardware and/or software for data integrity (such as backup hardware and software)
- The capability to support a large number of clients

Physical resources, such as hard-drive space and memory, must be greater in a server than in a workstation because the server needs to provide services to many clients. Also, a server should be located in a physically secure area.

3.5.2.3 Understanding Hosts

The term *host* is most commonly used when discussing TCP/IP related services and functions. A *host*, in TCP/IP terms, is any network device that has a TCP/IP network address. Workstations, servers, and any other network device (as long as it has TCP/IP addresses) can all be considered hosts. In conversation, you may also hear the word "*host*" used to describe any minicomputer or server.

3.5.3 Peer-to-Peer vs. Client/Server Architecture

The purpose of networking is to share resources. How this is accomplished depends on the architecture of the network operating system software. The two most common network types are peer-to-peer and client/server.

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If you were to look at an illustration of a group of computers in a LAN, it would be impossible to determine if the network was a peer-to-peer or a client/server environment. Even a videotape of this same LAN during a typical workday would reveal few clues as to whether it is peer-to-peer or client/server. Yet, the differences are huge. Since you can't see the differences, you might guess correctly that they are not physical but logical.

3.5.3.1 Peer-to-Peer Network

In *peer-to-peer networks*, the connected computers have no centralized authority. From an authority viewpoint, all of these computers are equal. In other words, they are peers. If a user of one computer wants access to a resource on another computer, the security check for access rights is the responsibility of the computer holding the resource.

Each computer in a peer-to-peer network can be both a client that requests resources and a server that provides resources. This is a great arrangement, provided the following conditions are met:

- Each user is responsible for local backup.
- Security considerations are minimal.
- A limited number of computers are involved.

Networks that run Windows 95/98 as their network operating system or networks using Windows NT in a workgroup are considered peer-to-peer networks. Peer-to-peer networks present some challenges. For example, backing up company data becomes an iffy proposition. Also, it can be difficult to remember where you stored a file. Finally, because security is not centralized, users and passwords must be maintained separately on each machine. Passwords may be different for the same users on different machines.

3.5.3.2 Client/Server Network

In contrast to a peer-to-peer network, a *client/server network* uses a network operating system designed to manage the entire network from a centralized point, which is the server. Clients make requests of the server, and the server responds with the information or access to a resource. Client/server networks have some definite advantages over peer-to-peer networks. For one thing, the network is much more organized. It is easier to find files and resources because they are stored on the server. Also, client/server networks generally have much tighter security.

All usernames and passwords are stored in the same database (on the server), and individual users can't use the server as a workstation.

Finally, client/server networks have better performance and can scale almost infinitely. It is not uncommon to see client/server networks with tens of thousands of workstations. Note that the server now holds the database of user accounts, passwords, and access rights.

3.5.4 Network Attached Storage

The most common type of server found on networks is the file server. File servers are typically the most accessed servers as well, storing files for all the users on the network. Traditionally, these servers are just computers, running a special network operating system that allows files and programs to be shared. Additionally, these servers cost several thousand dollars.

In the last few years, however, it has become very attractive to network administrators to replace these file servers with a new breed of device known as *network attached storage*. Network attached storage, such as the Quantum SNAP! Server, is basically a small network device, or "black box," with a network card and a large hard disk.

Network attached storage device usually runs a special proprietary operating system that allows the box to function as a file server.

The major reason these devices are so attractive to network administrators is that they are very inexpensive compared to traditional file servers. For example, a typical Pentium II Server with 256MB of RAM might cost a few thousand dollars. On the other hand, a 20GB network attached storage device might cost only a few hundred dollars.

Another advantage to these devices is that they are very easy to administrate. Usually, security and access are set up by connecting to the device with a web browser and making changes using a web interface.

The final advantage to these devices is their ease and speed of setup. It would take most network technicians about three hours to add another server to a network. Quantum, however, expresses setup times for its network attached storage devices in minutes and seconds. Basically, all an administrator has to do is plug in the power, plug in the network cable, turn the device on, and set up security and access, and the device will be ready to use.

3.6 INTRODUCTION TO GPRS

General Packet Radio Service (GPRS) is a Mobile Data Service available to users of Global System for Mobile Communications (GSM) and IS-136 mobile phones. GPRS data transfer is typically charged per megabyte of transferred data, while data communication via traditional circuit switching is billed per minute of connection time, independent of whether the user has actually transferred data or has been in an idle state. GPRS can be used for services such as Wireless Application Protocol (WAP) access, Short Message Service (SMS), Multimedia Messaging Service (MMS), and for Internet communication services such as email and World Wide Web access.

2G cellular systems combined with GPRS is often described as "2.5G", that is, a technology between the second (2G) and third (3G) generations of mobile telephony. It provides moderate speed data transfer, by using unused Time division multiple access (TDMA) channels in for example the GSM system. Originally there was some thought to extend GPRS to cover other standards, but instead those networks are being converted to use the GSM standard, so that GSM is the only kind of

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network where GPRS is in use. GPRS is integrated into GSM Release 97 and newer releases. It was originally standardized by European Telecommunications Standards Institute (ETSI), but now by the 3rd Generation Partnership Project (3GPP).

3.6.1 Basics of GPRS

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GPRS is packet-switched, which means that multiple users share the same transmission channel, only transmitting when they have data to send. Thus the total available bandwidth can be immediately dedicated to those users who are actually sending at any given moment, providing higher use where users only send or receive data intermittently. Web browsing, receiving e-mails as they arrive and instant messaging are examples of uses that require intermittent data transfers, which benefit from sharing the available bandwidth. By contrast, in the older Circuit Switched Data (CSD) standard included in GSM standards, a connection establishes a circuit, and reserves the full bandwidth of that circuit during the lifetime of the connection.

Usually, GPRS data are billed per kilobyte of information transceived, while circuit-switched data connections are billed per second. The latter is because even when no data are being transferred, the bandwidth is unavailable to other potential users.

The multiple access methods used in GSM with GPRS are based on frequency division duplex (FDD) and FDMA. During a session, a user is assigned to one pair of up-link and down-link frequency channels. This is combined with time domain statistical multiplexing, i.e. packet mode communication, which makes it possible for several users to share the same frequency channel. The packets have constant length, corresponding to a GSM time slot. The down-link uses first-come first-served packet scheduling, while the up-link uses a scheme very similar to reservation ALOHA. This means that slotted Aloha (S-ALOHA) is used for reservation inquiries during a contention phase, and then the actual data is transferred using dynamic TDMA with first-come first-served scheduling.

GPRS originally supported Internet Protocol (IP), Point-to-Point Protocol (PPP) and X.25 connections. The last has been typically used for applications like wireless payment terminals, although it has been removed as from the standard. X.25 can still be supported over PPP, or even over IP, but doing this requires either a router to do encapsulation or intelligence built into the end terminal. In practice, mainly IPv4 is used. PPP is often not supported by the mobile phone operator, while IPv6 is not yet popular.

3.7 INTRODUCTION TO CDMA

Code division multiple access (CDMA) is a form of multiplexing and a method of multiple access that divides up a radio channel not by time (as in time division multiple access), nor by frequency (as in frequency-division multiple access), but instead by using different pseudo-random code sequences for each user. CDMA is a form of "spread-spectrum" signaling, since the modulated coded signal has a much higher bandwidth than the data being communicated.

As a crude analogy to the CDMA scheme, imagine a large room (channel) containing many people wishing to communicate amongst each other. Possible mechanisms for avoiding confusion include having only one person speak at a time (time division),

having people speak at different pitches (frequency division), or in different directions (spatial division). The CDMA approach is, by contrast, to have them speak different languages to each other. Groups of people speaking the same language can understand each other, but not any of the other groups. Similarly in CDMA, each group of users is given a shared code. There are many codes occupying the same channel, but only the users associated with a particular code can understand each other.

CDMA also refers to digital cellular telephony systems that make use of this multiple access scheme, such as those pioneered by QUALCOMM, and W-CDMA by the International Telecommunication Union or ITU.

CDMA has been used in many communications and navigation systems, including the Global Positioning System and in the OmniTRACS satellite system for transportation logistics.

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3.7.1 Usage in Mobile Telephony

A number of different terms are used to refer to CDMA implementations. The original U.S. standard defined by QUALCOMM was known as IS-95, the IS referring to an Interim Standard of the Telecommunications Industry Association (TIA). IS-95 is often referred to as 2G or second generation cellular. The QUALCOMM brand name cdmaOne may also be used to refer to the 2G CDMA standard. CDMA has been submitted for approval as a mobile air interface standard to the ITU International Telecommunication Union.

Whereas the Global System for Mobile Communications (GSM) standard is a specification of an entire network infrastructure, the CDMA interface relates only to the air interface—the radio part of the technology. For example, GSM specifies an infrastructure based on internationally approved standard while CDMA allows each operator to provide the network features as it finds suited. On the air interface, the signalling suite (GSM: ISDN SS7) work has been progressing to harmonise these.

After a couple of revisions, IS-95 was superseded by the IS-2000 standard. This standard was introduced to meet some of the criteria laid out in the IMT-2000 specification for 3G, or third generation, cellular. It is also referred to as 1xRTT which simply means "1 times Radio Transmission Technology" and indicates that IS-2000 uses the same 1.25 MHz carrier shared channel as the original IS-95 standard. A related scheme called 3xRTT uses three 1.25 MHz carriers for a 3.75 MHz bandwidth that would allow higher data burst rates for an individual user, but the 3xRTT scheme has not been commercially deployed. More recently, QUALCOMM has led the creation of a new CDMA-based technology called 1xEV-DO, or IS-856, which provides the higher packet data transmission rates required by IMT-2000 and desired by wireless network operators.

Another important application of CDMA — predating and entirely distinct from CDMA cellular — is the Global Positioning System or GPS.

The QUALCOMM CDMA system includes highly accurate time signals (usually referenced to a GPS receiver in the cell base station), so cell phone CDMA-based clocks are an increasingly popular type of radio clock for use in computer networks. The main advantage of using CDMA cell phone signals for reference clock purposes

is that they work better inside buildings, thus often eliminating the need to mount a GPS antenna on the outside of a building.

3.8 INTRODUCTION TO GSM

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The Global System for Mobile communications is the most popular standard for mobile phones in the world. GSM service is used by over 2 billion people across more than 212 countries and territories. Its ubiquity makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM differs significantly from its predecessors in that both signaling and speech channels are digital call quality, and so is considered a second generation (2G) mobile phone system. This has also meant that data communication was built into the system from the 3rd Generation Partnership Project (3GPP).

The key advantage of GSM systems to consumers has been higher digital voice quality and low cost alternatives to making calls, such as the Short message service (SMS, also called "text messaging"). The advantage for network operators has been the ease of deploying equipment from any vendors that implements the standard. Like other cellular standards, GSM allows network operators to offer roaming services so that subscribers can use their phones on GSM networks all over the world.

Newer versions of the standard were backward-compatible with the original GSM phones. For example, Release '97 of the standard added packet data capabilities, by means of General Packet Radio Service (GPRS). Release '99 introduced higher speed data transmission using Enhanced Data Rates for GSM Evolution (EDGE).

3.8.1 Radio Interface

GSM is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity. GSM networks operate in four different frequency ranges. Most GSM networks operate in the 900 MHz or 1800 MHz bands. Some countries in the Americas (including Canada and the United States) use the 850 MHz and 1900 MHz bands because the 900 and 1800 MHz frequency bands were already allocated.

In the 900 MHz band the uplink frequency band is 890-915 MHz, and the downlink frequency band is 935-960 MHz. This 25 MHz bandwidth is subdivided into 124 carrier frequency channels, each spaced 200 kHz apart. Time division multiplexing is used to allow eight full-rate or sixteen half-rate speech channels per radio frequency channel. There are eight radio timeslots (giving eight burst periods) grouped into what is called a TDMA frame. Half rate channels use alternate frames in the same timeslot. The channel data rate is 270.833 kbit/s, and the frame duration is 4.615 ms.

The transmission power in the handset is limited to a maximum of 2 watts in GSM850/900 and 1 watt in GSM1800/1900.

GSM has used a variety of voice codecs to squeeze 3.1 kHz audio into between 6 and 13 kbit/s. Originally, two codecs, named after the types of data channel they were allocated, were used, called "Full Rate" (13 kbit/s) and "Half Rate" (6 kbit/s). These used a system based upon linear predictive coding (LPC). In addition to

being efficient with bitrates, these codecs also made it easier to identify more important parts of the audio, allowing the air interface layer to prioritize and better protect these parts of the signal.

GSM was further enhanced in 1997 with the GSM-EFR codec, a 12.2 kbit/s codec that uses a full rate channel. Finally, with the development of UMTS, EFR was refactored into a variable-rate codec called AMR-Narrowband, which is high quality and robust against interference when used on full rate channels, and less robust but still relatively high quality when used in good radio conditions on half-rate channels.

There are four different cell sizes in a GSM network - macro, micro, pico and umbrella cells.

The coverage area of each cell varies according to the implementation environment. Macro cells can be regarded as cells where the base station antenna is installed on a mast or a building above average roof top level. Micro cells are cells whose antenna height is under average roof top level; they are typically used in urban areas. Picocells are small cells whose coverage diameter is a few dozen meters; they are mainly used indoors. Umbrella cells are used to cover shadowed regions of smaller cells and fill in gaps in coverage between those cells.

Cell horizontal radius varies depending on antenna height, antenna gain and propagation conditions from a couple of hundred meters to several tens of kilometers. The longest distance the GSM specification supports in practical use is 35 km or 22 miles. There are also several implementations of the concept of an extended cell, where the cell radius could be double or even more, depending on the antenna system, the type of terrain and the timing advance.

Indoor coverage is also supported by GSM and may be achieved by using an indoor picocell base station, or an indoor repeater with distributed indoor antennas fed through power splitters, to deliver the radio signals from an antenna outdoors to the separate indoor distributed antenna system. These are typically deployed when a lot of call capacity is needed indoors, for example in shopping centers or airports. However, this is not a prerequisite, since indoor coverage is also provided by in-building penetration of the radio signals from nearby cells.

A nearby GSM handset is usually the source of the "dit dit dit, dit dit dit, dit dit dit" signal that can be heard from time to time on home stereo systems, televisions, computers, and personal music devices. When these audio devices are in the near field of the GSM handset, the radio signal is strong enough that the solid state amplifiers in the audio chain function as a detector. The clicking noise itself represents the power bursts that carry the TDMA signal. These signals have been known to interfere with other electronic devices, such as car stereos and portable audio players. This is a form of RFI, and could be mitigated or eliminated by use of additional shielding and/or bypass capacitors in these audio devices, however, the increased cost of doing so is difficult for a designer to justify.

3.9 INTRODUCTION TO FM TECHNOLOGIES

Frequency modulation (FM) is a form of modulation that represents information as variations in the instantaneous frequency of a carrier wave. (Contrast this with amplitude modulation, in which the amplitude of the carrier is varied while its

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frequency remains constant.) In analog applications, the carrier frequency is varied in direct proportion to changes in the amplitude of an input signal. Digital data can be represented by shifting the carrier frequency among a set of discrete values, a technique known as frequency-shift keying.

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FM is commonly used at VHF radio frequencies for high-fidelity broadcasts of music and speech. Normal (analog) TV sound is also broadcast using FM. A narrowband form is used for voice communications in commercial and amateur radio settings. The type of FM used in broadcast is generally called wide-FM, or W-FM. In two-way radio, narrowband narrow-fm (N-FM) is used to conserve bandwidth. In addition, it is used to send signals into space.

FM is also used at intermediate frequencies by most analog VCR systems, including VHS, to record the luminance (black and white) portion of the video signal. FM is the only feasible method of recording video to and retrieving video from magnetic tape without extreme distortion, as video signals have a very large range of frequency components — from a few hertz to several megahertz, too wide for equalisers to work with due to electronic noise below -60 dB. FM also keeps the tape at saturation level, and therefore acts as a form of noise reduction, and a simple limiter can mask variations in the playback output, and the FM capture effect removes print-through and pre-echo. A continuous pilot-tone, if added to the signal — as was done on V2000 and many Hi-band formats — can keep mechanical jitter under control and assist timebase correction.

FM is also used at audio frequencies to synthesize sound. This technique, known as FM synthesis, was popularized by early digital synthesizers and became a standard feature for several generations of personal computer sound cards.

3.9.1 Applications in Radio

An example of frequency modulation. The top diagram shows the modulating signal superimposed on the carrier wave. The bottom diagram shows the resulting frequency-modulated signal. Edwin Armstrong presented his paper: "A Method of Reducing Disturbances in Radio Signaling by a System of Frequency Modulation", which first described FM radio, before the New York section of the Institute of Radio Engineers on November 6, 1935. The paper was published in 1936.

Wideband FM (W-FM) requires a wider bandwidth than amplitude modulation by an equivalent modulating signal, but this also makes the signal more robust against noise and interference. Frequency modulation is also more robust against simple signal amplitude fading phenomena. As a result, FM was chosen as the modulation standard for high frequency, high fidelity radio transmission: hence the term "FM radio" (although for many years the BBC insisted on calling it "VHF radio", because commercial FM broadcasting uses a well-known part of the VHF band; in certain countries, expressions referencing the more familiar wavelength notion are still used in place of the more abstract modulation technique name).

FM receivers employ a special detector for FM signals and exhibit a phenomenon called capture, where the tuner is able to clearly receive the stronger of two stations being broadcast on the same frequency. Problematically however, frequency drift or lack of selectivity may cause one station or signal to be suddenly overtaken by another on an adjacent channel. Frequency drift typically constituted a problem on very old or inexpensive receivers, while inadequate selectivity may plague any tuner.

An FM signal can also be used to carry a stereo signal: see FM stereo. However, this is done by using multiplexing and demultiplexing before and after the FM process, and is not part of FM proper. The rest of this article ignores the stereo multiplexing and demultiplexing process used in "stereo FM", and concentrates on the FM modulation and demodulation process, which is identical in stereo and mono processes.

NOTES

SUMMARY

1. When more than two computers are connected to each other and sharing information, resources and remote systems then this is called Networking.
2. PAN is used for communication among the personal devices (intrapersonal communication), or for connecting to a higher level network and Internet. The reach of a PAN is typically a few meters.
3. A network covering a small geographic area, like a home, office, or building is called Local Area Network.
4. WAN technologies generally function at the lower three layers of the OSI reference model: the physical layer, the data link layer, and the network layer.
5. If connected to the Internet, the intranet or extranet is normally protected from being accessed from the Internet without proper authorization.
6. All networks are made up of basic hardware building blocks to interconnect network nodes, such as Network Interface Cards (NICs), Bridges, Hubs, Switches, and Routers.
7. A **network card**, **network adapter** or **NIC** (network interface card) is a piece of computer hardware designed to allow computers to communicate over a **computer network**.
8. A **network bridge** connects multiple network segments at the data link layer (layer 2) of the OSI model.
9. A **hub** is a piece of hardware which provides the connectivity of a segment of a network by directing traffic through the network.
10. Switches are the device of networking that directs traffic to the correct node by filtering and forwarding packets between Nodes.
11. Routers are the networking device that forwards data packets along networks by using headers and forwarding tables to determine the best path to forward the packets.
12. Closely related to the concept of a model is that of an *architecture*.
13. A **MAN** (metropolitan area network) is a larger network that usually spans several buildings in the same city or town.
14. A **WAN** (wide area network), in comparison to a MAN, is not restricted to a geographical location, although it might be confined within the bounds of a state or country.
15. The length of the cable connecting a computer to a LAN also varies depending on the LAN.
16. One of the major benefits of implementation of LAN is sharing expensive resources such as storage devices, printers, etc.
17. Three major categories of services used in LANs are: File Server; Printer Server and Modem Server.
18. Some popular LAN operating systems are : Novel Netware; Ethernet; Corvus; ArcNet LAN; Server Omni Net; PC Net; IBM PC LAN and Etherlink Plus, etc.
19. Features of LAN are: Typically connects computer in a single building or campus; Developed in 1970s; Medium : optical fibres, coaxial cables, twisted pair, wireless; Low latency (except in high traffic periods); High speed networks (0.2 to 100 Mb/sec); Speeds adequate for most distributed systems; Problems : Multi media based applications; Typically buses or rings and Ethernet, Token Ring.
20. Routers is a special type of device that can be used to connect networks that may not be similar.
21. Feature of Wide Area Networks are: Developed in 1960s; Generally covers large

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- distances (states, countries, continents); Medium : communication circuits connected by routers; Routers forwards packets from one to another following a route from the sender to the receiver. Store-and-Forward; Hosts are typically connected (or close to the routers; Typical latencies : 100ms - 500ms; Problems with delays if using satellites
Typical speed : 20 - 2000 Kbits/s; Not (yet) suitable for distributed computing; and New standards are changing the landscape.
22. Features of MAN are: Generally covers towns and cities (50 kms); Developed in 1980s; Medium : optical fibres, cables; Data rates adequate for distributed computing applications; A typical standard is DQDB (Distributed Queue Dual Bus); Typical latencies : < 1 msec and Message routing is fast.
 23. All network communications (including LAN and WAN communications) can be categorized as half-duplex or full-duplex.
 24. The term *host* is most commonly used when discussing TCP/IP related services and functions.
 25. The purpose of networking is to share resources.
 26. In *peer-to-peer networks*, the connected computers have no centralized authority.
 27. **Network topology** is the study of the *arrangement* or *mapping* of the elements (links, nodes, etc.) of a network, especially the physical (real) and logical (virtual) interconnections between nodes.
 28. In Bus topology all the server/nodes share a common bus of connecting cables.
 29. In Star topology all the computers and the main server form a star like shape.
 30. In Ring topology all the server/nodes are joined together to form a ring.
 31. In Tree topology all the server/nodes are joined together to form a tree.

TEST YOURSELF

1. What is a computer network?
2. Define the various types of networks.
3. Which are the various hardware components required for networking?
4. Describe the various models of network computing.
5. What is Local Area Networks?
6. Describe Wide Area Networks.
7. Describe the various network services.
8. What is Peer-to-peer network?
9. What is Client/Server network?
10. Write a short note on the following:

Bus Topology	Star Topology
Ring Topology	Mesh Topology
Tree Topology	Hybrid Topology

Multiple Choice Questions

1. LAN is :

(a) Local Area Network	(b) Local Around Network
(c) Love Area Network	
2. WAN is :

(a) Windows Area Network	(b) Wide Area Network
(c) Well Area Network	
3. MAN is :

(a) My Area Network	(b) Metro Area Network
(c) Metropolitan Area Network	
4. CAN is :

(a) Campus Area Network	(b) Clear Area Network
(c) Clear Area Network	
5. PAN is :

(a) Power Area Network	(b) Personal Area Network
(c) Pop Area Network	

True/False Questions

1. A network covering a small geographic area, like a home, office, or building is called Local Area Network.
2. If connected to the Internet, the intranet or extranet is not protected from being accessed from the Internet without proper authorization
3. A network bridge connects multiple network segments at the data link layer (layer 2) of the OSI model.
4. Routers are the networking device that forwards data packets along networks by using headers and forwarding tables to determine the best path to forward the packets.
5. Closely related to the concept of a model is that of an architecture.
6. The length of the cable connecting a computer to a LAN also varies depending on the LAN.
7. Three major categories of services used in LANs are: File Server; Printer Server and Modem Server.
8. Routers is a special type of device that can be used to connect networks that have to be similar.
9. The term host is most commonly used when discussing TCP/IP related services and functions.
10. The purpose of networking is to share resources.
11. In peer-to-peer networks, the connected computers have no centralized authority.
12. In Bus topology all the server/nodes share a common bus of connecting cables.
13. In Ring topology all the server/nodes are joined together to form a ring.

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Short Questions with Answers

1. Which are the popular networks?

Ans. Personal Area Network (PAN)

Local Area Network (LAN)

Campus Area Network (CAN)

Metropolitan Area Network (MAN)

Wide Area Network (WAN)

Internetwork

Internet

Extranet

2. Which are the famous topologies?

Ans. The Bus Topology

The Star Topology

The Ring Topology

The Mesh Topology

The Tree Topology

The Hybrid Topology

3. What are the hardware components of LAN?

Ans. The following are the major hardware components/devices for establishing LAN:
Transmission Channel; Network Interface Unit or NIU; Servers and Workstations.

4. What are the various features of LAN?

- Ans.**
- Typically connects computer in a single building or campus.
 - Developed in 1970s.
 - Medium : optical fibres, coaxial cables, twisted pair, wireless.
 - Low latency (except in high traffic periods).
 - High speed networks (0.2 to 100 Mb/sec).
 - Speeds adequate for most distributed systems
 - Problems : Multi media based applications
 - Typically buses or rings.

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- Ethernet, Token Ring
- 5. What are the features of WAN?

Ans. Features are: Developed in 1960s; Generally covers large distances (states, countries, continents); Medium : communication circuits connected by routers; Routers forwards packets from one to another following a route from the sender t the receiver. Store-and-Forward; Hosts are typically connected (or close to) the routers; Typical latencies : 100ms - 500ms; Problems with delays if using satellites; Typical speed : 20 - 2000 Kbits/s; Not (yet) suitable for distributed computing and New standards are changing the landscape.
- 6. What are the feature of MAN?

Ans.

 - Generally covers towns and cities (50 kms)
 - Developed in 1980s.
 - Medium : optical fibres, cables.
 - Data rates adequate for distributed computing applications.
 - A typical standard is DQDB (Distributed Queue Dual Bus).
 - Typical latencies : < 1 msec.
 - Message routing is fast.
- 7. What are the advantages of Bus topology?

Ans.

 1. Short cable length and simple wiring layout
 2. Resilient architecture
 3. East to extend
- 8. What are the advantages of Star topology?

Ans.

 1. Ease of service
 2. One device per connection
 3. Centralized control/ problem diagnosis
 4. Simple access protocols
- 9. What are the advantages of Ring topology?

Ans.

 1. Short cable length
 2. No wiring closet space required
 3. Suitable for optical fibers
- 10. What are the advantages of Mesh topology?

Ans.

 1. Units affected by media failure
 2. Ease of installation
 3. Ease of troubleshooting
 4. Ease of reconfiguration
- 11. What are the advantages of Tree topology?

Ans.

 1. Easy to extend
 2. Fault isolation
- 12. What are the advantage of Hybrid topology?

Ans.

 1. Fault diagnoses and isolation
 2. Ease of expansion
 3. Cabling

ANSWERS

Multiple Choice Questions

- | | | | |
|------|------|------|------|
| 1. a | 2. b | 3. c | 4. a |
| 5. b | | | |

True False Questions

- | | | | |
|-------|-------|-------|-------|
| 1. T | 2. F | 3. T | 4. T |
| 5. T | 6. T | 7. T | 8. F |
| 9. T | 10. T | 11. T | 12. T |
| 13. T | | | |

INRODUCTION TO INTERNET TECHNOLOGIES

LEARNING OBJECTIVES

After going through this chapter, you should appreciate the following:

- Introduction to HTML
- DHTML
- WWW
- FTP
- TELNET
- Web Browsing, Surfing Using Search Engines
- e-mail
- ISP
- e-commerce
- Public and Private Key
- *Safety of business transaction on web*

4.1 INTRODUCTION TO HTML

NOTES

HTML is the language of Internet. By using this language you can create a Web site. It has all the features of a basic word processing program and is capable of handling graphics too. If you remember that in earlier class it was taught that there are languages which need to be compiled or assembled. In this case nothing of that sort has to be done. Just type, save and run.

In most cases you would be using the plain ASCII text file. Then using the HTML language tags you would be able to generate the required shapes or text. But, please remember that since these languages would have their ultimate test in a browser, make sure that the browser accepts that particular tag. Some tags are not accepted by Internet Explorer and some of them are not accepted by Netscape Navigator. So make sure before hand.

4.1.1 HTML Command Tags

For all practical purposes, HTML tags are written within the less than (<) and greater than (>) signs, also known as angle brackets. These signify the opening and closing of the commands. The command for opening and closing are the same but, for one exception, the closing one has a / attached to it.

For example, the bold command is like this.

```
<B>Bold Text</B>
```

It is possible to have tags within tags. Take a look at the following example, which shows how a tag can be added within a tag. Don't bother to find out what it means at this stage. But in case remember to close the tag after opening it, else, you will get an error.

```
<H1>Kapil<EM>Dev</EM></H1>
```

4.1.2 Quotation Marks

Mostly all values should be enclosed in straight quotation marks " " (NOT curly ones " ", note the difference). However, you can omit the quote marks if the value only contains letters (A-Z, a-z), digits (0-9), a hyphen (-), or period (.).

4.1.3 Spacing

There is no restriction on the number of spaces given by you. HTML always finds out the extra spaces and ignores them. To add to that there is the concept of entering p tag while beginning of each para. Each new para would begin on a new line. It goes without saying that the tag <p> would always have to be followed up with a </p>. For controlling the spaces in the a browser, each browser has its concept, which you will learn later.

4.1.4 Special Symbols

Besides the usual ASCII set of characters, HTML supports other characters too. The standard ASCII set characters can be used as it is and will be displayed as it is in the browser. There are four symbols that have special meanings in HTML documents. These are the greater than (>), less than (<), straight double quotation marks ("), and the ampersand (&). If you simply type them in your HTML document,

the browser may attempt to interpret them. To show the symbols themselves, use a name or number code. *Introduction to Internet Technologies*

Look at the following example, where
 has resulted in giving a line break.

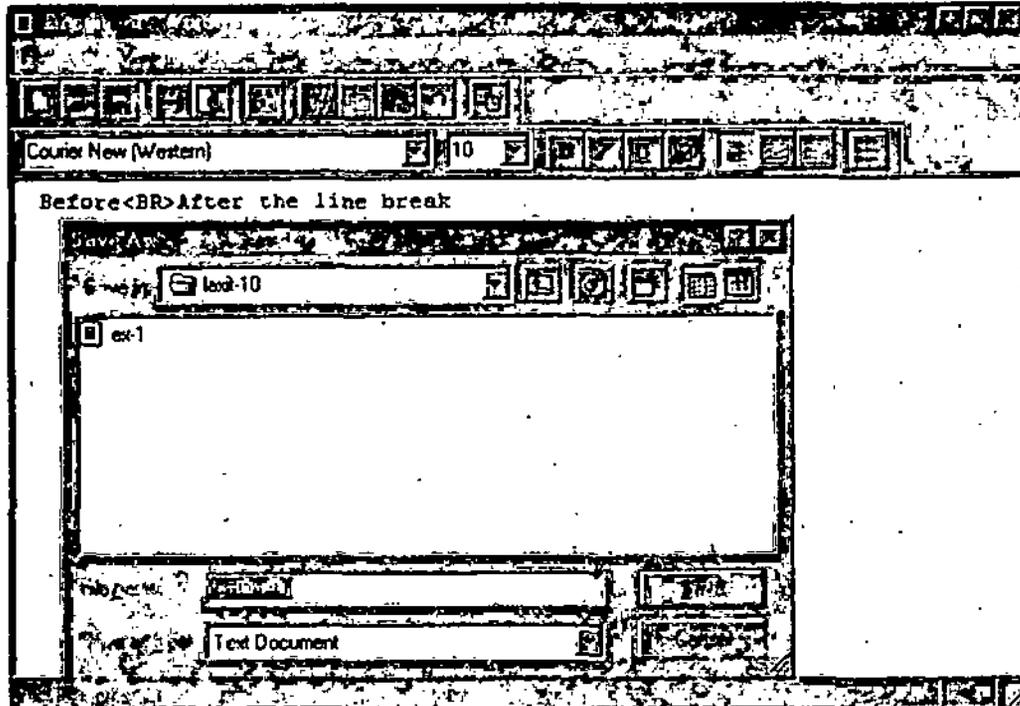
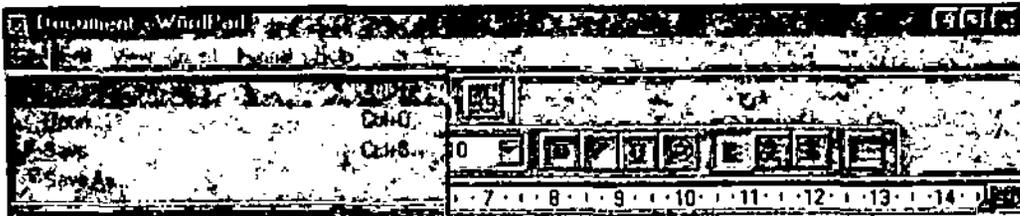
For line break we use

Let us now get into creating web pages using HTML.

4.1.5 New Web Page Creation

As said earlier, you can type in your text in any word processor, like WordPad and create the page. Following steps can be used for creating a new line.

1. Open a text editor or word processor, in this case the Word Pad.
2. Choose New from File menu to create a new, blank document.
3. Type the following text to create the HTML content as shown here:
Before
After the line break
4. Choose File>Save As.
5. In the dialog box that appears, choose Text Document for the type.
6. Give the name as Text-1 and give the document the .htm or .html extension.
7. Choose the folder in which to save the Web page.
8. Click Save.



NOTES

Remember

You must save the file in the Text Document format. Without this your file will have problem.

Now we will run this text file in a browser and see the result.

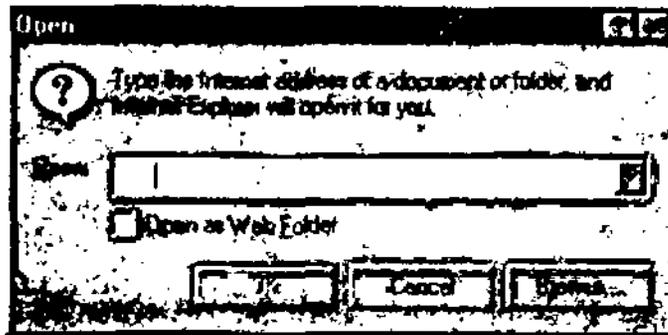
NOTES

4.1.6 Looking at Your Page in a Browser

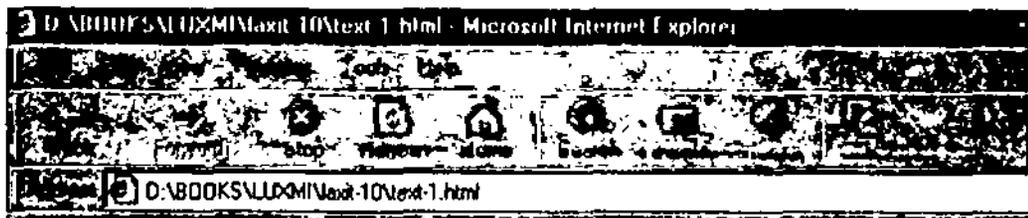
As was mentioned earlier, we can use either Internet Explorer or Netscape Navigator to browse. Here in this chapter I would be mostly using Internet Explorer. So the text file created above would be used using the browser to see the result.

Follow the following steps to look at your page in a browser:

1. Open your browser, in this case Microsoft Internet Explorer.
2. Choose File > Open to Open file using the browser button.



3. Once the file has been selected. Press ok to see the result of the HTML text in the browser.
4. See the line break at the point where
 was given.



Before
After the line break

Remember

If your Web pages does not appear in the Open dialog box, make sure that you have saved it as Text Only and given it the .htm or html extension. You don't have to close the document in the text editor before you view it with a browser.

This makes editing much faster. You can switch to the editor, make your changes, and then back to the browser and click Reload to view the changes.

4.1.7 Defining Web Page

As mentioned there are various browsers and so are the word processors. In fact, there are various versions of HTML too. So what you do is that in the first line of the document, you put all the information that you have about the file.

Following is all what is needed to be put on the top of the page before browsing.

!DOCTYPE HTML

This is needed to inform browser that the file is in HTML mode and is a document type.

PUBLIC

This defines that the text is not private and does not need any kind of password to open it.

"-//W3C//DTD HTML

This signifies that we are using the HTML developed by W3 consortium.

Transitional

The other option here is Framset, which is used if you are using lots of frames in your text.

//EN">

With this we end the definition of the line for the HTML.

</HTML>

As mentioned in the case of tags, each tage has to have a open and close command. This is the closing command of HTML.

So now if we combine all this, our first line would becomes:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional/
/EN"></HTML>
```

So we would be putting this line in most of our text as the first line.

Next, we would be putting our text and other items.

4.1.8 Main Body of the Text

As we have the body of the text in a letter, we have here the body of the text too. In fact, the whole text is divided into body and head. The head defines the various headings and body defines the text. The body is contained in <BODY> and </BODY> whereas the head is contained in <HEAD> and </HEAD>. The Head section provides information about the URL of your Web page as well as its relationship with the other pages at your site. The only element in the HEAD section that is visible to the user is the title of the Web page. The BODY of your HTML document contains the bulk of your Web page, including all the text, graphics, and formatting.

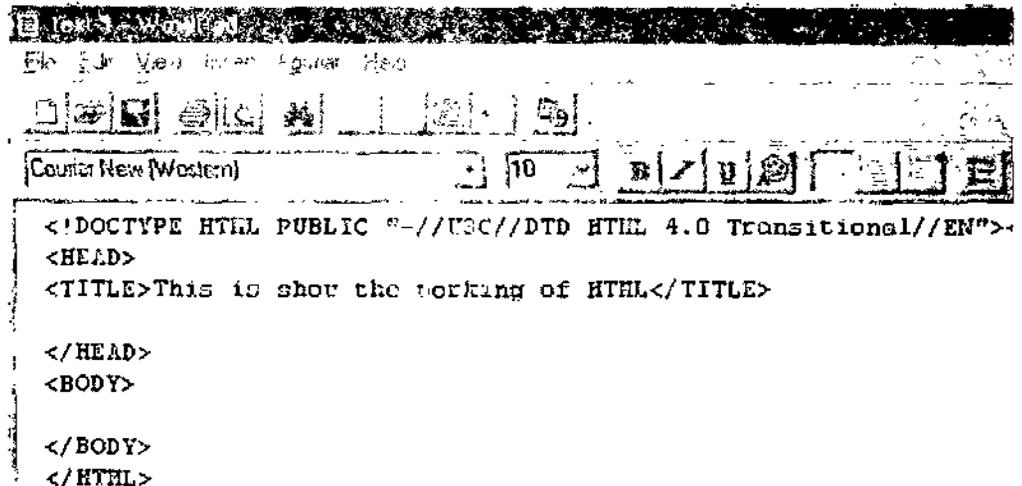
Then there is a title. This is the page title. So this should be short and descriptive. The title is used in search indexes as well as in browsers' history lists and bookmarks. There must be only one TITLE tag in each HTML document. A title cannot contain any formatting, images, or links to other pages. Don't use colons or backslashes in your titles. These symbols cannot be used by some operating systems for file names. It's good idea to use a common element to begin each page's title. For example, you could begin each page with My Page: followed by the specific area described on that page.

All the above information about body, title and head is shown in the following example.

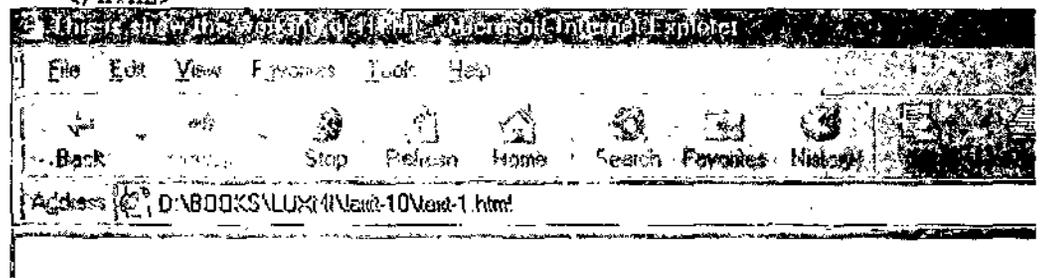
NOTES

Both the text and its effect in browser are shown here.

NOTES



```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HEAD>
<TITLE>This is show the working of HTML</TITLE>
</HEAD>
<BODY>
</BODY>
</HTML>
```

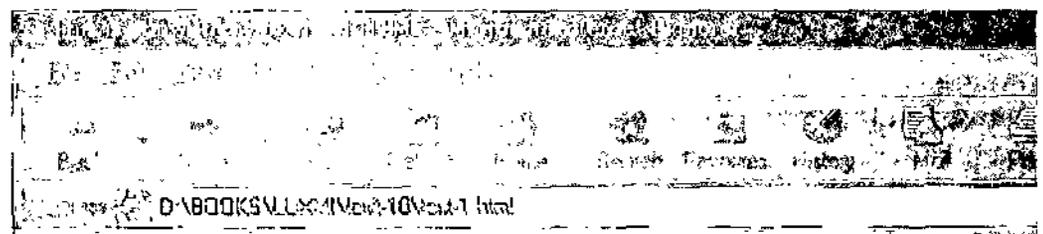


4.1.9 Putting Headers

Various type of headings can be placed in the text. Maximum of 6 headings are allowed. But, you can use only 3 at a time. Each one of the heading is numbered from 1 onward. Obviously you cannot repeat the numbers.

Let us try to create a heading.

1. In the BODY section of your HTML document, type (Hn where n is a number from 1 to 6, depending on the level of header that you want to create). Here I have used it as H1.
2. Type the contents of the header, in this case I have typed it as "Information Technology Class X.
3. Type </Hn> where n is the same number used in step 1, in this case H1.
4. The result of this typing and result in browser are both shown here.



Information Technology Class X

A screenshot of the WordPad application window. The title bar reads "text1 WordPad". The menu bar includes "File", "Edit", "Format", and "Help". The font settings are "Courier New (Western)" and "10". The text area contains the following HTML code:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><
<HEAD>
<TITLE>This is show the working of HTML</TITLE>

</HEAD>
<BODY>
<H1>Information Technology Class X</H1>

</BODY>
</HTML>
```

NOTES

4.1.10 Adding Paragraph

For every new paragraph in HTML you must use the p tag, as was mentioned in the earlier paragraph. The following example shows how it is done.

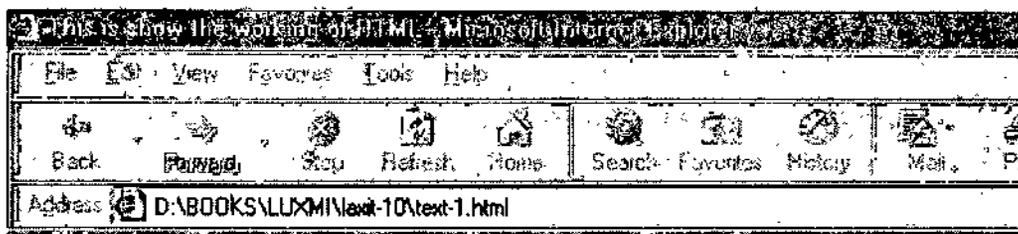
1. After the heading line, press Enter to reach the next line in Word Pad.
2. Type <p> to start the new paragraph.
3. Type the text which you want to put in the paragraph. I have typed here LAXMI PUBLICATIONS PVT. LTD.
4. Close the paragraph by using the tag </p>.
5. The text in Word Pad and its effect in the browser is shown next.

A screenshot of the WordPad application window, similar to the previous one. The text area now includes an additional paragraph tag:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><
<HEAD>
<TITLE>This is show the working of HTML</TITLE>

</HEAD>
<BODY>
<H1>Information Technology Class X</H1>
<p>LAXMI PUBLICATIONS PVT. LTD.</p>

</BODY>
</HTML>
```



Information Technology Class X

LAXMI PUBLICATIONS PVT. LTD.

4.1.11 Formatting Text in HTML

Those of you who have worked on any word processing knows what formatting of the text is. Using this concept you make the text more presentable by making it Bold, Italics, Underline. Not only this you change the look by changing the font in use and make it bigger or smaller by changing the font size. Here in HTML you have to be careful while formatting because you do not know which browser the user is going to use. The result is different for different browser.

First among them is Font.

4.1.12 Font Type

You have the liberty to load any number of fonts in your system. But, while using any one of them you have to make sure that the user of the web site may or may not have the same font. In that case this font would be replaced by a default font of the user's system. The tag for font is

``

For changing the font, we will do the following:

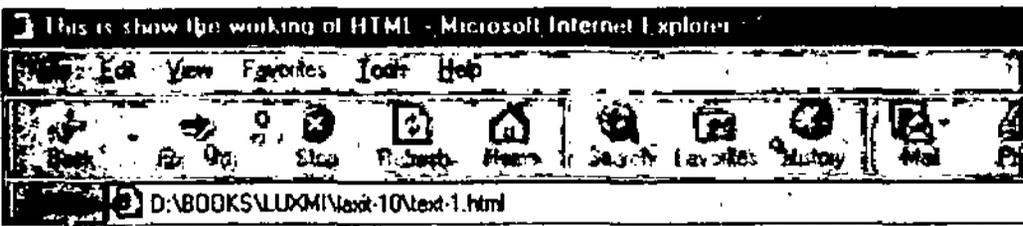
1. In the above text, we would change the font of the heading, which we had typed earlier.
2. Type `<FONT FACE="Arial`, where Arial is the font name, before the text whose font you want to change. Remember you have to type the complete name of the font as it appears in the Windows.
3. You can even put the second font so as to make sure that atleast one of them would be available on the site. You can put more fonts too, but, each successive font should be separated from the previous one by a comma.
4. Repeat the above step 2 for each additional font choice.
5. Type `>` to complete the FONT tag.
6. Type the text that you want to get displayed.
7. Type `` to close the font tag.
8. Open this file in browser to see the result.
9. Text and browser effect are shown on the next page.

4.1.13 Font Size

While with font type you can change the font, with size you can change the size of

NOTES

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><I
<HEAD>
<TITLE>This is show the working of HTML</TITLE>
</HEAD>
<BODY>
<H1>Information Technology Class X</H1>
<p><FONT FACE="Arial Black">LAXMI PUBLICATIONS PVT. LTD.</FONT>
</BODY>
</HTML>
```



Information Technology Class X

LAXMI PUBLICATIONS PVT. LTD.

the font. You can choose any size but make sure that it doesn't fill the whole page.

The tag for this is:

```
<FONT SIZE="n">
```

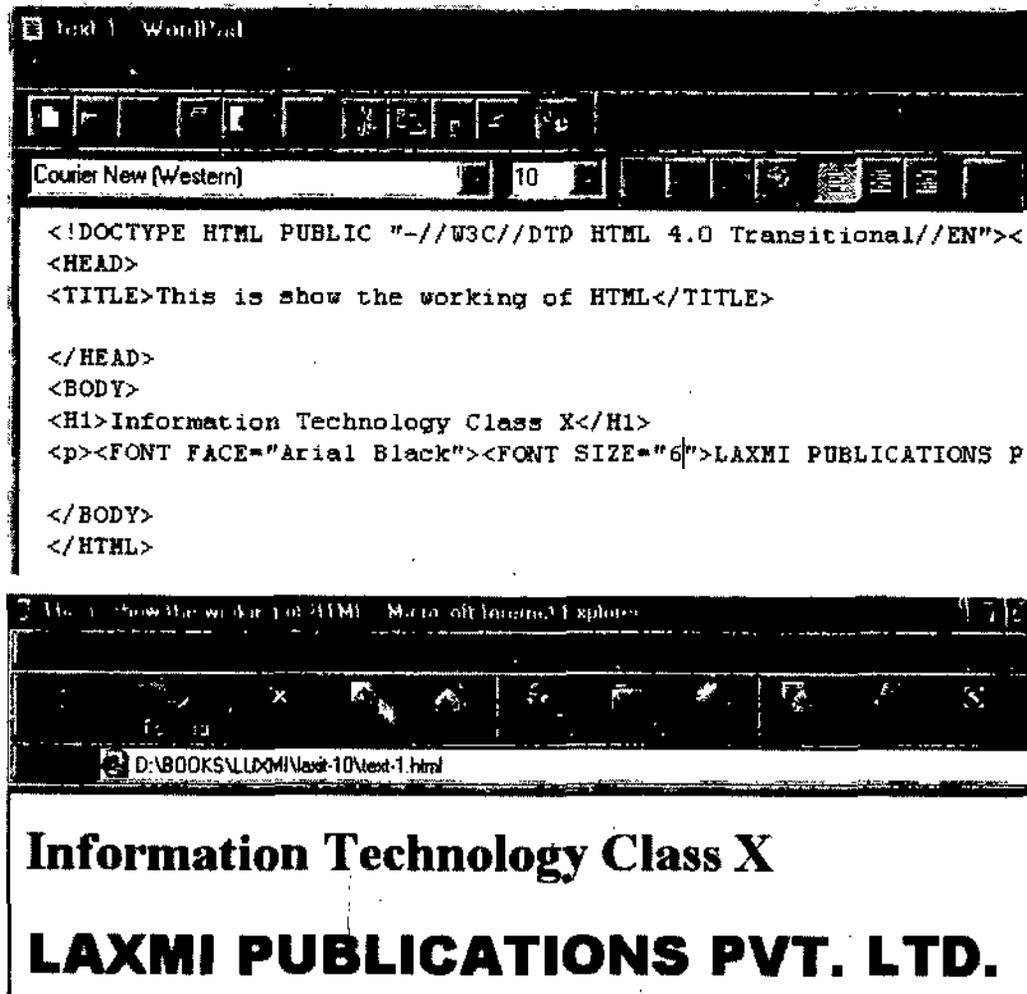
where n is the number in terms of 1 to 7. Here the actual fonts are not used but the relative font size from 1 to 7 are used. Once you start using, you will get familiar how each of the font number looks. Let us apply this to our text too.

1. Type `` where n is a number from 1 to 7. I have used the number 6.
2. You can use the relative numbers too, for example, +n or -n too.
3. End the para with ``
4. The text and the result in browser are shown below.
5. Open this file in browser to see the result on the next page.
6. If you want you can change the size of each character, for example, making the first character bigger than the other ones.

4.1.14 Using Big and Small

You can use the BIG or SMALL size to make the text big or small. Remember

NOTES



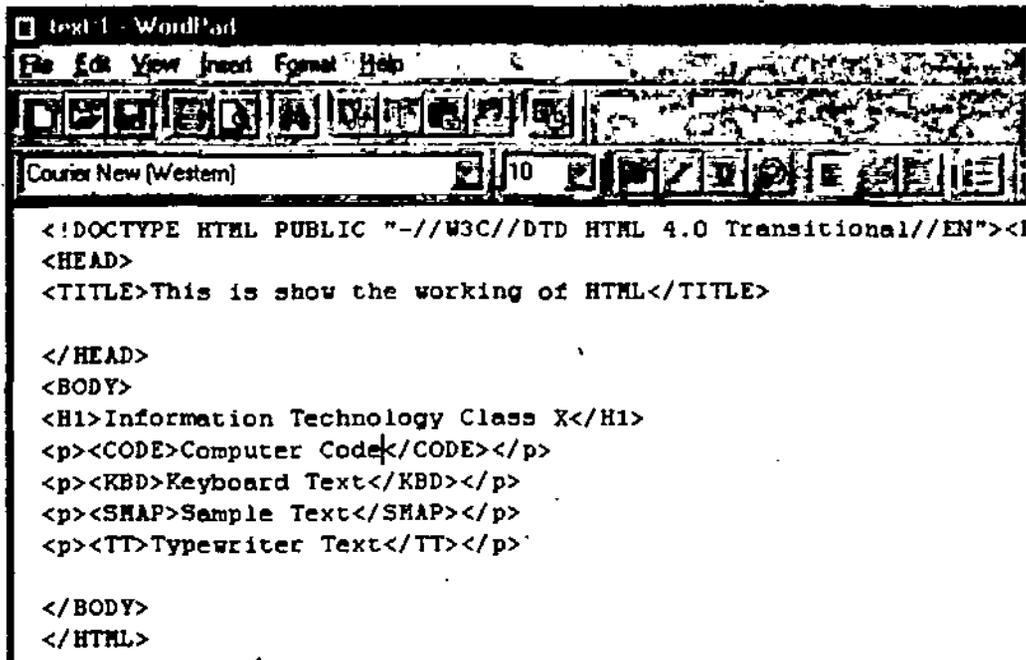
these are relative size of a given word or phrase with respect to the surrounding text. Just type **BIG** or **SMALL** before the text and the text will change accordingly.

4.1.15 Using Predefined Fonts

It is not that the browser uses the fonts available with Windows only. There are few fonts which have been predefined by the computer in terms of codes. You can use them in your text and they will be accordingly displayed. There are several tags that are displayed with monospaced font: **CODE** (computer code), **KBD** (keyboard input), **SAMP** (sample text) and **TT** (typewriter text).

See how they have been used.

1. Type `<CODE>`, `<KBD>`, `<SAMP>`, or `<TT>`, as the case maybe.
2. Type the text that you want to display in monospaced font.
3. Type `</CODE>`, `</KBD>`, `<SAMP>`, or `</TT>`, the corresponding closing code for the font.
4. See how I have used them for my page and how they get displayed in the web page.
5. Text on this page and browser effect on the next page.



```

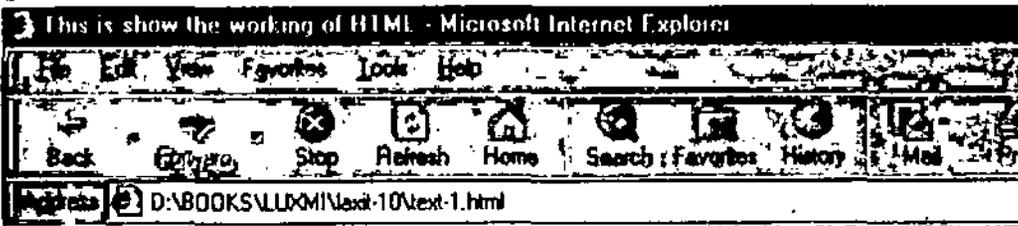
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><I
<HEAD>
<TITLE>This is show the working of HTML</TITLE>

</HEAD>
<BODY>
<H1>Information Technology Class X</H1>
<p><CODE>Computer Code</CODE></p>
<p><KBD>Keyboard Text</KBD></p>
<p><SNAP>Sample Text</SNAP></p>
<p><TT>Typewriter Text</TT></p>

</BODY>
</HTML>

```

NOTES



Information Technology Class X

Computer Code

Keyboard Text

Sample Text

Typewriter Text

4.1.16 Making Bold and Italic

As you do in word processing, you can make the characters bold or italics here too. This can be applied to a set of characters or even on a single one too.

For this you have to use them the following way:

1. Before the text which has to be made bold, type ``.
2. Type the text.
3. Close it with ``.

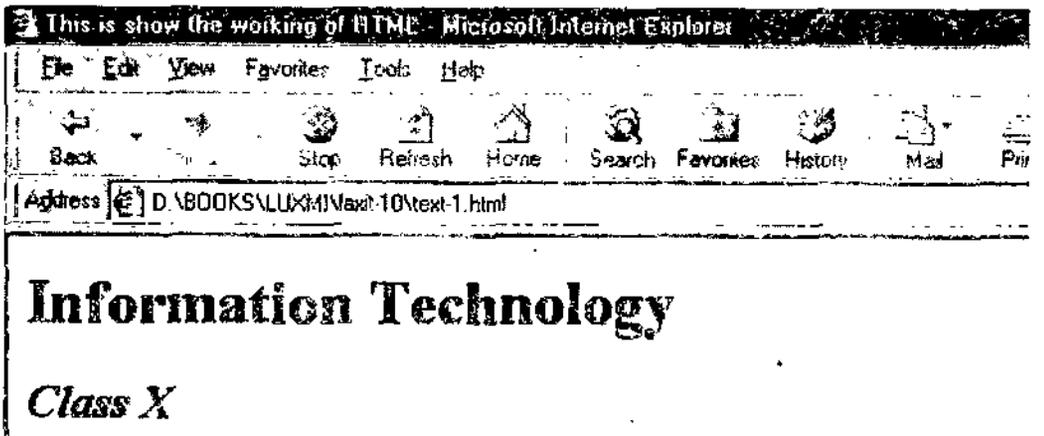
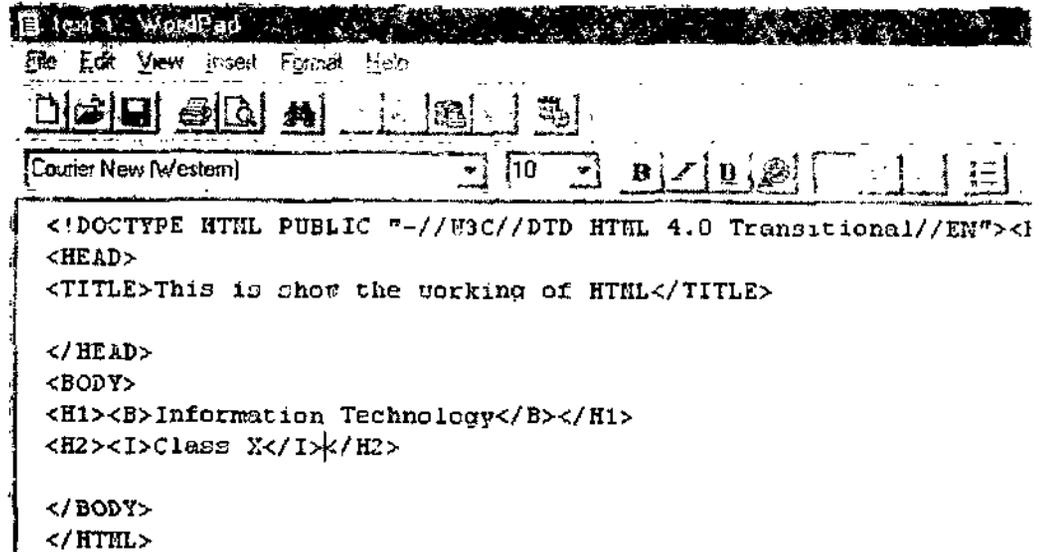
Similarly you can make the text italics too.

1. Type `<I>` before the text which you want to make italics.

2. Type the text.
3. Close it with </I>

I have used them in my text, as shown next.

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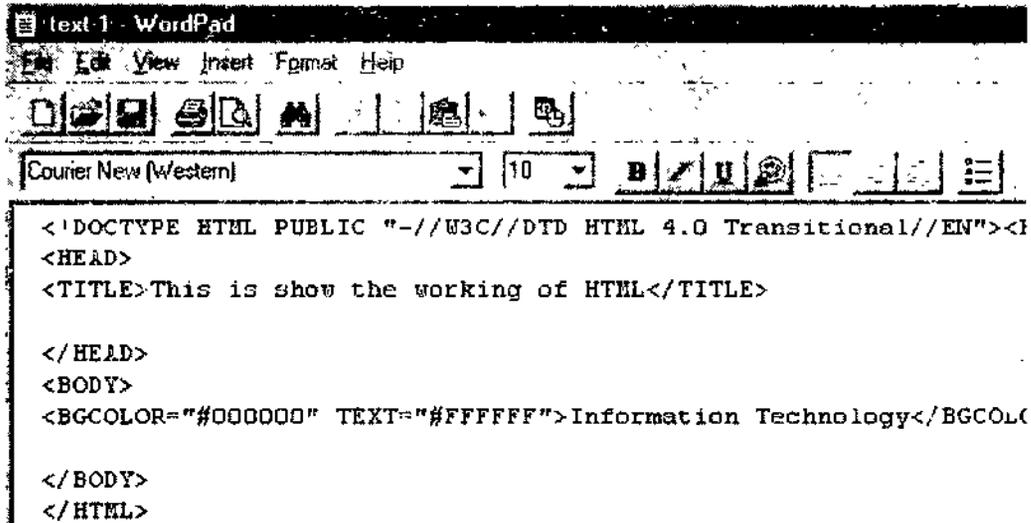


4.1.17 Setting Colours

Well, if you can change the text to bold and italics, then you can change its colour too. For this we use the tag BGCOLOR for background colour. But, remember, you may need to use the actual number of the colour. As usual you can change the colour of each character of the text/word/sentence. But, unfortunately the colour which I am using here would not be visible to you, since the book is in black and white. You must use this option to see the colours on the screen.

1. Type <BODY> to start the new text line.
2. Type BGCOLOR =" #000000" TEXT =" #ffff", where 000000 represents the default color and ffffff represents the colour of the text.
3. Now type the text which you have to type.
4. Close the color line by putting the closing words </BODY>.

On the next page, you see both the text and its effect.



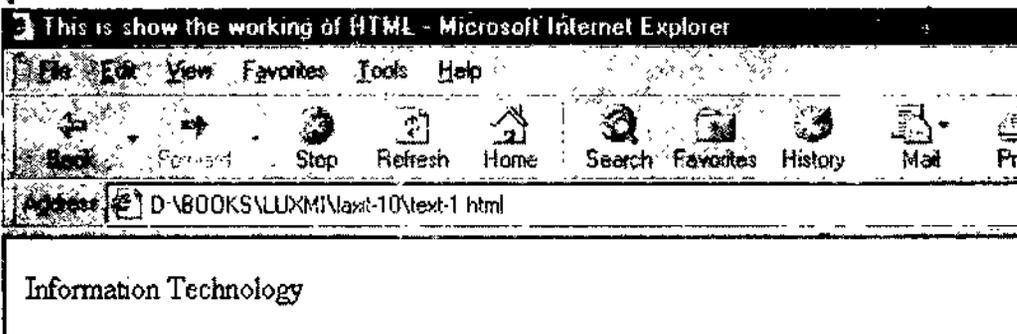
```

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><I
<HEAD>
<TITLE>This is show the working of HTML</TITLE>

</HEAD>
<BODY>
<BGCOLOR="#000000" TEXT="#FFFFFF">Information Technology</BGCOL
</BODY>
</HTML>

```

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4.1.18 Text Color

So far we had seen the background colour. Let us now see the colour of the text. For this the tag is:

```
<FONT COLOR = "red">
```

Red can be replaced by any other predefined colour out of the 16 known colours. Using this you can change the colour of the individual text paragraphs, lines or even characters.

Let us see how it is done.

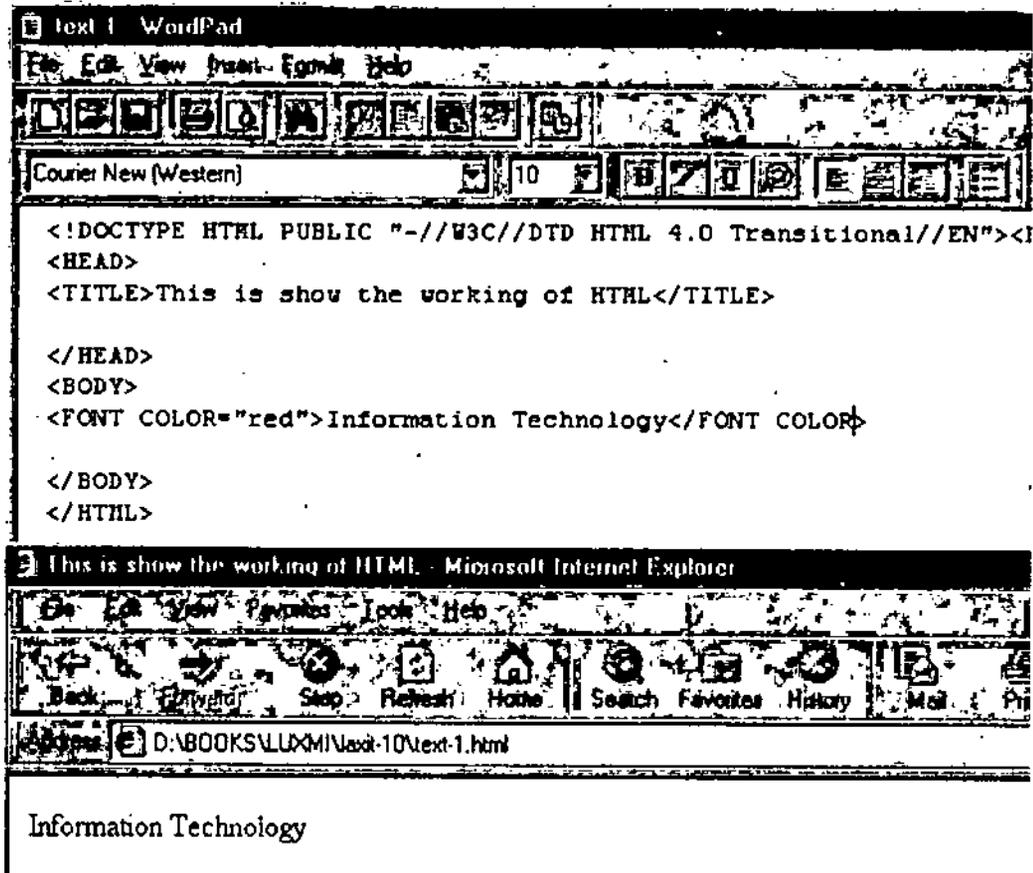
1. Type `` in front of the text of which you want to change the colour.
2. Of course, you can use any other colour.
3. Type the text that you wish to color.
5. Type `` to close the tag.
6. See how it looks in the browser, as shown next.

The line Information Technology appears in red on my screen, it may appear black on this page.

4.1.19 Superscripts and Subscripts

Those of you who are familiar with chemistry formulas would know what I am talking about. Superscript is when you raise the character to a height. Subscript is when you lower it. In the case of H^2SO_4 , 2 is Superscript and 4 is Subscript. You may not

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use them in your text very often, but you must know how to use them. For them we use tag `<SUP>` for Superscript and `<SUB>` for Subscript. The same word H_2SO_4 can be represented as below:

1. Type H and then `<SUP>` to start creating superscript.
2. Type character 2 which has to be superscripted.
3. Type `</SUP>` to close the effect of the superscript.
4. Now type SO which have to be normal.
5. Type `<SUB>` to start the subscript operation.
6. Type the number 4 which has to be subscripted.
7. Close this with `</SUB>`.
8. See how it reflects in the browser on the next page.

4.1.20 Striking Out or Underlining Text

Similar to Bold and Italics, we have Strikethrough and Underline. These are used to highlight the text. The tags for these are:

`<STRIKE>`

`<U>`

I am not showing any text or browser effect here, since I want you to do it yourself.

Now, we will learn about inserting Graphics.

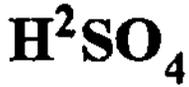
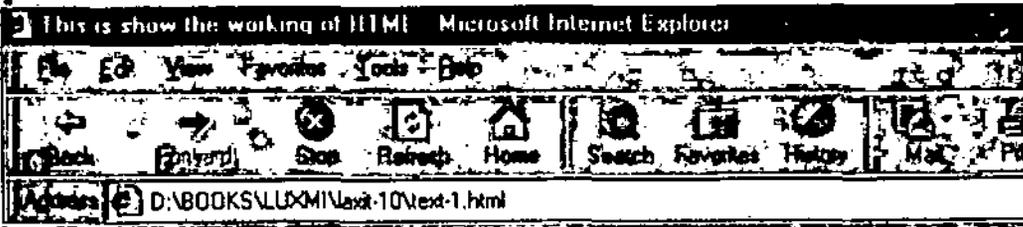
```

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><I
<HEAD>
<TITLE>This is show the working of HTML</TITLE>

</HEAD>
<BODY>
<H1>H<SUP>2</SUP>SO<SUB>4</SUB></H1>

</BODY>
</HTML>

```



4.1.21 Inserting Graphics

Text is the only thing that is supported by HTML. It has facilities to work with graphics too. Though you cannot create a new graphics in it, but you can mingle text with it in your web site. In this I am using a photograph and work on it here.

First thing first, lets insert the graphics. For this the tag is:

```
<IMG SRC="image.ext"
```

Here the image.ext is the name of the image with extension.

The following steps can be performed for inserting the graphic.

1. Place the cursor in the text where you want the image to appear.
2. Type <IMG SRC="crane.jpg" where crane.jpg is the file name of the graphic.
3. Close the tag with >.
4. See the result, how it looks in the browser, on the next page. Also note the text how it is typed in the word pad.

4.1.22 Scaling an Image

You can change the height and width of the image in terms of pixels. For this you must know the value in terms of pixels for increasing the width and height.

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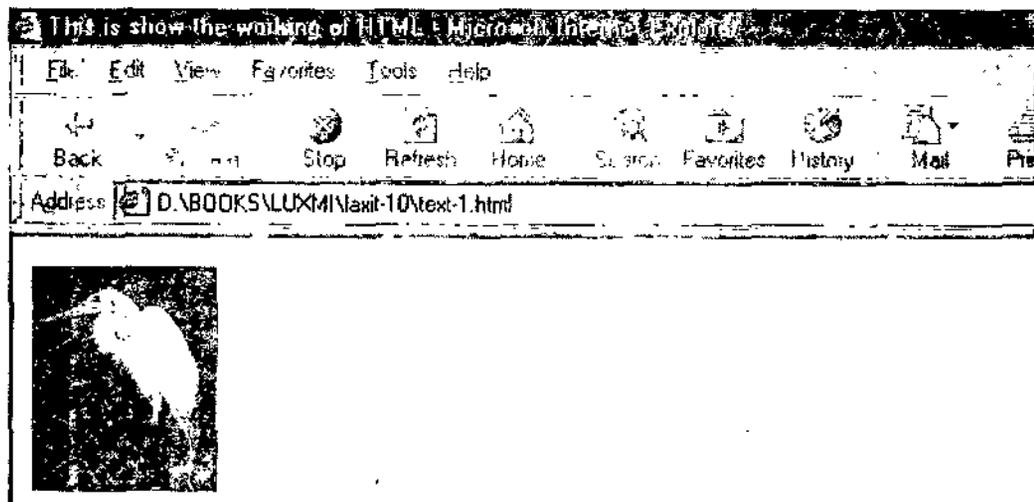
```

Text-1 - WordPad
File Edit View Insert Format Help
[Icons]
Courier New (Western) 10 [Icons]
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HEAD>
<TITLE>This is show the working of HTML</TITLE>

</HEAD>
<BODY>
<IMG SRC="d:\books\luxmi\laxit-10\crane.jpg">

</BODY>
</HTML>

```



Let us now change the width and height of the image which we have used.

1. After you have typed the image tag.
2. Type WIDTH=x HEIGHT=y where x and y are the desired width and height, respectively, in pixels, of your image.
3. Do not increase the size of the image too much, it will take more time to load and will make the image messy.

4.1.23 Images Alignment

Like text you can wrap the text around the image. For this we use the tag called ALIGN and the parameters for this are:

ALIGN=texttop, top, middle, absmiddle, bottom or absbottom

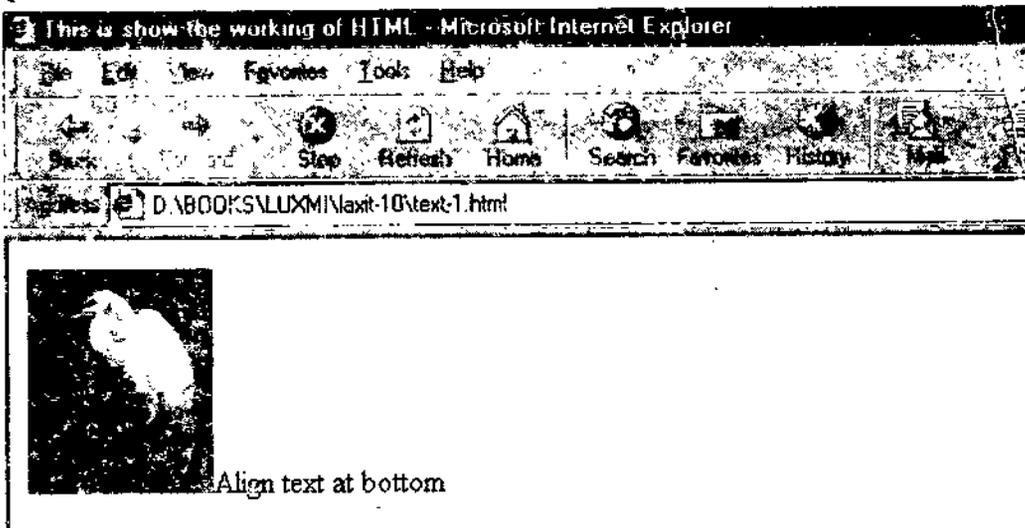
You can use any one of the options given above. In the following example, I have used the option of absmiddle.

1. Before closing the IMG tag, give the tag for ALIGN.
2. Close the option with >.
3. Close the IMG option too.

```

test-1 - WordPad
File Edit View Insert Format Help
[Icons]
Courier New (Western) 10 [Icons]
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><
<HEAD>
<TITLE>This is show the working of HTML</TITLE>

</HEAD>
<BODY>
<IMG SRC="d:\books\luxmi\laxit-10\crane.jpg" ALIGN="bottom">Align
</BODY>
</HTML>
    
```



4.1.24 Creating Banner

You can create a banner which would be reflected on the top of each page. You can create one the following way:

1. Change the width and height of the image to 450 x 100 pixels. You can make it narrower and shorter, but you shouldn't make it much wider, otherwise it won't fit easily on most screens.
2. After converting it to indexed color, using the smallest bits/pixels ratio you can stand, save it as a GIF image.
3. Use this exact same image at the top of each of your Web pages, by typing ``, where image.name is the location on the server of the banner.

4.1.25 Adding Horizontal Rules

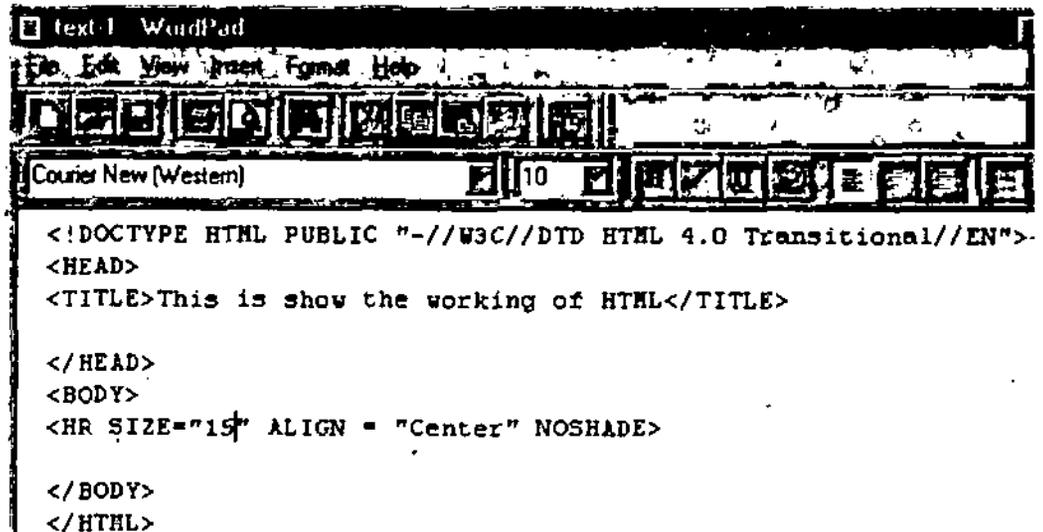
There may be times when you would be needing to put a horizontal line or rule in your site. For this we use the tag HR and its use is as follows:

```
<HR SIZE="8" ALIGN = "Center" NOSHADE>
```

In the above case 8 is the width of the line to be used. You can choose any alignment which you want. Also you can use the various shades for the line. See how a line has been created in the following example.

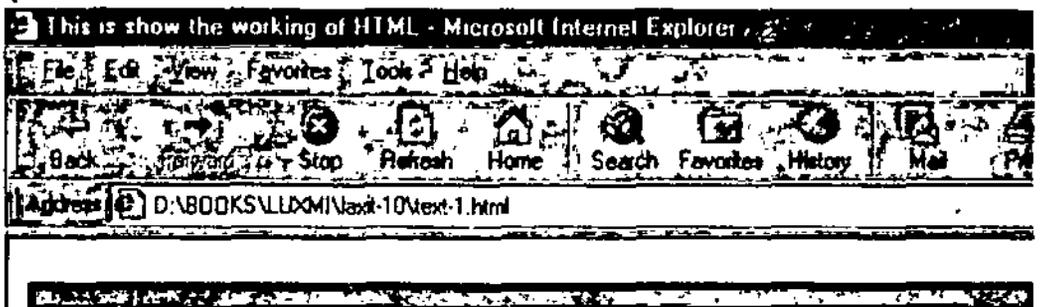
NOTES

1. Type <HR where you want the rule to appear. The text that follows will appear in a new paragraph below the new line.
2. If desired, type SIZE=n, where n is the rule's height in pixels.
3. If desired, type WIDTH=w, where w is the width of the rule in pixels, or as a percentage of the document's width.
4. If desired, type ALIGN=direction, where direction refers to the way a rule should be aligned on the page; either left, right or center.
5. If desired, type NOSHADE to create a solid bar, with no shading.
6. Type the final > to complete the horizontal rule definition.
7. See the text and the result in the browser next.



```

text1 WordPad
File Edit View Insert Format Help
Courier New (Western) 10
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HEAD>
<TITLE>This is show the working of HTML</TITLE>
</HEAD>
<BODY>
<HR SIZE="15" ALIGN = "Center" NOSHADE>
</BODY>
</HTML>
  
```



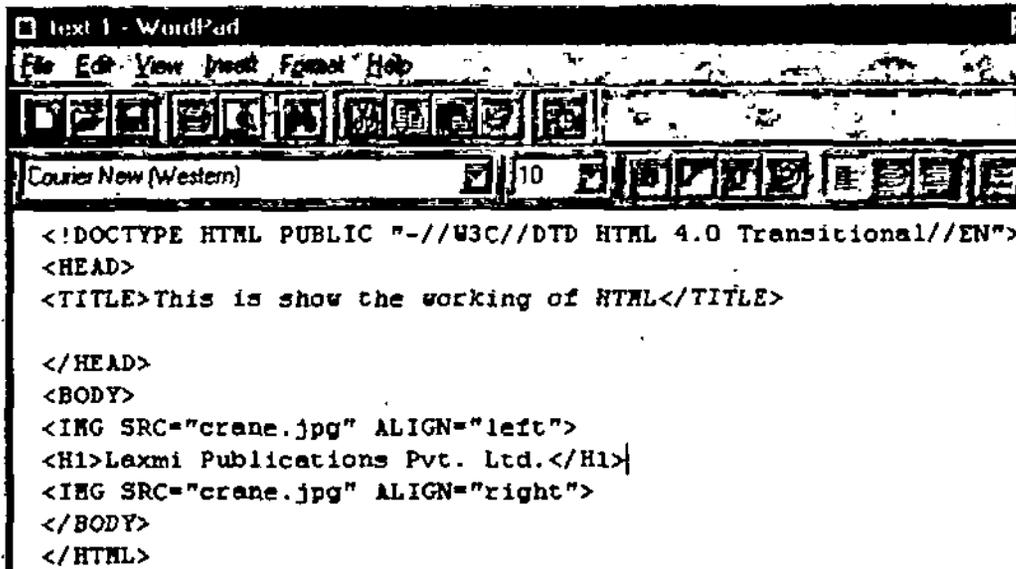
4.1.26 Wrapping Text between Two Images

Instead of one, you can have 2 images on the same page. In between you can have the text. Let us see how this is done.

1. Type to have the first image appearing on the left.

2. Type the text that should flow around the first image.
3. Type `` to have the second image on the right hand side of the page.
4. Type the text that should flow around the second image.
5. See the text and its effect in the browser on the next page.

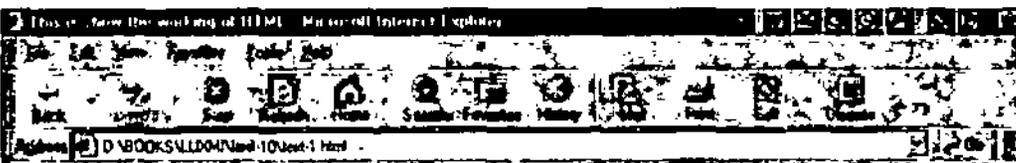
NOTES



```

text1 - WordPad
File Edit View Insert Format Help
Courier New (Western) 10
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HEAD>
<TITLE>This is show the working of HTML</TITLE>
</HEAD>
<BODY>
<IMG SRC="crane.jpg" ALIGN="left">
<H1>Laxmi Publications Pvt. Ltd.</H1>
<IMG SRC="crane.jpg" ALIGN="right">
</BODY>
</HTML>

```



Laxmi Publications Pvt. Ltd.



4.1.27 Ending Text Wrap

A wrapped image affects all the text that follows it, unless you insert a special line break. The CLEAR attribute added to the regular BR tag indicates that the text should not begin until the specified margin is clear (that is, at the end of the image or images). See how it is done.

1. Create your image and the text, as was done before.
2. Place the cursor where you want to stop wrapping text to the side of the image.
3. Either type `<BR CLEAR= left>` to stop flowing text until there are no more images aligned to the left margin.

Or

type `<BR CLEAR = right>` to stop flowing text until there are no more images aligned to the right margin.

Or

type `<BR CLEAR = all>` to stop flowing text until there are no more images on either margin.

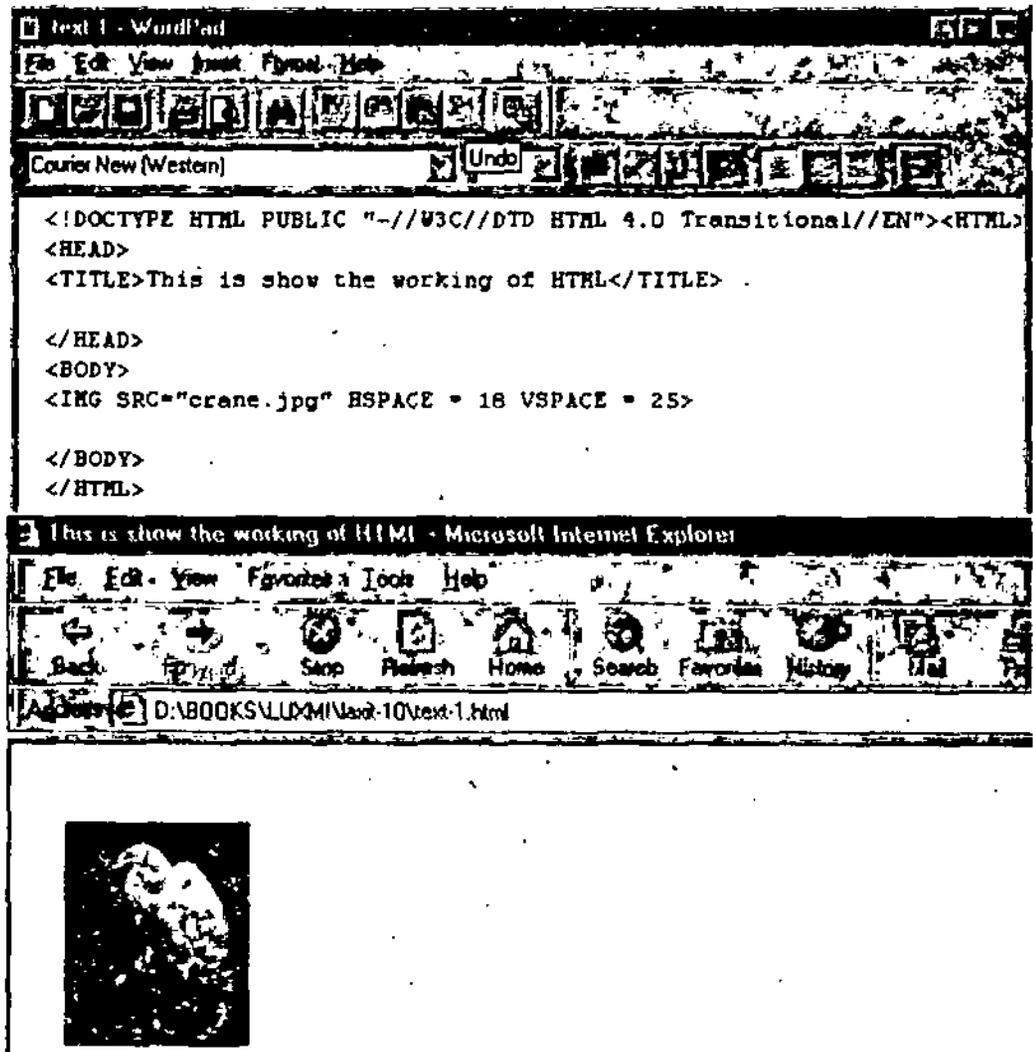
NOTES

4.1.28 Adding Space Around an Image

You can give space on both sides of the image using the tags called `VSPACE` and `HSPACE`. For these you have to add the number in terms of pixels which you have to add to the left or top. See how it is done.

1. Give the tag for image.
2. Type `HSPACE=x` where `x` is the number of pixels of space to add on both the right and left sides of the image.
3. Type `VSPACE=y` where `y` is the number of pixels of space to add on both the top and bottom of the image.
4. Close the tag with `>`.

The text and final output in the browser are shown below.



4.1.29 Using Low Resolution Images

You can have reference to both high and low resolution versions of your image so that the low resolution image loads quickly and keeps the visitor's interest while the high resolution version impresses your visitors, once it loads in. This can be done in the following manner:

1. Create a low resolution version of your image using Photoshop or any other image editing program.
2. Place the cursor where you want the full resolution image to appear.
3. Type `<IMG SRC = "image.gif"`, where image.gif is the location on the server of the high resolution image.
4. Type `LOWSRC = "imagelow.gif"`, where imagelow.gif is the location on the server of the low resolution image.
5. Type `HEIGHT=x WIDTH=y`, where x and y are the height and width in pixels, respectively of the original image. If you do not specify these values, browsers use the size of the low resolution image for both images.
6. If desired, type `ALT="substitute text"`, where substitute text is the text that will appear if the visitor can't view images with their browser. Type the final.

NOTES

4.1.30 Page Layouts

After formatting the text and adding image to it, let us now understand about the concept of the page. In other words we would learn about the various options of page layouting. This would include setting of margins, columns, controlling the spacing between the elements on a page, changing the background color for the entire page, positioning elements in layers, and determining when line breaks should, and should not, occur, etc.

4.1.31 Setting Margins

You can use `LEFTMARGIN` and `TOPMARGIN` tags to specify just how much space you would like to have on both left and right hand side. See how it is done.

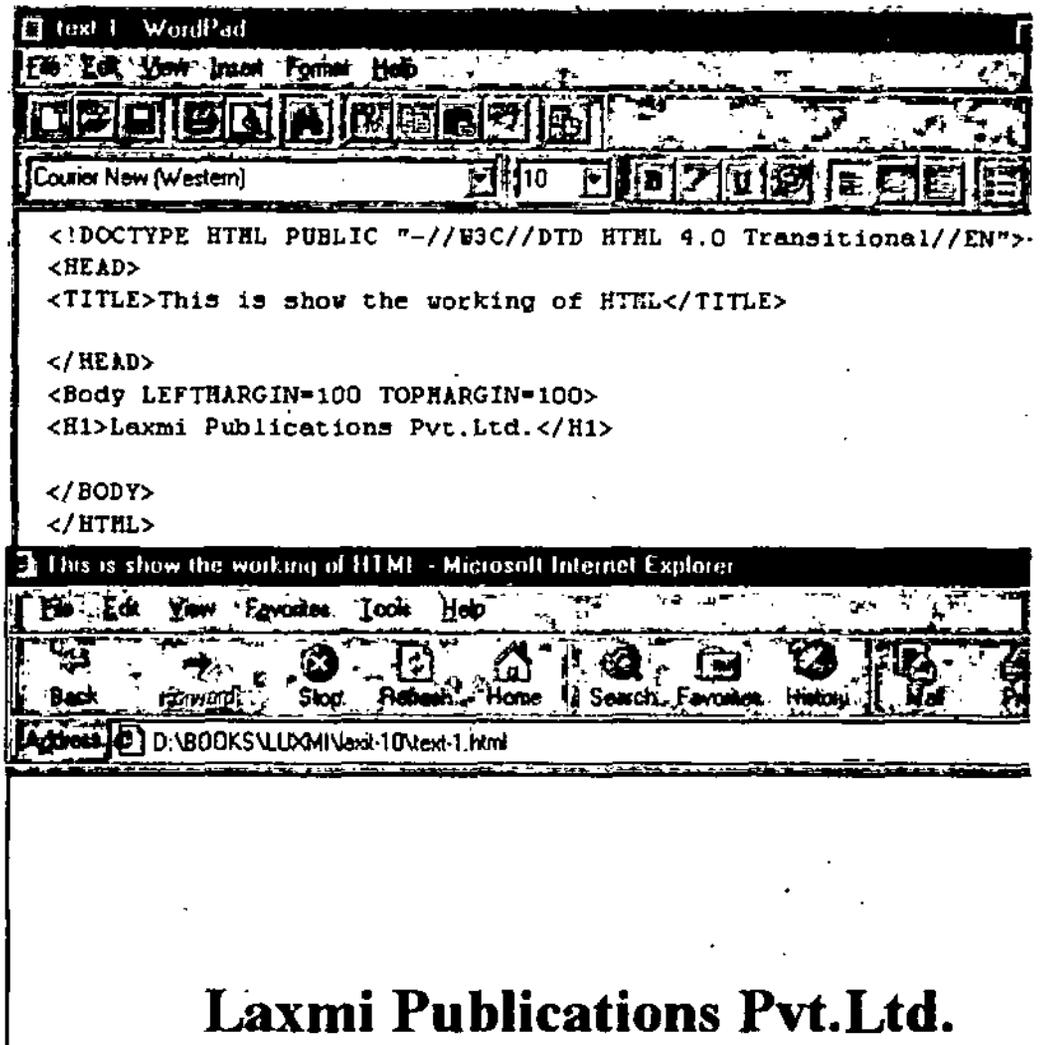
1. Inside the `BODY` tag, after the word `BODY` but before the final `>`, type `LEFTMARGIN=x`, where x is the width in pixels of the space between the left border of the window and the contents of the page.
2. Type `TOPMARGIN=y`, where y is the height in pixels of the space between the top border of the window and the contents of the page.
3. When used in the file being used, see the result on the next page.

4.1.32 Space between Paragraphs

For setting spaces between lines and words you can use the tag called `SPACER`. Here also you have to give the number in terms of pixels as to how much space is needed between the lines, etc. See how it is done in the following example.

1. Place your cursor at the place where you want to set the space.
2. Type `SPACER`
3. Type `TYPE=vertical`

NOTES



4. Type SIZE=n, where n is the amount of space in pixels that you want between the paragraphs.
5. Type the final >.
6. See the text in Word Pad shown below.
7. I am not showing the browser effect since it is not supported by Internet Explorer. You will have to use Netscape Navigator.

4.1.33 Leaving Block of Space

Instead of leaving space in terms of pixels, you can leave the space as a whole block. For this do the following.

1. Type <SPACER.
2. Type TYPE=block.
3. Type WIDTH=x, HEIGHT=y, where x and y are in terms of pixels and represent the space you want to leave widthwise and heightwise.

4.1.34 Line Breaks

Sometimes the broken text does not look good. You may at that time use this

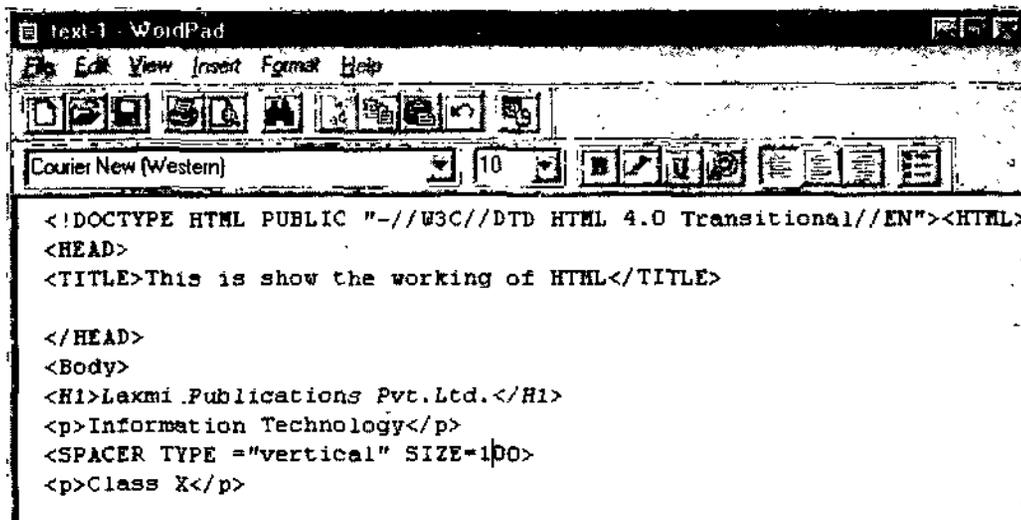
command so that the text does not break into two lines. It can also be used to keep a word and image together.

1. Type <NOBR>.
2. Create the text or element/image which you want to keep together.
3. Type </NOBR>.

4.1.35 Indents

When you use text you are bound to need a tab too. However, HTML does not allow it. But, there are a number of ways to create indents for you paragraphs. Let us see how.

1. Place the cursor where you want the space to appear.
2. Type <SPACER =horizontal SIZE=n, where n is the desired indent size, in pixels.
3. Close with > tag.
6. Type the text of the indented paragraph.
7. See the result in the browser.
8. Since command is also not accepted by Internet Explorer, try it in Netscape Navigator.



```

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><HTML>
<HEAD>
<TITLE>This is show the working of HTML</TITLE>

</HEAD>
<Body>
<H1>Laxmi Publications Pvt.Ltd.</H1>
<p>Information Technology</p>
<SPACER TYPE ="vertical" SIZE=100>
<p>Class X</p>
  
```

4.1.36 Centerizing Text

By using the tag called CENTER, you can centralize the text in a easier method.

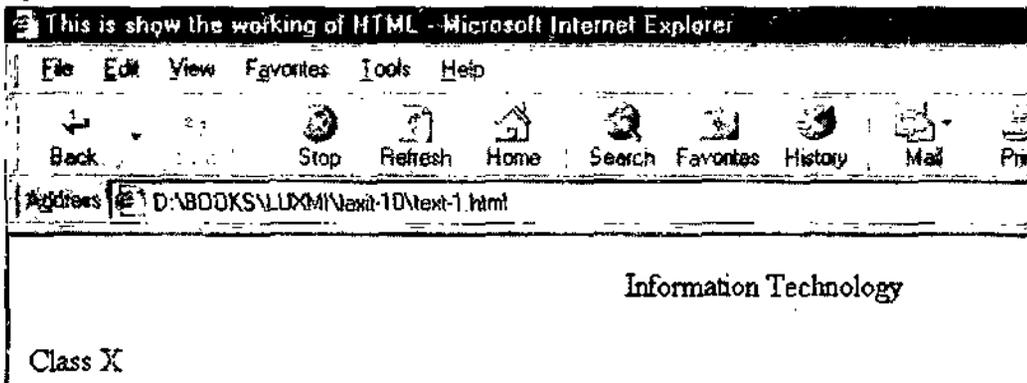
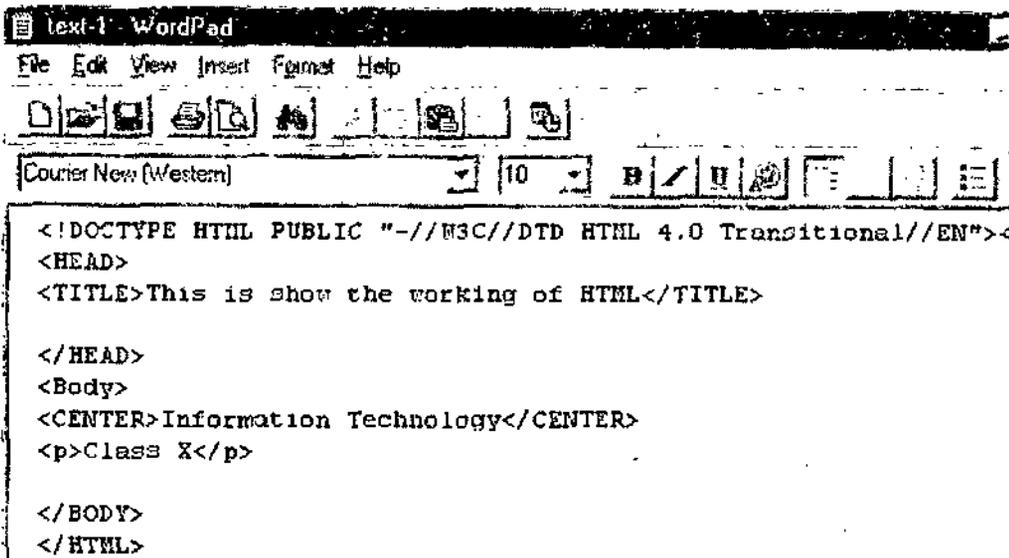
1. Type <CENTER> and follow it up with the text which you want to centralize.
2. Close the tag with </CENTER>.
3. See the result of your text in the browser, on the next page alongwith the text in the Word Pad.

4.1.37 Creating Columns

You must have seen the text in newspapers. It is divided into various columns. Well, you can divide your text too in various columns by using the tag called MULTICOL. You have also to define number of cols, gutter space and width. The complete tag looks like this:

NOTES

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`<MULTICOL COLS=x GUTTER=y WIDTH=z Text</MULTICOL>`

where x is the number of columns you want, y is the gutter space needed and z is the width of the text block. Let us see how it is done.

1. Type `<MULTICOL`.
2. Type `COLS=x`, where x is the number of columns.
3. Type `GUTTER=y`, where y is the gutter space.
4. Type `WIDTH=z`, where z is the total width. This is optional.
5. Type the final `>` to finish the column definition.
6. To end the multicol page, end it with `</MULTICOL>`.

You can see how it has been in the text. Again, it is not accepted by Internet Explorer but Navigator accepts it.

4.1.38 Setting Background Colour

You can set the background colour by using the tag called `BGCOLOR`. For this you can choose any of the 16 predefined colours. The tag for this is:

`BGCOLOR="name of the colour"`

See how I have used yellow colour for background and blue for the text.

1. In the `BODY` tag, type `BGCOLOR = "yellow"` and follow it with `>`.

2. Type the text which you want to type but before this you must use a different colour for the text, else it would be hidden in the background colour.
3. See how I have used blue colour for my text
4. The text and the browser result are both shown next.

NOTES

```

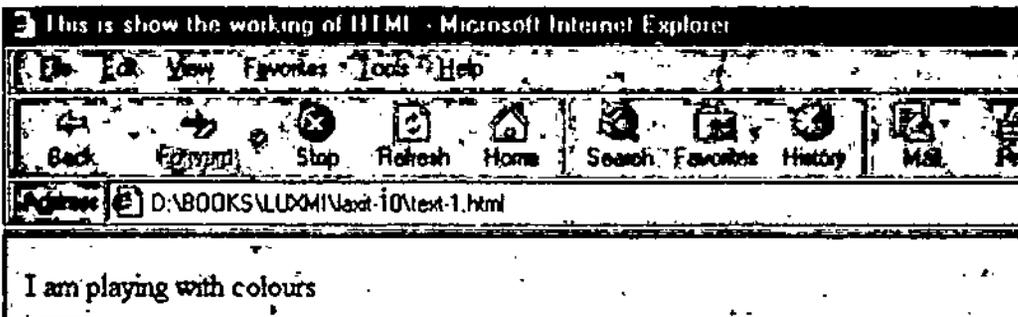
text1 - WordPad
File Edit View Insert Format Help
[Icons]
Courier New (Western) 10 [Icons]
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><HTML>
<HEAD>
<TITLE>This is show the working of HTML</TITLE>

</HEAD>
<Body>
<MULTICOL COLS=2 GUTTER=30>This text is being typed to give you an
idea about the multicolumns text representation in a browser.Since
this tag is not accepted by Internet Explorer, it is not shown here.
But, you can try it yourself.</MULTICOL>
</BODY>
</HTML>
    
```

```

text1 - WordPad
File Edit View Insert Format Help
[Icons]
Courier New (Western) 10 [Icons]
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><HTML>
<HEAD>
<TITLE>This is show the working of HTML</TITLE>

</HEAD>
<BODY BGCOLOR="yellow">
<p><FONT COLOR="blue">I am playing with colours</FONT></p>
</BODY>
</HTML>
    
```



4.1.39 Block Quotes

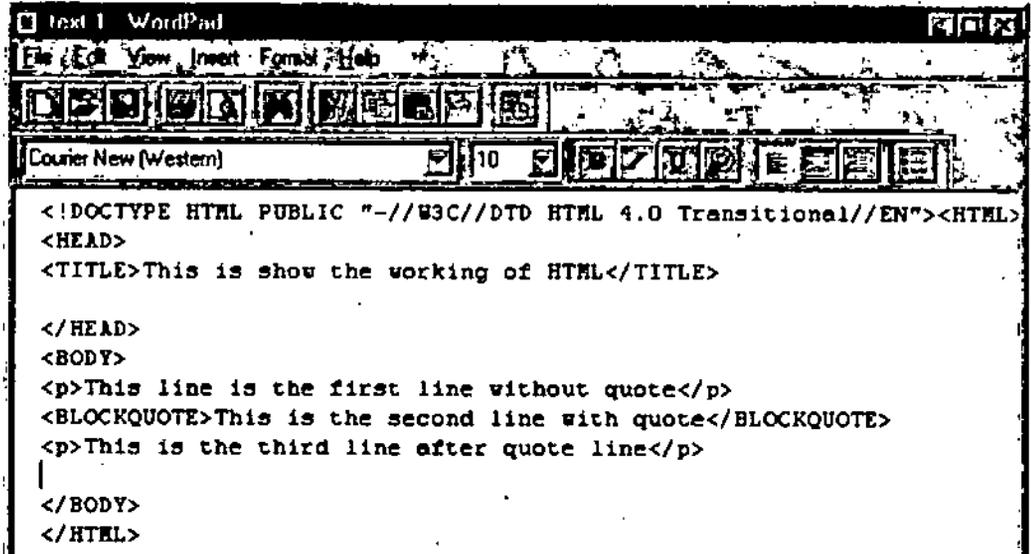
You can use a part of the text in term of quotes. These can be a part of the text or otherwise. The tag for this is:

<BLOCKQUOTE>

See how it is used.

1. Type your text as usual.
2. Type **<BLOCKQUOTE>**.
3. Type the desired text which you want to quote starting with **<p>** if required.
4. Type **</BLOCKQUOTE>** to end the quote.
5. If needed you can type the remaining text.
6. See the result of your setting in the browser, as shown next. See the text too.

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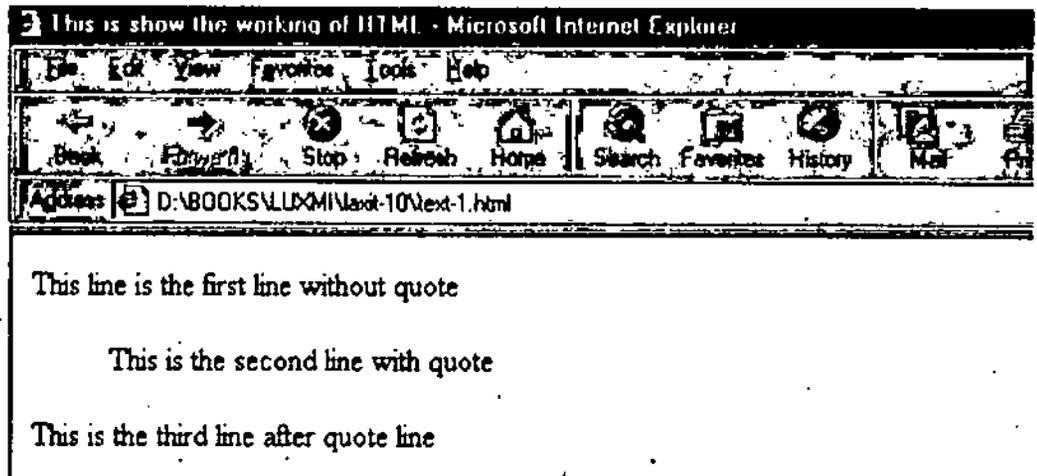


```

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><HTML>
<HEAD>
<TITLE>This is show the working of HTML</TITLE>

</HEAD>
<BODY>
<p>This line is the first line without quote</p>
<BLOCKQUOTE>This is the second line with quote</BLOCKQUOTE>
<p>This is the third line after quote line</p>
</BODY>
</HTML>

```



4.1.40 Tables—a way of representing data

We can represent data in a better form by using the Tables. It also emphasizes the text since it stands out from the regular text. You can use Tables in HTML too but the result somehow not as good as you would get in a word processing or a publishing program. It is also not very easy to create tables in HTML.

Let me show you how these tables are created and then we will work on other aspects of the table.

1.41 Creating Table

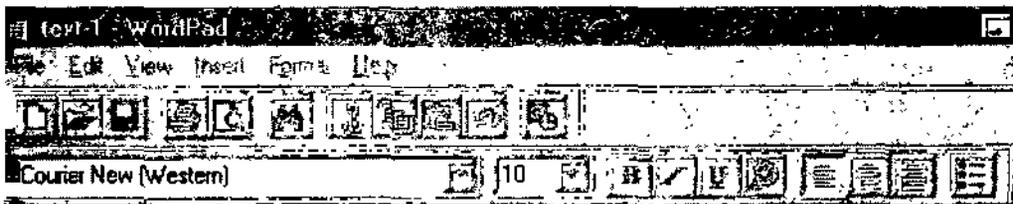
The initial table which we would create is of 2 x 2, which means that the table could have 2 rows and 2 columns. This is just the beginning, you can create bigger tables later on. The tag for table as expected is:

<TABLE>

Since we would be having both headings and data in the table. We would be using **<TH>** for heading, **<TR>** for the row and **<TD>** for the data. See the following steps and create a table.

1. Type **<TABLE>** to initiate the table.
2. Type **<TR>** to define the beginning of the first row.
3. Create a header cell in the first row of elements by typing the headings after **<TH>**.
4. Type the contents of the first header.
5. Create a regular cell after the header by using **<TD>**.
6. Type the contents of the regular cell.
7. Repeat steps 2-6 for each row.
8. To finish the table, type **</TABLE>**.

As the following figure you see both the text in Word Pad and how the text is displayed in the form of a table in the browser too.



```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><I
<HEAD>
<TITLE>This is show the working of HTML</TITLE>

<TABLE>
<TR>
  <TH>Sachin
  <TD>44
<TR>
  <TH>Saurav
  <TD>14
<TR>
  <TH>Sehwag
  <TD>84
</TABLE>
```

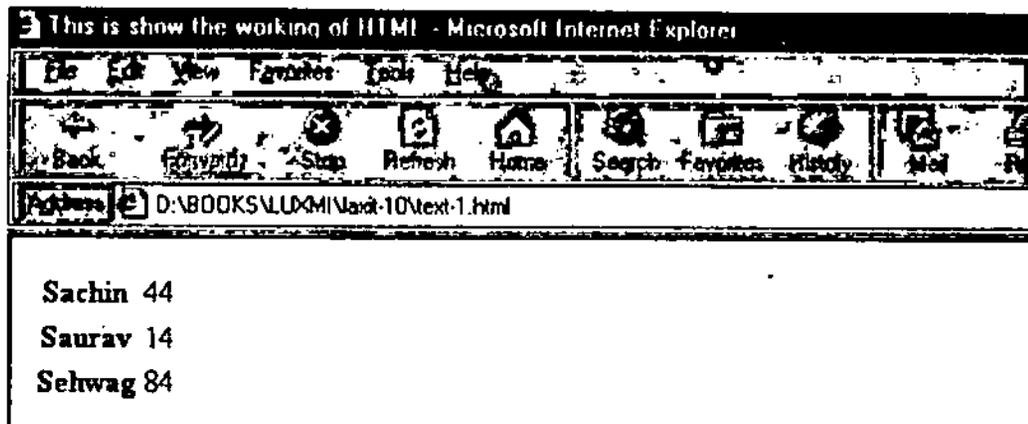
1.42 Dividing Table into Columns

You can divide your table into columns by using the tag **COLGROUP**. Let us see how it is done. You can have both structural and non-structural columns.

1. After the **<TABLE>** type **<COLGROUP>**.

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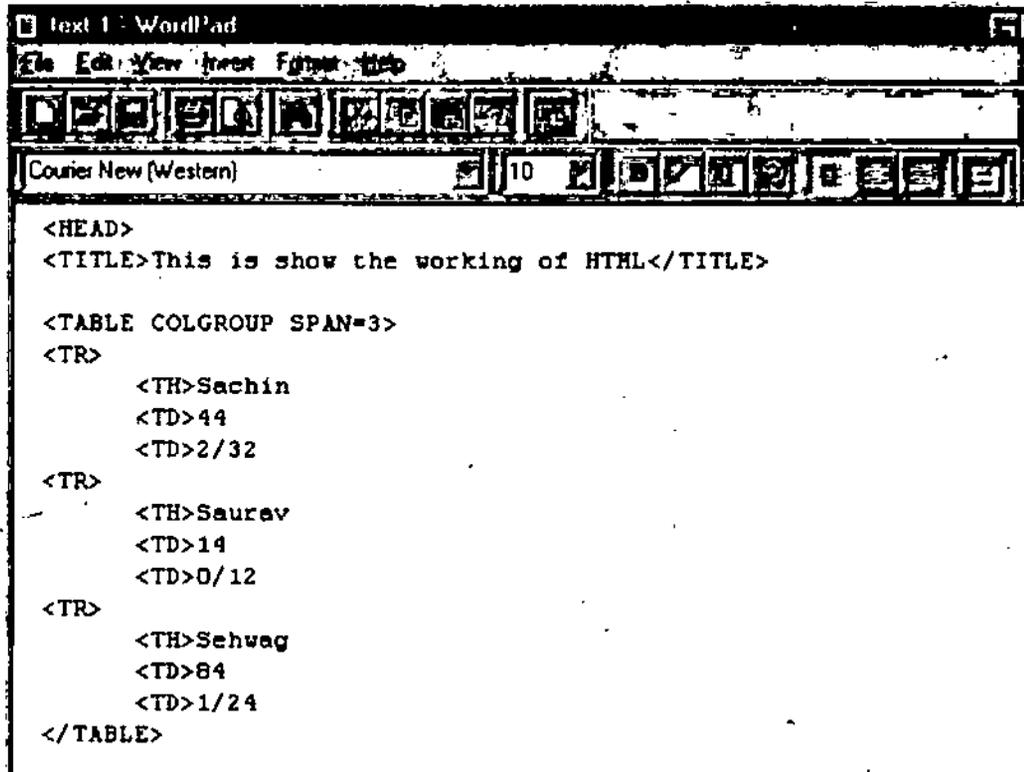


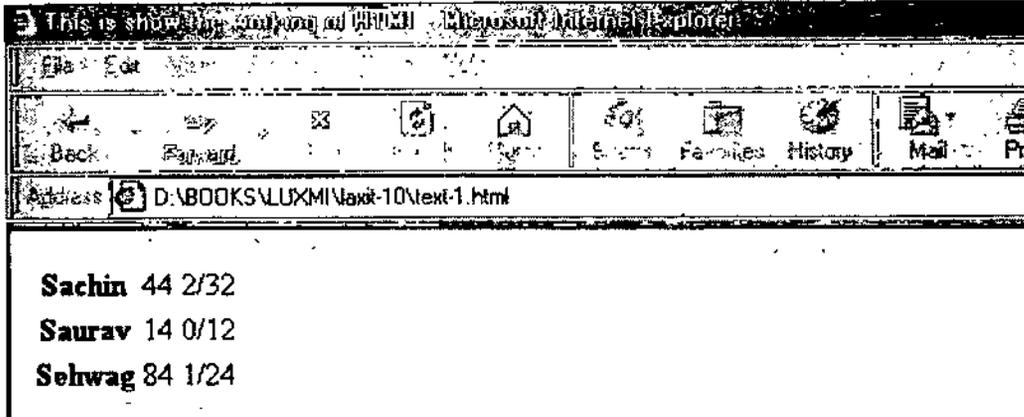
2. If the column group has more than one column, type SPAN= n , where n is the number of columns in the group.
3. Type the final >.
5. Repeat steps 1-3 for each column group that you wish to define.

Follow the following steps to divide a table into non-structural column groups:

1. After the <TABLE> tag, type <COL>.
2. If the column group has more than one column, type SPAN= n , where n is the number of columns in the group.
3. Type the final >.
4. Repeat steps 1-4 for each column group that you wish to define. Let us apply this to our example and see the result.

Browser effect is shown on the next page.





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4.1.43 Dividing Table into Horizontal Sections

You can also mark a horizontal section of your table—one or more rows—and then format it all at once. Just follow the following steps to divide table into horizontal sections:

1. Before the first `<TR>` tag of the section you want to create, type `<THEAD>`, `<TBODY>` or `<TFOOT>`.
2. If required, define the desired attributes for the section.
3. Type `>`.
4. If necessary, create the section's contents.
5. Close the section with `</THEAD>`, `</TBODY>`, or `</TFOOT>`.

4.1.44 Creating Headers

Let us now turn our table into a decent looking table by having headers in it. Obviously the headers will be placed on the top of the text. Follow the following steps to do so:

1. Type `<TABLE>`.
2. Type `<TR>` to define the beginning of the first row.
3. Create the first header cell in the first by typing `<TH>`.
4. Type the contents of the first header cell.
5. Repeat steps 3-4 for each header cell.
6. Type `<TR>` to begin the second row.
7. Type `<TD>` to define the first regular cell in the second row.
8. Type the cell data.
9. Repeat steps 7-8 for each regular cell.
10. To finish the table, type `</TABLE>`.

Create the table as per the text and see the result in the browser, as shown on the next page.

4.1.45 Adding a Border

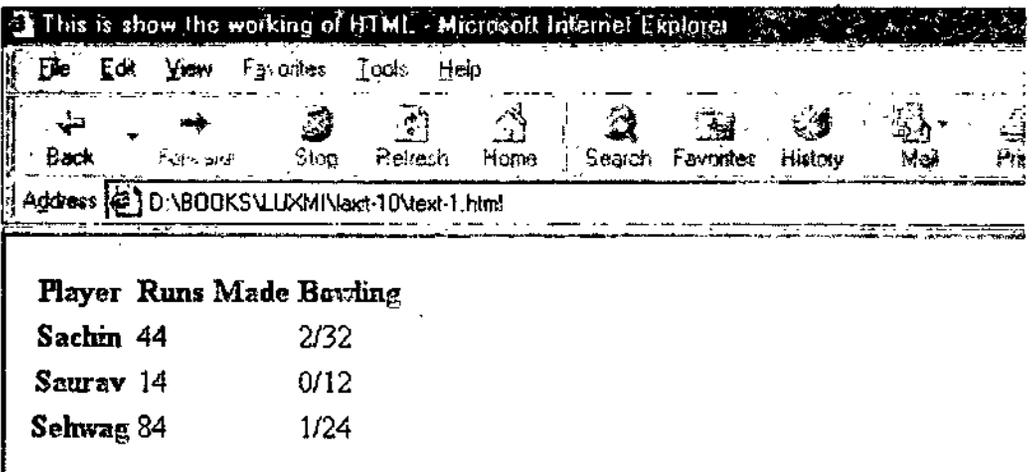
By putting the border around the table you can highlight it. Let us see how it done.

1. Inside the initial `TABLE` tag, type `BORDER`.

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```

text-1 WordPad
File Edit View Insert Format Help
[Icons]
Courier New (Western) 10 [B] [I] [U] [Align] [List]
<TABLE>
<TR>
    <TH>Player
    <TH>Runs Made
    <TH>Bowling
<TR>
    <TH>Sachin
    <TD>44
    <TD>2/32
<TR>
    <TH>Saurav
    <TD>14
    <TD>0/12
<TR>
    <TH>Sehwag
    <TD>84
    <TD>1/24
</TABLE>
    
```



2. If desired, type =n, where n is the thickness in pixels of the border.
3. If desired, type BORDERCOLOR="#rrggbb", where rrggbb is the hexadecimal representation of the desired colour for the border.
4. If desired, type BORDERCOLOR-DARK="#rrggbb", where rrggbb is the hexadecimal representation of the colour that you want to use for the darker parts of the border.
5. If desired, type BORDERCOLOR-LIGHT="#rrggbb", where rrggbb is the hexadecimal representation of the colour that you want to use for the lighter parts of the border.

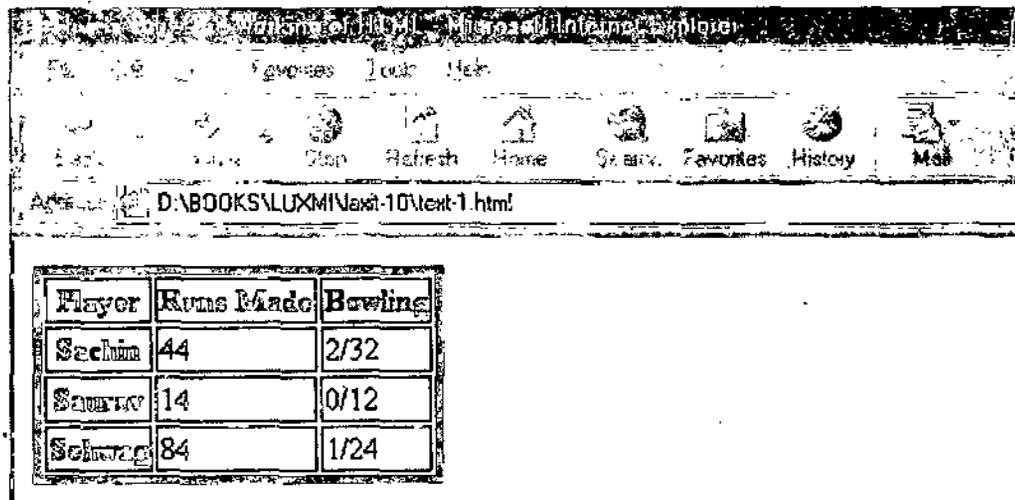
Let us apply a border to our table and see the result. Notice that I have used border width as 4 and border colour as blue.

```

<TABLE BORDER=4 BORDERCOLOR="blue">
<TR>
  <TH>Player
  <TH>Runs Made
  <TH>Bowling
<TR>
  <TH>Sachin
  <TD>44
  <TD>2/32

```

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4.1.46 Putting a Background Image

You can have a background image for the table of yours. Let us use the same old crane figure as the background for our table. See how it is done.

1. Within the TH or TD tag, type `BACKGROUND="crane.jpg"`.

See the HTML text and the result of the same in the browser on the next page.

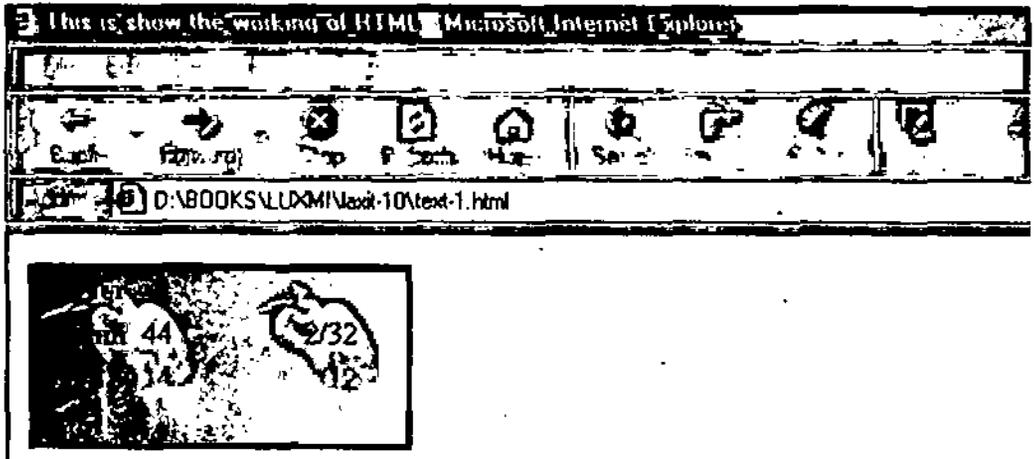
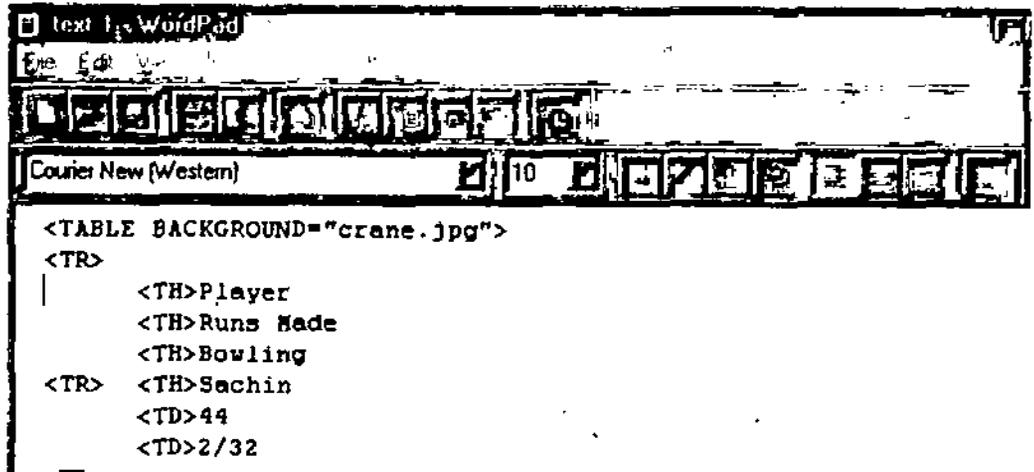
As you can see that the background colour of the crane is stronger than the text of the table so it is somewhat hiding the text.

4.1.47 Heading Across Two or More Columns

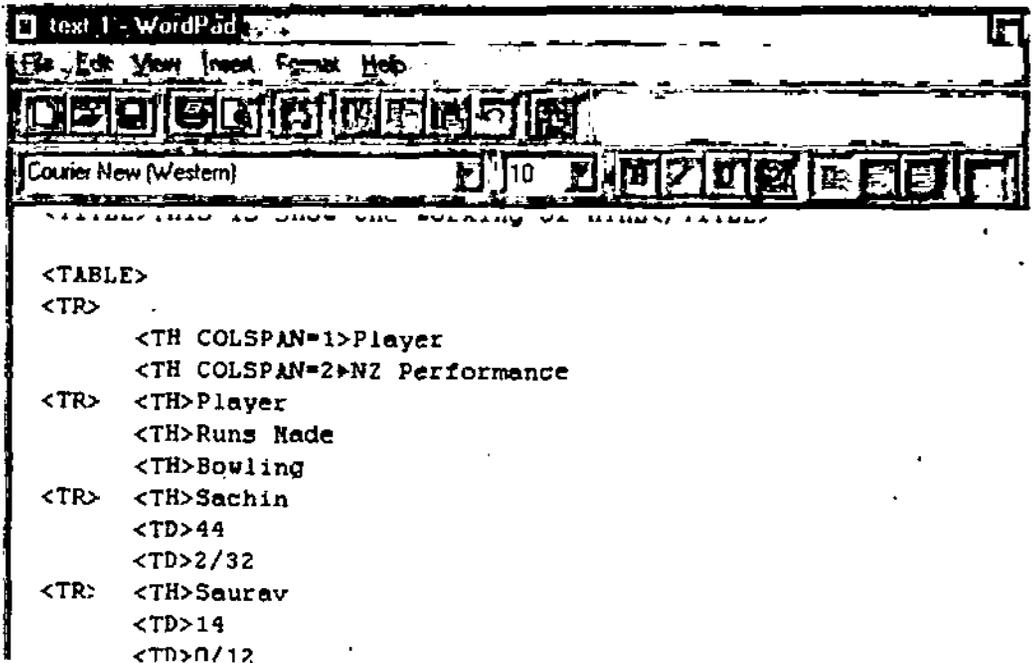
Assume that you have 3 columns and 2 of them have a common heading. For this we would be using this option. Let us see how the heading can be divided like this.

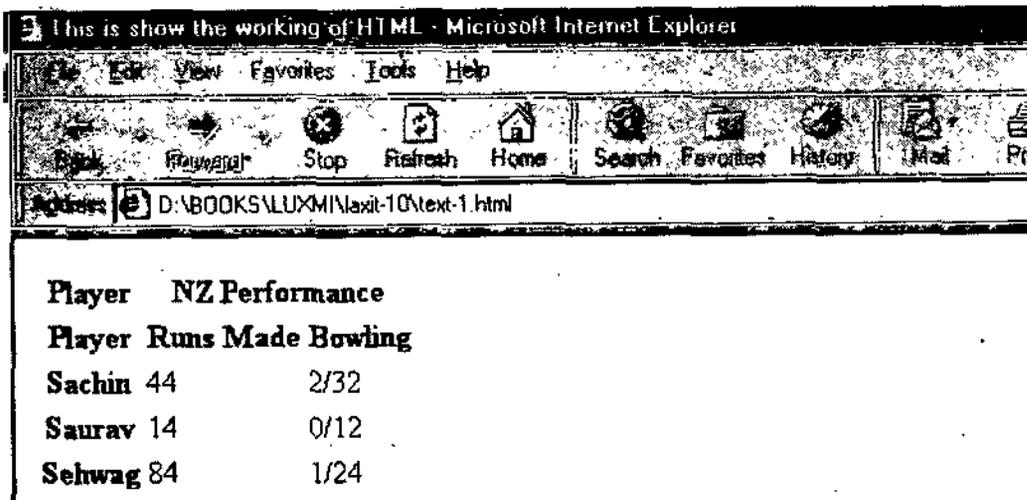
1. When you get to the point in which you need to define the cell that spans more than one column, either type `<TH` or type `<TD`, depending on whether the cell should be a header cell or a regular cell, respectively.
2. Type `COLSPAN=n>`, where n equals the number of columns the cell should span.
3. Type the cell's contents.
4. Complete the rest of the table. If you create a cell that spans 2 columns,

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you will need to define one less cell in that row. If you create a cell that spans 3 columns, you will define two less cells for the row. And so on.





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4.1.48 Changing Colour of a Cell

You can change the colour of a cell to give it more important than the other ones. Let us see how it is done.

1. Within the TH or TD tag, type BGCOLOR=.
2. Type "#rrggbb", where rrggbb is the hexadecimal representation of the desired color.

Or

type color, where color is one of the 16 predefined color names

Here I have changed the colour of the row containing Sachin, see the text and its effect in the browser, as shown on the next page.

4.1.49 Aligning the Contents of Cells

You can align the text in a cell of a table according to your liking. For this we use the tag called ALIGN or VALIGN for vertical alignment. This is how this is done.

1. Place the cursor in the initial tag for the cell, row, or section, after the name of the tag but before the final >.
2. Type ALIGN=direction, where direction is left, center, right, justify (flush on both sides), or char (aligned with a given character).
3. If you've used char in step 2, type CHAR="a", where a is the character to be used for alignment (like a decimal point or decimal comma).

The results are shown on the next page.

4.1.50 Display of Tables

Tables sometimes appear very slowly in the browser. For increasing the speed of display of these tables, you must follow the following steps:

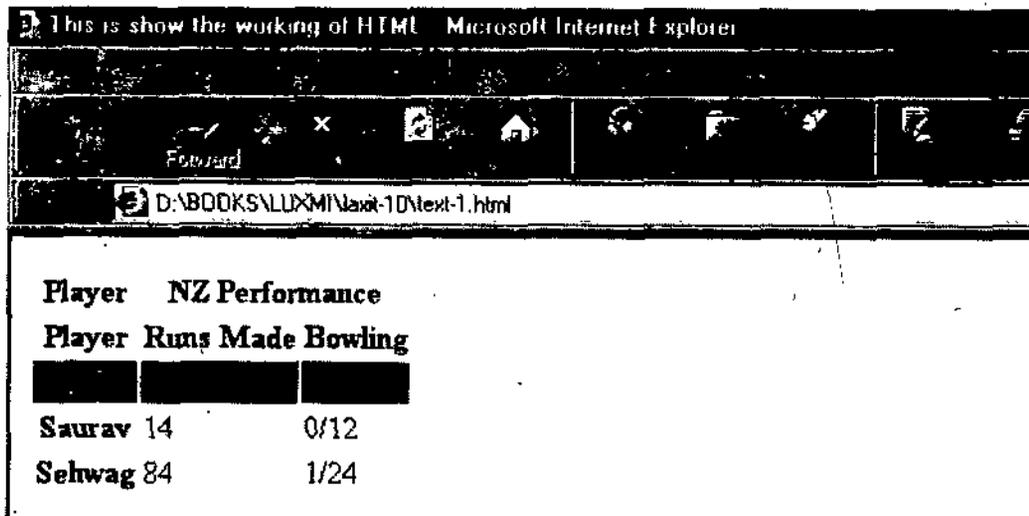
1. Use absolute values (in pixels) or percentages for determining cell width.
2. Use only specify proportional widths for cells, columns, and horizontal sections when you've already set a fixed width in pixels for the entire table.
3. Divide your table into column groups.

NOTES

```

text - WordPad
[Icons]
Courier New (Western) 10
<TH COLSPAN=1>Player
<TH COLSPAN=2>NZ Performance
<TR> <TH>Player
      <TH>Runs Made
      <TH>Bowling
<TR> <TH BGCOLOR="red">Sachin
      <TD BGCOLOR="red">44
      <TD BGCOLOR="red">2/32
<TR> <TH>Saurav

```



4.1.51 Working with Forms

It is not that you display your products only on the web site. You make the site interactive to have people respond to it. This response may be in the form of feed back, purchase order or just comments. For all these we use what is called the Forms. The main idea to get information from the visitors of the site. These forms are integral part of the HTML and are easy to create, as you would learn in this chapter.

HTML allows you to have the forms in such a way that the user has minimum effort to do. It usually is in the form of buttons or options to choose from. Then you have text boxes for users to fill up, or have check boxes, drop-down menus, larger text areas and even clickable images.

4.1.52 Creating a Form

We can divide the form into 3 parts:

1. FORM tag, which includes the URL of the CGI script that will process the form;
2. Form elements, like fields and menus;
3. Submit button, which sends the data to the CGI script on the server.

text1 WordPad

Courier New (Western) 10

```

<TH>Runs Made
<TH>Bowling
<TR ALIGN=CENTER>
<TH BGCOLOR="red">Sachin
<TD BGCOLOR="red">44
<TD BGCOLOR="red">2/32
<TR ALIGN=CENTER>
<TH>Saurav
<TD>14
<TD>0/12
<TR ALIGN=CENTER>
<TH>Sehwag
<TD>84
<TD>1/24
</TABLE>

```

This is show the working of HTML Microsoft Internet Explorer

D:\BOOKS\LUXMI\text-10\text-1.html

Player	NZ Performance	
Player	Runs Made	Bowling
Saurav	14	0/12
Sehwag	84	1/24

Let us see how this is done.

1. Type `<FORM` to initiate the form.
2. Type `METHOD=method`, where method is either GET or POST. You would learn about them later in the chapter.
3. Type `ACTION="script.url">` where script.url is the location on the server of the CGI script that will run when the form is submitted.
4. Create the form's contents.
5. Here I am using the form to get information from a possible client.
6. Type `</FORM>` to complete the form.

See how the text is created in Word Pad and its result in the browser.

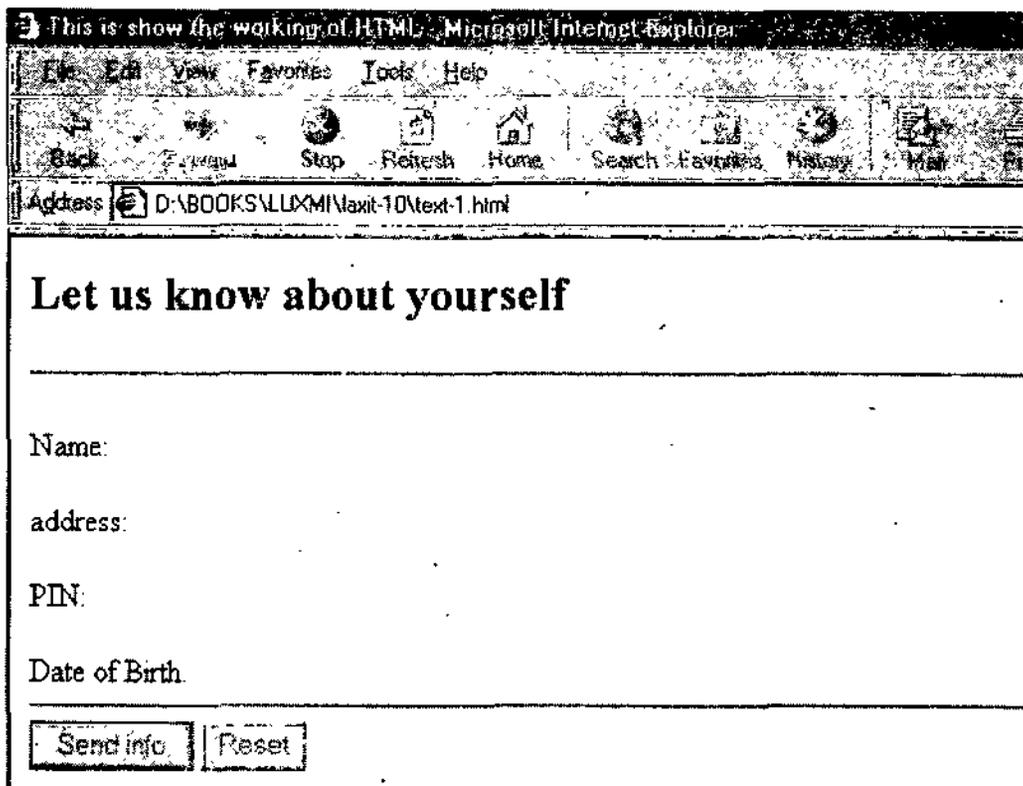
4.1.53 Working with Menus

Menus are the best way of filling up the data. You give the visitors the options of

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```

text-1 - WordPad
File Edit View Insert Format Help
[Icons]
Courier New (Western) 10 [Icons]
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><HTML>
<HEAD>
<TITLE>This is show the working of HTML</TITLE>
<FORM METHOD=POST>
<H2>Let us know about yourself</H2>
<HR>
<p>Name:<INPUT="text" NAME="userid" SIZE="25">
<p>address:<INPUT="text" NAME="address" SIZE="35">
<p>PIN:<INPUT="text" NAME="pin" SIZE="6">
<p>Date of Birth:<INPUT="text" NAME="dob" SIZE="15">
<HR>
<INPUT TYPE="submit" VALUE="Send info">
<INPUT TYPE="reset">
</FORM>
</HEAD>
</BODY>
</HTML>
    
```



selecting one of the few options provided by you. The tag for this is OPTION. Let us see how this is done.

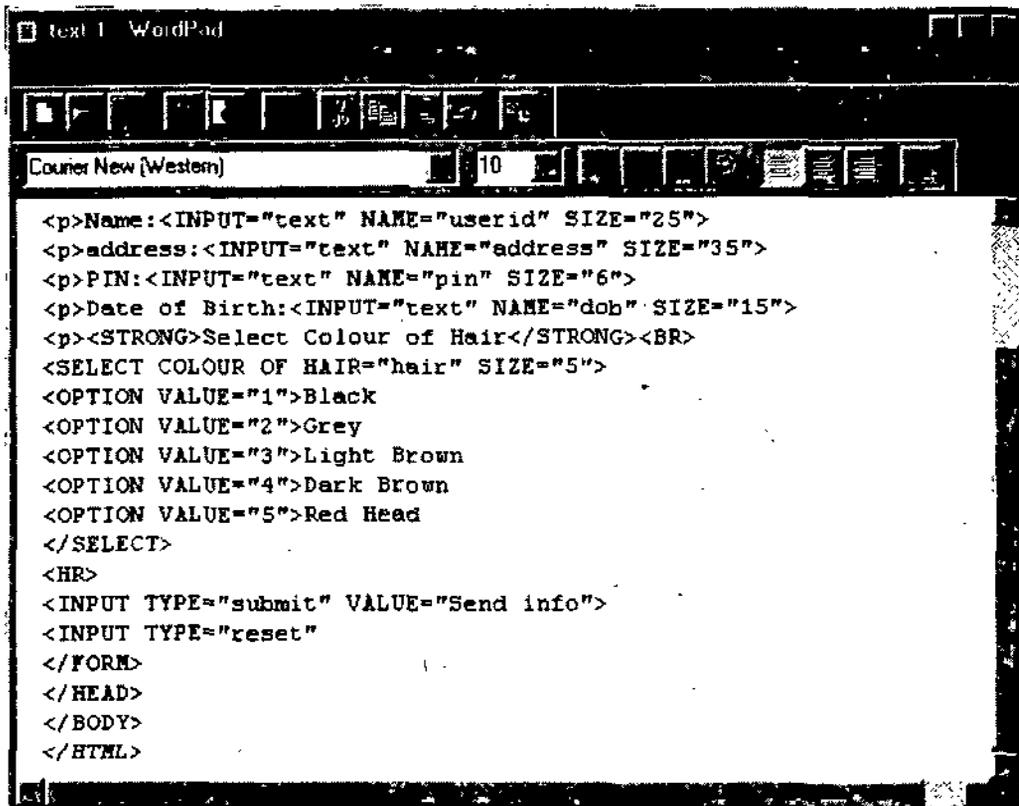
1. Let the first part of the text remain as it was in the earlier example.
2. Type <SELECT.

3. Type NAME="name", where name will identify the data collected from the menu when it is sent to the server.
4. Type SIZE="n", where n represents the number of options that should be initially visible in the menu.
5. Type > to close the option.
6. Type <OPTION to start the next option.
7. Type SELECTED if you want the option to be selected by default.
8. Type VALUE="value", where value specifies the data that will be sent to the server when the option is selected.
9. Type > to close this option.
10. Type the option name as you wish it to appear in the menu.
11. Repeat steps 6-10 for each option.
13. Type </SELECT> to close the select option.

NOTES

In the earlier form I have added the colour of the hair of the person. The options I have taken are: Black, Grey, Light Brown, Dark Brown and Red Head.

On the next page, you can see the effect in the browser and the text here.



```

<p>Name:<INPUT="text" NAME="userid" SIZE="25">
<p>address:<INPUT="text" NAME="address" SIZE="35">
<p>PIN:<INPUT="text" NAME="pin" SIZE="6">
<p>Date of Birth:<INPUT="text" NAME="dob" SIZE="15">
<p><STRONG>Select Colour of Hair</STRONG><BR>
<SELECT COLOUR OF HAIR="hair" SIZE="5">
<OPTION VALUE="1">Black
<OPTION VALUE="2">Grey
<OPTION VALUE="3">Light Brown
<OPTION VALUE="4">Dark Brown
<OPTION VALUE="5">Red Head
</SELECT>
<HR>
<INPUT TYPE="submit" VALUE="Send info">
<INPUT TYPE="reset"
</FORM>
</HEAD>
</BODY>
</HTML>

```

If you have a particularly large menu with many options, you may want to group the options into categories and place them in submenus. This is how it is done.

1. Create a menu as described above.
2. Before the first <OPTION> tag in the first group that you wish to place together in a submenu, type <OPTGROUP>.

NOTES

This is show the working of HTML. Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail News RSS

Address D:\BOOKS\LUXMI\Nad-10\text-1.html

Let us know about yourself

Name:

address:

PIN:

Date of Birth:

Select Colour of Hair

- Grey
- Light Brown
- Dark Brown
- Red Head

3. Type LABEL="submenutitle">, where submenutitle is the header for the submenu.
4. After the last <OPTION> tag in the group, type </OPTGROUP>.
5. Repeat steps 2-4 for each submenu.

4.1.54 working with Radio Buttons

Instead of giving the options of selecting one of the options to the user, you can provide buttons for him to click one of them as a feedback. These buttons are also known as radio buttons, because of their similarity of the ones used on the radio panels. Let us use our earlier examples and create radio buttons for the same.

1. Let the matter before the options value remain the same.
2. Instead of <OPTION VALUE, type <INPUT TYPE="radio" and follow it up with NAME="hair" VALUE="one of the values".
3. Put > to close the input type.
4. Follow it up with the actual value of the type, in this case hair.
5. Repeat the steps 2 to 4 for all the values.
6. You can use PRESSED to make the radio button active by default when the page is opened.
7. Let the remaining text remain as it is.

See the text and the browser effect on the next page.

```

text-1 - WordPad
File Edit View Insert Format Help
[Icons]
Counter New (Western) 10 [Icons]
<p>Name:<INPUT="text" NAME="userid" SIZE="25">
<p>address:<INPUT="text" NAME="address" SIZE="35">
<p>PIN:<INPUT="text" NAME="pin" SIZE="6">
<p>Date of Birth:<INPUT="text" NAME="dob" SIZE="15">
<p><STRONG>Select Colour of Hair</STRONG><BR>
<INPUT TYPE="radio" NAME="hair" VALUE="Black">BLACK
<INPUT TYPE="radio" NAME="hair" VALUE="Grey">GREY
<INPUT TYPE="radio" NAME="hair" VALUE="Light Brown">LIGHT BROWN
<INPUT TYPE="radio" NAME="hair" VALUE="Dark Brown">DARK BROEN
<INPUT TYPE="radio" NAME="hair" VALUE="Red Head">RED HEAD
<HR>
<INPUT TYPE="submit" VALUE="Send info">
<INPUT TYPE="reset"
</FORM>
</HEAD>
</BODY>
</HTML>

```

NOTES

This is show the working of HTML - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print

Address D:\BOOKS\LU\MI\text-10\text-1.html

Let us know about yourself

Name: _____

address: _____

PIN: _____

Date of Birth: _____

Select Colour of Hair

BLACK GREY LIGHT BROWN DARK BROWN RED HEAD

4.1.55 Check Boxes

Check boxes are very similar to radio buttons. Instead of rounded hollow buttons, they are square boxes. I am not showing any text here, but on the next page, you will see the output, as it would appear in the browser. The only thing to change in the text is that you replace radio with checkbox.

NOTES

This is show the working of HTML - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail

Address D:\BOOKS\LLD\MI\text-10\text-1.html

Let us know about yourself

Name:

address:

PIN:

Date of Birth:

Select Colour of Hair

BLACK GREY LIGHT BROWN DARK BROWN RED HEAD

4.1.56 Text Boxes

So far we have given the options for the user to click, we have not asked him to fill up some boxes. The text boxes which we are going to talk about now need to be filled up by the user. Of course, you must know how much space you want to leave for him to fill up or how much space he would be needing to fill up. Let us see how this is done.

1. We leave the text which we have already filled up in our example.
2. Type `<INPUT TYPE="text">`.
3. Type `NAME="title"`, where title is the word that identifies the data entered in the text box when it is collected by the server.
4. If desired, define the size of the box on your form by typing `SIZE="n"`, replacing n with the desired width of the box, measured in characters.
5. If you want you can even set the maximum number of characters that can be entered in the box by typing `MAXLENGTH="n"`, where n is the desired maximum length in characters.
6. Finish the text box by typing a final `>`.

This will create the blank boxes for the user to fill up. Next, both the text and browser result are shown. *Introduction to Internet Technologies*

NOTES

The image shows two screenshots. The top one is a WordPad window titled 'text1 - WordPad' containing the following HTML code:

```
<TITLE>This is show the working of HTML</TITLE>
<FORM METHOD=POST>
<H2>Let us know about yourself</H2>
<HR>
<p>Name:<INPUT TYPE="text" NAME="userid" SIZE="25">
<p>address:<INPUT TYPE="text" NAME="address" SIZE="35">
<p>PIN:<INPUT TYPE="text" NAME="pin" SIZE="6">
<p>Date of Birth:<INPUT TYPE="text" NAME="dob" SIZE="15">
<p><STRONG>Select Colour of Hair</STRONG><BR>
<INPUT TYPE="checkbox" NAME="hair" VALUE="Black">BLACK
```

The bottom screenshot is a Microsoft Internet Explorer window titled 'This is show the working of HTML - Microsoft Internet Explorer'. The address bar shows 'D:\BOOKS\LLDXMI\text-10\text-1.html'. The page content displays the rendered HTML form:

Let us know about yourself

Name:

address:

PIN:

Date of Birth:

Select Colour of Hair

BLACK GREY LIGHT BROWN DARK BROWN RED HEAD

4.1.57 Larger Text Areas

You are not going to ask the user to write thesis, but, sometimes you have to give me space to fill up, maybe, some comments. For this you need a larger text area. for this

we use the tag called TEXTAREA and the parameters contain the number of rows and columns.

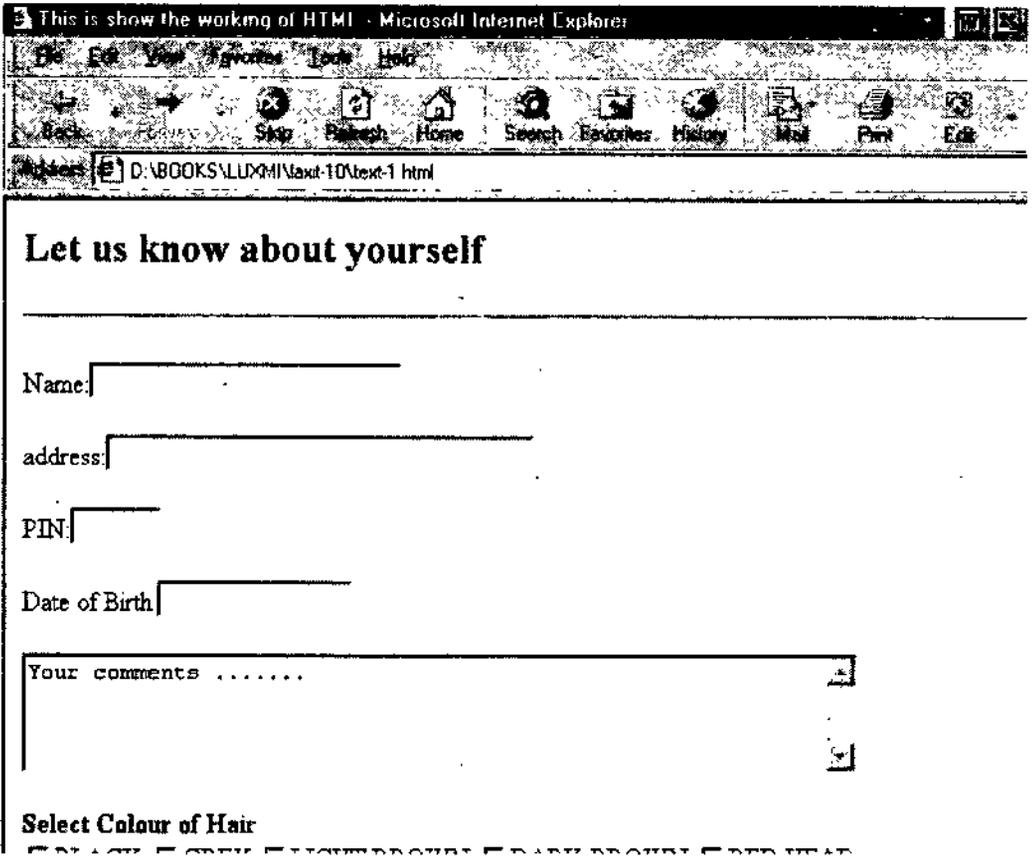
Let us use this in our text and see the result, as shown below.

NOTES

```

text-1 - WordPad
File Edit Format View Help
[Icons]
Courier New (Western) 10 [Icons]
<H2>Let us know about yourself</H2>
<HR>
<p>Name:<INPUT TYPE="text" NAME="userid" SIZE="25">
<p>address:<INPUT TYPE="text" NAME="address" SIZE="35">
<p>PIN:<INPUT TYPE="text" NAME="pin" SIZE="6">
<p>Date of Birth:<INPUT TYPE="text" NAME="dob" SIZE="15">
<p><TEXTAREA NAME="answer" ROWS="4" COLS="60">Your comments .....</TEXTAREA>
<p><STRONG>Select Colour of Hair</STRONG><BR>
<INPUT TYPE="checkbox" NAME="hair" VALUE="Black">BLACK

```



4.1.58 Password Boxes

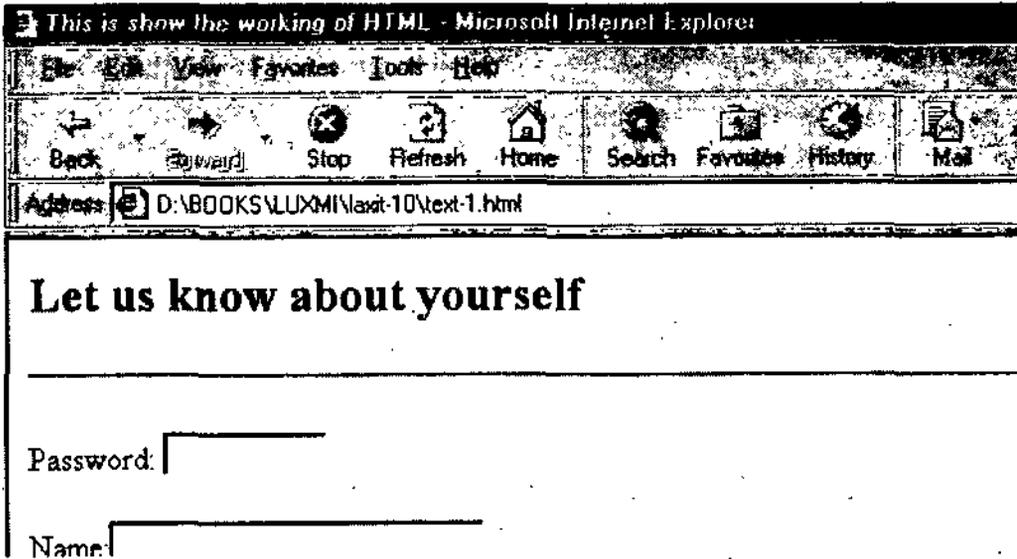
You can even provide space for creating a password by just adding a line as shown below:

```

<p>Password: <INPUT TYPE="password" NAME="password" SIZE="10">

```

Use this in your text and you would a result as shown below:



NOTES

4.1.59 Submit Button

It is not that you can use graphics in the text only, you can use them in the submit buttons also. Alongwith submit button, you can place a graphic too, which the user will click to respond. Let us see how this is done.

1. Type `<INPUT TYPE="reset">`.
2. If desired type `VALUE="reset message"` where reset message is the text that appears in the button. The default reset message is Reset.
3. Type `>`.

With HTML 4 (and Explorer for the time being), you can add images, font choices, and even a background color to your reset button. Let us see how this is done.

1. Type `<BUTTON NAME="reset" VALUE="reset" TYPE="reset">`.
2. If desired, type `STYLE="font: 24pt ArialBlack; background:yellow"` to change the appearance of the button text.
3. Type `>`.
4. Type the text, if any, that should appear on the left side of the image in the button.
5. Type `<IMG SRC="crane.jpg"`, where crane.jpg is the name of the image that will appear on the button.
6. If desired, add any other image attributes.
7. Type `>` to complete the image.
8. Type the text, if any, that should appear on the right side of the image in the button.
9. Type `</BUTTON>`.

See next how the submit button has been used in its text and the result in the browser.

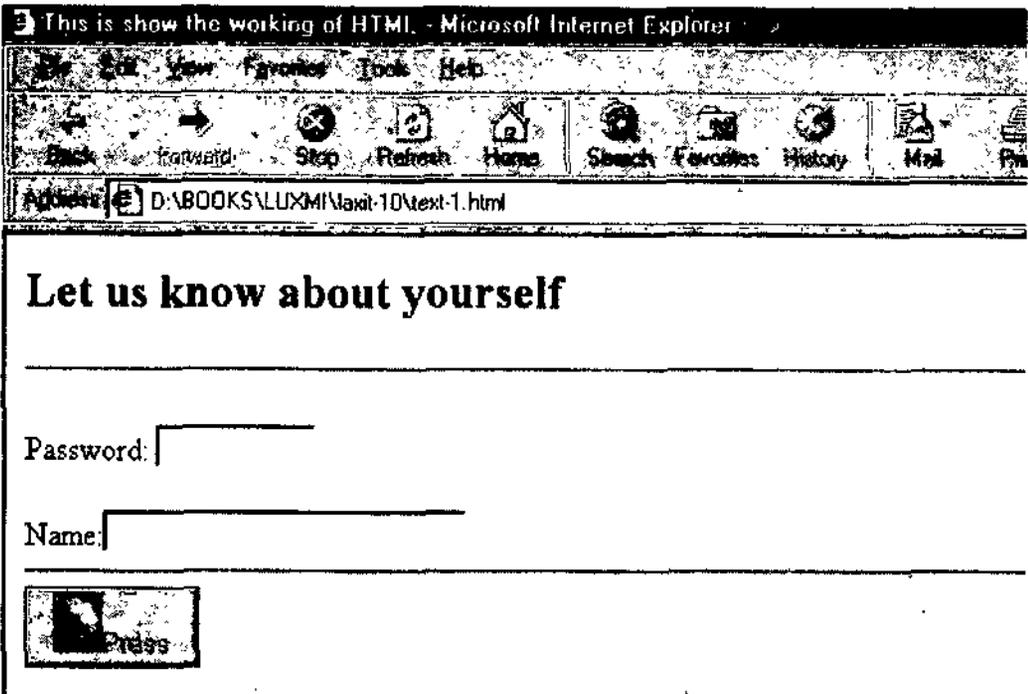
4.1.60 Resetting the Form

While filling up the form, it is very likely that the visitor may make a mistake which

NOTES

```

text-1 - WordPad
Courier New (Western) 10
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><I
<HEAD>
<TITLE>This is show the working of HTML</TITLE>
<FORM METHOD=POST>
<H2>Let us know about yourself</H2>
<HR>
<p>Password: <INPUT TYPE="password" NAME="password" SIZE="10">
<p>Name:<INPUT TYPE="text" NAME="userid" SIZE="25">
<HR>
<BUTTON TYPE="submit" NAME="submit" VALUE="submit">
<IMG SRC="crane.jpg" WIDHT=30 HEIGHT=30>Press</BUTTON>
</FORM>
</HEAD>
    
```



can of spelling, or second thought. You can give your visitors a reset button so that they can start over with a fresh form. Let us see how this is done.

1. Type <INPUT TYPE="reset".
2. If desired type VALUE= "reset message" where reset message is the text that appears in the button. The default reset message is Reset.
3. Type > to close the tag.

With HTML you can add images, font choices, and even a background color to your reset button. Let us see how this is done.

1. Type <BUTTON NAME="reset" VALUE="reset: TYPE="reset".

2. If desired, type `STYLE="font: 24pt ArialBlack; background:yellow"` to change the appearance of the button text.
3. Type `>` to close the tag.
4. Type `<IMG SRC="crane.jpg,"`, the name of the graphic which we have been using.
5. Type `>` to complete the image.
6. Type the text, if any, that should appear on the right side of the image in the button.
7. Type `</BUTTON>` to close the button command.

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4.1.61 Allowing Visitors to Upload Files

You can even ask your visitors to send an entire file of information instead of filling up the form. Let me show you how this is done.

1. Make sure you have `METHOD=POST` in the `FORM` tag. You cannot use the `GET` method for a form that includes a file upload area.
2. In the `FORM` area, type the caption for the file upload area. Something like "What file would you like to upload?"
3. Type `<INPUT TYPE="file"` to create a file upload box and a Browse button.
4. Type `ENCTYPE="multipart/form-data"` so that the file is uploaded in the proper format.
5. Type `NAME="title"`, where title identifies to the server the files being uploaded.
6. If desired, type `SIZE="n"`, where n is the width (in characters) of the field in which the visitor will enter the path name to the file.
7. Type the final `>` to complete the file upload area.

4.1.62 Active Images

You may use images as active elements in a `FORM` area. A click on the image appends the current mouse coordinates (as measured from the top left corner) to the variable name and sends the data to the server. See how it is done.

1. Create a GIF image and save it in your images directory on your server.
2. Type `<INPUT TYPE="image"`.
3. Type `SRC="image_url"` where `image_url` is the location of the image on the server.
4. Type `NAME="name"`. When the visitor clicks on the image, the x and y coordinates of the mouse will be appended to the name defined here and sent to the server.
5. Type the final `>` to finish the active image definition for the `FORM`.

4.2 DHTML

Dynamic HTML (DHTML) combines HTML with Cascading Style Sheets (CSS) and scripting languages. It has the following features:

NOTES

- From HTML it takes Web page's elements, like a table, a heading, a paragraph or a bulleted list.
- From CSS it takes a style to determine an element's size, color, position and a number of other features.
- From scripting languages it manipulates the Web page's elements, so that the styles you assigned to them can change in response to an end user's input.

DHTML makes Web page events seemingly instantaneous: they occur within the browser after the page has downloaded. With DHTML, Web pages become very much like other software applications.

Microsoft and Netscape, the companies behind the two most popular Web browsers, each have a version of DHTML. Both are called "DHTML" and each vendor's version is compatible only with its own browser.

Microsoft and Netscape have proposed separate versions of DHTML to the World Wide Web Consortium. Each, of course, hopes the Consortium adopts its proposal and stamps it the official version, but it's probably the case that a sort of hybrid will emerge.

4.2.1 Using DHTML in Internet Explorer

Let us now see how DHTML can be used in Internet Explorer. By using this you can do the following:

- Moving your mouse through a heading on the top of the page will cause a hidden text display to appear and will change the color of the heading.
- Moving your mouse through the heading will also change the color and the content of a small box on the page.
- Clicking on the heading will cause a box in the center of the page to split into four boxes that move outward toward the corners of the page, revealing a short message in the center of the page.
- The centered message will appear to be layered above the text display.
- Moving the mouse out of the heading will return the page to its original appearance.

4.2.2 DHTML in Netscape Navigator

Netscape implementations of dynamic HTML is more limited than Microsoft's. The following list contains the key elements of Netscape's version of dynamic HTML.

- Absolute positioning—You can update cascading style sheet positioning coordinates in a page at any time to create animated effects, and you can also use layers to do the same thing.
- DOM—Netscape's dynamic HTML provides an object model for HTML, just as Microsoft does. However, Netscape's DOM is more limited.
- Downloadable fonts—You can download fonts from the Internet and install them in your Web pages.
- Dynamic content—You can change the content of a page in Netscape Navigator at any time, adding or deleting items.

Thus, Netscape's implementation of dynamic HTML is more restricted than Microsoft's. *Introduction to Internet Technologies*

4.2.3 Heading and Horizontal Line

Let's get started. Open you WordPad file, select File, Save As, and save the file as .htm file. You can name it as per your wish. Change the title of the page by typing My First Dynamic Web page between <TITLE> and </TITLE>. Inside the </BODY> tag, type Style = "background-color: 'Silver' " to give your page that macho silver-gray color you see in many applications.

This expression is called a style sheet. Because it's inside a tag, it's an inline style sheet. As you can see, in this context, Style is an attribute and its value is a string. The string contains a style property, a colon and the value of the property. A style sheet can hold more than one property value pair and when it does, a semicolon separates adjacent pairs.

Next, center an H1 heading by typing:

```
<H1 Style = "text-align:center">Dynamic HTML: Master the Essentials</H1>
```

after the <BODY> tag. To follow the heading with a horizontal line, type <HR>.

At this point, we're going to add an extremely important attribute to the <H1> tag. This attribute, ID, will give us a way of referring to the header when we have to work with it in a scripting language. Inside the <H1> tag, type ID = h1Header.

Your document should look like this:

```
<HTML>
<HEAD>
<TITLE>My First Dynamic HTML Page</TITLE>
</HEAD>
<BODY Style = "background-color:'silver' ">
<H1 ID = h1Header Style = "text-align:center">Dynamic HTML:
Master the Essentials</H1>
<HR>
</BODY>
</HTML>
```

The page in Internet Explorer looks like figure shown next.

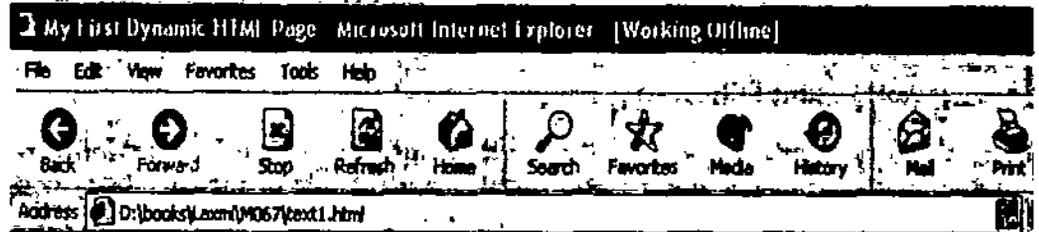
4.2.4 Hidden Message

Next step is very important. To create the remaining elements of the page, we'll divide the page into segments called DIVs. Each segment starts with <DIV> and ends with </DIV>. After we've created our segments, we'll script them to exhibit the desired effects.

Let's create a segment to hold the hidden message that you see in a large, bold, white font. Just after the <HR> tag, type:

NOTES

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Dynamic HTML: Master the Essential

```
<DIV ID = divMessage>
</DIV>
```

Next, type the message between these two DIV tags. Put the message in a paragraph (that is, enclose it with a <P> and a </P>) and make it a bulleted list.

Here's the HTML to type between the DIV tags:

```
<P> Movies released today are:
<UL>
<LI> Khel
<LI> Baghban
<LI> Rules
<LI>...and Many More!
</UL>
</P>
```

We've typed the message, but so far its appearance in Internet Explorer would be pretty nondescript. We haven't colored the text white, enlarged it or made it bold. We also haven't positioned the message on the page.

To take care of the message's size, appearance and position, we'll add information to the <DIV> tag. We add the information as a group of styling specifications in an inline style sheet. Within the <DIV> tag, type:

```
Style
"Position:Absolute;Left:5%;Top:10%;Visibility:Hidden;z-
index:-1;font-style:normal;font-weight:bold;font-
family:Normal;font-size:50; color:'White'"
```

The first property-value pair, Position: Absolute, tells the browser to position the DIV with respect to the top edge and left edge of the browser window. The next two property-value pairs show one way that style sheets let you specify position – via percentages of distance from the left edge and the top edge of the browser window.

The first of the two pairs positions the DIV's left side 5 percent of the distance from the left edge to the right and the second positions its top edge 10 percentage of the distance from the top of the browser to the bottom. The fourth pair, Visibility:Hidden, keeps the message invisible when the page opens.

The next pair positions the DIV in the "third dimension." If you look closely at

figure you'll see that the large, white-lettered message appears to be underneath the message in the center of the screen and underneath the page's heading. The z-index, the deeper the apparent layer of its element.

The remaining property-value pairs determine the message font's size, weight, appearance and color. The font-size attribute's value, 50, specifies a font whose size is 50 pixels.

4.2.5 The Message at the Center of the Page

Now we'll create another message at the center of the page. Create a <DIV> tag called divLearn and then position it by pixels, rather than percentages. We'll position it 180 pixels from the left edge of the page and 200 pixels from the top edge:

```
<DIV ID = divLearn Style = "Position:Absolute;Left:180;
Top:200;">
```

It will be helpful to confine the message to a specific width – say, 210 pixels – so that we can make its text cover three lines. To overlay the message on top of the large white-font text display, we'll give a z – index of 0.

```
<DIV ID = divLearn Style = "Position:Absolute;Left:180;
Top:200;Width:210;z-Index:0;">
```

The message will reside in a paragraph:

```
<P>
Learn how to create striking effects on your Web pages.
```

```
</P>
and we'll add some styling information to the <P> tag. In this tag, we can specify an appearance, size and weight for the font. The entire <P> tag should look like this:
```

```
<P ID = pLearn Style = "font-family:cursive; font-size:15pt;font-weight:bold">
```

here's the HTML for the DIV:

```
<DIV ID = divLearn Style = "Position:Absolute;Left:180;
Top:200;Width:210;z-Index:0;">
```

```
<P ID = pLearn Style = "font-family:cursive; font-size:15pt;font-weight:bold">
```

```
Learn how to create striking effects on your Web pages.
```

```
</P>
</DIV>
```

4.2.6 Moving Boxes

To create the effect of a box that splits into four boxes, we position four boxes in the center of the page and give them all the same background color. Each box will be a separate DIV. I used blue as the background color, but you can pick any color you like. I also specified a color property and a text-align property, because we'll use them in an exercise.

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Here is one way to write the DIVs for the boxes:

```
<DIV ID = divBox1 Style="background-
color:blue;color:blue;text-
align:center;position:Absolute;Left:150;Top:180;
Width:120;Height:60;z-index:1 ">
</DIV>
<DIV ID = divBox2 Style="background-color:blue;color:blue;
text-align:center; position:Absolute;Left:270;Top:180;
Width:120;Height:60;z-index:1 ">
</DIV>
<DIV ID = divBox3 Style="background-color:blue;color:blue;
text-align:center;position:Absolute;Left:150;Top:240;
Width:120;Height:60;z-index:1 ">
</DIV>
<DIV ID = divBox4 Style="background-color:blue;color:blue;
text-align:center;position:Absolute;Left:270;Top:240;
Width:120;Height:60;z-index:1 ">
</DIV>
```

If you write the DIVs this way, you will create the boxes in figures, but the CSS syntax presents another possibility. Instead of writing the colors, text alignment, width and height four times, we can put the style specifications for these properties at the beginning of the document, between <HEAD> and </HEAD>; give those specifications a name and then that name within each box's <DIV> tag.

Here's how to do it. After the <HEAD> tag in your document, type:

```
<STYLE Type = "type/css">
</STYLE>
```

We'll put the style information between these two tags. To give a name ("bluebox") to the style specifications and specify the background color, color, text alignment, width and height for the boxes, type:

```
.bluebox {background-color:blue;
color:blue;
text-align:center;
width:120;
height:60}
```

after your newly created <STYLE> tag. When you preface the name of a style with a dot, you create a style class. Note the consistent syntax for the style sheet. We will use a color to separate a property from its value and a semicolon to separate adjacent property-value pairs. With the style specified as a class in the head of your document, you insert the name of the class in each box's DIV.

Here's the HTML for the movable boxes:

```
<DIV ID = divBox1 Class="bluebox" Style="Position:Absolute;
Left:150;Top:180; z-index:1 ">
```

```
</DIV>
```

```
<DIV ID = divBox2 Class = "bluebox" Style="Position:Absolute;
Left:270;Top:180; z-index:1 ">
```

```
</DIV>
```

```
<DIV ID = divBox3 Class = "bluebox" Style="Position:Absolute;
Left:150;Top:240; z-index:1 ">
```

```
</DIV>
```

```
<DIV ID = divBox4 Class = "bluebox"
Style="Position:Absolute;Left:270;Top:240; z-index:1 ">
```

```
</DIV>
```

Save your work and open the page in Internet Explorer.

4.2.7 Changeable Box

We finish off the page design by creating the box in the lower right corner. The box changes color and content when you pass the mouse through the heading at the top of the page. You can see this by comparing figures.

By now, you've probably guessed that we'll implement the effect by writing two DIVs, assigning them different z-indices and making one invisible.

We'll write a script that switches the visibility of the DIVs when the mouse passes into the heading the returns to the original values when the mouse passes out of the heading. Here's the HTML that sets up the two DIVs:

```
<DIV ID = divReady Style = "Position:absolute; Top:70%;
Left:80%; Width:10%;z-index:1;Visibility:Visible">
```

```
<P Align = Center Style = "font-family:cursive; Background-
Color:'Beige';Color:Chocolate"> Are<BR>You<BR>Ready?</P>
```

```
</DIV>
```

```
<DIV ID = divReady Style = "Position:absolute; Top:70%;
Left:80%; Width:10%;z-index:1;Visibility:Hidden">
```

```
<P Align = Center Style = "font-family:cursive; Background-
Color:'BlanchedAlmond;Color:Blue">Let's<BR>Get<BR>Started</P>
```

```
</DIV>
```

4.3 WWW

A global hypertext system that uses the Internet as its transport mechanism is called World Wide Web. In a hypertext system, you navigate by clicking hyperlinks, which display another document (which also contains hyperlinks). What makes the Web such an exciting and useful medium is that the next document you see could be housed on a computer next door-or halfway around the world. The Web makes the Internet easy to use.

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Created in 1989 at the European Laboratory for Particle Physics (CERN), a research institute in Switzerland, the Web relies upon the HyperText Transport Protocol (HTTP), an Internet standard that specifies how an application can locate and acquire resources (such as document, sound or graphic) stored on another computer on the Internet. HTTP provides transparent, easy-to-use access to Web documents, FTP (File transfer Protocol) file archives, Gopher menus, and even UseNet newsgroups, users of Web navigation software, called Web browsers, simply click on an underlined word or phrase, and HTTP takes care of locating and downloading the desired documents. Most Web documents are created using the HyperText markup language (HTML), a markup language that is easy to learn and will soon be supplanted by automated tools. Incorporating hypermedia (graphics, sound, animations, and video), the Web has become the ideal medium for publishing information on the Internet.

A key 1995 agreement on security protocols ensures that Web will quickly become an important commercial medium, in which consumers can browse on-line catalog and place orders without worrying about anyone intercepting the supplied credit card information.

4.3.1 Basic Features

Before we go any further in WWW we must learn more about the basics of it. We had earlier learned what Home page, Web page, Hypertext Hyperlinks, etc., mean. Now we will learn what all comes into play when a web page is opened. The following information is not sequential.

1. Information System
2. Graphical Navigation
3. Platform
4. Distribution
5. Accessing Information
6. Interactiveness

Let us read about them in details.

Information System: As we all know that Internet is full of information. It is upto you to explore it. This information is available in the form of a book. As you can jump from one page to another, the Web also allows you to skip from one page to another using the Hyperlink. Once this information is there on the screen, you can copy, move or transfer it to your hard disk for later reading.

Graphical Navigation: The best part of Web is that it can display both text and graphic with equal ease. What's more there are sites which have sound and video too. So much so that they can be called truly multimedia applications.

Platform: The World Wide Web is not limited to any one kind of machine, or developed by any one company. The Web is entirely cross-platform. It can be displayed on any computer hardware using any operating system.

Distribution: When you run the Internet and access any site, everything works in RAM. There is no hard disk space involved. The information is totally distributive and can be distributed anywhere even to the hard disk, only if the need be.

Dynamic: A web site goes through various changes at various instances. So everytime you load the site, you get the latest site on your screen. You need not go

to buy any new software or hardware for that purpose. The web site developer would probably not come and tell you when the site is updated. So while getting the data from the site make sure that you are getting the latest data.

Accessing Information: As mentioned earlier, Internet is full of information. You can get the information from the net using any of the method, maybe FTP, Usenet, Telnet or even e-mail. Although the most popular way of getting the information is by using the software called browsers and the famous ones are Microsoft Internet Explorer and Netscape Navigator. Web browsers can also read files from other Internet services and you can create links to information on those systems just as you would create links to information on Web pages.

Interactiveness: This means that web sites are not just one way information. There are sites which ask for information from you, the users too. This information is mostly taken in the form of Forms (Read how to create forms in Chapter 10 on HTML). This way the web site developers not only get the information but also are able to access and compile the information in any form.

4.3.2 Web Browsers

A software program that is used to view Web pages is called a Browser. Browser help you to connect to Web sites. You can surf the Web, view Web sites and/or download files and programs. A Web browser works by using a protocol called Hypertext Transfer Protocol (HTTP) to request a specially encoded text document from the Web server.

Browsers are so designed that they can run on many kinds of computers and operating systems (also called platforms). Some of the popular browsers are - Microsoft Internet Explorer, Netscape Navigator, Mosaic, Lynx, etc. Amongst these, two browsers are very widely used, namely Netscape's Navigator and Microsoft's Internet Explorer.

4.3.3 Popular Web Browsers

To begin with, there was only one browser, named Mosaic, in use and it was available free of cost. It was written by Marc Andreessen, who later started a new venture for making a new browser called Netscape. With the passage of time, Microsoft incorporated in its browser Internet Explorer many of the features for which Netscape used to be preferred by the users. Others are:

Lynx: It is the text only browser and works on Unix platform. It was developed by University of Kansas. It requires the emulation of terminal VT-100. Designing pages that work equally well in Lynx and in graphical browsers is one of the more interesting challenges of Web page design.

Netscape Navigator: It is available for Windows, Macintosh Operating System and Unix too. It supports features like integrated news and mail reader, etc.

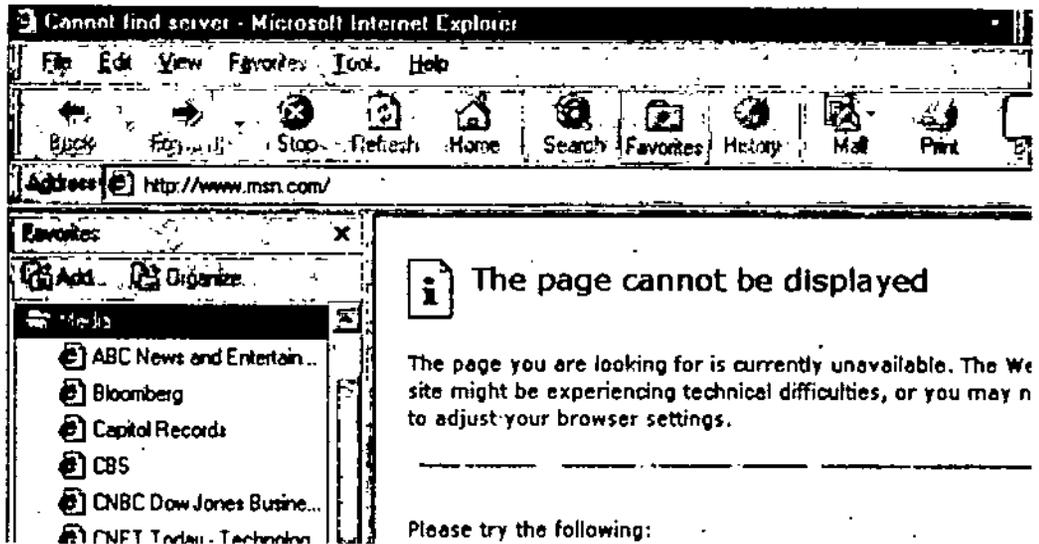
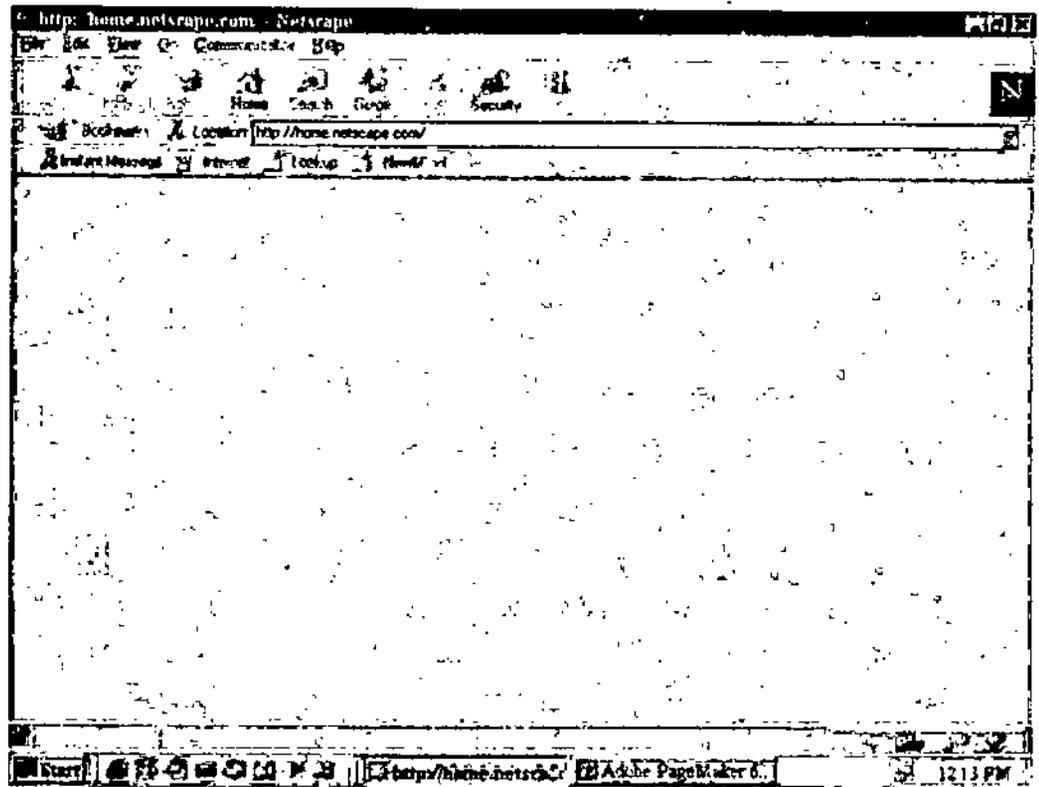
Microsoft Internet Explorer: No doubt the most popular one. It also runs on most of the operating systems. What's more it is usually free with Windows operating system.

4.3.4 Web Servers

To upload a web site a host computer and server software is needed. This manages the communications protocols and the related software required to create a Web

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site on the Internet. The host machine usually uses Unix. There are different types of servers available.

A web server mostly performs the following jobs:

1. The server software includes configuration files and utilities to secure and manage the Web site in a variety of ways.
2. It passes requests to run CGI (Common Gateway Interface) scripts to the CGI applications. These scripts run external mini-programs, such as a database lookup or interactive forms processing.

4.3.5 Hypertext Transfer Protocol (HTTP)

It is used as the communication protocol to transport hypertext documents over the Internet. It tells the server what to send to the client, so that the client can view Web pages, FTP sites or other areas on the Net. It is the mechanism that opens the related documents when you select a hypertext link, no matter where that document resides on the Web. It is non-proprietary, platform independent, open document architecture which works on most of the computers.

4.3.6 Uniform Resource Locator

A URL describes the location and a method of accessing a resource on the Internet. For example, the URL `http://www.adobe.com` describe the name of the site of the company called Adobe Corporation. The term URL is also used to describe the address system used on the Web.

Each URL is unique, identifying a particular point on the Internet. It consists of a string that supplies the Internet address of a resource on the WWW along with the protocol by which the resource is accessed. The most common URL is 'http' which gives the Internet address of a World Wide Web page. Some other URL types are 'gopher' which gives the Internet address of a Gopher directory, and 'ftp' which gives the address of a FTP resource. All Web sites have URLs. One could say a URL is what a telephone number is to a telephone or a street address is to a house.

4.3.7 Search Engines

They are programs that locate needed information in a database, but especially an Internet accessible search service that enables you to search for information on the Internet. To use a search engine, you type one or more key words; the result is a list of documents or files that contain one or more of these words in their titles, descriptions, or text. The databases of most Internet search engines contain World Wide Web (WWW) documents; some also contain items found in Gopher menus and File Transfer Protocol (FTP) file archives.

Compiling the database requires an automated search routine called a spider, forms filled out by Web authors, or a search of other databases of Internet documents. The effectiveness of search engine can be measured in terms of Indexing and Term specificity. Since the Internet is a vast collection of information, it is difficult to find specific information you actually need. Therefore, search engines are more than a boom.

4.3.8 Search Engine Categories

Some of the popular search engines are:

- Yahoo!
- Lycos
- WebCrawler
- Excite

Let us read about them in details.

4.3.9 Yahoo!

No doubt, the most popular and commonly used search engine. It is very simple to

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The screenshot shows a Yahoo! search results page for the query 'computer game'. The browser is Microsoft Internet Explorer. The page features the Yahoo! logo, navigation buttons (Back, Stop, Refresh, Home, Search, Forward, Print, Mail), and a search bar with the query 'computer game'. Below the search bar, there are links for 'Advanced Search' and 'About These Results'. The search results are categorized into 'Inside Yahoo!' and 'Web Matches'. The 'Inside Yahoo!' section includes 'Shopping: PC Games on Yahoo! Shopping' with top brands like EA, Microsoft, and Infogrames, and 'Games: play PC Games Online on Yahoo! Games on Demand'. The 'Web Matches' section lists '1. GameSpot - gaming site offering software and hardware reviews, features, demos, links, hints, ...'. The page also includes a 'Ask or Tech' sidebar with 'Live PC Support' and a '1 Year Plan \$89' offer.

use and mostly gives you the best results. It indexes Web pages, Usenet and e-mail addresses. The search has 14 categories listed on its homepage. Each of these categories is divided into several subcategories. If the search fails, it is automatically passed on to AltaVista for more search. Yahoo! provides other services too like e-mail accounts, searches to locate people, sites, news, etc.

4.3.10 Lycos

This one has a robot to help the software locate the needed in search. For each document indexed, the robot keeps the outgoing links in a queue and selects a URL from it. Lycos indexes, titles, headings, and subheadings of HTML, FTP and Gopher documents.

4.3.11 Web Crawler

It has a web robot called Webbot that creates a daily index of keywords from documents all over the Web. The search engine directs the navigation in a modified breadth first mode. It indexes both the title and the full text of HTML document.

4.3.12 Excite

It uses a spider and indexer for the full text search of documents. The spider retrieves only Web and Usenet newsgroup documents. It offers services like searches that are case sensitive. It uses the various Boolean operators.

But, this is not the end of the search engines. There are more available on the net, but I have covered here the famous ones.

4.3.13 Searching Criterion

So far we have learned about the various search engines. Let us know in brief how these search engines work. As was mentioned in the case of various search

engines above, each one of them uses either the directories, spiders and even the robots for searches. A spider strips away many other markup features so that it simply sees the pure HTML source. Search sites are basically of the following two types:

Search Directories: They contain a list of websites organized hierarchically into categories and sub-categories. These are created manually.

Search Engines: It continuously sends out the so called spiders which start on a homepage of a server and pursue all links stepwise.

When you open a search engine, it asks you what to search. If it is to be case sensitive, make sure that you are using the right case. Click Ok to begin the search and the result is shown in the form of URLs leading to the pages you need.

4.3.14 Hypertext

It is a method of preparing and publishing text, ideally suited to the computer, in which readers can choose their own paths through the material. To prepare hypertext, you first divide the information into small, manageable units, such as single pages of text. These units are called nodes. You then embed hyperlinks in the text. When the reader clicks on a hyperlink, the hypertext software displays a different node. The process of navigating among the nodes linked in this way is called browsing. A collection of nodes that are interconnected by hyperlinks is called a web. The World Wide Web is a hypertext system on a global scale.

4.4 FTP

FTP is the short name for File Transfer Protocol. FTP is the Internet service that allows you to transfer files from one computer to another. Like all Internet services, ftp uses a client/server system. You run a client program on your computer which connects to a server program on a remote compute. You tell your client what to do and it carries out your orders by sending commands to the server.

When you copy a file from a remote computer to your own computer, we say that you are **DOWNLOADING** the file. When you copy a file from your computer to the remote one, you are **UPLOADING** the file. In ftp terminology, your computer is called the **LOCAL HOST**. The other computer is called the **REMOTE HOST**. Thus, we can say that ftp allows you to upload and download files to and from a remote host. Sometimes we use the word "ftp" as a verb.

4.4.1 Anonymous Ftp

The ftp service lets you transfer files from one Internet computer to another. However, there is one basic restriction: you cannot access a computer unless you can log into it. In other words, you cannot copy fields to or from a remote computer unless you have a user name and a password. **ANONYMOUS FTP** is a facility that lets you connect to certain remote hosts and download files without having to be registered as a user. To do so, you log in using a special user name: **anonymous**. With this user name you do not need a regular password. Instead, you type your mail address.

For example, say your mail address is `laxmi@nim.com`. When you connect to an anonymous ftp server, you would log in as `anonymous` and use a password of `laxmi@nim.com`. The beauty of this system as it allows anyone on the Internet to lot

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in to a remote host and download public files without having an account on that system. It is important to understand that the anonymous user name will only work with computers that have been set up to act as anonymous ftp servers: that is, with those computers that are set up as repositories of publicly-available files. Moreover, the anonymous user name is only for ftp access. You cannot, for example, use a telnet connection and expect to log in as anonymous.

As you might imagine, allowing people all over the Internet to access your computer is not something you do frivolously. There are a number of security considerations which must be addressed. Anonymous ftp hosts are set up to be secure so that outsiders cannot cause trouble, even inadvertently. For example the system manager can control exactly which files on the computer are available for anonymous ftp access. The rest of the files are off limits and cannot be accessed except by people with valid user accounts.

As an extra security measure, many anonymous ftp hosts will not allow you to upload files. In other words, you can copy all the files you want from the remote host to your computer, but you cannot copy files from the remote host to your computer, but you cannot copy files from your computer to the host. Some anonymous ftp hosts do allow anyone to upload files, which will then be upload the files to a special, designated directory which is not accessible for files, he or she will move them to one of the public download areas. In this way, remote users are protected against people who might upload troublesome files, such as programs with viruses.

4.4.1.1 *The Importance of Anonymous Ftp*

At first, anonymous ftp sounds useful but not really all that special. Okay, so anyone on the Internet can access files on an anonymous ftp host. What's the big deal?

The big deal is that the public anonymous ftp archives are so vast as to be well beyond human understanding. The internet has thousands of anonymous ftp hosts offering all kinds of files for free. Virtually every type of information and every type of many organizations have generously donated disk space and computing facilities to make these files available. Nobody gets paid for providing an anonymous ftp service, but countless people set up and maintain anonymous ftp hosts as a public service available to anyone. Until you start to use anonymous ftp this may not sound like much. Anonymous ftp is one of the most significant inventions in the history of mankind. This can be credited to for three important reasons.

First, anonymous ftp allows you to download virtually any type of information. Until you are an experienced Internet user it is difficult to appreciate how important this is, but, put simply, anonymous ftp provides access to the largest library of information ever accumulated. Moreover, it is an ever-growing library that never closes, covers every conceivable topic and best of all, is free. *Second*, anonymous ftp is the principal way in which software is distributed on the Internet. Indeed, the reason the Internet can exist at all is that we all use standardized programs. Most of these programs are distributed via anonymous ftp and hence, are available to anyone who wants to use the Internet or to set up an internet host.

For example, in order to provide access to the Usenet discussion groups. Your Internet service provider must have installed the Usenet software on their computer. Where does the system manager acquire his software? Anonymous ftp. Here is another example. In order to use the Internet with a PC, you need client programs to

run on your computer. Where do you get such clients? You could buy them or get them for free from your Internet service provider, but many people download their clients for free by using anonymous ftp. This is especially important when a new version of a client is released. You can download it the same day from one of the anonymous ftp sites. Indeed, if you were to write a new Internet exposure for your product would be to make it available to the public via anonymous ftp (and this is exactly what people do).

The *final reason* anonymous ftp is so important is it is used to achieve and disseminate the technical information that defines the Internet itself. It is called REQUEST FOR COMMENT or RFC. Each RFC is given a number and is made freely available to anyone who wants to read it. In this manner, the technical information that supports the Internet is distributed around the world in an organized, reliable manner. Programmers and engineers who must design products to work with the Internet protocols can ensure that everyone is using the same specifications and that all Internet programs are designed to follow the same set of standards. Thus, without anonymous ftp, there would be no modern-day Internet.

4.4.2 Using a Browser for Anonymous Ftp

There are two different types of ftp clients. First, there are programs that can serve as ftp clients, but which were really designed for some other primary purpose. For example, web browsers are designed to serve as web clients, but can also act as ftp clients. Alternatively, there are programs designed specially to be ftp clients and nothing else.

If you spend most of your time using the Web and your anonymous ftp needs are small, a browser will work just fine. However, if you use anonymous ftp a lot, you will be better off with an actual ftp client program. There are two ways to access an anonymous ftp resources using a browser. From time to time, you will encounter an ftp resources as a link on a web page. When you click on that link, your browser will automatically contact the ftp site, log in as anonymous, send your mailing address as a password and request the file. Depending on how your browser has been configured. You may have to specify where you want to put the file before the actual data transfer takes place.

For example, say you are reading a web page having to do with stupid things and you encounter a link that says the Stupid FAQ. When you move your mouse pointer to this link, you see the following URL:

`ftp://ftp.sunet.se/pub/usenet/news.answers/stupidity/FAQ`

This URL points to a particular anonymous ftp resources on the computer named ftp.sunet.se in a directory named /pub/usenet/news.answers/stupidity. Within that directory is the information in question, stored in a file named FAQ.

When you click on this link, your browser will act like an ftp client and contact the specified computer in order to download the file on your behalf. It will all be automatic. As an alternative to finding an anonymous ftp resource on a web page, all browsers have a way for you to enter a URL directly. This means you can jump directly to an ftp site by just entering the appropriate URL. Here is an example that shows how this works.

Let's say you read about a file containing cheese recipes. The file is available via anonymous ftp from the computer named ftp.spies.com. On that computer, in a directly

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named /Library/Article/Food the recipes are contained in a file named cheese.rcp. To construct the appropriate URL, use the following format:

ftp://computer/pathname

(The pathname is the directory + file name.) in this case, the URL to use would be:

ftp://ftp.spies.com/Library/Article/Food/cheese.rcp

Just tell your browser that you wish to enter a URL and type this URL. The browser will connect to the remote ftp host and download the recipe file for you.

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4.4.3 Using an Ftp Client for Anonymous Ftp

An ftp client is a program designed for one purpose: to use the ftp service to copy files from one Internet computer to another. It is possible to access anonymous ftp resources with a browser, but an ftp client will provide more features and afford more control over the process. Now, I describe how to use an ftp client for anonymous ftp. Here I refer to files and directories, which are explained in the next section. For now, if you are not familiar with how directories are used, you only need to understand three things:

1. On a Windows computer, directories are called "folders".
2. Directories are used to organize files.
3. Directories can contain either files or other directories, or both.

If you access the Internet via PPP or a direct network connection, you will use a graphical ftp client that runs on your own computer. If you access the Internet via a shell account, you will use a text-based ftp client that runs on the host computer.

The most common text-based client is called ftp and runs under Unix.

If you access the Internet via PPP or a direct network connection, you will use a graphical ftp client that runs on your own computers. If you access the Internet via a shell account, you will use a text-based ftp client that runs on the host computer. The most common text based client is called ftp and runs under Unix. All graphical clients work more or less the same way. Typically, your window will be divided into two sections, one on the right and one on the left. The directory names are in the top part; the file names are in the bottom part. On the left, you can see similar information about the local computer.

All ftp clients have their own nuances, of course, but the general process of accessing an anonymous ftp resource generally involves the following steps:

1. Establish a connection to the remote host. To establish a connection, you will have to specify the name of the remote computer. You may also have to enter a user name and password. Use a user name of anonymous and your mail address for a password. Some ftp programs let you select "anonymous ftp" as an option, in which case you will not need to specify a user name and password: the program will know what to use. Once the connection is established, your ftp client will request a listing of the contents of the top level directory. When it arrives, the information will be displayed on the right with the directory names on top and the file names on the bottom.
2. Navigate to the directory on the remote host that contains the file you want. To navigate on the remote computer, you select directory names from the list on the right, one name after another, until you get to where you want.

Each time you select a directory name you will have to wait for your ftp client to request a listing of the new directory from the remote computer. When this listing arrives, it will be displayed, directories on top, files on the bottom. Eventually, you will reach the directory that contains the file you want. At that point, you should see the name of your file in the list.

3. Set the options you want for the transfer. There are various options you can set to specify what type of file transfer you want. In particular, you can use either an "ASCII" transfer for text files, or a "binary" transfer for binary files. (If you are downloading software, be sure to use "binary".) Your program may also have special options or settings pertaining to your type of computer.
4. Select the file to be transferred. With most ftp programs, you highlight the name of the file you want by clicking on it with your mouse.
5. Navigate to the directory on the local host (your computer) to which you want to download the file. Check the left side of the window to see the current directory on your own computer. This is the directory into which your ftp client will copy the file. If this is not where you want to copy the file, navigate to the directory you want.
6. Initiate the file transfer. With some programs, you initiate the downloading - copying of the file from the remote computer to your computer - by clicking on a button that has a left arrow. The idea is you are copying a file from the right (remote computer) to the left (local computer). With other programs, you may have to click on a "transfer" button or something similar.

Basically, that is all there is to downloading a file via anonymous ftp. Your ftp client will have its own special features, but the general idea is the same with all ftp programs.

There are two features that are especially useful in your ftp program. The *first* feature is a *view* function. This allows you to select a file and then view it without actually copying it to your local directory the file is copied to your computer, but it is not stored permanently. Indeed your ftp client stores the data in a temporary file and then calls upon an editor program to display the file for you. This feature is handy when you want to take a quick look at a file but you don't want to keep a copy of it (such as a README file).

The *second* feature to look for in your ftp client is the capability of storing various configurations. This allows you to save the names of your favorite anonymous ftp sites, so you can connect to them easily whenever you want. Indeed, most client programs include configurations for well-known, useful anonymous ftp sites. For example, if your program has a list of configurations, you will probably see well-known software archives for Windows and DOS systems, as such sites are useful to just about everyone.

4.4.4 Files

Once you start using anonymous ftp, you will find you need to know something about files and directories. Since most of the anonymous ftp hosts are Unix computers, you will need to know something about the Unix file system. Within Unix, the definition of a file is a highly generalized one. A file is considered to be any source of input or any target of output. For our purposes, this definition is too technical so let us be a bit more informal: a FILE is a collection of data. Files can hold any type of information that can be stored on a computer: programs, documents,

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pictures, sounds and so on. Files are kept on some type of storage device: a hard disk, a floppy disk, a CD or a tape. When you use anonymous ftp, you are almost always accessing files stored on a hard disk.

Every file has a name. Whenever you want to do something with a file, you must refer to it by its name. For example, if you want to download a file using anonymous ftp, you must be able to tell your ftp client the name of the file you want. Unix file names can consist of letters, numbers and certain punctuation characters. Here, for example are two typical Unix file names: rfc1325.txt and rfc-index.txt. Unix distinguishes between uppercase (capital) letters and lowercase (small) letters. For this reason, you must be careful to use the exact letters when you type a file name. In Unix, the letters R and r are completely different, so rfc325.txt and Rfc1325.txt are two completely different names. For the most part, Unix file names consist of all lowercase letters. However, there will be times when you encounter a file name that has uppercase letters. When you do, be sure to type the name exactly.

4.4.5 Directories

Within Unix, files are organized into collections called DIRECTORIES. When you connect to an anonymous ftp site, you will find a number of directories. In order to download a file, you must be able to specify the exact name of the directory in which the file lies, as well as the name of the file itself. Around the Net, various computers act as Usenet archive sites by making copies of the FAQs available via anonymous ftp. For example, all of these sites will have the file folklore-faq. One well-known Usenet archive is the computer rtfm.mit.edu. On this computer, the file folklore-faq is kept in the directory named /pub/usenet/news.answers.

How can we make sense of that name? To do so, all we need to understand how Unix organizes directories.

Being able to collect files into directories is important. However, many Unix systems have thousands of files and merely collecting them into directories is not enough: we need more levels of organization. The solution is to collect the directories themselves into other directories, to form a hierarchy. For example, on the rtfm.mit.edu computer, all the public directories are kept in a directory named pub. Within pub, all the directories containing Usenet information are kept in a directory named usenet. Within the usenet directory, there are files and directories are kept in a directory named usenet. Within the usenet directory, there are files and directories that contain information relating to the various discussion groups.

Now, it happens that there is a special group named news.answers whose purpose is to act as a repository for all the FAQs that are posted to the various other groups. Thus, on the rtfm.mit.edu host, the usenet directory contains a directory named news.answers which is used to hold all the FAQs. That is why the file named folklore-faq is found within the directory named /pub/usenet/news.answers. When a directory contains another directory, the first directory is called the PARENT DIRECTORY and the second directory is called a SUBDIRECTORY. In our example, usenet is a subdirectory of pub, while pub is the parent directory of usenet. Similarly, news.answers is a subdirectory of usenet, while usenet is the parent directory of news.answers.

Each Unix computer has one main directory which is the overall parent for all the subdirectories and files on the system. This main directory is called the ROOT DIRECTORY. Within the root directory are subdirectories; within these subdirectories

are other subdirectories; and so on. If you were to draw a diagram of such a system, it would look like a tree with branches and sub-branches growing from one main trunk: hence the name, "root directory" for the main trunk. When we write the fullname of a subdirectory, we start at the root directory and show each directory we must pass through in order to reach the ultimate branch. In our example, we start at the root directory, pass through the pub subdirectory, the usenet subdirectory and finally, we read the news.answers subdirectory. To write this down, we use the following two rules.

First, we use a single / (slash) character to indicate the root directory; we do not actually spell the name, hence, the name /pub/usenet/news.answers. Literally, it means, "Start from the root directory, then go to the pub subdirectory, then go to the usenet subdirectory and finally, go to the news.answers subdirectory." Where you are connected to a Unix computer you can think of yourself as sitting somewhere in the directory tree. Whichever directory you are in is called your **CURRENT DIRECTORY** or **WORKING DIRECTORY**. By using the appropriate commands, you can move from one directory to another. Each time you move, your current directory changes.

For convenience, we often describe the location of a file by tacking its name onto find the urban folklore FAQ list, all you have to do is tell him to ftp to rtfm.mit.edu is the same as saying. "The file is folklore-faq and it is found in the directory named news.answers, which is in the directory named usenet, which is in the directory named pub, which is in the root directory."

4.4.6 Path

A description like this – in which the names are separated by / character – is called a **PATHNAME** or a **PATH**. Thus, in order to ftp a file, anywhere on the Internet all you need to know is (1) the name of an anonymous ftp host that has the file and (2) the pathname of that file. If you take a look at a catalog of Internet resources, you will see that ftp resources are described in just this way. As a convenience, there are two special names used as abbreviations within the Unix file system. First, the name .(a single period) refer to the current directory. The name ..(two periods) refers to the parent of the current directory. When you talk about these abbreviations, the . character is referred to as "dot". For example, say you are connected to the rtfm., mit.edu computer and your current directory is /pub/usenet. The . (dot) directory is /pub/usenet. The .. (dot-dot) directory is /pub.

You won't use these abbreviations a lot, but you should know what they mean when you see them. In particular, you should know that selecting the item named .. from a list of directories will move you one level higher in the tree. For example, if your current directory is /pub/usenet and you select the ..directory, you will move to /pub.

4.4.7 Starting the ftp Program

To download or upload files from a remote host, you use the ftp program. This program acts as a client and connects to the ftp server on a remote host. Once the connection is made, you will be asked to specify a userid and password. You can then enter whatever ftp commands you want. To start ftp, enter the name of the *command followed by the address of the remote host to which you want to connect.* For example, say you want to download files from the computer named rtfm.mit.edu.

Enter the command:

```
ftp rtfm.mit.edu
```

When the ftp program starts, it will initiate connection to the remote host you specified. Once the connection is made – which might take a few moments if the host is far away – you will see a message like the following:

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```
Connected to BLOOM-PICAYUNE.MIT.EDU.
```

```
220 rtfm ftpd (wu-2.4(26)); bugs to ftp-bugs@rtfm.mit.edu
```

```
Name (rtfm.mit.edu:harley):
```

The first line of this message shows us that we have made the connection. Notice that the name of the computer we have connected to is really bloom-picayune.mit.edu. This is because the name rtfm.mit.edu is actually alias for bloom-picayune.mit.edu.

Such aliasing is fairly common in the world of anonymous ftp because it allows us to use easily remembered names. It also gives system managers the flexibility to change computers whenever they want without confusing people. For example, if it should become necessary for the rtfm system manager to use a different computer for anonymous ftp, he does not have to inform everybody of the change. All he has to do is ensure that the address rtfm.mit.edu is aliased to the new computer.

It is especially common to see names that begin with ftp. For example, the Electronic Frontier Foundation has an anonymous ftp host named ftp.eff.org. (The EFF is a public-service organization dedicated to “the pursuit of policies and activities that will advance freedom and openness in computer-based communications”. As part of its work, the EFF maintains an anonymous ftp host that contains a wealth of interesting information, including electronic magazines.) The public name of the EFF’s anonymous ftp host is ftp.eff.org. However, when you ftp to this address, you will see that it is actually aliased to another computer. Now, to return to our example, the second line we say was:

```
220 rtfm ftpd (wu-2.4(26)); bugs to ftp-bugs@rtr.mit.edu
```

This tells us the name of the ftp server and the version of the ftp software being used and were to send mail if you find a bug.

Finally, let us look at the last line of the message:

```
Name (ftrm.mit.edu:harley):
```

This is a request from our ftp client program, asking as what userid we want to use to log into the computer named rtfm.mit.edu. As it happens, we are currently logged into the local host as harley. The ftp program knows this and suggests that we may want to use the same userid on the remote system. That is why you see the name harley in parentheses. If you press RETURN, the ftp program will use this userid as a default and send it to the remote host. However, in this case (and most of the time), you will want to log in as anonymous. Simply type this name and press RETURN:

```
anonymous
```

you now see:

```
331 Guest login ok, send e-mail address as password.
```

password:

The ftp server has approved the userid anonymous. You are now being asked to enter your mail address as a password. Out of courtesy, it is a good idea to honor this request.

Indeed, some ftp servers will not let you log in if your password does not look like a valid address. Once you have entered an approved userid and password, you will see a message like the following:

```
230 Guest login ok, access restriction apply.
```

```
ftp?
```

This means that you are officially logged in and can use the anonymous ftp facility.

The second line, ftp> is a prompt from your ftp client program. Whenever you see this prompt, you can enter one of the ftp commands. I just want to mention two commands here, rest of them will be taken up later.

1. To display a list of all the ftp commands, enter the ? command.
2. To end the ftp session, use the quit command.

The last point I want to cover is what to expect if your ftp client is unable to connect to the remote host. There are three ways in which this might happen, first, the ftp service may be temporarily unavailable. In such cases, you will see:

```
ftp: connect: Connection refused
```

Second, the network connection to the remote host may be inoperative. This might be a problem with the network to which the host is connected, or it might be that the host computer itself is not working. In such cases, you will see a message like:

```
ftp: connect: Host is unreachable
```

The best thing to do is try again later.

Finally, there may be a problem with the address you specified. For example, say that you want to download files from rtfm.mit.edu, but you accidentally enter the wrong address:

```
ftp rtff.mit.edu
```

You will see a message like the following:

```
rtff.mit.edu: unknown host
```

```
ftp>
```

At this point, you can enter the name of another host. Otherwise, you can use the quit command to stop the program.

4.4.7.1 Second Way to Start the Ftp Program

The first way is to enter the ftp command along with the address of the remote host. For example:

```
ftp rtfm.mit.edu
```

the second way is to start ftp without specifying a host. Simply enter:

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ftp

The program will start, but will not make a connection. Instead, you will see:

ftp>

This is the ftp prompt. It means that the program is waiting for you to enter a command. To connect to a remote host, type open, followed by the address of the host. For example:

open rtfm.mit.edu

The connection will be made just as if you had specified the address when you entered the ftp command.

Earlier, I gave you an example in which an ftp command had a bad address. In the example, the remote host was named rtfm.mit.edu but we mistakenly entered:

ftp rtff.mit.edu

What happens in such a case is that the ftp program tries to make the connection. When it can't, it gives up and displays its prompt, waiting for you to enter a command. In this case, you would see:

Rtff.mit.edu: unknown host**ftp>**

you can now enter:

open rtfm.mit.edu

If this address doesn't work, you can try another one. If one decides to give up, enter:

Quit

This will stop the ftp program.

4.4.8 Ftp Commands

Once you have entered the ftp command and established a connection with a remote host, you will see the prompt:

ftp>

At this point, you can enter an ftp command (of which there are many). The ftp client program will send whatever command you enter to the ftp server, which will carry out your request. The idea is to enter one command after another until you have achieved your goal (say, to download a file). Then enter the quit command to terminate the ftp session. At any time, you can display a list of all the ftp commands by entering ? or help (either will do). Do not worry if your ftp client does not have all these commands. It will have the most important ones. If you want to see a one-line summary of a particular command, enter ? (or help) followed by the name of the command. For example, if you enter:

? quit

you will see:

quit terminate ftp session and exit

notice how many commands there are in figure. The number of commands you see will vary, depending on what version of the ftp software you are using. You might wonder, do you have to learn all these commands? The answer is no. For formal anonymous ftp session, all you need to know few basic commands. I will discuss these commands now.

4.4.9 The Basic Ftp Commands

We can divide the ftp commands into several groups. First, there are the basic commands. I have already discussed quit? And help (which is the same as ?). The other basic command is ! (exclamation mark). This command is used to send a regular Unix command to your local computer. Simply type the command after the ! character and then press RETURN. The ftp program will put itself on hold and send the command to your Unix shell to be executed. Once the command is finished the ftp program will again control and redisplay its prompt.

Here is an example. We want to use the Unix date command to display the time and date on your local system. At the ftp? Prompt, we enter !date. After the date command display its output, we are returned to an ftp> prompt:

```
ftp> !date
```

```
Wed Aug 28 17:42 PDT 1995
```

```
ftp>
```

If you would like to enter more than one Unix command, you can use the ! character by itself:

```
ftp> !
```

The ftp program will put itself on hold and start a new shell. You can now enter as many Unix commands as you want. When you are finished, terminate the shell and the ftp program will regain control. With most shells, you would press CTRL-D to terminate the shell. If this does not work, try the exit command.

4.4.10 Some Common Ftp Commands with Description

Here I give the description of some of the commonly used ftp commands.

Basic Commands

Command Syntax		Description
quit	quit	close connection to remote host, stop ftp program.
?	?	displays a list of all the ftp commands.
?	? command	displays one-line summary of the specified command.
help	help	display a list of all the ftp commands.
help	help command	displays one-line summary of the specified command.
!	!	local: pause ftp and start a shell.
!	! command	local: execute specified shell command.

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open	<i>open</i> [host]	establish connection to specified computer
close	<i>close</i>	close the connection to remote host, stay in ftp
user	<i>user</i> [name [password]]	set user name
cd	<i>cd</i> [directory]	remote: change to specified directory
cdup	<i>cdup</i>	remote: change to parent directory
dir	<i>dir</i> [directory [local-file]]	remote: display a long directory listing
lcd	<i>lcd</i> [directory]	local: change directory
ls	<i>ls</i> [directory [local-file]]	remote: display a short directory listing
pwd	<i>pwd</i>	remote: display name of current directory
get	<i>get</i> [remote-file [local-file]]	download one file
mget	<i>mget</i> [remote-file...]	download multiple files
ascii	<i>ascii</i>	(default) set file type to ASCII text file.

4.4.11 The Connection Ftp Commands

The next category ftp commands are those that control the connection to the remote host: **open**, **close** and **user**. I have already discussed the **open** command, which you can use to establish an ftp connection. The **close** command will terminate an ftp connection without quitting the ftp program. You can use **close** when you want to close one connection and then open another one.

If you connect to a remote host successfully, but there is something wrong with your user name or password, you may or may not lose your connection. (This depends on the ftp server.) However, if you do not lose the connection, you will not be able to do anything until you specify a valid userid and password. To do so, you can use the **user** command. Simply enter:

user

the ftp program will ask you to enter a userid and then a password. If you want, you can specify the information directly:

```
user anonymous harley@fuzzball.ucsd.edu
```

In this case, we are specifying a userid of **anonymous** and a password of **harley@fuzzball.ucsd.edu**.

4.4.11.1 The Directory Ftp Commands

The third group of ftp commands are those which move from one directory to another and display the contents of a directory. Whichever directory you are in is called your working directory (or current directory). Once you establish on ftp connection, you have two working directories to keep track of: one of the remote host and one on your local computer.

With most anonymous ftp hosts, you are automatically placed in the root (top-level) directory to start. To move to another directory, use the **cd** (change directory) command. Type the command name, followed by the name of the directory you want to move to and then press RETURN. For example, if you want to move to the directory named **/pub/usenet/news.answers**, Enter:

```
cd /pub/usenet/news.answers
```

If you understand the Unix file system, you can move one directory at a time by using separate cd commands. For example:

```
cd pub
```

```
cd usenet
```

```
cd news.answers
```

At any time, you can display the name of your remote working directory by using the pwd (print working directory) command. For example, if you enter:

```
pwd
```

you will see a message similar to the following one:

```
257 "/pub/usenet/news.answers" is current directory.
```

At times, you may see a directory name that is different from what you expect. For example on the rtm.mit.edu system, if you move to the directory named /pub/usenet/news.answers and then enter a pwd command, you will actually see:

```
257 "/pub/usenet-by-usenet/news.answers" is current directory.
```

Do not be confused. All that this means is that the system manager has given the second level directory two different names: usenet and usenet-by-group. In such cases, you can use whichever name you want. The name usenet-by-group is more informative, but the name usenet is a lot easier to type.

The working directory on your local computer will be whatever will be whatever directory you happened to be in when you entered the ftp command. When you download files, this is the directory into which they will be placed. If you want your files to be placed into a different directory, you can use the lcd (local change directory) command to move to a different directory before you start the downloading. For example:

```
lcd faq-files
```

This command changes your local working directory to faq-files. There is no ftp command to display the name of your local working directory. However, it is possible to do this by using the ! command to send a pwd command to your local computer.

```
!pwd
```

To display the contents of a directory on the remote host you can use two different commands. The ls (list) command will display the names of the files in the directory. Here is some typical output. It shows the names of some of the files in the news.answers directory.

```
esperanto-faq
```

```
feminism
```

```
finding-addresses
```

```
finding-sources
```

```
fleas-ticks
```

```
folklore-faq
```

```
fonts-faq
```

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The `dir` command will display a longer listing. Along with the file name, you will also see extra information. Here is some typical output.

```
-rw-rw-r      8 root  3  27120   Jun  2 01:24  esperanto-faq
drwxrwxr-x    2 root  3    512   Jun 12 00:07  feminsim
-rw-rw-r---   14 root  3 288890   Jun 12 03:37  finding-addresses
-rw-rw-r---   12 root  3  41939   Jun 16 04:04  finding-sources
-rw-rw-r---   10 root  3  41533   Jun 16 03:30  fleas-ticks
-rw-rw-r---    8 root  3  84701   Jun 15 03:33  folklore-faq
drwxrwxr-x    2 root  3    512   Jun 18 01:46  fonts-faq
```

If you have some experience with the Unix file commands, you will recognize this output as being from the `ls -l` command. Otherwise, don't worry about it. You only need to understand four things. First, the character at the far left tells you if the line describes a directory or a file. A `d` character indicates a directory while a `-` (hyphen) character indicates a file. In this example, we have two directories and five files.

At the far right of each line, we see the name of the file or directory. To the left of the name, the time and date show you when the file or directory was updated. Finally, the number to the left of the time and date shows the size of the file in bytes (characters). This number is not meaningful for directories. Thus, we can see that `folklore-faq` is a file, it was last updated on June 15 at 3:33 AM and is 84,701 characters long. You can ignore the rest of the information. You will find that it is often convenient to download a copy of a long directory listing to a file on your local computer. To do so, simply specify the name of the directory followed by the name of a file. For example:

```
ls /pub/usenet/news.answers ls.list
```

```
dir /pub/usenet/news.answers dir.list
```

Each of these commands generates a directory listing of the specified directory. The first command downloads its output to a file on your local computer named `ls.list`. The second command sends its output to a local file named `dir.list` (Of course, you can choose whatever names you want.)

When you use this form of the `ls` and `dir` commands, you must always specify a directory name and a local file name. If you want to download a listing of the working directory, you can use a directory name of `.` (a single period character). In Unix a single `.` character stands for your working directory. For example:

```
Ls . ls.list
```

```
Dir . dir.list
```

4.4.12 The File Transfer Ftp Commands

There are two commands you can use to download files (that is, to copy files from the remote host to your computer). These commands are `get` and `mget`. The `get` command allows you to download one file at a time. The `mget` (multiple get) command allows you to download more than one file at a time.

To use `get`, specify the name of the remote file followed by the name that you want to give the file on your local computer. For example say that you have established an

anonymous ftp session with the rtfm.mit.edu computer mentioned earlier. You would like to download the folklore-faq file. You want the file to be name Durban-legends on your computer. First move to the directory that contains the file:

```
cd /pub/usenet/news.answers
```

Now, enter the get Command to download the file:

```
get folklore-faq urban-legends
```

You will see the following message:

```
200 PORT command successful.
```

```
150 Opening ASCII mode data connection for folklore-faq
(84701 bytes).
```

At this point, the file is being copied to your computer. Once the copy is complete, you will see:

```
226 Transfer complete.
```

```
Local: urban-legends remote: folklore-faq
```

```
86113 bytes received in 17 seconds (4.9 kbytes/s)
```

```
ftp>
```

You can now enter another command. (BY the way, don't worry about the fact that the file is 84,701 bytes long but we received 86,113 bytes. The extra bytes have to do with how certain characters are encoded when you copy a text file.

Rest assured that the actual downloaded file will be exactly the right size.) If you use the get command with only a single file name, the ftp program will use this name for the new file on your local computer. For example, if you enter.

```
get folklore-faq
```

the downloaded file will automatically be named folklore-faq.

If you are using a Unix system, there is a way to send the remote file as input to a Unix command on your local computer, rather than to a local file. Instead of a second file name, you type a | (vertical bar, called the pipe symbol), followed by the name of the command. For example, suppose that you want to read a remote file named README. One way is to download it to a local file, stop or pause the ftp session, read the file, delete the file and then resume the ftp session. Alternatively, you can read the remote file by sending it directly to a paging program (such as more) on your local computer.

```
get README |more
```

Notice that you cannot put a space after the | character (like you can with a regular Unix command). This is because get expects only two words; the remote file name (in this case, README) and the name of the local target (in this case, |more).

The mget (multiple get) command is used when you want to download more than one file at the same time. Type the command, followed by the names of the file you want to download. For example:

```
mget finding-addresses finding-sources folklore-faq
```

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when you use `mget`, you cannot specify alternate names, so as the files will be given the same names when they are copied to your local computer.

The `mget` command will transfer one file at a time. Before transferring a file, `mget` will display the file name and ask you for confirmation. For example:

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```
mget finding-addresses?
```

At this point you can type either `y` (yes) or `n` (no) and press RETURN.

You can specify the name of a directory and `mget` will process each file in the directory. Similarly, if you know how to use the Unix wildcard characters, you can download all the files whose name matches particular pattern. If you do not know about wildcard characters, I will mention briefly that an `*` (asterisk) character matches zero or more characters and a `?` (question mark) character matches any single character. For example, to download all the files in the remote working directory whose names begin with the letters `fi`, you can use:

```
Mget fi*
```

4.4.13 Setting Ftp Options

Within the `ftp` program, there are several commands you can use to control the downloading operation. The ones worth mentioning are **binary**, **ascii**, **hash**, **prompt** and **status**.

A text file (also called an ASCII file) holds ordinary characters: letters, numbers, punctuation and so on. A binary file contains information that is not textual. For example, if you want to download files that contain pictures, you will be dealing with binary files.

By default, the `ftp` programs assumes that it is working with text files. If you want to download binary files, you should tell the program before you enter the `get` or `mget` command. The `binary` command tells the `ftp` program that you will be downloading binary files. If you want to switch back, the `ascii` command indicates that you will be downloading text files. When you use one of these commands, we say that you are setting the REPRESENTATION TYPE.

For example, say that you are about to download some files that contain pictures. Before you do, you enter the command;

```
Binary
```

When you enter this command, you will see the following message:

```
200 Type set to I.
```

The `I` stands for "image". If you use the `binary` command and then download a text file. It's only when you are copying binary files that you should be exact. With some remote hosts, a binary file will not be copied properly unless you have set the representation type to `binary`. The next option is `hash`. This tells the `ftp` program to display a `#` character (sometimes called a hash mark) after each data block is transferred. This allows you to watch the program when you are downloading a large file. The size of a data block depends on the nature of your `ftp` connection, but you will be told what it is before the downloading starts.

To turn on the hash option, just enter:

```
hash
```

To turn it off, enter the same command again.

The last option to mention is `prompt`. The `ftp` client queries you about each file whenever you use `mget`. If you set the `prompt` option off, `mget` will automatically transfer each file without asking your permission. To turn off the `prompt` option, just enter:

prompt

To turn it back on, enter the same command again.

Finally, if you want to display the current setting all the options, you can use the `status` command:

status

When you do, you will see many options, most of which you can safely ignore.

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4.5 TELNET

TELNET is the Internet service that allows you to log in to a remote Internet computer. To utilize this service, you run a telnet client program on your computer. This program uses the Internet to connect to the remote computer. Once the connection is made, your telnet client acts as an intermediary between you and the other computer. Everything you type on your keyboard passed on to the other computer. Everything the other computer displays is sent to your computer, where it appears on your screen. As a result, your keyboard and screen seem to be connected directly to the remote computer. Telnet is actually the oldest of the various Internet services.

Though it may not matter at this stage but let me go through the development of Telnet or the historical background of it. The Internet is the descendent of the Arpanet, a network created in the late 1960s by the U.S. Department of Defense. At that time, there were no personal computers. There were only large, expensive mainframe computers and smaller, expensive "minicomputers". To work a computer interactively, you used a terminal, a device with a screen, a keyboard, some electronics and not much more.

The first service provided on the Arpanet was "Remote login", that is, Telnet. This service, which was a remarkable achievement, allowed researchers to work on remote computers from a distance. To do so, they used the Arpanet to connect their terminal to a computer that was part of the Arpanet.

Once the connection was made, a researcher could log in, by typing a user name and password, and use the keyboard and screen on his terminal, just as if it were connected directly to the remote computer. In those days, terminals could only display characters—letters, numbers, punctuation and so on—there were no graphics or windows or pictures. However, compared together methods of using a computer (such as punch cards) terminals were extremely convenient. For this reason, when the Unix operating system was developed, it was designed to work with terminals. And, within a few years, Unix became an important part of the Arpanet. Although Unix was designed to work with many types of terminals, one specific terminal became a *de facto* standard. This was the VT-100 terminal, manufactured by the Digital Equipment Corporation(DEC). The VT-100 standard

became so accepted that, whenever someone wrote a program which needed to provide the functionality of a terminal, he would design the program to act like a VT-100.

In technical terms, we would say that the program would "emulate" a VT-100.

So this is what Telnet really is: a service that

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- connects to a remote Internet computer and
- emulates a VT-100 terminal.

Since the VT-100 is a character-based terminal, you cannot use graphics (pictures, icons, windows and so on) when you use telnet.

4.5.1 Telnet Concepts

In telnet terminology, your computer is called the LOCAL computer. The other computer, the one to which your telnet client connects, is called the REMOTE computer. We use these terms no matter how far away the other computer actually is: whether it is across the world or in the same room. On the Internet, we sometime refer to Internet computers as "hosts". Using this terminology, we can say the job of your Telnet client is to connect your local computer to a remote Internet host. In general, there are two ways to use Telnet. First, you can connect to any computer on the Internet for which you have a shell account. When you do, you will see the standard login: and Password: prompts. You can now log in and use the computer in the usual manner. Second, there are many public resources which you can access via Telnet. Some of these do not require a password. As soon as your Telnet client makes the connection, you can start working with the remote computer. For example, a number of public library catalogs are set up in this manner. Other public services (such as MUDs) do require passwords. The first time you connect to one of these systems, you will be asked to choose a user name and password. From then on, you would log in using whatever name and password you have chosen.

4.5.2 Using Telnet Client

To use Telnet, you turn a Telnet client program. This program connects you to a remote Internet host and then emulates a VT-100 terminal. If you access the Internet using a shell account your telnet client will be the Unix telnet program. Otherwise, you use telnet by running a client program on your own computer. If you have a PC, you will run a Windows client. If you have a Macintosh, you will run a Macintosh client program. Windows 95 comes with its own telnet clients. You can use the built-in client or you can find another one. Telnet clients for PCs are readily available on the Net. With Windows 95, you can start the telnet program in the regular manner (by double-clicking on an icon or by putting it in your Start menu), or you can go to a DOS prompt and enter the telnet command. Regardless of how you start the program, it works the same.

Using a telnet client is easy. All you have to do is start the program, and tell it the name of the remote host to which you want to connect. Once the connection to the host is established, you will see whatever message that computer displays as part of the starting procedure. If you connect a Unix computer which expects you to log in, it will start by displaying the line:

Login:

Type the appropriate user name and press ENTER. You will then see the line:

Password:

Type the password and press ENTER. You will now be logged in. Once your Telnet client starts, there is generally nothing special to do. Just log into to the remote computer and start work. However, there are certain facets of the telnet program you can control by using the pull-down menus. Each program operates differently, so be sure to read the help information for your particular program.

4.5.3 Working with Telnet

To start Telnet, enter the name of the command followed by the address of the remote host to which you want to connect. For example, say that you want to connect to a computer named **nim**, whose full address is **nim.ucsb.edu**. Enter the following:

```
telnet nim.ucsb.edu
```

If you are connecting to a computer on your local network, you can usually get by with just the name of the computer, instead of the full address. For example:

```
telnet nim
```

When the telnet program starts, it will initiate a connection to the remote host that you specified. As telnet is waiting for a response, you will see:

Trying...

or a similar message. Once the connection is made, which might take a few moments if the host is far away, you will see a message like the following:

```
Connected to nim.ucsb.edu.
```

```
Escape character is '^]'
```

If, for some reason, telnet is unable to make the connection, you will see a message telling you that the host is unknown. For example, say that you want to connect to the remote host **nippet.com**. However, you mistakenly enter:

```
telnet nippet.com
```

You will see:

```
nippet.com: unknown host
```

```
telnet?
```

At this point you can either specify another host name or quit the program. Another problem that may arise is that your local network may, for some reason, not be able to make connections to certain parts of the Internet. One reason is that a particular host may be off-limits for security reasons. Another reason is that some locations just do not have a way to connect to other locations. In that case you will get a message similar to:

```
Host is unreachable
```

If this happens to you, double-click that you are entering your telnet command correctly. You can also ask your system manager if there is some trick that you don't understand about making such a connection. However, if the remote host is really unreachable from where you are, there is not much you can do about it. Once telnet makes a connection, you will be interacting with the remote host. At this point, most hosts display some type of informative message, usually identifying the computer. If you are expected to log in, you will see the standard prompt. For example if you have connected to a remote Unix computer, you will see:

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Login:

You can now log in in the regular manner:

Type your userid and press RETURN. You will then see.

Password:

Now enter your password and press RETURN again. When you type your password, it will not be displayed. This prevents someone else from finding out your password by watching you log in. When you are finished working with the remote computer, all you need to do is log out in the regular manner. The connection will break and telnet will stop automatically.

4.5.4 A Second Way to Start Telnet

The second way to start telnet without specifying a host. Simply enter:

```
telnet
```

the program will start by will not make a connection. You will see:

```
telnet>
```

this is the telnet prompt. It means that the program has started and is waiting for you to enter a command. To make a connection to a remote host, type `open`, followed by the address of the host. For example:

```
open nim.ucsb.edu
```

the connection will be made just as if you had specified it when you entered the telnet command. If you need to specify a port number, simply type it after the computer name. Be sure to leave a space before the number. For example:

```
open nighemare.winternat.com 1701
```

Earlier a telnet command had been given with a bad address. In the example, the remote host was named `nipper.com`, but we mistakenly entered:

```
telnet nippest.com
```

What happens in such a case is that telnet tries to make the connection. When it can't it gives up and display its prompt, waiting for you to enter a command. In this case, you would see:

```
Nippest.com: unknown host
```

```
telnet>
```

You can now enter an `open` command with the correct address;

```
Open nipper.com
```

If this address doesn't work, you can try another one. If you decide to give up, enter:

```
Quit
```

This will stop the telnet program.

4.5.5 The Escape Character: CTRL+]]

As you interact with a remote host, there is a way to put your work on hold and enter

commands directly to telnet. For example, you are having problems with the remote host, you can pause your work session, return to telnet and enter the Quit command. To do so, you press the special key combination CTRL+]. That is, you hold down the CTRL key and press] (the right square bracket). When you press this key combination, it sends a signal to telnet to pause the remote connection and display the prompt:

```
telnet>
```

You can now enter any telnet command that you want. With some commands, telnet will automatically resume the connection after carrying out the command. Otherwise, you can resume the connection at any time by pressing RETURN at the telnet> prompt. The technical term for a key like CTRL is an ESCAPE CHARACTER. Many programs allow you to use an escape character to request a special service or to indicate that what follows is to be interpreted differently. In the world of Unix, there is a convention that CTRL keys are often indicated by using the ^ (carat) character. For example CTRL-C would be written as ^C. Now we can make sense out of the message that appears whenever telnet makes a remote connection:

Escape character is '^']'

You are being reminded that the telnet escape character is CTRL. It is possible to change this to another character but there is usually no reason to do so.

4.5.6 Using Telnet Commands

Any time you are at the telnet> prompt, there are a number of different commands that you can use. Now, I will go over the most important ones. Before I do, I will remind you that if instead of entering a command you just press RETURN, telnet will resume the remote connection. To display a summary of the various telnet commands, you can enter the ? character:

?

Here is a typical summary:

<i>Command</i>	<i>Description</i>
close	close current connection
display	display operating parameters
mode	try to enter line-by-line or character-at-a-time mode
open	connect to a site
quit	exit telnet
send	transmit special characters
set	set operating parameters
status	print status information
toggle	toggle operating parameters
z	suspend telnet
?	print help information

Out of all these commands, the most important ones are ?, open, close, quit and z.

Open

The open command tells telnet to make a connection to a remote computer. Enter open followed by the address of the computer: For example:

NOTES

Open `nim.ucsb.edu`

This will leave the telnet> prompt and connect you to the remote computer.

Close

The close command terminates a remote connection without stopping the telnet program. Here is how this might come in handy. Let's say you are working with a remote host and something goes wrong. For some reason, the host seems to be ignoring your commands. No matter what you type, nothing happens and you can't even log out. One solution is to press CTRL, wait for the telnet> prompt and then enter the Close command. You can now re-establish a connection to the same host. You can, of course, also connect to a different host.

Quit

The quit command stops telnet. If a remote connection is active, telnet will terminate it.

Other commands

All the other commands are less important and you will probably never need to use them. For the most part, they control various technical aspects of the communication session that you can almost always ignore. If you want to display a summary of the send, set or toggle commands, enter the command followed by a ? character. For example:

Send ?

Job Control

Unix systems support a facility, called JOB CONTROL, that allows you to pause a program, work with another program and then return to the first one. At the telnet prompt, you can enter the z command. This tells telnet to pause itself and return you to the shell (the program that reads and process your commands.). This allows you to enter regular commands on your local computer in the middle of a remote session. The z command will only work if your shell supports job control.

4.6 WEB BROWSING, SURFING USING SEARCH ENGINES

In broad terms browser is the software which allows you to view the web sites. It is a multi-function software package which allows you to access, download, and display multimedia documents. Before we go any further, let us see what the basic features of a Web browser are.

4.6.1 Basic Features of Web Browsers

In all probability a web connection would have the following:

1. Client computer
2. Host computer
3. Internet Service Provider (ISP)
4. Communication network

Let us see what these are:

4.6.1.1 Client Computer

This is the base computer from where you access the Internet. This computer as expected would have modem, a telephone line attached to it and a software to browse the Internet, such as Internet Explorer or Netscape Navigator.

4.6.1.2 Host Computer

This is the computer which holds all the Web pages. They have giga bytes of hard-disk storage, considerable Random Access Memory (RAM) and a high speed processor. It runs special Web server software that reads requests sent from various client computers. The host computer also retrieves and sends an appropriate information to the client.

4.6.1.3 Internet Service Provider (ISP)

I had mentioned about ISP in the last chapter. It is the agency which acts as a media for providing the Internet access.

4.6.1.4 Communication Network

The message from client computer is converted to signals and transferred through telephone lines. These then reach the host computer. So to reach the signals fast you have to have very fast network. In India this is done by VSNL. In fact, ISP has a stack of modems that accepts multiple incoming calls simultaneously. Your connection is complete when it reaches the host computer.

4.6.2 Running a Browser

The first page that you see on the screen of the browser on the screen is the home page of that browser. So in case of Netscape Navigator you will see Netcentre while in the case of Internet Explorer you would see msn.com. These software can be launched as you would launch any other software in a Windows environment. This can be done from the Start button, Its icon on the desktop or even from Quick Launcher on the Taskbar. Once launched you would see their initial page on the screen. Here I am showing the opening page of Internet Explorer.

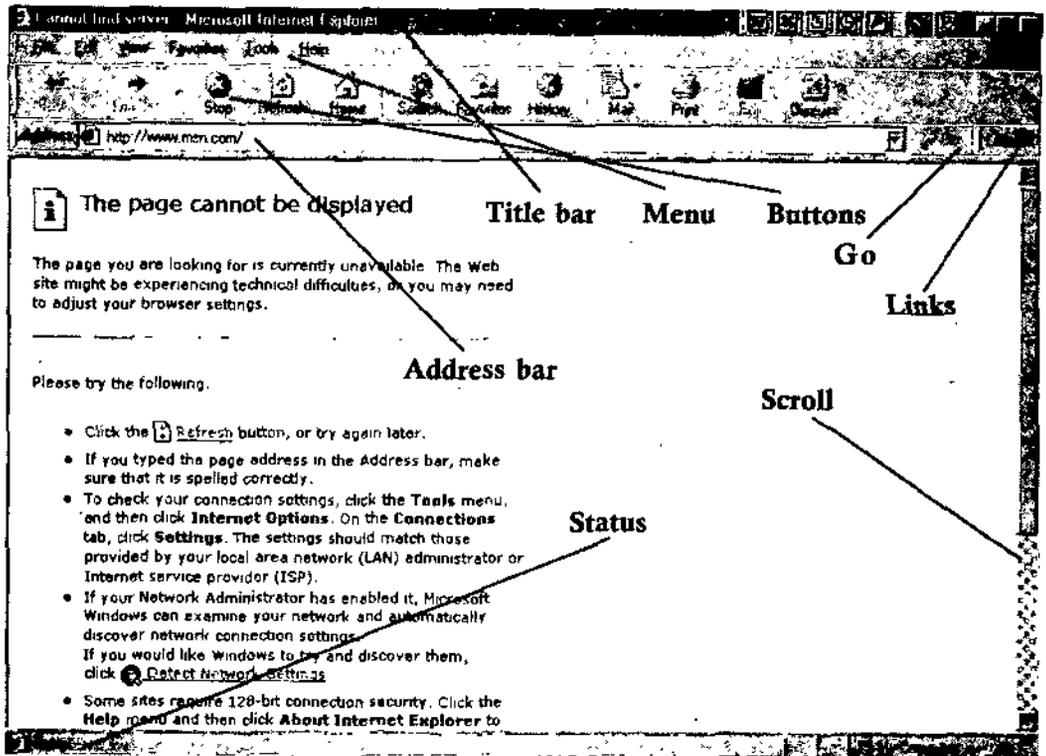
4.6.3 Working of Internet Explorer

As you would see from the Internet Explorer screen, there are various bars, having various buttons. Let us see what all them mean.

- Title Bar** It displays the title of the current Web page.
- Menu Bar** It gives access to all the features of the Explorer.
- Buttons** The Internet toolbar contains some graphically styled buttons. They provide convenient shortcuts that enable you to navigate through the Web.
- Link Menu** This menu selects several links to Microsoft related sites.
- Go Button** After typing the URL, click on this button to display the Web page.
- Scroll Bars** These bars help to move or scroll the screen up or down.
- Status Bar** This bar displays information relating to the activity that is being currently carried out.
- Address Bar** The URLs of various Web sites are typed on this bar.

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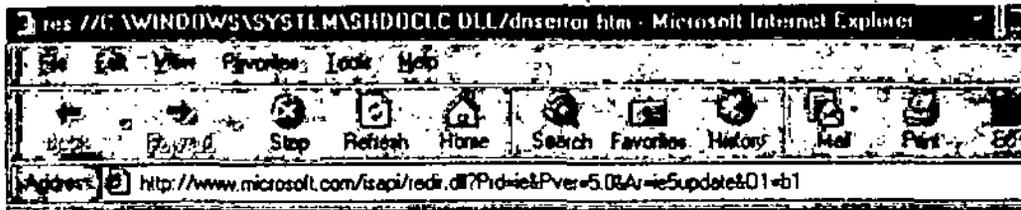
NOTES



4.6.4 Toolbar Buttons

As you can see there are various buttons on the toolbar of Internet Explorer. Let me explain what each one of them stands for.

- Back** It displays a page in the list of previously viewed pages.
- Forward** It displays a page in the list next to viewed pages.
- Stop** It stops downloading the current page.
- Refresh** It downloads the current page again, ensuring that the latest version of the Web page is displayed.
- Home** It displays the home page.
- Search** It displays or hides the Search Explorer bar, which provides access to Internet search engines.
- Favorites** It displays or hides the Favorites Explorer bar, which provides access to your favorite sites.
- History** It displays or hides the History Explorer bar, that provides access to sites you may have visited recently.
- Full Screen** It switches to or from full screen view, which provides maximum viewing space for Internet Explorer's document area.
- Mail** It launches your mail or newsreader program, by default Outlook Express, and lets you send links and pages to others via e-mail.
- Print** It prints the current page, if your printer is online.



NOTES

4.6.5 Getting to a Web Site

As mentioned earlier, you can start the browser by one of the 3 methods mentioned. Now to go to the site, you have to type the name of the site complete with all the dots. You must ensure that you have made the connection to the net via your modem and telephone line, before pressing the Go button.

If the address of the site to be visited is not known, enter keyword/s in the Search Box and click the Search button on the toolbar and follow the instructions that appear on the screen. You can also use on the Search Engines like Yahoo, AltaVista, Google, HotBot. Enter the keywords in the Search Box and click Search or Go.

In the following case the required address was typed to get the website.

You can similarly type the name and press Go to get the required website.

4.6.6 Working with Favorites

As you can see there is a button called Favourite on the toolbar. This helps you in working with your favourite websites. These favourites can be obtained from the Start button too. The ones here are provided by the Microsoft but you can always add and delete from them.

15 March 2002, 14:23 SA. W. 10:00

South Africa World Cup warm-up squad

SPORT

JOHANNESBURG, March 14 (AFP) - South Africa squad for a World Cup warm-up match against fellow qualifiers Saudi Arabia on March 20 in Italian city of Florence.

Goalkeepers: Emile Baron (Lillestrom/Nor), Caven Martin (Ajax Cape Town)

Defenders: Matthew Booth (Sundowns), Tony Coyle (Wits University), Brett Evans (Ajax Cape Town), Hilton Jordaan (Jomo Cosmos), Mbuliso Mabizela (Orlando Pirates), Theang Molife (Jomo Cosmos), Cyril Nzama (Kaizer Chiefs)

FRIENDLIES

Latest Results	
TUR - BRA	02
ECU - SEN	01
KOR - ENG	11

Full Results

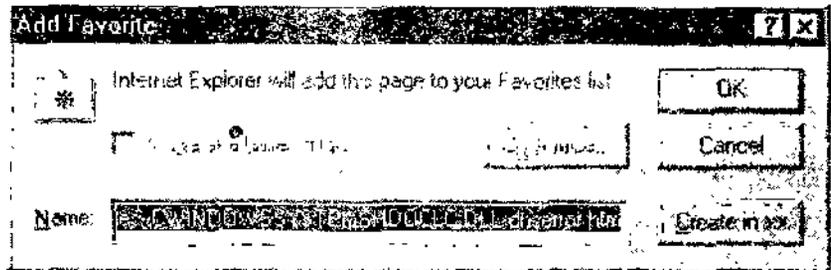
Upcoming Results	
CHN - POR	25 05
JPN - BRA	25 05
MAS - BRA	25 05

4.6.6.1 Adding an item to Favorites

The Add To Favorites command allows you to create a favorite page listing for the page you are currently viewing. Do the following to add.

NOTES

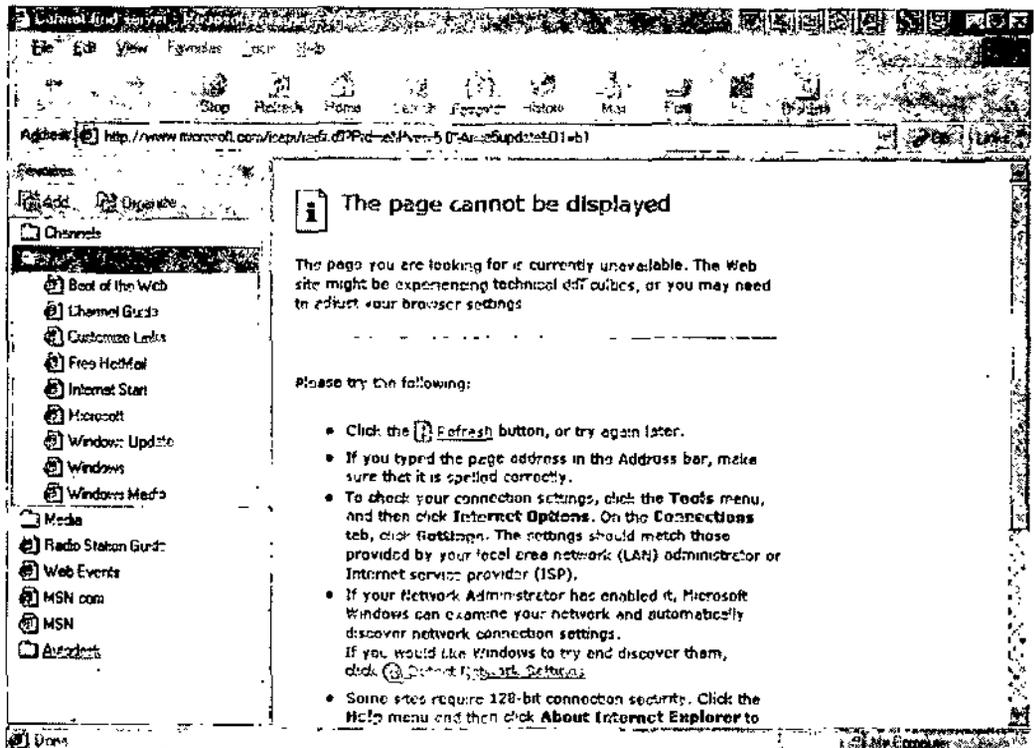
1. Click the Favorites menu and choose Add to Favorites. Or click Add to Favorites on the Favorites Explorer bar. The Add Favorite dialog box appears.
2. In the Name text box, make changes you want to the name of the page.



3. In the create In box select the location of the favorite page.
4. Click the Ok button. This creates a favorite page listing for the current page.

4.6.6.2 Using Search Button

The search button here is an easy access to various search engines. To use the search feature, use the Search button. To use the search feature do this.



1. To choose a search engine click the customize button in the window.
2. Choose the desired category for your search.
3. Click in the text box in the Search Explorer bar, and type the words or topics you are trying to find.

4. Click the Search button.
5. The results of your query appear in the bottom of the Search Explorer bar.
6. Click one of the result links, and the page appears in Internet Explorer's document area.

4.6.7 Working with History

Well, you must have guessed it. It keeps the history of the sites which you had visited during the last working time. The various options are:

3 weeks ago

Last week and

Today

All these would give you the list of various sites which you has visited during the last time you had worked with the browser.

Ok now that you have got the site which you wanted on the screen. The next step would be to work on it. Let us do it.

4.6.8 Copying Data

For this follow the following steps:

1. Open the site from where you have to copy the data.
2. Select the data to be copied
3. Click the Edit menu
4. Click at Copy.
5. Minimize the software.

Cannot find server - Microsoft Internet Explorer

View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print

http://www.msn.com/

3 Weeks Ago

- FrontPage Run-Time Component Page
- Untitled Document
- New Page 0
- New Page 1
- Untitled Document
- Untitled Document
- Untitled Document
- Welcome to Microsoft Personal Web S...

Last Week

Today

i The page cannot be display

The page you are looking for is currently unavailable. The site might be experiencing technical difficulties, or you may have typed the page address incorrectly. To adjust your browser settings, click on the menu bar, click **Internet Options**, and then click **Settings**. The settings should be correct.

Please try the following:

- Click the **Refresh** button, or try again.
- If you typed the page address in the Address bar, make sure that it is spelled correctly.
- To check your connection settings, click on the menu bar, click **Internet Options**, and then click **Settings**. The settings should be correct.

NOTES

6. Open the software/document where you want to paste.
7. Paste the required data.

4.6.9 Saving Pictures from a Web Page

1. Open the site which has the required picture.
2. Right-click on the picture to be saved.
3. Choose the Save As option to save the picture.
4. Your picture would be saved on the clipboard and you can paste it any other software/document.

NOTES

4.6.10 Saving a Page or Picture without Opening

1. Right-click the link for the item to be saved.
2. Choose the Save Target As option to save the picture.
3. Your picture would be saved on the clipboard and you can paste it any other software/document.

4.6.11 Making Pages Available for Off-line Viewing

1. On the Favorites menu, click Add to Favorites.
2. Select the Make available off-line Check Box.
3. Your selected page would be available for the off-line viewing.

4.6.12 Downloading Files/Folders from Internet

The Internet allows you to download a fantastic variety of files/programs. You can access the needed material by using an Internet Browser. For this purpose, point to a link that is connected to a file on a Web site. You will find downloading to be easier from Web sites that are in your time zone. At night, you may often find the sites to be less busy and therefore, more easily accessible.

4.6.13 Printing a Web Page

The various print options available to you are:

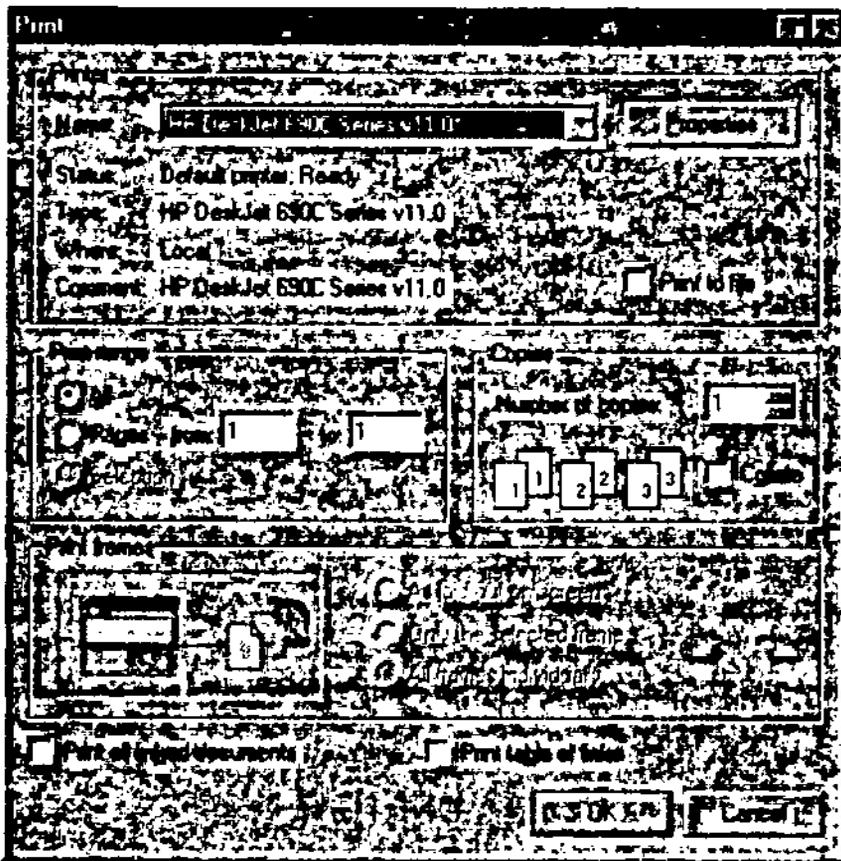
1. Printing all documents linked to the current page.
2. Printing a list of links contained on the current page.
3. Printing selected portions of a page that has been constructed using frames. This option is available only if the current page has frames.

To print a Web page using the options, do the following:

1. Click at the File menu, and choose Print.
2. The print dialog box, as shown next, appears.
3. Select the printer, the pages and number of copies you want.
4. Click Ok to start printing.

4.6.13.1 Options of the Print Dialog Box

- | | |
|-------------------------|---|
| As laid out on screen | It prints the entire page as it appears on the screen |
| Only the selected frame | It prints one selected frame. This option requires you to select a few words in the area you want to print, prior to printing |



NOTES

- All frames individually It prints each frame on a separate page
- Print All Linked documents This option generates a printout of every document linked to the current page
- Print Table of Links This option produces a short printout listing all the URLs mentioned in the document

4.6.14 Keyboard Shortcuts for Working in Internet Explorer

- Enter It activates the selected link
- Shift + F10 It displays the context menu for the current link
- Tab It selects the next link
- Ctrl + Tab Cycled between frames
- Shift + Tab It selects the previous link
- Alt + right arrow It moves to the next page
- Alt + left arrow It returns to the previous page
- F5 It refreshes display of the current page
- Esc It stops display of the current page
- Ctrl + N It opens a new window
- Ctrl + O It opens a document
- Ctrl + P It prints the current page
- Ctrl + S It saves the current page as a file

4.7 E-MAIL

NOTES

Since the facility of e-Mail provided by Internet, people have more or less stopped using the post. It has been in fact, named as Snail mail, or the mail which moves at the snail speed. Whereas electronic mail is fast and moves over from one computer to another electronically at an amazing speed. Most of the Internet users are very happy with this facility. In fact, you can send not only the text, but pictures and graphics too.

Most of the offices are sending their mail through computers. No more fussy papers or carbons. In fact, no need to file them too. All is stored in computers and can be accessed whenever needed. All you need is to open an e-mail account and start mailing your letters even if you do not have a computer. You can send the mail using your account number from any Cyber cafe too.

So to work with e-mail you must have an account of your own. For this, as already mentioned in the earlier chapter, each popular search engine allows you to open an e-mail account. Here, in our case, I am using the account opening process of Hotmail.com.

4.7.1 Opening of E-mail Account

The following are the popular sites which allow you to open an e-mail account:

Yahoo	http://www.mail.yahoo.com
Hotmail	http://www.hotmail.com
Rediff	http://www.deiff.com
Mailcity	http://www.mailcity.com

Besides these most of your ISPs would allow you to open an account. Please remember that these e-mail services are all free and the sites do not charge any amount for using the same.

The following dialog boxes would show you how to create your own e-mail account with hotmail.

4.7.2 E-mail Organization

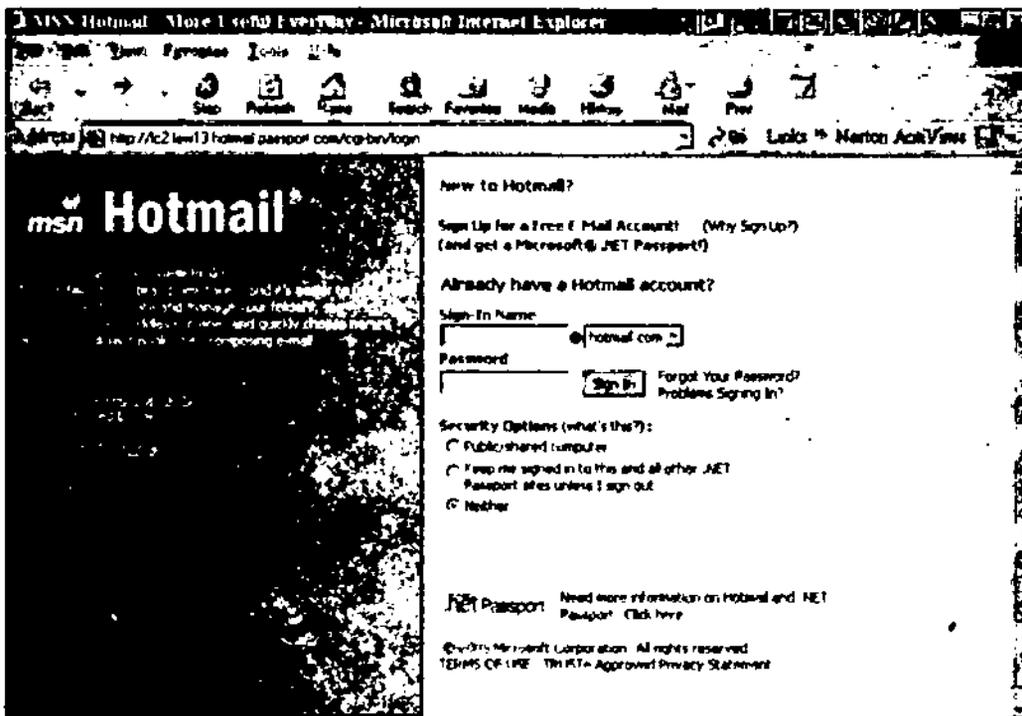
With reference to the e-mail program named Outlook Express, the messages in the software can be roughly organized in the following folders:

Inbox	For all incoming messages
Outbox	For all messages queued for sending
Sent Items	For all messages previously sent
Deleted items	For all messages marked for deletion
Drafts	For all messages which are pending completion

All these can be seen in the figure on the next page.

Before we start reading and sending the e-mails, we must understand few e-mail terms which are quite useful in reading and sending messages.

NOTES



4.7.2.1 Using Abbreviations

An abbreviation would save both time and space. It is important that the abbreviations used by you are understood equally well by the receiver of your e-Mail. So I give here a list of abbreviations which have by now become the universally accepted abbreviations around the world.

NOTES

Cannot find server - Microsoft Internet Explorer

Hotmail[®]

Registration

Your MSN[®] Hotmail[®] account is also a Microsoft[®] NET Passport. Completing this form will register you with Hotmail and with NET Passport. With NET Passport, you can use the Hotmail address and password you create below to sign in to any site that has the NET Passport sign-in button [Sign In](#)

Profile Information [Help](#)

First Name

Last Name

Your first and last names will be sent with all outgoing e-mail messages.

Language

Country/Region

State

ZIP Code

Time Zone

Gender Male Female

Birth Date (ex. 1999)

Occupation

Account Information

E-mail Address @hotmail.com

Password

Six-character minimum, no spaces

Retype Password

Secret Question

Secret Answer

Services Hotmail Member Directory Internet White Pages

Use these check boxes to indicate whether you'd like to be listed in these Internet directories. [More information about directories](#)

Registration Check: Time the characters that most use on this number. Why?

Full Word/Term/Phrase	Abbreviation
By The Way	BTW
Frequently Asked Questions	FAQ
Friend of a friend	FOAF
For what it is worth	FWTW
For Your Information	FYI
In My Humble Opinion	IMHO

Registration Check Type the characters that you see in this picture [Why?](#)

Z6-S5S X4P

Characters are not case-sensitive

Tired of registration forms? You can speed registration and get personalized services at participating sites by sharing your .NET Passport information with them when you sign in. Select the boxes below to choose how much of your .NET Passport information Microsoft can share with other companies' .NET Passport sites at sign-in.

Share my e-mail address
 Share my first and last names
 Share my other registration information

[Tell me more about .NET Passport, privacy, and security.](#)

AGREEMENT BETWEEN YOU AND MICROSOFT CORPORATION

NOTES

Inbox Main Identity

Outlook Express Local Folders Outlook Sent Items Deleted Items Drafts new.vort.net.nl

From: Microsoft Outlook Express Team For: New Outlook Express User
 Subject: Welcome to Outlook Express®

Outlook
 The solution for all your messaging needs

There are no contacts to display. Click on Contacts to create a new contact.

- E-mail and Newsgroups
- Multiple accounts and identities
- HTML message support
- Address Book and directory services
- Office synchronization

Hotmail
 Tired of sharing your email account with others in your household? Get a free Hotmail account. Then read your mail from

In My Opinion

IMO

In my opinion

IMO

In other words

IOW

In Regard To

IRT

Later

LR

NOTES

Laughing out loud	LOL
Member of the appropriate sex	MOTAS
Member of the opposite sex	MOTOS
On The Other Hand	OTOH
Refer to/Regarding	RE:
Rolling on the floor and laughing	ROFTAL
Significant other	SO
You	U
With respect to	WRT

4.7.2.2 Using Smilies

There are lots of ways that you can convey your messages across. Not, only in terms of abbreviations but in terms of small similies too. These are also like abbreviations are finding their way into most of the computers around the world. A smiley is a sequence of characters on your computer's keyboard. For example, the colon represents the eyes, the dash represents the nose and the right parenthesis represents the mouth.

Given below a list of the most common smileys.

<i>Emotions</i>	<i>Meaning</i>
8:-)	Little girl
X-(Mad
&-L	Makes me cry
:-(*)	Makes me sick
:-S	Makes no sense
:-{	Moustache
:-#	My lips are seaed
8-O	Omigod!
:-^)	Personality
:-C	Real unhappy
:-)^<	Big boy
(:-)	Big face
:-D	Said with a smile
:-)8<	Big girl
:-@	Screening
:-V	Shouting
:-(<	Standing firm
:-0	Talkative
H-)	Cross-eyed
:-@!	Cursing

:-E	Disappointed
:(Very unhappy
:6	Eating something spicy
-	Wearing sunglasses
:")	Embrassed
;-)	Winking
L-O	Yawning

NOTES

As you become proficient in e-Mailing, you will be able to learn many more of these fascinating emoticons, which exist in thousands.

4.7.3 Parts of E-mail Text

Like a formal letter e-mail also is divided into various sections. In a good business letter, you would have, date, the name and address of the person to whom the letter is addressed, salutation, text matter, sender's name, etc. Most of these you would find here too but with some difference. Lets see what an e-mail is supposed to have.

4.7.3.1 Headers

It is very important that your header must be loud and clear for it can be seen and read from a distance too.

4.7.3.2 To

The To: field contains the e-mail address of the person to whom you are sending the e-mail. If you are sending e-mail to someone in your own domain, you do not need to include @ domain.

4.7.3.3 From

In most of the cases, you would not be typing this, since it would be taken from the system. It in fact includes your e-mail address.

4.7.3.4 Subject

The Subject: field should contain a very short description (20-30 characters) of what your message is about. This field can also be called Subject of the Message: or simply message. It is not compulsory to have a subject.

4.7.3.5 Cc

You can send the copy of the same e-mail to another person. For this you have to mention the e-mail address of the second receipt. The software would take care that the same message is sent to the second recipient too.

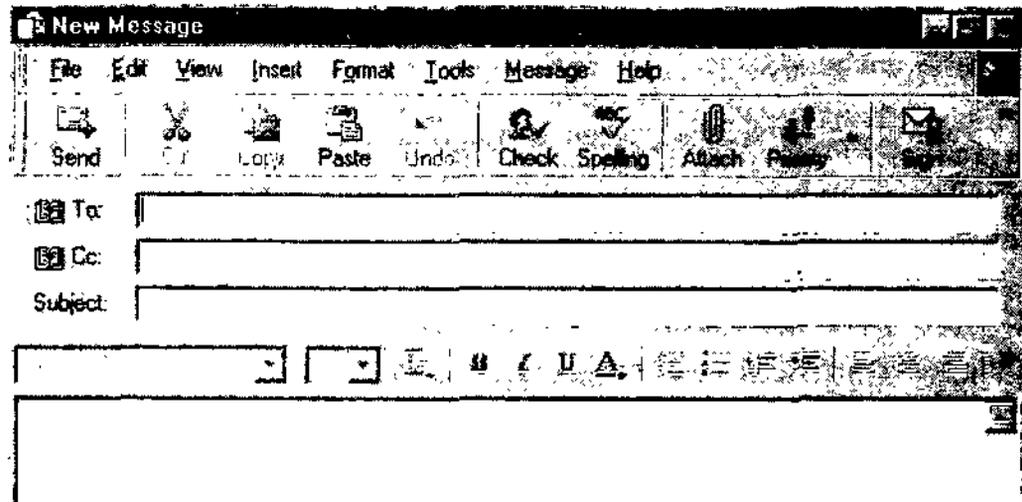
4.7.3.6 Bcc

It is the short form of Blind Carbon Copy, which gives you a way of copying and transmitting an e-Mail message to another person, without the first person (the main addressee), knowing about it.

4.7.3.7 Attachments

Using this option you can attach a file created in other software along with this e-

NOTES



mail. In most of the cases while applying for a job, the letter is typed in the e-mail text and the bio-data which is mostly in some word processing mode, attached to it.

4.7.3.8 Date

Date and time are usually taken from the system. You need not type it.

4.7.3.9 Body

The body of an e-Mail message is simply the text that you want to send to the other person.

4.7.4 Working with Messages

The first thing that you would do on opening the software would be receive the messages. For this you will have to click on Send/Receive button.

You can also set Outlook to automatically check for messages at regular intervals, or you can have Outlook check for message whenever you want.

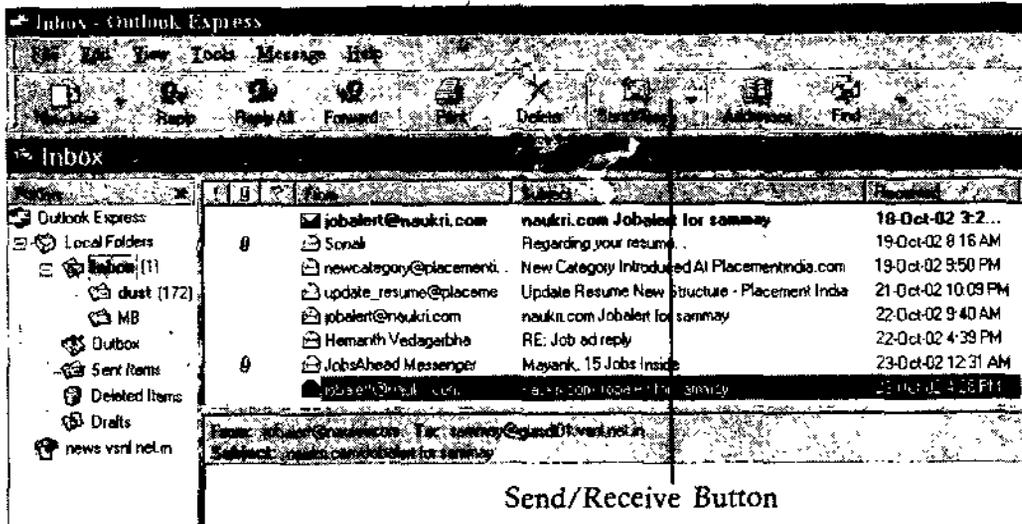
1. Click the Send/Receive button on the Standard toolbar, as shown below.
2. The Internet connection will be made depending upon the type of connection you have. Its progress will be shown to you in the dialog box in the lower right corner of the window.
3. When messages arrive, Outlook asks you whether you want to start reading them. Click Yes in the Microsoft Outlook dialog box to starting reading messages, or click No to read them later.

4.7.5 Reading a Message

Once the messages have been received in the Inbox, they will be appended to the other ones, i.e., in the last. The last few messages are always new. There are various type of messages which are there in the mailbox.

The messages in the Inbox can have the following symbols attached to them.

- Unread message
- High importance message
- Low importance message
- Message that has been read



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- Message with attachment
- Message that has been forwarded
- Message that has been replied to
- Meeting for which response is requested
- Follow-up flag

All these have a symbol attached to them.

4.7.5.1 Reading the Message

1. Double-click a message in the Inbox list.

Or

Select the message to open and press Ctrl + O

Or

Select the message to open and from the File menu, choose Open. Then choose Selected Items from the submenu.

Each message opens in a separate window.

4.7.6 Replying to a Message

Once read, a message can either be replied or trashed.

To reply to a message:

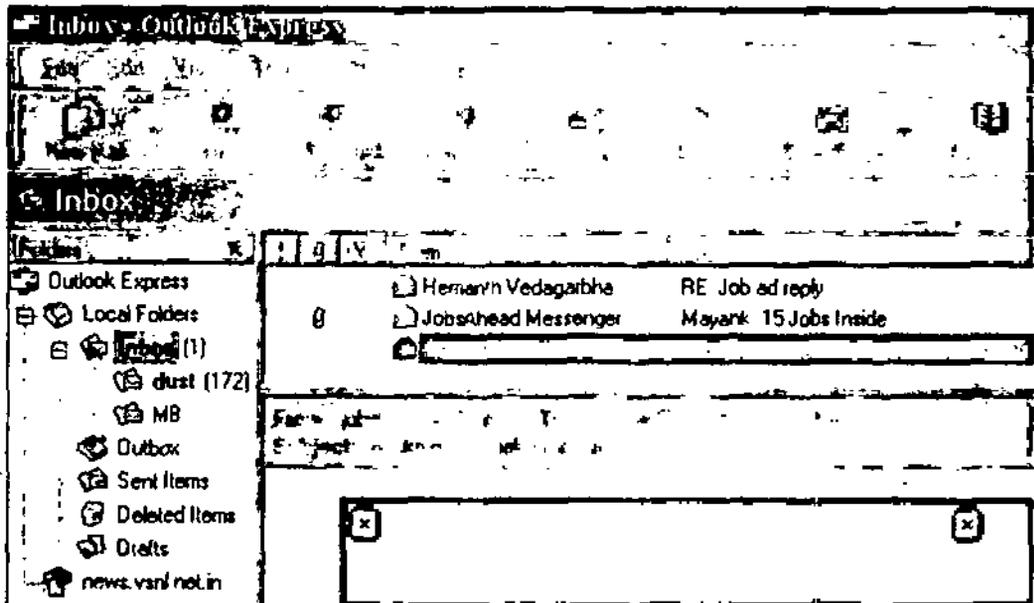
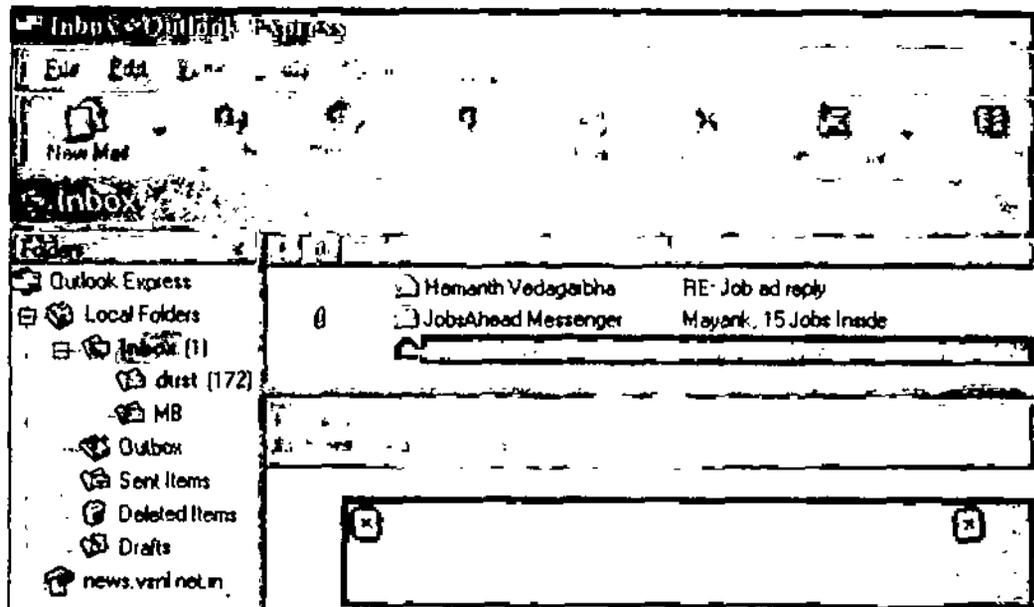
1. With a message selected in the Inbox window or with the message open, click the Reply button on the Standard toolbar. The reply has the sender in the To box and the original subject in the Subject box preceded by RE.
2. In the text area, type your reply. The reply appears above the original message.

Replying in a Phased Manner

You can reply in phases. You can type half a reply now, save it and then complete it later. In this case, since the reply is half baked, it is stored in drafts folder.

For this do the following:

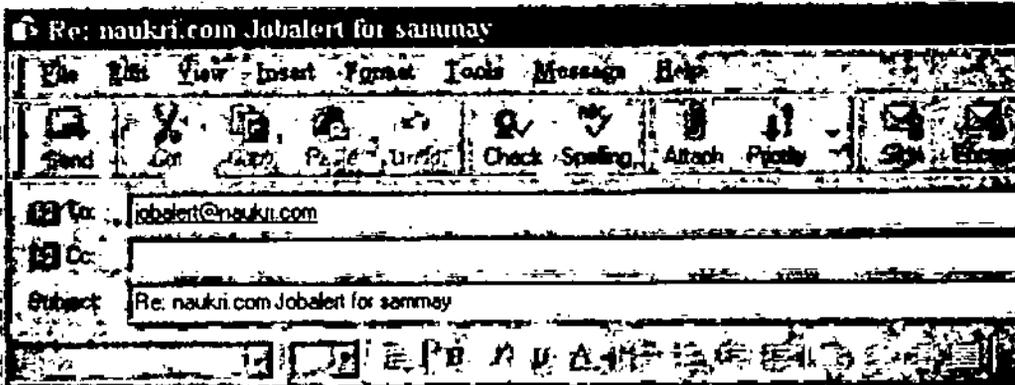
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1. Click Save on the Standard toolbar.
Or
From the File menu, choose Save.
2. Close the window.
3. Outlook places the reply in the Drafts folder. You can open it there to continue working on it.
4. To reply to all of them, click the Reply to All button on the Standard toolbar.
5. You can still edit a message that is waiting in the Outbox. Just double-click the message, make your changes, and then click Send again.

4.7.7 Forwarding a Message

The message received from A can be sent to B by using Forward option. You can also add your own comments to it before sending it.



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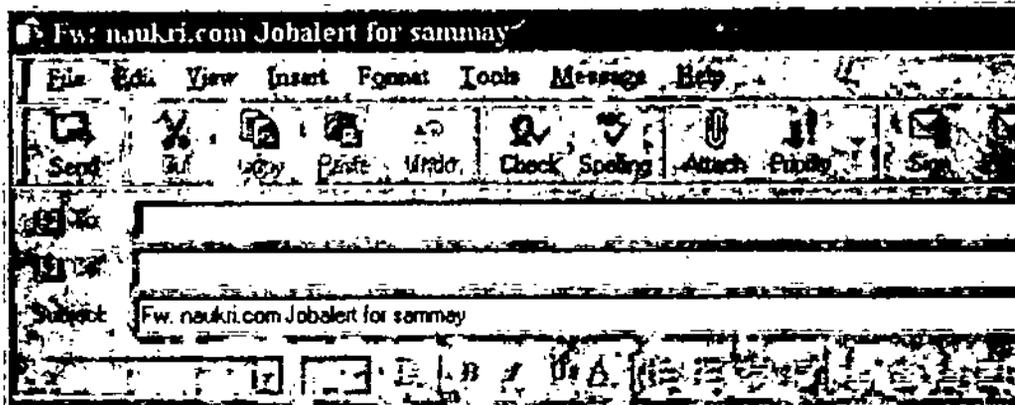
1. With a message selected in the Inbox window or with the message open, click the Forward button on the Standard toolbar.
The new message shows the original subject in the Subject box preceded by FW, as shown here.
2. Type the recipient's e-mail address in the To box.
Or
To select an address from the Address Book, click the To button, select one or more names in the Select Names dialog box, click the To button in the dialog box, and click Ok.
3. Type comments which you want to add in the space above the message.
4. Click Send on the Standard toolbar to move the message to the Outlook folder.
5. If a message has files attached, the files are forwarded as well.

4.7.8 Deleting a Message

If you do not require any message, you can delete it or others too.

1. Click the Delete button on the toolbar in the message window.
Or
Press Ctrl + D

The message is moved to the Deleted Items folder.



4.7.9 Changing View

Outlook lets you view the contents of a message folder in a number of ways.

1. From the View menu, choose Current View, and then choose a view from the submenu, as shown on next page.
2. The view of the current folder is changed.

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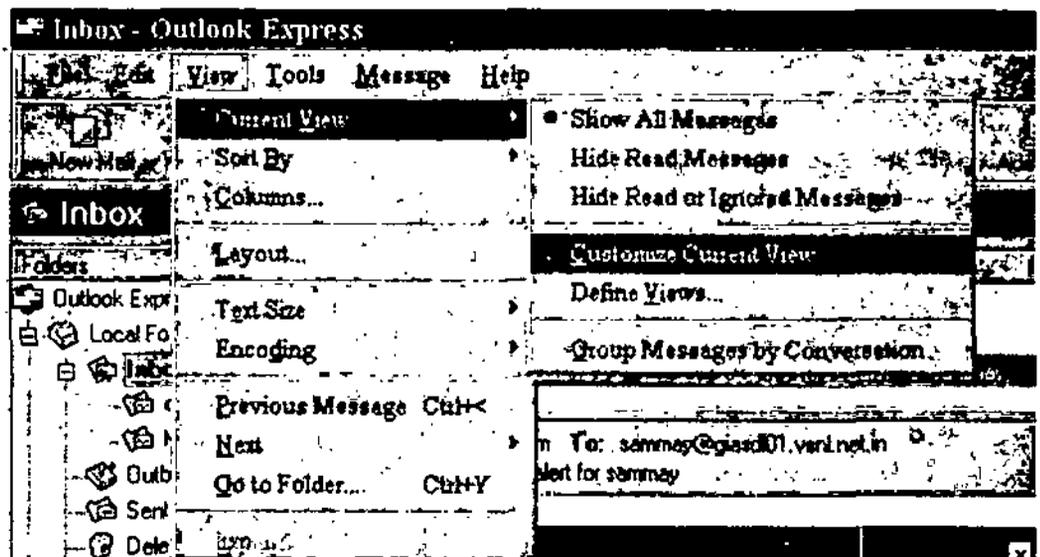
4.7.10 Using Your Own Stationery

When you send a message to somebody, Outlook sees to it that it should have your distinctive features on it. It provides you with the stationery which you can add to your message page. What's more it even gives you an option of putting your signature. You can also set flags to call attention of important messages and to request follow-up actions such as asking the recipient to reply to the message before a certain date.

If you want to send file, such as documents or pictures, you can attach them to e-mail messages, too, using the attachment command.

4.7.10.1 Mail Options

You can use the mail format options to specify the appearance of your outgoing messages. You can override these default settings for individual messages.



Setting Mail Format Options

1. From the Tools menu, choose Options.
2. On the Send tab of the Options dialog box, choose a format from the Send in this Message Format drop-down list.

Choose HTML to send the message in the format used for Web pages, which allows text formatting. Most popular mail programs can display HTML e-mail messages.

Choose Microsoft Outlook Rich Text if you know that your recipient uses Outlook too. This setting allows you to use boldfacing and other formatting in the message.

3. Click Ok when you have finished.

1. On the Mail Format tab of the Options dialog box, choose the Plain Text or Microsoft Outlook Rich Text format option.
2. Click the Fonts button.
3. In the Fonts dialog box, choose the default fonts for messages you type.
4. Click Ok to return to the Options dialog box.
5. Click Ok when you have finished setting options.
6. If you choose HTML or Microsoft Outlook Rich Text as the mail format, a formatting toolbar appears in a new message window. You can use the buttons on this toolbar to set text formatting for the message text.
7. In the Fonts dialog box, you can indicate when you want your default fonts to override stationery fonts.

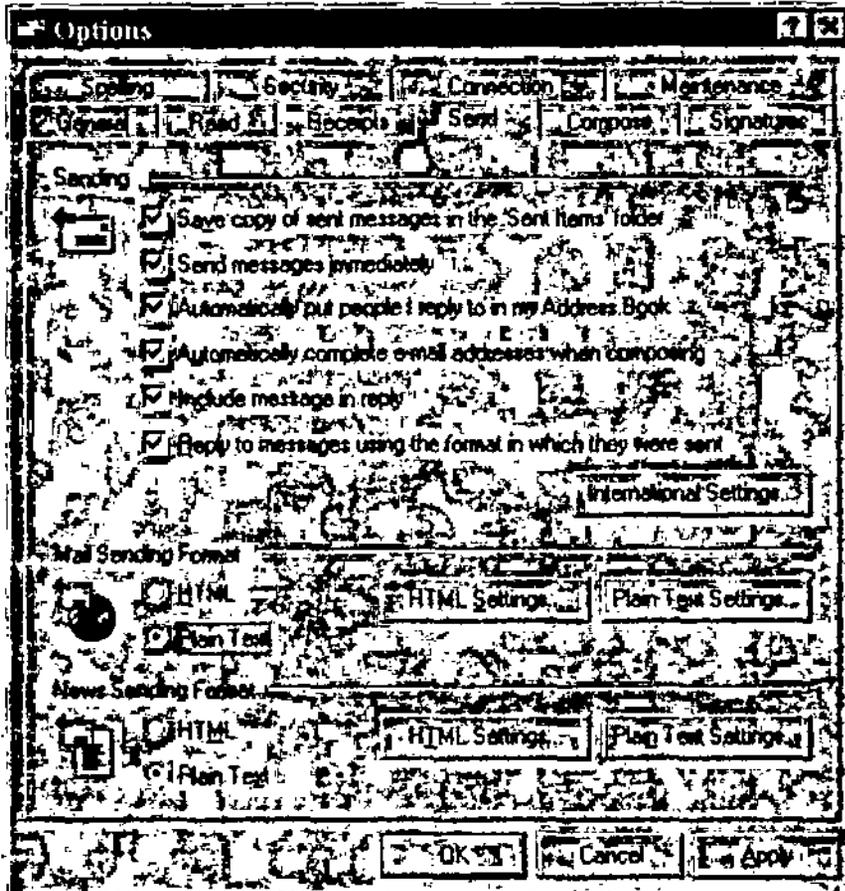
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4.7.11 Starting and Addressing a Message

You can start a message from any Outlook e-mail folder, address the message to as many recipients as you want, and send copies to anyone who might want to be informed. You can also send a blind copy (hidden from other recipients) to someone.

Starting Message

1. In the Inbox or Outlook Today window (or any other e-mail folder), click the New button on the Standard toolbar.
2. If your e-mail editor is not Word, choose whether you want Word to be default editor.



3. A message window with the default format opens.

Typing Addresses

1. In the To box, type a single e-mail address.

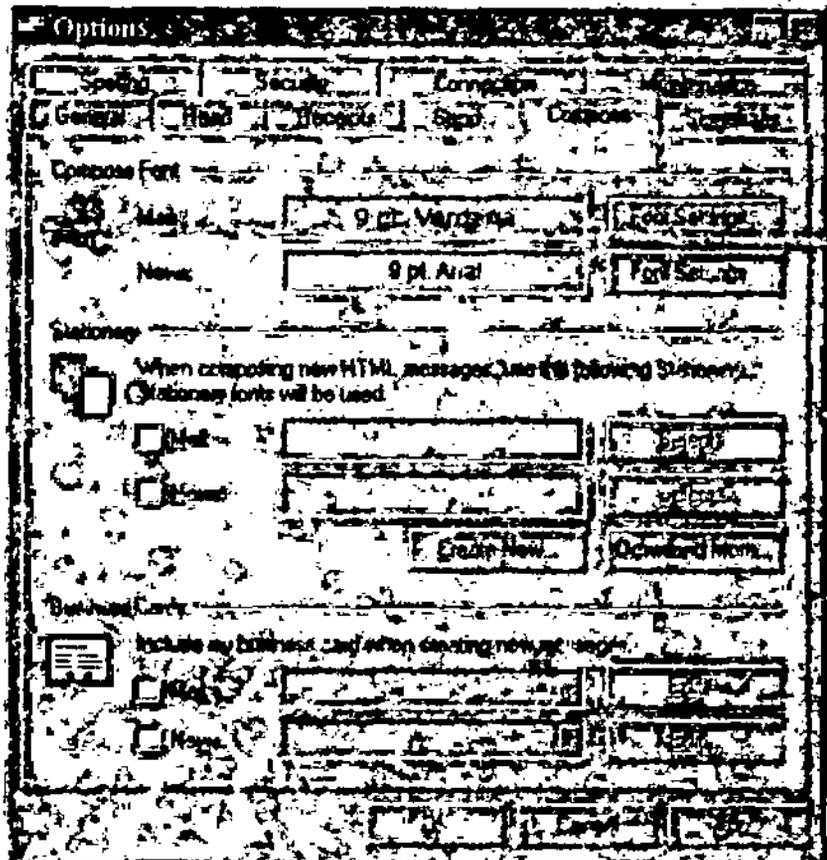
Or

Type several addresses, separating them by commas or semicolons.

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Using Address Book

1. Click the To or the Cc button to choose from the Address Book.
2. Choose a name in the Select Names dialog box and click the To, Cc, or Bcc button to add the name.
3. When you have finished adding names, click Ok to return to the new message.
4. If you want others to receive a copy of this message, you can add e-mail addresses in the Cc box as well.
5. To verify that you have typed an e-mail address properly, click the Check Name button on the Standard toolbar. Outlook checks the address against the Address Book and warns you if no match is found.
6. If you want to display the Bcc field, choose Bcc field from the View menu.
7. For help finding a name, click the Find button in the Select Names dialog box to open the Find People dialog box.
8. To open the Address Book quickly, click the Address Book button on the Standard toolbar.



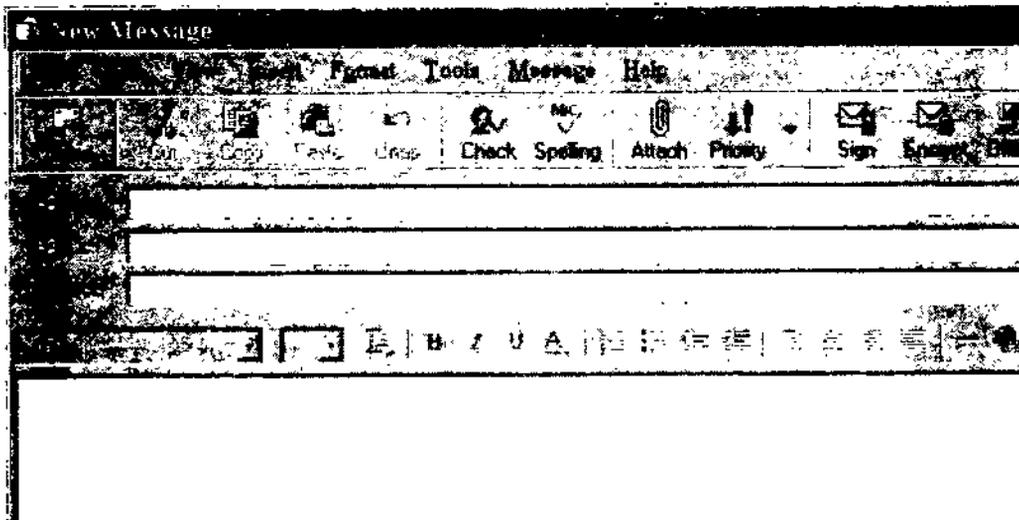
4.7.12 Creating Stationery

For e-mail in HTML format, you can choose predesigned stationery, which includes a background; graphical elements such as bullets, pictures, and horizontal lines; text fonts; and colours that blend with the background design. If Word is specified as your e-mail editor and HTML is selected format, the first time you create a new message you can choose a theme.

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Choosing Default Outlook Stationery:

1. From the Tools menu, choose Options.
2. On the Send tab of the Options dialog box, choose HTML as the format.
3. Click at Create New.
4. This would lead you to a Stationery Picker Wizard, which will guide you to select the stationery of your choice.
5. On this and next pages, you will see the various options of the wizard and their selection.



6. You can use the same options or can have some of your own.

More Stationery Options:

1. In the Options dialog box, choose Download More.
2. From the net, this would give you more options of stationery to choose from.

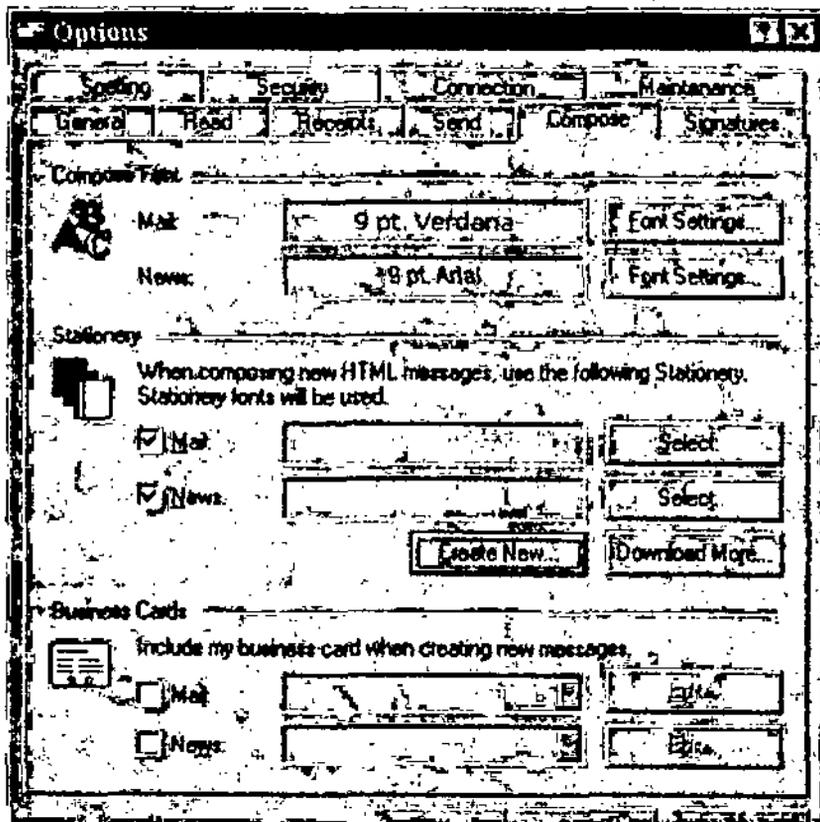
4.7.13 Creating a Signature

You can have Outlook add a signature, a special tag line, to each message you send.

Creating Default Signature

1. From the Tools menu, choose Options.
2. On the Signature tab of the Options dialog box, click at New.
3. In the Create New Signature dialog box, enter a name for the new signature and click Next.
4. In the Edit Signature dialog box, type the signature that will appear at the end of your message if this signature is selected.
5. You can make this signature as the default signature to appear at all messages sent by you.

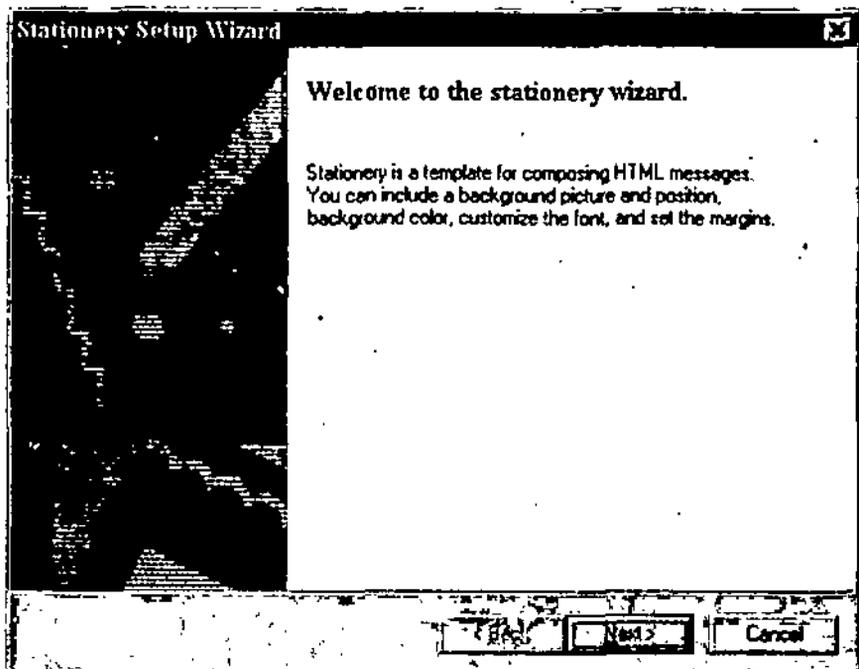
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6. Click Ok.

4.7.14 Attaching a File or an Item to a Message

You can attach files to your message, and you also attach or include as text the items in your Outlook folders.



Stationery Setup Wizard

Background
Stationery can have a background picture and a background color. Note that the picture might cover the entire page.

Picture
[Path] Browse...
Position: Top Left
Tile: Entire Page
 Color
[Default]

Preview: [Image showing background pattern]

Stationery Setup Wizard

Font
Choose the font you would like to use for this stationery.

Font: [Serif Condensed]
Size: 10
Color: [Default]
 Bold Italic

Preview: [Image showing text "AaBbYz" in the selected font]

Stationery Setup Wizard

Margins
Enter the margin width you want for this stationery.

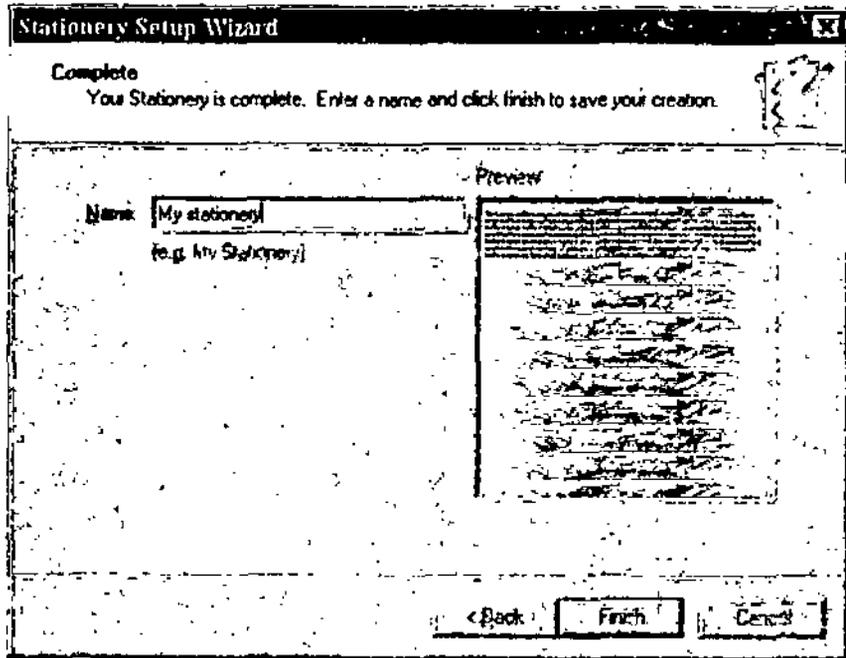
Left Margin: [0] pixels
Top Margin: [0] pixels

Preview: [Image showing margins on a page]

< Back Next > Cancel

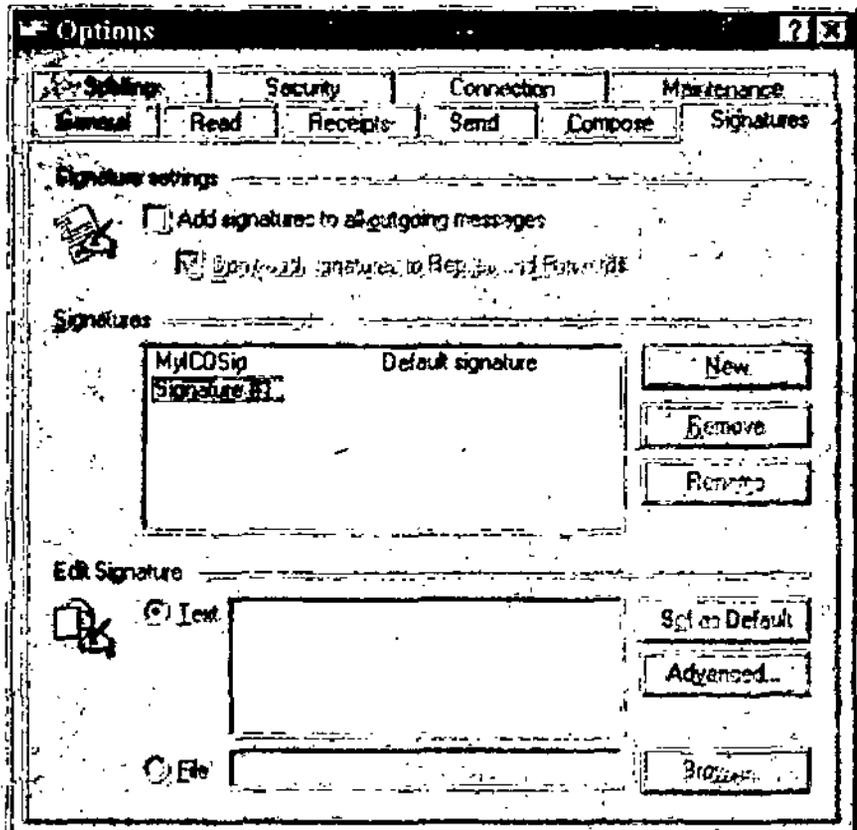
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Attaching a File

1. From the Insert menu; choose Attachment or Picture whichever the case maybe.
Or
Click the Insert File button on the Standard toolbar.



2. In the Insert File dialog box, select the file you want to attach and click Insert.

The file icon appears at the bottom of the message. The recipient can view the attachment by double-clicking its icon.

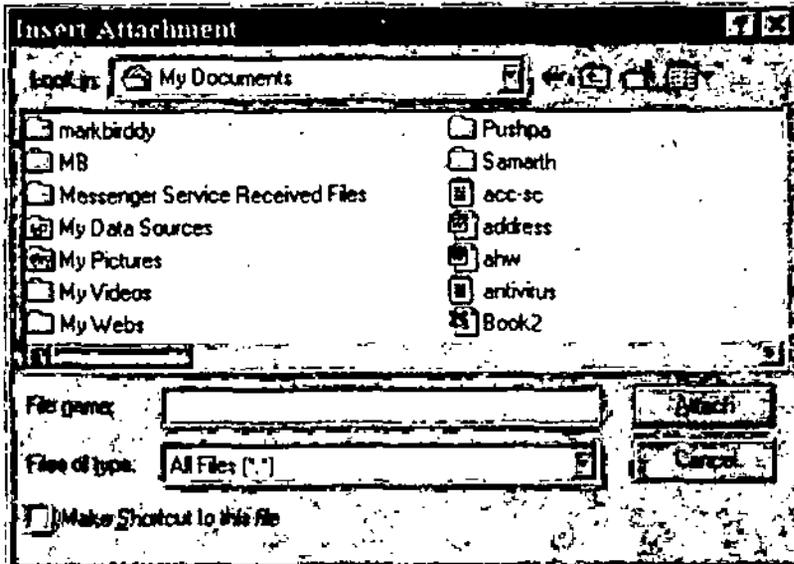
4.8 ISP

An Internet service provider (abbr. ISP, also called Internet access provider or IAP) is a business or organization that provides to consumers access to the Internet and related services. In the past, most ISPs were run by the phone companies. Now, ISPs can be started by just about any individual or group with sufficient money and expertise. In addition to Internet access via various technologies such as dial-up and DSL, they may provide a combination of services including Internet transit, domain name registration and hosting, web hosting, and colocation.

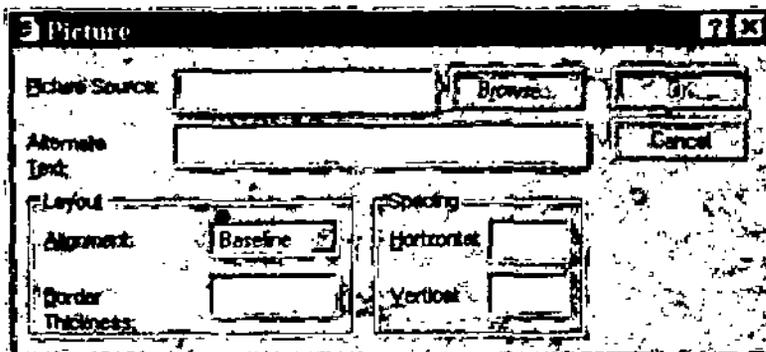
4.8.1 ISP Connection Options

ISPs employ a range of technologies to enable consumers to connect to their network. For "home users", the most popular options include dial-up, DSL (typically ADSL), Broadband wireless access, Cable modem, and ISDN (typically BRI). For customers

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who have more demanding requirements, such as medium-to-large businesses, or other ISPs, DSL (often SHDSL or ADSL), Ethernet, Metro Ethernet, Gigabit Ethernet, Frame Relay, ISDN (BRI or PRI), ATM, satellite Internet access and SONET are



more likely. With the increasing popularity of downloading music and online video and the general demand for faster page loads, higher bandwidth connections are becoming more popular.

4.8.2 How ISPs Connect to the Internet?

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Just as their customers pay them for Internet access, ISPs themselves pay upstream ISPs for Internet access. In the simplest case, a single connection is established to an upstream ISP using one of the technologies described above, and the ISP uses this connection to send or receive any data to or from parts of the Internet beyond its own network; in turn, the upstream ISP uses its own upstream connection, or connections to its other customers (usually other ISPs) to allow the data to travel from source to destination.

In reality, the situation is often more complicated. For example, ISPs with more than one Point of Presence (PoP) may have separate connections to an upstream ISP at multiple PoPs, or they may be customers of multiple upstream ISPs and have connections to each one at one or more of their PoPs. ISPs may engage in peering, where multiple ISPs interconnect with one another at a peering point or Internet exchange point (IX), allowing the routing of data between their networks, without charging one another for that data - data that would otherwise have passed through their upstream ISPs, incurring charges from the upstream ISP. ISPs that require no upstream, and have only customers and/or peers, are called Tier 1 ISPs, indicating their status as ISPs at the top of the Internet hierarchy. Routers, switches, Internet routing protocols, and the expertise of network administrators all have a role to play in ensuring that data follows the best available route and that ISPs can "see" one another on the Internet.

4.8.3 Virtual ISP

A Virtual ISP (vISP) purchases services from another ISP (sometimes called a wholesale ISP or similar within this context) that allow the vISP's customers to access the Internet via one or more Points of Presence (PoPs) that are owned and operated by the wholesale ISP. There are various models for the delivery of this type of service, for example, the wholesale ISP could provide network access to end users via its dial-up modem PoPs or DSLAMs installed in telephone exchanges, and route, switch, and/or tunnel the end user traffic to the vISP's network, whereupon they may route the traffic toward its destination.

In another model, the vISP does not route any end user traffic, and needs only provide AAA (Authentication, Authorization and Accounting) functions, as well as any "value-add" services like email or web hosting. Any given ISP may use their own PoPs to deliver one service, and use a vISP model to deliver another service, or, use a combination to deliver a service in different areas. The service provided by a wholesale ISP in a vISP model is distinct from that of an upstream ISP, even though in some cases, they may both be one and the same company. The former provides connectivity from the end user's premises to the Internet or to the end user's ISP, the latter provides connectivity from the end user's ISP to all or parts of the rest of the Internet.

A vISP can also refer to a completely automated white label service offered to anyone at no cost or for a minimal set-up fee. The actual ISP providing the service generates revenue from the calls and may also share a percentage of that revenue with the owner of the vISP. All technical aspects are dealt with leaving the owner of vISP with

the task of promoting the service. This sort of service is however declining due to the popularity of unmetered internet access also known as flatrate.

4.9 E-COMMERCE

Electronic Commerce is exactly analogous to a marketplace on the Internet. Electronic Commerce (also referred to as EC, e-commerce eCommerce or ecommerce) consists primarily of the distributing, buying, selling, marketing and servicing of products or services over electronic systems such as the Internet and other computer networks. The information technology industry might see it as an electronic business application aimed at commercial transactions; in this context, it can involve electronic funds transfer, supply chain management, e-marketing, online marketing, online transaction processing, electronic data interchange (EDI), automated inventory management systems, and automated data collection systems. Electronic commerce typically uses electronic communications technology of the World Wide Web, at some point in the transaction's lifecycle, although of course electronic commerce frequently depends on computer technologies other than the World Wide Web, such as databases, and e-mail, and on other non-computer technologies, such as transportation for physical goods sold via e-commerce.

E-Commerce according to Person Halls book E-Commerce started in 1994 with the first banner ad being placed on a website.

The meaning of the term "electronic commerce" has changed over the last 30 years. Originally, "electronic commerce" meant the facilitation of commercial transactions electronically, usually using technology like Electronic Data Interchange (EDI) and Electronic Funds Transfer (EFT), where both were introduced in the late 1970s, for example, to send commercial documents like purchase orders or invoices electronically.

The 'electronic' or 'e' in e-commerce refers to the technology/systems; the 'commerce' refers to be traditional business models. E-commerce is the complete set of processes that support commercial business activities on a network. In the 1970s and 1980s, this would also have involved information analysis. The growth and acceptance of credit cards, automated teller machines (ATM) and telephone banking in the 1980s were also forms of e-commerce.

However, from the 1990s onwards, this would include enterprise resource planning systems (ERP), data mining and data warehousing.

In the dot com era, it came to include activities more precisely termed "Web commerce" -- the purchase of goods and services over the World Wide Web, usually with secure connections (HTTPS, a special server protocol that encrypts confidential ordering data for customer protection) with e-shopping carts and with electronic payment services, like credit card payment authorizations.

Today, it encompasses a very wide range of business activities and processes, from e-banking to offshore manufacturing to e-logistics. The ever growing dependence of modern industries on electronically enabled business processes gave impetus to the growth and development of supporting systems, including backend systems, applications and middleware. Examples are broadband and fibre-optic

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networks, supply-chain management software, customer relationship management software, inventory control systems and financial accounting software.

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When the Web first became well-known among the general public in 1994, many journalists and pundits forecast that e-commerce would soon become a major economic sector. However, it took about four years for security protocols (like HTTPS) to become sufficiently developed and widely deployed. Subsequently, between 1998 and 2000, a substantial number of businesses in the United States and Western Europe developed rudimentary web sites.

Although a large number of "pure e-commerce" companies disappeared during the dot-com collapse in 2000 and 2001, many "brick-and-mortar" retailers recognized that such companies had identified valuable niche markets and began to add e-commerce capabilities to their Web sites. For example, after the collapse of online grocer Webvan, two traditional supermarket chains, Albertsons and Safeway, both started e-commerce subsidiaries through which consumers could order groceries online.

The emergence of e-commerce also significantly lowered barriers to entry in the selling of many types of goods; accordingly many small home-based proprietors are able to use the internet to sell goods. Often, small sellers use online auction sites such as EBay, or sell via large corporate websites like Amazon.com, in order to take advantage of the exposure and setup convenience of such sites.

4.9.1 Success Factors

In many cases, an e-commerce company will survive not only based on its product, but by having a competent management team, good post-sales services, well-organized business structure, network infrastructure and a secured, well-designed website. A company that wants to succeed will have to perform 2 things: Technical and organizational aspects and customer-oriented. Following factors will make business of companies succeed in e-commerce:

Technical and organizational aspects

1. Sufficient work done in market research and analysis. E-commerce is not exempt from good business planning and the fundamental laws of supply and demand. Business failure is as much a reality in e-commerce as in any other form of business.
2. A good management team armed with information technology strategy. A company's IT strategy should be a part of the business re-design process.
3. Providing an easy and secured way for customers to effect transactions. Credit cards are the most popular means of sending payments on the internet, accounting for 90% of online purchases. In the past, card numbers were transferred securely between the customer and merchant through independent payment gateways. Such independent payment gateways are still used by most small and home businesses. Most merchants today process credit card transactions on site through arrangements made with commercial banks or credit cards companies.
4. Providing reliability and security. Parallel servers, hardware redundancy, fail-safe technology, information encryption, and firewalls can enhance this requirement.
5. Providing a 360-degree view of the customer relationship, defined as ensuring

that all employees, suppliers, and partners have a complete view, and the same view, of the customer. However, customers may not appreciate the big brother experience.

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6. Constructing a commercially sound business model.
7. Engineering an electronic value chain in which one focuses on a "limited" number of core competencies -- the opposite of a one-stop shop. (Electronic stores can appear either specialist or generalist if properly programmed.)
8. Operating on or near the cutting edge of technology and staying there as technology changes (but remembering that the fundamentals of commerce remain indifferent to technology).
9. Setting up an organization of sufficient alertness and agility to respond quickly to any changes in the economic, social and physical environment.
10. Providing an attractive website. The tasteful use of colour, graphics, animation, photographs, fonts, and white-space percentage may aid success in this respect.
11. Streamlining business processes, possibly through re-engineering and information technologies.
12. Providing complete understanding of the products or services offered, which not only includes complete product information, but also sound advisors and selectors.

Naturally, the e-commerce vendor must also perform such mundane tasks as being truthful about its product and its availability, shipping reliably, and handling complaints promptly and effectively. A unique property of the Internet environment is that individual customers have access to far more information about the seller than they would find in a brick-and-mortar situation. (Of course, customers can, and occasionally do, research a brick-and-mortar store online before visiting it, so this distinction does not hold water in every case.)

4.9.2 Customer Experience

A successful e-commerce organization must also provide an enjoyable and rewarding experience to its customers. Many factors go into making this possible. Such factors include:

1. Providing value to customers. Vendors can achieve this by offering a product or product-line that attracts potential customers at a competitive price, as in non-electronic commerce.
2. Providing service and performance. Offering a responsive, user-friendly purchasing experience, just like a flesh-and-blood retailer, may go some way to achieving these goals.
3. Providing an incentive for customers to buy and to return. Sales promotions to this end can involve coupons, special offers, and discounts. Cross-linked websites and advertising affiliate programs can also help.
4. Providing personal attention. Personalized web sites, purchase suggestions, and personalized special offers may go some of the way to substituting for the face-to-face human interaction found at a traditional point of sale.
5. Providing a sense of community. Chat rooms, discussion boards, soliciting customer input and loyalty programs (sometimes called affinity programs) can help in this respect.

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6. **Owning the customer's total experience.** E-tailers foster this by treating any contacts with a customer as part of a total experience, an experience that becomes synonymous with the brand.
7. **Letting customers help themselves.** Provision of a self-serve site, easy to use without assistance, can help in this respect. This implies that all product information is available, cross-sell information, advice for product alternatives, and supplies & accessory selectors.
8. **Helping customers do their job of consuming.** E-tailers and online shopping directories can provide such help through ample comparative information and good search facilities. Provision of component information and safety-and-health comments may assist e-tailers to define the customers' job.

4.9.3 Problems

Even if a provider of E-commerce goods and services rigorously follows these "key factors" to devise an exemplary e-commerce strategy, problems can still arise. Sources of such problems include:

1. **Failure to understand customers, why they buy and how they buy.** Even a product with a sound value proposition can fail if producers and retailers do not understand customer habits, expectations, and motivations. E-commerce could potentially mitigate this potential problem with proactive and focused marketing research, just as traditional retailers may do.
2. **Failure to consider the competitive situation.** One may have the will to construct a viable book e-tailing business model, but lack the capability to compete with Amazon.com.
3. **Inability to predict environmental reaction.** What will competitors do? Will they introduce competitive brands or competitive web sites? Will they supplement their service offerings? Will they try to sabotage a competitor's site? Will price wars break out? What will the government do? Research into competitors, industries and markets may mitigate some consequences here, just as in non-electronic commerce.
4. **Over-estimation of resource competence.** Can staff, hardware, software, and processes handle the proposed strategy? Have e-tailers failed to develop employee and management skills? These issues may call for thorough resource planning and employee training.
5. **Failure to coordinate.** If existing reporting and control relationships do not suffice, one can move towards a flat, accountable, and flexible organizational structure, which may or may not aid coordination.
6. **Failure to obtain senior management commitment.** This often results in a failure to gain sufficient corporate resources to accomplish a task. It may help to get top management involved right from the start.
7. **Failure to obtain employee commitment.** If planners do not explain their strategy well to employees, or fail to give employees the whole picture, then training and setting up incentives for workers to embrace the strategy may assist.
8. **Under-estimation of time requirements.** Setting up an e-commerce venture can take considerable time and money, and failure to understand the timing and sequencing of tasks can lead to significant cost overruns. Basic project

- planning, critical path, critical chain, or PERT analysis may mitigate such failings. Profitability may have to wait for the achievement of market share.
9. Failure to follow a plan. Poor follow-through after the initial planning, and insufficient tracking of progress against a plan can result in problems. One may mitigate such problems with standard tools: benchmarking, milestones, variance tracking, and penalties and rewards for variances.
 10. Becoming the victim of organized crime. Many syndicates have caught on to the potential of the Internet as a new revenue stream. Two main methods are as follows: (1) Using identity theft techniques like phishing to order expensive goods and bill them to some innocent person, then liquidating the goods for quick cash; (2) Extortion by using a network of compromised "zombie" computers to engage in distributed denial of service attacks against the target Web site until it starts paying protection money.
 11. Failure to expect the unexpected. Too often new businesses do not take into account the amount of time, money or resources needed to complete a project and often find themselves without the necessary components to become successful.

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4.9.4 Product Suitability

Certain products or services appear more suitable for online sales; others remain more suitable for offline sales. While credit cards are currently the most popular means of paying for online goods and services, alternative online payments will account for 26% of e-commerce volume by 2009 according to Celent.

Many successful purely virtual companies deal with digital products, (including information storage, retrieval, and modification), music, movies, office supplies, education, communication, software, photography, and financial transactions. Examples of this type of company include: Google, eBay and Paypal. Other successful marketers such as use Drop shipping or Affiliate marketing techniques to facilitate transactions of tangible goods without maintaining real inventory. Examples include numerous sellers on eBay.

Virtual marketers can sell some non-digital products and services successfully. Such products generally have a high value-to-weight ratio, they may involve embarrassing purchases, they may typically go to people in remote locations, and they may have shut-ins as their typical purchasers. Items which can fit through a standard letterbox — such as music CDs, DVDs and books — are particularly suitable for a virtual marketer, and indeed Amazon.com, one of the few enduring dot-com companies, has historically concentrated on this field.

Products such as spare parts, both for consumer items like washing machines and for industrial equipment like centrifugal pumps, also seem good candidates for selling online. Retailers often need to order spare parts specially, since they typically do not stock them at consumer outlets — in such cases, e-commerce solutions in spares do not compete with retail stores, only with other ordering systems. A factor for success in this niche can consist of providing customers with exact, reliable information about which part number their particular version of a product needs, for example by providing parts lists keyed by serial number.

Purchases of pornography and of other sex-related products and services fulfill the requirements of both virtuality (or if non-virtual, generally high-value) and potential

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embarrassment; unsurprisingly, provision of such services has become the most profitable segment of e-commerce.

There are also many disadvantages of e-commerce, one of the main ones is fraud. This is where your details (name, bank card number, age, national insurance number) are entered into what look to be a safe site but really it is not. These details can then be used to steal money from you and can be used to buy things on line that you are completely unaware of until it is too late. If this information is leaked into the wrong hands. People are able to steal your identity, and commit more fraud crimes under your name. Finally there are many problems with e commerce some of which are:

Failure to understand customers, why they buy and how they buy. Even a product with a sound value proposition can fail if producers and retailers do not understand customer habits, expectations, and motivations. E-commerce could potentially mitigate this potential problem with proactive and focused marketing research, just as traditional retailers may do. Failure to consider the competitive situation. One may have the will to construct a viable book e-tailing business model, but lack the capability to compete with Amazon. Inability to predict environmental reaction. What will competitors do? Will they introduce competitive brands or competitive web sites? Will they supplement their service offerings? Will they try to sabotage a competitor's site? Will price wars break out? What will the government do? Research into competitors, industries and markets may mitigate some consequences here, just as in non-electronic commerce. Over-estimation of resource competence. Can staff, hardware, software, and processes handle the proposed strategy? Have e-tailer's failed to develop employee and management skills? These issues may call for thorough resource planning and employee training.

Products less suitable for e-commerce include products that have a low value-to-weight ratio, products that have a smell, taste, or touch component, products that need trial fittings — most notably clothing — and products where colour integrity appears important. Nonetheless, Tesco.com has had success delivering groceries in the UK, albeit that many of its goods are of a generic quality, and clothing sold through the internet is big business in the U.S. Also, the recycling program Cheapcycle sells goods over the internet, but avoids the low value-to-weight ratio problem by creating different groups for various regions, so that shipping costs remain low.

4.9.5 Acceptance

Consumers have accepted the e-commerce business model less readily than its proponents originally expected. Even in product categories suitable for e-commerce, electronic shopping has developed only slowly. Several reasons might account for the slow uptake, including:

- Concerns about security. Many people will not use credit cards over the Internet due to concerns about theft and credit card fraud.
- Lack of instant gratification with most e-purchases (non-digital purchases). Much of a consumer's reward for purchasing a product lies in the instant gratification of using and displaying that product. This reward does not exist when one's purchase does not arrive for days or weeks.
- The problem of access to web commerce, mainly for poor households and for developing countries. Low penetration rates of Internet access in some sectors greatly reduces the potential for e-commerce.

- The social aspect of shopping. Some people enjoy talking to sales staff, to other shoppers, or to their cohorts: this social reward side of retail therapy does not exist to the same extent in online shopping.
- Poorly designed, bug-infested e-Commerce web sites that frustrate online shoppers and drive them away.
- Inconsistent return policies among e-tailers or difficulties in exchange/return.

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4.10 PUBLIC AND PRIVATE KEY

Public key cryptography, also known as asymmetric cryptography, is a form of cryptography in which a user has a pair of cryptographic keys - a public key and a private key. The private key is kept secret, while the public key may be widely distributed. The keys are related mathematically, but the private key cannot be practically derived from the public key. A message encrypted with the public key can be decrypted only with the corresponding private key.

Conversely, Secret key cryptography, also known as symmetric cryptography uses a single secret key for both encryption and decryption.

The two main branches of public key cryptography are:

public key encryption — a message encrypted with a recipient's public key cannot be decrypted by anyone except the recipient possessing the corresponding private key. This is used to ensure confidentiality.

digital signatures — a message signed with a sender's private key can be verified by anyone who has access to the sender's public key, thereby proving that the sender signed it and that the message has not been tampered with. This is used to ensure authenticity.

An analogy for public-key encryption is that of a locked mailbox with a mail slot. The mail slot is exposed and accessible to the public; its location (the street address) is in essence the public key. Anyone knowing the street address can go to the door and drop a written message through the slot; however, only the person who possesses the key can open the mailbox and read the message.

An analogy for digital signatures is the sealing of an envelope with a personal wax seal. The message can be opened by anyone, but the presence of the seal authenticates the sender.

A central problem for public-key cryptography is proving that a public key is authentic, and has not been tampered with or replaced by a malicious third party. The usual approach to this problem is to use a public-key infrastructure (PKI), in which one or more third parties, known as certificate authorities, certify ownership of key pairs. Another approach, used by PGP, is the "web of trust" method to ensure authenticity of key pairs.

Public key techniques are much more computationally intensive than purely symmetric algorithms. The judicious use of these techniques enables a wide variety of applications. In practice, public key cryptography is used in combination with secret-key methods for efficiency reasons. For encryption, the message may be encrypted with secret-key algorithm using a randomly generated key, and that key encrypted with the user's public key. For digital signatures, a message is hashed (using a

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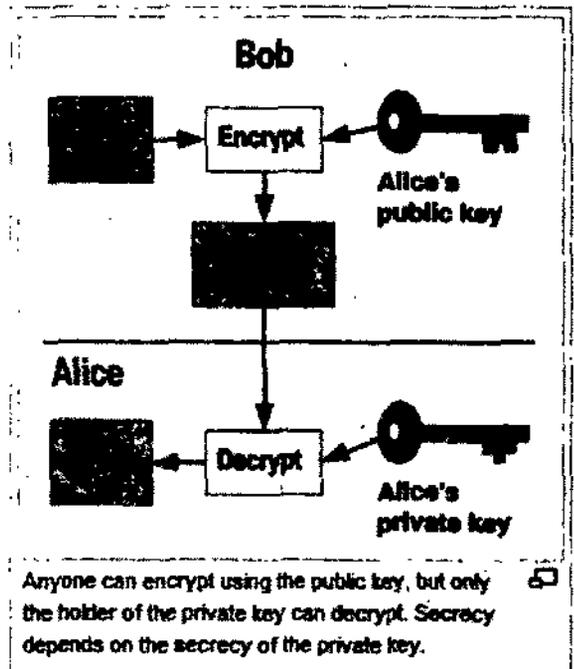
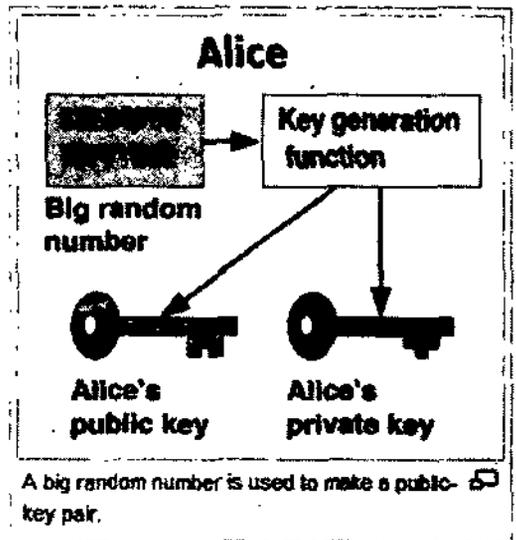
cryptographic hash function) and the resulting "hash value" is signed; before verifying the signature, the recipient computes the hash of the message himself, and compares this hash value with the signed hash value to check that the message has not been tampered with.

4.10.1 Security

There is nothing especially more secure about asymmetric key algorithms than symmetric key algorithms. There are popular ones and unpopular ones. There are broken ones and ones that are, for now, not broken. Unfortunately, popularity is not a reliable indicator of security. Some algorithms have security proofs with various properties and of varying quality. Many proofs claim that breaking an algorithm, with respect to some well-defined security goals, is equivalent to solving one of the more popular mathematical problems that are presumed to be intractable, like factoring the product of two large primes or finding discrete logarithms. Some proofs have also been shown to be flawed. None of these algorithms can be proved secure in as absolute a sense as the one-time pad has. As with all cryptographic algorithms, these algorithms must be chosen and used with care.

The most obvious application of a public key encryption system is confidentiality; a message which a sender encrypts using the recipient's public key can only be decrypted by the recipient's paired private key.

Public-key digital signature algorithms can be used for sender authentication and non-repudiation. For instance, a user can encrypt a message with his own private key and send it. If another user can successfully decrypt it using the corresponding public key, this provides assurance that the first user (and no other) sent it. In practice, a cryptographic hash value of the message is calculated, encrypted with the private key and sent along with the message (resulting in a cryptographic signature of the message). The receiver can then verify message integrity and origin by calculating the hash value of the received message and comparing it against the decoded signature (the original hash). If the hash from the sender and the hash on the receiver side do not match, then the received message is not identical to the message which the sender "signed", or the sender's identity is wrong.



To achieve authentication, non-repudiation, and confidentiality, the sender would first encrypt the message using his private key, then a second encryption is performed using the recipient's public key.

These characteristics are useful for many other, sometimes surprising, applications, like digital cash, password-authenticated key agreement, multi-party key agreement, etc.

4.10.2 Actual Algorithms — Two Linked Keys

Not all asymmetric key algorithms operate in precisely this fashion. The most common ones have the property that Alice and Bob each own two keys, one for encryption and one for decryption. In a secure asymmetric key encryption scheme, the decryption key should not be deducible from the encryption key. This is known as public-key encryption, since the encryption key can be published without compromising the security of encrypted messages. In the analogy above, Bob might publish instructions on how to make a lock ("public key"), but the lock is such that it is impossible (so far as is known) to deduce from these instructions how to make a key which will open that lock ("private key"). Those wishing to send messages to Bob use the public key to encrypt the message; Bob uses his private key to decrypt it.

4.10.3 Weaknesses

Of course, there is a possibility that someone could "pick" Bob's or Alice's lock. Among symmetric key encryption algorithms, only the one-time pad can be proven to be secure against any adversary, no matter how much computing power is available. Unfortunately, there is no public-key scheme with this property, since all public-key schemes are susceptible to brute force key search attack. Such attacks are impractical if the amount of computation needed to succeed (termed 'work factor' by Shannon) is out of reach of potential attackers. The work factor can be increased by simply choosing a longer key. Other attacks may be more efficient, and some are known for some public key encryption algorithms. Both RSA and ElGamal have known attacks which are much faster than the brute force approach. Such estimates have changed both with the decreasing cost of computer power, and new mathematical discoveries.

In practice, these insecurities can be avoided by choosing key sizes large enough that the best known attack would take so long that it is not worth any adversary's time and money to break the code. For example, if an estimate of how long it takes to break an encryption scheme is one thousand years, and it were used to encrypt your credit card details, they would be safe enough, since the time needed to decrypt the details will be rather longer than the useful life of those details, which expire after a few years. Typically, the key size needed is much longer for public key algorithms than for symmetric key algorithms.

Major weaknesses have been found for several formerly promising asymmetric key algorithms. The 'knapsack packing' algorithm was found to be insecure when a new attack was found. Recently, some attacks based on careful measurements of the exact amount of time it takes known hardware to encrypt plain text have been used to simplify the search for likely decryption keys (see side channel attack). Thus, mere use of asymmetric key algorithms does not ensure security; it is an area of active research to discover and protect against new attacks.

Another potential security vulnerability in using asymmetric keys is the possibility

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of a man in the middle attack, in which communication of public keys is intercepted by a third party and modified to provide different public keys instead. Encrypted messages and responses must also be intercepted, decrypted and re-encrypted by the attacker using the correct public keys for different communication segments in all instances to avoid suspicion. This attack may seem to be difficult to implement in practice, but it's not impossible when using insecure media (e.g. public networks such the Internet or wireless communications). A malicious staff member at Alice or Bob's ISP might find it outright easy.

One approach to prevent such attacks is the use of a certificate authority, a trusted third party who is responsible for verifying the identity of a user of the system and issuing a digital certificate, which is a signed block of data stating that this public key belongs to that person, company or other entity. This approach also has weaknesses. For example, the certificate authority must be trusted to have properly checked the identity of the key-holder and the correctness of the public key when it issues a certificate, and has been correctly set up at communication participants before it can be used. An attacker who could subvert the certificate authority into issuing a certificate for a bogus public key could then mount a man in the middle attack as easily as if the certificate scheme were not used at all. Despite its problems, this approach is widely used; examples include SSL and its successor, TLS, which are commonly used to provide security in web browsers, for example, to securely send credit card details to an online store.

4.11 SAFETY OF BUSINESS TRANSACTION ON WEB

In many cases, an e-commerce company will survive not only based on its product, but by having a competent management team, good post-sales services, well-organized business structure, network infrastructure and a secured, well-designed website. A company that wants to succeed will have to perform 2 things: Technical and organizational aspects and customer-oriented. Following factors will make business of companies succeed in e-commerce:

4.11.1 Technical and Organizational Aspects

- Sufficient work done in market research and analysis. E-commerce is not exempt from good business planning and the fundamental laws of supply and demand. Business failure is as much a reality in e-commerce as in any other form of business.
- A good management team armed with information technology strategy. A company's IT strategy should be a part of the business re-design process.
- Providing an easy and secured way for customers to effect transactions. Credit cards are the most popular means of sending payments on the internet, accounting for 90% of online purchases. In the past, card numbers were transferred securely between the customer and merchant through independent payment gateways. Such independent payment gateways are still used by most small and home businesses. Most merchants today process credit card transactions on site through arrangements made with commercial banks or credit cards companies.
- Providing reliability and security. Parallel servers, hardware redundancy, fail-safe technology, information encryption, and firewalls can enhance this requirement.

- Providing a 360-degree view of the customer relationship, defined as ensuring that all employees, suppliers, and partners have a complete view, and the same view, of the customer. However, customers may not appreciate the big brother experience.
- Constructing a commercially sound business model.
- Engineering an electronic value chain in which one focuses on a "limited" number of core competencies -- the opposite of a one-stop shop. (Electronic stores can appear either specialist or generalist if properly programmed.)
- Operating on or near the cutting edge of technology and staying there as technology changes (but remembering that the fundamentals of commerce remain indifferent to technology).
- Setting up an organization of sufficient alertness and agility to respond quickly to any changes in the economic, social and physical environment.
- Providing an attractive website. The tasteful use of colour, graphics, animation, photographs, fonts, and white-space percentage may aid success in this respect.
- Streamlining business processes, possibly through re-engineering and information technologies.
- Providing complete understanding of the products or services offered, which not only includes complete product information, but also sound advisors and selectors.

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Naturally, the e-commerce vendor must also perform such mundane tasks as being truthful about its product and its availability, shipping reliably, and handling complaints promptly and effectively. A unique property of the Internet environment is that individual customers have access to far more information about the seller than they would find in a brick-and-mortar situation. (Of course, customers can, and occasionally do, research a brick-and-mortar store online before visiting it, so this distinction does not hold water in every case.)

4.11.2 Problems

Even if a provider of E-commerce goods and services rigorously follows these "key factors" to devise an exemplary e-commerce strategy, problems can still arise. Sources of such problems include:

- Failure to understand customers, why they buy and how they buy. Even a product with a sound value proposition can fail if producers and retailers do not understand customer habits, expectations, and motivations. E-commerce could potentially mitigate this potential problem with proactive and focused marketing research, just as traditional retailers may do.
- Failure to consider the competitive situation. One may have the will to construct a viable brick e-tailing business model, but lack the capability to compete with Amazon.com.
- Inability to predict environmental reaction. What will competitors do? Will they introduce competitive brands or competitive web sites? Will they supplement their service offerings? Will they try to sabotage a competitor's site? Will price wars break out? What will the government do? Research into competitors, industries and markets may mitigate some consequences here, just as in non-electronic commerce.

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- Over-estimation of resource competence. Can staff, hardware, software, and processes handle the proposed strategy? Have e-tailers failed to develop employee and management skills? These issues may call for thorough resource planning and employee training.
- Failure to coordinate. If existing reporting and control relationships do not suffice, one can move towards a flat, accountable, and flexible organizational structure, which may or may not aid coordination.
- Failure to obtain senior management commitment. This often results in a failure to gain sufficient corporate resources to accomplish a task. It may help to get top management involved right from the start.
- Failure to obtain employee commitment. If planners do not explain their strategy well to employees, or fail to give employees the whole picture, then training and setting up incentives for workers to embrace the strategy may assist.
- Under-estimation of time requirements. Setting up an e-commerce venture can take considerable time and money, and failure to understand the timing and sequencing of tasks can lead to significant cost overruns. Basic project planning, critical path, critical chain, or PERT analysis may mitigate such failings. Profitability may have to wait for the achievement of market share.
- Failure to follow a plan. Poor follow-through after the initial planning, and insufficient tracking of progress against a plan can result in problems. One may mitigate such problems with standard tools: benchmarking, milestones, variance tracking, and penalties and rewards for variances.
- Becoming the victim of organized crime. Many syndicates have caught on to the potential of the Internet as a new revenue stream. Two main methods are as follows: (1) Using identity theft techniques like phishing to order expensive goods and bill them to some innocent person, then liquidating the goods for quick cash; (2) Extortion by using a network of compromised "zombie" computers to engage in distributed denial of service attacks against the target Web site until it starts paying protection money.
- Failure to expect the unexpected. Too often new businesses do not take into account the amount of time, money or resources needed to complete a project and often find themselves without the necessary components to become successful.

Security is the condition of being protected against danger or loss. In the general sense, security is a concept similar to safety. The nuance between the two is an added emphasis on being protected from dangers that originate from outside. Individuals or actions that encroach upon the condition of protection are responsible for the breach of security.

The word "security" in general usage is synonymous with "safety," but as a technical term "security" means that something not only is secure but that it has been secured. In telecommunications, the term security has the following meanings:

- A condition that results from the establishment and maintenance of protective measures that ensure a state of inviolability from hostile acts or influences.
- With respect to classified matter, the condition that prevents unauthorized persons from having access to official information that is safeguarded in the interests of national security.

- Measures taken by a military unit, an activity or installation to protect itself against all acts designed to, or which may, impair its effectiveness.
- Security has to be compared and contrasted with other related concepts: Safety, continuity, reliability. The key difference between security and reliability is that security must take into account the actions of active malicious agents attempting to cause destruction.

NOTES

SUMMARY

1. HTML is the language of Internet.
2. HTML tags are written within the less than (<) and greater than (>) signs.
3. Mostly all values should be enclosed in straight quotation marks.
4. There is no restriction on the number of spaces given by you.
5. HTML supports most of the special characters.
6. Any word processor can be used for creating a text file for HTML.
7. You can see your text in a browser.
8. Your text should have the html or htm extension.
9. The first line of the text defines the HTML.
10. Main body of the text is divided between <BODY> and </BODY>.
11. Headings in the text are divided between <HEAD> and </HEAD>.
12. You can have as many as 6 headings in the text.
13. A new paragraph can be added in the text using the tag <p>.
14. Font of the text can be changed using the tag FONT FACE and giving its name.
15. Using BIG and SMALL you can change the size of the font.
16. You can use the predefined fonts too.
17. Colours can also be used for fonts.
18. You can make the text bold by using .
19. You can make the text italic by using <I>.
20. You can define the colour by its name.
21. You can make the text superscripted by using the tag <SUP>.
22. You can make the text subscripted by using the tag <SUB>.
23. You can make the text strikethrough by using the tag <STRIKE>.
24. You can make the text underlined by using the tag <U>.
25. You can have graphics too in your HTML files.
26. The tag for using graphics is IMG SRC.
27. You can change the weight and height of the image in HTML.
28. You can align your text with respect to the image.
29. You can add lines of various widths in your text.
30. You can wrap the text in between two images.
31. You can add space around the image.
32. You can set margins for the page.
33. You can give space between various paragraphs.
34. You can use indented text too.
35. You can align your text in any alignment.
36. You can have your data in various columns.
37. You can change the background colour of the page.
38. BLOCKQUOTE is used for giving a block of text.
39. You can use Tables in HTML too but the result somehow not as good as you would get in a word processing or a publishing program.
40. To create a table you use the tag <TABLE>.
41. You use COLGROUP to divide table in columns.

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42. Horizontal rows are set using the tag <TR>.
43. Table headers are created using <TH>.
44. You can add a border too to the table.
45. You can add a background image to the table.
46. Using ALIGN you can align the text in the cells.
47. A form is used to get the feedback from the visitors to the site.
48. You can create a form using the tag <FORM>.
49. You can give various options using the tag <OPTION>.
50. Values can also be given to the Options.
51. Check boxes allow the visitor to click in them.
52. Text boxes are used to allow visitor to write text.
53. Large text can be left using the tag TEXTAREA.
54. Submit button can also be set by using the INPUT tag.
55. Reset tag is used for visitors to correct its entry.
56. You can allows users to upload files.
57. A global hypertext system that uses the Internet as its transport mechanism is called World Wide Web.
58. Web allows you to skip from one page to another using hyperlink.
59. Web is independent of the platform.
60. With Web you can get information from the user too.
61. Web browsers allow you to see the web pages.
62. Most popular Web browser is Microsoft Internet Explorer.
63. Web server manages the communications protocols and the related software required to create a Web site on the Internet.
64. HTTP is used as the communication protocol to transport hypertext documents over the Internet.
65. A URL describes the location and a method of accessing a resource on the Internet.
66. Search engines are used to search for different information on the net.
67. Yahoo! is the popular search engine.
68. Search is done using spiders.
69. FTP is the short name for File Transfer Protocol.
70. In FTP terminology, your computer is called the LOCAL HOST and the other computer is called the REMOTE HOST.
71. ANONYMOUS FTP is a facility that lets you connect to certain remote hosts and download files without having to be registered as a user.
72. Public anonymous ftp achieves are so vast as to be well beyond human understanding.
73. Each RFC is given a number and is made freely available to anyone who wants to read it.
74. An ftp client is a program designed for one purpose: to use the ftp service to copy files from one Internet computer to another.
75. Since most of the anonymous ftp hosts are Unix computers, you will need to know something about the Unix file system.
76. The main directory in UNIX is called Root directory.
77. Path shows the location of the directory/file.
78. To download or upload files from a remote host, you use the ftp program.
79. ftp> is the prompt for giving all the commands.
80. The common ftp commands are open, close and user.
81. Each of the dir commands generates a directory listing of the specified directory.
82. There are two commands you can use to download files (that is, to copy files form the remote host to your computer). These commands are get and mget.
83. Within the ftp program, the commands used to control the downloading operations are: binary, ascii, hash, prompt and status.

84. If you want to display the current setting all the options, you can use the status command.
85. Before you start downloading pictures you must give the Binary command.
86. One way is to download it to a local file, stop or pause the ftp session, read the file, delete the file and then resume the ftp session.
87. With most anonymous ftp hosts, you are automatically placed in the root (top-level) directory to start.
88. Anonymous ftp allows you to download virtually any type of information.
89. TELNET is the Internet service that allows you to log in to a remote Internet computer.
90. In telnet terminology, your computer is called the LOCAL computer.
91. To use Telnet, you turn a Telnet client program, which connects you to a remote Internet host and then emulates a VT-100 terminal.
92. To start Telnet, enter the name of the command followed by the address of the remote host to which you want to connect.
93. Any time you are at the telnet> prompt, there are a number of different commands that you can use.
94. Browser is the software which allows you to view the web sites.
95. Client computer is the base computer from where you access the Internet.
96. Host computer is the computer which holds all the Web pages.
97. ISP is the agency which provides the Internet access.
98. Common browsers are Microsoft Internet Explorer and Netscape Navigator.
99. There are various bars and buttons on the opening screen of the Explorer.
100. There are buttons on the toolbar to do various things.
101. Favorites helps you in working with your favourite websites.
102. Search button helps you in accessing various search engines.
103. History shows you the sites which you had visited during the last working time.
104. You can copy data from a web page.
105. You can download a web page into your hard disk.
106. You can also print the web page.
107. e-mail is an important usage of Internet.
108. All Internet Service Provider allow you to open an e-mail account.
109. In Outlook Express, Inbox is used for incoming messages..
110. Outbox is used for sending messages.
111. Sent items stores all messages previously sent.
112. Deleted items has the messages which are marked for deletion.
113. Drafts has all the half completed messages.
114. To cut down the time of writing a message, lots of abbreviations are used.
115. You can even use similes in your message.
116. Various parts of the e-mail text are: Headers, To, From, Subject, Cc, Bcc, Attachments, Date and Body.
117. Using Send/Receive button on the standard toolbar, you can send and receive mail.
118. Various type of messages are: Unread message, High importance message, Low importance message, Message that has been read, Message with attachment, Message that has been forwarded, Message that has been replied to, Meeting for which response is requested and Follow-up flag.
119. For reading the message you can use Ctrl + O.
120. You can click the RE button for replying to a message.
121. By using FW you can forward a message.
122. You can delete a message by Ctrl+D.
123. You can create your own stationery for sending message.
124. You can create and put your own signature in messages.
125. You can attach a file to your message.
126. You can even attach a picture to your message.

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1. What is HTML used for?
2. How are HTML tags written?
3. How are the values given in HTML?
4. How is the text typed for HTML?
5. How would you start and end the body of the text?
6. How many headings you can have in a page?
7. How are BIG and SMALL used?
8. Describe the various predefined fonts.
9. Describe the process of making characters Bold and Italics.
10. How can characters be superscripted and subscripted?
11. Describe the process of making text coloured.
12. What tags would you use for making the text underlined?
13. Can you make the text strikethrough in HTML? How?
14. What all goes in the first line of HTML text? Explain them.
15. Describe the process of inserting graphics.
16. How would you create a banner?
17. How would you add a horizontal line?
18. How would you wrap text around the image?
19. How would you set margins for the page?
20. Describe the method of giving space between paras?
21. How would you give indent in a para?
22. How would you set background colour of the page?
23. Describe how would you create tables in HTML?
24. How would you divide the table in various cols?
25. How would you put background colour to the table?
26. Can you have a border for your table, if yes, how?
27. What tags are used for Table heads and Table rows?
28. Can you have an image as background for the table?
29. How would you align text in cells?
30. Describe the process of putting a common heading for various cells.
31. How would you create a form?
32. How would you create menu like options?
33. Describe the process of creating radio buttons.
34. What are check boxes? How are they created?
35. What is a text box? How is it created?
36. How would you create a larger text box?
37. What role does Submit and Reset buttons play?
38. What is World Wide Web?
39. What are the basic features of World Wide Web?
40. Describe the various popular web browsers.
41. What is the use of a Web server?
42. What is a URL?
43. What is a Search Engine?
44. What is FTP?
45. What is Anonymous FTP?
46. How can you use browser Anonymous FTP?
47. What steps would you take for accessing an Anonymous FTP?
48. How are files and directories stored in FTP?

49. What do you understand by Path?
50. How would you start the FTP program?
51. Describe the alternative method of starting FTP.
52. Which are the basic commands of FTP?
53. Which commands are used for connecting to FTP?
54. What are the different options of Directory command?
55. Describe the various setting commands of FTP.
56. What is Telnet?
57. What is the concept of Telnet?
58. How would you start Telnet?
59. What is the use of Ctrl+] command?
60. What is a browser?
61. Define the various items on the Internet Explorer screen.
62. Describe the various buttons on Toolbar.
63. What are Favorites?
64. What is Search button used for?
65. What is e-mail?
66. How would create your own e-mail account?
67. Which are the different folders in Outlook Express?
68. Which type of messages you have in Outlook Express?
69. Describe the process of replying to a message.
70. How would you forward a message?
71. How would you create your own stationery?
72. How would you create your own signature?
73. Describe the process of attaching a file to your message.
74. Write short notes on the following:

Client Computer	Host Computer
Internet Service Provider	Yahoo!
Lycos	WebCrawler
Excite	HyperText
Searching Criterion	
75. Describe the following commands:

Open	Close
------	-------

Multiple Choice Questions

1. Full form of HTML is:
 - (a) Hyper Text Markup Language
 - (b) Hyper Text Monitor Language
 - (c) Hyper Type Markup Language
2. HTML tags must be written within :
 - (a) ()
 - (b) []
 - (c) <>
3. Values in HTML are provided within :
 - (a) Question marks
 - (b) Quotation marks
 - (c) Left and right brackets
4. Your text file should have the extension :
 - (a) html
 - (b) htm
 - (c) any of the 2 above
5. HTML definition is given in the text in :
 - (a) Last line
 - (b) Not given
 - (c) First line
6. What character is used to end the tag :
 - (a) /
 - (b) ?
 - (c) !
7. A new paragraph can be started using :
 - (a) Enter
 - (b) r
 - (b) p

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8. For making the characters bold, you use the tag :
 - (a)
 - (b) <L>
 - (c) <D>
9. Superscript _____ the character.
 - (a) lowers
 - (b) raises
10. Subscript _____ the character.
 - (a) lowers
 - (b) raises
11. Tag for using graphic is IMG followed by :
 - (a) SRC
 - (b) RCS
 - (c) CRS
12. For giving a line in the page, we which tag :
 - (a) Line
 - (b) HR
 - (c) SR
13. For giving space around the image we use :
 - (a) VSPACE
 - (b) HSPACE
 - (c) Both
14. For setting margins for the page, we give space on the left and :
 - (a) Right
 - (b) Top
 - (c) Bottom
15. For indenting we use the tag :
 - (a) Tag
 - (b) Space
 - (c) SPACER
16. For creating a table, you would use the tag :
 - (a) <TABLE>
 - (b) <CREATE>
 - (c) <TAB>
17. Table can be divided into cols and :
 - (a) semi colons
 - (b) rows
 - (c) cells
18. Horizontal rows are created by using :
 - (a) <TH>
 - (b) <TR>
 - (c) <CR>
19. You can put header to a table using the tag :
 - (a) <TH>
 - (b) <TR>
 - (c) <CR>
20. A form is used for :
 - (a) filling data
 - (b) getting information
 - (c) displaying data
21. Tag used for creating menu is :
 - (a) OPTION
 - (b) TYPE
 - (c) MENU
22. Radio buttons are so called because :
 - (a) They look like radio buttons
 - (b) They were created by radio
 - (c) You have to switch on radio for using them
23. Submit button is so called because :
 - (a) It allows visitors to submit his response to the web site
 - (b) It submits all the information to the visitor's hard disk.
 - (c) You have to submit its printout to the web site
24. The browser is which is available free:
 - (a) Internet Explorer
 - (b) Netscape Navigator
 - (c) Lynx
25. Which of the following is not a search engine:
 - (a) Yahoo!
 - (b) Internet Explorer
 - (c) Lycos
26. A URL is like a :
 - (a) Name
 - (b) Vegetable
 - (c) Food
27. Web server is a :
 - (a) Hardware
 - (b) Software
 - (c) Both
28. To get information from the users you use :
 - (a) Tables
 - (b) Queries
 - (c) Forms
29. ftp is the short form of :
 - (a) File Transfer Protocol
 - (b) File Transfer Program
 - (c) File Transfer Public
30. Other than your computer, the other computer is called:
 - (a) HOST
 - (b) REMOTE HOST
 - (c) OTHER HOST
31. The main directory of UNIX is _____ directory:
 - (a) Main
 - (b) New
 - (c) Root

32. Prompt for ftp commands is:
 (a) fpt> (b) f> (c) ft>
33. For downloading files you can use the commands get and :
 (a) use (b) mget (c) down
34. For displaying the current status of the job, you can use the command:
 (a) Status (b) Current (c) Job
35. Telnet is:
 (a) Telephone which connect to net
 (b) A service for connecting to net
 (c) Network service provider
36. In Telnet, the client computer is called:
 (a) LOCAL (b) NODE (c) REMOTE
37. To start telnet, you type command followed by name of the :
 (a) remote host (b) remote server (c) nothing
38. Browser is :
 (a) Hardware (b) Software (c) Computer
39. Search button helps you in accessing :
 (a) Search engines (b) Hard Disk (c) Directories
40. History shows the sites visited, Today, Last Week and :
 (a) 1 week ago (b) 2 week ago (c) 3 week ago
41. You cannot copy an image from the web site :
 (a) Yes (b) No
42. You can print a web page on the screen:
 (a) Yes (b) No
43. In India, the main networking service provider is :
 (a) BSNL (b) VSNL (c) MTNL
44. Commonly used program for e-mail is:
 (a) Outlook Express (b) Internet Explorer (c) Microsoft Windows
45. Your half finished messages are stored in:
 (a) Inbox (b) Outbox (c) Drafts
46. For sending and receiving messages you click at:
 (a) Send/Receive button (b) Send button (c) Receive button
47. For replying you use which button :
 (a) REPLY (b) SEND (c) RE
48. For deleting a message you use Ctrl + :
 (a) D (b) Del (c) Esc

True/False Questions

- HTML tags are written within the less than (<) and greater than (>) signs.
- HTML does not support most of the special characters.
- You can see your text in a browser.
- The first line of the text defines the HTML.
- Main body of the text is not divided between <BODY> and </BODY>.
- You can have as many as 7 headings in the text.
- Using **BIG** and **SMALL** you can change the size of the font.
- You can make the text bold by using .
- You can make the text superscripted by using the tag <SUP>.
- You can make the text underlined by using the tag <I>.
- You can change the weight and height of the image in HTML.
- You can wrap the text in between two images.
- You can give space between various paragraphs.
- You cannot have your data in various columns.

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15. You can use Tables in HTML, too but the result somehow not as good as you would get in a word processing or a publishing program.
16. Horizontal rows are set using the tag <TR>
17. You cannot add a background image to the table.
18. You can create a form using the tag <FORM>
19. Check boxes allow the visitor to click in them.
20. Submit button can also be set by using the INPUT tag.
21. A global hypertext system that uses the Internet as its transport mechanism is called World Wide Web.
22. With Web you can get information from the user too.
23. Web server manages the communications protocols and the related software required to create a Web site on the Internet.
24. Search engines are not used to search for different information on the net.
25. FTP is the short name for File Transfer Protocol.
26. Public anonymous ftp achieves are so vast as to be well beyond human understanding.
27. Since most of the anonymous ftp hosts are Unix computers, you will need to know something about the Unix file system.
28. To download or upload files from a remote host, you use the ftp program.
29. Each of the dir commands generates a directory listing of the specified directory.
30. If you want to display the current setting all the options, you can use the status command.
31. With most anonymous ftp hosts, you are automatically placed in the root (top-level) directory to start.
32. In telnet terminology, your computer is called the HOST computer.
33. Any time you are at the telnet> prompt, there are a number of different commands that you can use.
34. Host computer is the computer which holds all the Web pages.
35. There are various bars and buttons on the opening screen of the Explorer.
36. Search button helps you in accessing various search engines.
37. You cannot download a web page into your hard disk.
38. All Internet Service Provider allow you to open an e-mail account.
39. Sent items stores all messages previously sent.
40. To cut down the time of writing a message, lots of abbreviations are used.
41. Using Send/Receive button on the standard toolbar, you can send and receive mail.
42. You can click the RE button for replying to a message.
43. You can create your own stationery for sending message.
44. You can even attach a picture to your message.

Short Questions with Answers

1. How are values given in HTML?
Ans. Mostly all values should be enclosed in straight quotation marks " " (NOT curly ones " ", note the difference).
2. How is body and head information given?
Ans. The body is contained in <BODY> and </BODY> whereas the head is contained in <HEAD> and </HEAD>.
3. What sort of headings are used in HTML?
Ans. Various type of headings can be placed in the text. Maximum of 6 headings are allowed.
4. How is a new paragraph started in HTML?
Ans. For every new paragraph in HTML you must use the p tag
5. What are BIG and SMALL used for in HTML?
Ans. You can use the BIG or SMALL size to make the text big or small.
6. Which are the embeded fonts in HTML?
Ans. There are several tags that are displayed with monospaced font: **CODE** (computer code), **KBD** (keyboard input), **SAMP** (sample text) and **TT** (typewriter text).

7. Can text be changed to colour in HTML?

Ans. Well, if you can change the text to bold and italics, then you can change its colour too. For this we use the tag BGCOLOR for background colour.

8. What is banner used for?

Ans. You can create a banner which would be reflected on the top of each page.

9. How would you given margins?

Ans. You can use LEFTMARGIN and TOPMARGIN tags to specify just how much space you would like to have on both left and right hand side.

10. Can you change the colour of the cell?

Ans. You can change the colour of a cell to give it more important than the other ones.

11. What are Forms?

Ans. You make the site interactive to have people respond to it. This response may be in the form of feed back, purchase order or just comments. For all these we use what is called the Forms.

12. What are radion buttons?

Ans. Instead of giving the options of selecting one of the options to the user, you can provide buttons for him to click one of them as a feedback. These buttons are also known as radio buttons.

13. What is DHTML?

Ans. Dynamic HTML (DHTML) combines HTML with Cascading Style Sheets (CSS) and scripting languages.

14. What is World Wide Web?

Ans. A global hypertext system that uses the Internet as its transport mechanism is called World Wide Web.

15. What is a browser?

Ans. A software program that is used to view Web pages is called a Browser.

16. What are Search Engines?

Ans. Search engines are programs that locate needed information in a database, but especially an Internet accessible search service that enables you to search for information on the Internet.

17. What is FTP?

Ans. FTP is the short name for File Transfer Protocol. FTP is the Internet service that allows you to transfer files from one computer to another.

18. What is TELNET?

Ans. TELNET is the Internet service that allows you to log in to a remote Internet computer. To utilize this service, you run a telnet client program on your computer.

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ANSWERS

Multiple Choice Questions

- | | | | |
|-------|-------|-------|-------|
| 1. c | 2. c | 3. b | 4. c |
| 5. c | 6. a | 7. b | 8. a |
| 9. b | 10. a | 11. a | 12. b |
| 13. c | 14. b | 15. c | 16. a |
| 17. b | 18. b | 19. a | 20. b |
| 21. c | 22. a | 23. a | 24. a |
| 25. c | 26. a | 27. b | 28. c |
| 29. a | 30. b | 31. c | 32. a |
| 33. b | 34. a | 35. b | 36. c |
| 37. b | 38. b | 39. a | 40. b |
| 41. b | 42. a | 43. b | 44. a |
| 45. c | 46. a | 47. c | 48. a |

True False Questions

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- 1. T
- 5. F
- 9. T
- 13. T
- 17. F
- 21. T
- 25. T
- 29. T
- 33. T
- 37. F
- 41. T

- 2. F
- 6. F
- 10. F
- 14. F
- 18. T
- 22. T
- 26. T
- 30. T
- 34. T
- 38. T
- 42. T

- 3. T
- 7. T
- 11. T
- 15. T
- 19. T
- 23. T
- 27. T
- 31. T
- 35. T
- 39. T
- 43. T

- 4. T
- 8. T
- 12. T
- 16. T
- 20. T
- 24. F
- 28. T
- 32. F
- 36. T
- 40. T
- 44. T

CONCEPTS IN OPERATING SYSTEM

LEARNING OBJECTIVES

After going through this chapter, you should appreciate the following:

- Elementary concepts in operating system
- GUI.
- Introduction to DOS
- Introduction to MS Windows

5.1 ELEMENTARY CONCEPTS IN OPERATING SYSTEM

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An operating system (OS) is a set of computer programs that manage the hardware and software resources of a computer. It processes raw data which is given to the computer as input. It then allocates and manages the tasks of the internal system resources of the computer. It is the operating system which performs basic tasks such as controlling and allocating memory, prioritizing system requests, controlling input and output devices, facilitating networking and managing file systems.

Most operating systems come with an application that provides an interface to the operating system managed resources. These applications have had command line interpreters as a basic user interface, but more recently have been implemented as a Graphical User Interface (GUI) for ease of operation.

Operating Systems themselves have no user interfaces; the user of an operating system is an application, not a person.

The operating system forms a platform for other system software and for application software. Windows, Linux, and Mac operating system are some of the most popular Operating System's.

5.1.1 Types of Operating Systems

Operating system can be classified into various categories, with respect to the type of processing, it supports. Following are the main types of Operating System:

5.1.1.1 Batch Operating System

Batch processing requires that a program, its related data and relevant control commands should be submitted together, in the form of a Job. Batch operating system allows no interaction between the users and the executing programs. Thus the programs that have long execution times (like payrolls, forecasting, statistical analysis and large scientific number-crunching programs) and require little operator interaction during execution, were well served by Batch Processing. However, due to long turn-around delays and infeasibility of online debugging, the Batch Processing was not at all suitable for software development.

Batch operating system allows no interaction between the users and the executing programs.

The typical features of a batch operating system were:

1. **Scheduling.** The scheduling of jobs was normally in the order of their arrival, i.e., First Come First Served (FCFS). This criteria provides a fair deal to the jobs, but suffers from long average turn-around time and average waiting time, since some short jobs may have to wait for unduly long periods to get executed, if some long jobs are already queued ahead of the short jobs. To overcome this limitation, another criteria known as Shortest Job Next, was evolved, which offered preference to pending shorter jobs over the long jobs. This offered much better his average turn around time and average waiting time of the pending jobs.
2. **Memory Management.** Memory used to be divided into two permanent

partitions—one permanently occupied by the resident portion of the operating system and the other dynamically used to load the transient programs for execution. When a transient program terminates, it vacates the memory partition occupied by it and the same is assigned to other waiting transient program.

3. **I/O Management.** Since, only one program used to be under execution at a time, there was no contention for the allocation of I/O Devices. So, a simple program-controlled I/O approach was good enough to access the I/O Devices.
4. **File Management.** Since, ther used to only one program accessing the files at a time, there was no need of providing concurrency control.

Thus, in a nutshell the Batch operating system was limited to a Loader and some simple Device Drivers.

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5.1.1.2 Multi-programming Operating System

A multi-programming system permists multiple programs to be loaded into the memory and execute the programs concurrently. A program in execution is called a "Process" or a "Task".

The concurrent execution of programs has a significant potential for improving the utilization of system resources and thus enhanceing the system thourghput, as compared to batch and serial processing.

This potential is exploited by multi-programming operating system, which multiplexes the computer resources amongst a multitude of concurrent programs. A program in execution is called a Process. When a running process requests ome I/O, it goes to "Wait" state. Then another Ready process (i.e., one of the processes from the "Ready" queue) is scheduled to "Run". So, when a process goes for I/O, the CPU is not left idling. When the I/O requested by a Waiting process is completed, it is transferred from "Waiting" to "Ready" state and wait to be scheduled, as per the predecided scheduled criteria.

5.1.1.3 Time-sharing Interactive Operating System

The time-sharing interactive systems belong to the-era of a large mainframe systems, that were made available to a large number of users for accessing concurrently in an interactive mode. Each user used to interact with the system through a separate Video Terminal. A programmer could enter its source code using sophisticated editors, compile the source code, link the object code and run the executable code interactively. At any stage, the user could interact with the execution of its program. Debugging could be performed online. This reduced the time needed for pprogram development, drastically. The operating system served the interactive users, in a round-robin fashion, allowing a fixed time-slice for each user to have control of the CPU. Since, the operators were interacting through slow I/O devices, each user had a feel as if the CPU was available solely to itself. So, the computation capacity of the CPU is multiplexed evenly, amongst the interactive users.

At any stage, the user could interact with the execution of its program. Debugging could be performed online.

So, time-sharing systems were large multi-programmed multi-user systems, designed

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for program development. One of the major requirements of such a system is good terminal response. It should give an illusion to each user as if the entire computer resources are available to itself, solely. It should provide an equitable share of common resources to each user. For example, when the system is overloaded, the program with higher processing requirements is made to wait longer.

Most time-sharing systems use time-sliced, non pre-emptive scheduling. It has FCFS Queue; and a program requiring service is put at the end of the queue. When the process reaches the front of the queue, service is put at the end of the queue. When the process reaches the front of the queue, it is despatched. If it is not completed within the time slice, it is pre-empted at the end of the time-slice and put at the end of the queue. Now, it has to wait for the next time-slice, to resume its execution from the point where it left at the end of previous time-slice. A process continues to run in bursts like this, till it terminates.

The main features of a time-sharing interactive operating system are:

1. **Memory Management.** The memory management in time-sharing systems provides for isolation and protection of co-resident programs. Since, the programs are being executed on behalf of different users, they do not involve much of inter-process communication.
2. **I/O Devices Management.** I/O Management must be sophisticated enough to cope with the requirements of multiple users, contending for multiple devices. However, due to relatively slow speed of terminals and users, processing of terminal-interrupts would not be so critical. As in most multi-user environments, allocation and de-allocation of devices must be handled in a manner so as to provide the system integrity, while attempting to optimize the system performance.
3. **File Management.** Since multiple users will be sharing access to multiple files, the file management must provide protection and access control.

5.1.1.4 Real Time Operating System

It refers to the environment of embedded systems, with a very rigid requirement of complete their processing of input data, in a pre-specified time. The input data, in such systems, is invariably received from real-world sensors. The outputs may be used to control some real-world processes.

For example, an Air Defense system, receiving information about aircraft movements from radars and control weapons for the elimination of hostile aircraft. For such an application, it can be well appreciated that the processing of data inputs, within specified time limits, is absolutely critical.

So, the real time systems are used in environments, where a large number of events, mostly external to the computer system, must be accepted and processed to a highly time-bound manner (with specified deadlines).

Such applications include process control in industry (like steel, petro-chemical plants, thermal plants and nuclear plants, etc.), military systems for processing of sensor information and weapon control, telephone switching equipment, flight control, real-time simulations, etc.

1. **Scheduling.** A primary objective for a real-time system is to provide quick response to external events, so as to meet the specified deadlines of

processing. Such systems have to be multi-tasking (may not be multi-user). The scheduling is normally priority-based pre-emptive, in which the processes handling the priority process becomes ready to run, it preempts a lower priority running process. User convenience and resource optimization are of secondary concern. Such systems may be expected to handle thousands of interrupts per second, with a stringent requirement of not missing even a single event.

2. **Memory Management.** The memory management is relatively less demanding, since the process population is more or less static and memory is so designed that most of the processes will always be memory resident, in order to provide a quick response. In fact, the programs are normally ROM resident. But, the processes have closer interaction. This requires features that enable sharing of memory, amongst processes and at the same time provide protection from each other.
3. **I/O Devices Management.** Time critical device management is one of the major requirements of real time systems. The external events and data have to be accepted and processed, in a highly time-bound manner. This is implemented using interrupt mechanism. The system calls allow the users to connect the devices and access Interrupt Service Routines (ISRs) directly, so as to achieve a good response time.
4. **File Management.** The file management is not very critical, since most of the real-time databases will be memory-resident. Some embedded systems may have program and static data on ROM and may not need any *online secondary devices at run-time*. The dynamic databases are maintained in ROM. If at all any files are to be accessed, as in the case of large real-time systems, the primary objective is fast access.

5.1.1.5 Category of Real Time Operating Systems

1. **Hard Real Time Operating System.** In Hard Real Time Systems, all critical tasks have to be completed strictly within the specified time limits. Not meeting the deadlines can be catastrophic; like an embedded system controlling the operation of a refinery. In such systems, all code and data must be in RAM/ROM. All kernel delays must be bounded. So, the Operating System should not have any unnecessary frills. Interrupt mechanism must be optimized, so as to respond to the real world inputs, with minimal delays.
2. **Soft Real Time Operating System.** This is less restrictive type of real time system. If the input data is not processed within specified time intervals, the results may not be catastrophic, but the output may lose its utility. For example, in a system monitoring flight path of an aircraft, the delayed information will have no utility. In such systems, tasks are divided into two categories—Real Time Tasks and Non-Real Time Tasks. The Real-Time Tasks are accorded priority over the other tasks. Any output from such systems would be useful, only if it is produced within a specified time after receiving the corresponding inputs. So, the kernel delays must be bounded. The soft real time systems are not suitable for industrial and defense use, since the delays are not uncertain.

5.1.1.6 Combination Operating System

Different types of operating systems are optimized or geared up to serve the needs of specific environments. However, sometimes an environment may be a hybrid of such environments, for example the same computer may be used as software development platform and as a target machine in a real-time environment. For this reason, the commercial operating systems like UNIX, VMS, etc., are designed to provide a large set of services, catering to the need of various environments: If batch and interactive jobs are being run simultaneously, lower priority is assigned to batch jobs. In fact, the batch jobs may be used as filter, executed only when system resources are idling. The processes, handling real-time interrupts to receive real-world events and inputs, will be assigned higher priority. Such systems would normally employ time-sliced, priority-based preemptive scheduling. A combination operating system will be one which caters for the needs a wide spectrum of target environments. For obvious reasons, such operating systems will not be optimized for a specific environment.

If batch and interactive jobs are being run simultaneously, lower priority is assigned to batch jobs.

5.1.1.7 Distributed Operating System

A Distributed operating system caters for a distributed environment, wherein a collection of autonomous computer systems, capable of communicating and cooperating with each other through network, are connected to each other through a LAN/WAN. A Distributed operating system governs the operation of such a distributed system and provides a virtual machine abstraction to its users. Key objective of Distributed operating system is transparency, i.e., the resource distribution must be hidden from the users and the application programs, unless they need to determine this information, in which case the information is provided through system services, provided the user has authorization for the same. The Distributed operating system provides means for system-side sharing of resources like computational capacity, I/O and files, etc.

A Distributed operating system governs the operation of such a distributed system and provides a virtual machine abstraction to its users.

Thus, it should also cater for the following services:

- Global Naming of resources
- Distribution of computations
- Enabling processes to access remote resources
- Enabling processes to communicate with remote processes.

5.1.2 Importance of Operating Systems

As we know the importance of operating system in a computer system. It is there to run the computer and that too without any fault. For this we look at the various needs, goals, services and characteristics of the operating system.

5.1.2.1 Needs of Operating Systems

Initially the computers were introduced as bare machines. The programs in them

were developed by manually translating squeezes of instructions into binary or some other code where base is usually an integer power of 2. Then the instructions and data were entered into computer by means of console switches or through a hexadecimal keyboard. Then address of first instruction was loaded into program counter to start execution of the program.

Results were obtained by examining the contents of the relevant registers and memory locations. Input/output devices were controlled by the executing program itself. There was no concept of any supporting system software at all. User had to do mostly all of sub-controlling jobs manually or through program. The need was of a user who knew each and everything about machine. A general/naive user was not at all able to work on computer.

At that time the following needs gave birth to the system software and development of operating system.

1. For fast and automatic working. As the manual entry and working in absence of system software result into the slow speed of processing so a need of such a software was felt which could do most of the intermediate job automatically so that user has to least bother about machines working, resulting into fast and automatic working of the machine. The operating system automates the sequencing of operations involved in program execution.
2. For better utilization of system Resources: The bare machine approach was not very efficient. With this approach, running of computer system may require frequent manual loading of programs and data. This results in low utilization of system resources. To overcome this problem operating systems with multiuser environment were developed. In absence of operating system even with the help of editors, debuggers and loaders the program development process was very slow.
3. To realize the resource utilization potential of batch processing, a mounted batch of jobs must be executed automatically, without slow human intervention and their results into the development of operating system.
4. To provide a human interface which could present a communication mode for both of them, the operating system was developed.
5. To match the speed of fast processors and comparatively slow I/O devices the need of operating system was felt.

5.1.2.2 Goals of Operating Systems

Any operating system should meet the following major goals:

1. Optimize the use of computer resources so as to maximize its throughput.
2. Create a user-friendly computing environment for accessing the computer resources.

To fulfill these two goals operating system started from command mode and travelled upto graphical user interfaces, i.e., the operating system progressed and became more and more friendly. To facilitate the use of hardware resources researchers developed different types of operating systems which also consider the user and time requirements. Various types of operating systems are developed over 45 years and they are discussed earlier.

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5.1.2.3 Services of Operating System

An operating system provides an environment for the execution of user programs. Operating System provides certain services to the programs and to the users of those programs for the accessing of system resources.

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Some of the common services are:

Program Execution: The main purpose of operating system is to provide an efficient and convenient environment for the execution of programs. So, an operating system must provide various functions for loading of a program into RAM and execute it. Each executing program must terminate, either normally or abnormally.

I/O Operations: A running program would need I/O operations for reading-in of input data and for outputting of results. This I/O may be from/to a file or from/to an I/O device. For each device, some special functions may be necessary (such as rewind a tape, clear screen, etc). All these operations are managed by an operating system.

File Manipulations: Each executing program would need to create, delete and manipulate files, which is managed by the operating system.

Communications: Operating system manages inter-process communication between the processes, executing on the same computer or running on different computers in a distributed/multi-processor environment. An operating system would provide mechanisms for this inter-process communications like mailboxes, shared memory, etc.

Error Detection and Recovery: Errors may occur during execution of a program; like divide by zero, memory access violation, etc. The operating system should provide for detection such errors (or exceptions) and handle recovery (called Exception Handling).

Resource Allocation: When multiple users are logged onto the system or multiple jobs are running concurrently, resources would need to be shared amongst them. The operating system would decide on the allocation of resources; like the CPU scheduling algorithm will determine the control of CPU amongst the concurrent processes. Similarly, there will be routines for the allocation and de-allocation of other resources like memory, I/O devices, files, etc.

Accounting: It relates to the accounting of resources used by each user in a multi-user environment. Resource usage statistics may be useful in planning the futuristic requirements of an enterprise.

System Protection: This is also a service provided to ensure that the users and user processes are protected from each other. For example, when a process is having an exclusive access to a device allocated to it, no other process would be granted access to that device during that period. Also, no process would be permitted to access a memory location in a segment not assigned to that process. This service ensures that a process can execute safely.

5.1.3 Characteristics of an Operating System

Characteristics of an Operating System can be discussed under the following heads.

5.1.3.1 Process Management

Every program running on a computer, be it background services or applications, is

a process. As long as a is used to build computers, only one process per CPU can be run at a time. Older microcomputer operating systems such as MS-DOS did not attempt to bypass this limit, with the exception of interrupt processing, and only one process could be run under them (although DOS itself featured TSR as a very partial and not too easy to use solution).

Mainframe operating systems have had multitasking capabilities since the early 1960s. Modern operating systems enable concurrent execution of many processes at once via multitasking even with one CPU. Process management is an operating system's way of dealing with running multiple processes. Since most computers contain one processor with one core, multitasking is done by simply switching processes quickly. Depending on the operating system, as more processes run, either each time slice will become smaller or there will be a longer delay before each process is given a chance to run.

Modern operating systems enable concurrent execution of many processes at once via multitasking even with one CPU.

Process management involves computing and distributing CPU time as well as other resources. Most operating systems allow a process to be assigned a priority which affects its allocation of CPU time. Interactive operating systems also employ some level of feedback in which the task with which the user is working receives higher priority. Interrupt driven processes will normally run at a very high priority. In many systems there is a background process, such as the System Idle Process in Windows, which will run when no other process is waiting for the CPU.

5.1.3.2 Memory Management

Current computer architectures arrange the computer's memory in a hierarchical manner, starting from the fastest registers, CPU cache, random access memory and disk storage. An operating system's memory manager coordinates the use of these various types of memory by tracking which one is available, which is to be allocated or deallocated and how to move data between them. This activity, usually referred to as virtual memory management, increases the amount of memory available for each process by making the disk storage seem like main memory.

There is a speed penalty associated with using disks or other slower storage as memory – if running processes require significantly more RAM than is available, the system may start thrashing. This can happen either because one process requires a large amount of RAM or because two or more processes compete for a larger amount of memory than is available. This then leads to constant transfer of each process's data to slower storage.

An operating system's memory manager coordinates the use of these various types of memory by tracking which one is available.

Another important part of memory management is managing virtual addresses. If multiple processes are in memory at once, they must be prevented from interfering with each other's memory (unless there is an explicit request to utilise shared memory). This is achieved by having separate address spaces. Each process sees the whole virtual address space, typically from address 0 up to the maximum size of virtual memory, as uniquely assigned to it. The operating system maintains a page table that match virtual addresses to physical addresses. These memory

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allocations are tracked so that when a process terminates, all memory used by that process can be made available for other processes.

The operating system can also write inactive memory pages to secondary storage. This process is called “**paging**” or “**swapping**” – the terminology varies between operating systems. It is also typical for operating systems to employ otherwise unused physical memory as a page-cache; requests for data from a slower device can be retained in memory to improve performance.

The operating system can also pre-load the in-memory cache with data that may be requested by the user in the near future: SuperFetch is an example of this.

5.1.3.3 *Disk and File Systems*

All operating systems include support for a variety of file systems. Modern file systems comprise a hierarchy of directories. While the idea is conceptually similar across all general-purpose file systems, some differences in implementation exist. Two noticeable examples of this are the character used to separate directories, and case sensitivity.

Unix demarcates its path components with a slash (/), a convention followed by operating systems that emulated it or at least its concept of hierarchical directories, such as Linux, Amiga OS and Mac OS X. MS-DOS also emulated this feature, but had already also adopted the CP/M convention of using slashes for additional options to commands, so instead used the backslash (\) as its component separator. Microsoft Windows continues with this convention; Japanese editions of Windows use ¥, and Korean editions use ©.

Unix and Unix-like operating allow for any character in file names other than the slash, and names are case sensitive. Microsoft Windows file names are not case sensitive. File systems may provide journaling, which provides safe recovery in the event of a system crash. A journaled file system writes information twice: first to the journal, which is a log of file system operations, then to its proper place in the ordinary file system. In the event of a crash, the system can recover to a consistent state by replaying a portion of the journal. In contrast, non-journaled file systems typically need to be examined in their entirety by a utility such as fsck or chkdsk. Soft updates is an alternative to journalling that avoids the redundant writes by carefully ordering the update operations. Log-structured file systems and ZFS also differ from traditional journaled file systems in that they avoid inconsistencies by always writing new copies of the data, eschewing in-place updates.

A journaled file system writes information twice: first to the journal, which is a log of file system operations, then to its proper place in the ordinary file system.

Many Linux distributions support some or all of ext2, ext3, ReiserFS, Reiser4, GFS, GFS2, OCFS, OCFS2, and NILFS. Linux also has full support for XFS and JFS, along with the FAT file systems, and NTFS. Microsoft Windows includes support for FAT12, FAT16, FAT32, and NTFS. The NTFS file system is the most efficient and reliable of the four Windows file systems, and as of Windows Vista, is the only file system which the operating system can be installed on. Windows Embedded CE 6.0 introduced ExFAT, a file system suitable for flash drives.

Common to all these (and other) operating systems is support for file systems typically found on removable media. FAT12 is the file system most commonly

found on floppy discs. ISO 9660 and Universal Disk Format are two common formats that target Compact Discs and DVDs, respectively. Mount Rainier is a newer extension to UDF supported by Linux 2.6 kernels and Windows-Vista that facilitates rewriting to DVDs in the same fashion as what has been possible with floppy disks.

5.1.3.4 Networking

Most current operating systems are capable of using the TCP/IP networking protocols. This means that one system can appear on a network of the other and share resources such as files, printers, and scanners using either wired or wireless connections. Many operating systems also support one or more vendor-specific legacy networking protocols as well, for example, SNA on IBM systems, DECnet on systems from Digital Equipment Corporation, and Microsoft-specific protocols on Windows. Specific protocols for specific tasks may also be supported such as NFS for file access.

5.1.3.5 Security

Many operating systems include some level of security. Security is based on the two ideas that:

- The operating system provides access to a number of resources, directly or indirectly, such as files on a local disk, privileged system calls, personal information about users, and the services offered by the programs running on the system;
- The operating system is capable of distinguishing between some requesters of these resources who are authorized (allowed) to access the resource, and others who are not authorized (forbidden). While some systems may simply distinguish between "privileged" and "non-privileged", systems commonly have a form of requester identity, such as a user name. Requesters, in turn, divide into two categories:
 - Internal security: an already running program. On some systems, a program once it is running has no limitations, but commonly the program has an identity which it keeps and is used to check all of its requests for resources.
 - External security: a new request from outside the computer, such as a login at a connected console or some kind of network connection. To establish identity there may be a process of authentication. Often a username must be quoted, and each username may have a password. Other methods of authentication, such as magnetic cards or biometric data, might be used instead. In some cases, especially connections from the network, resources may be accessed with no authentication at all.

In addition to the allow/disallow model of security, a system with a high level of security will also offer auditing options. These would allow tracking of requests for access to resources (such as, "who has been reading this file?").

Security of operating systems has long been a concern because of highly sensitive data held on computers, both of a commercial and military nature. The United States Government Department of Defense (DoD) created the Trusted Computer System Evaluation Criteria (TCSEC) which is a standard that sets basic requirements for assessing the effectiveness of security. This became of vital importance to

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operating system makers, because the TCSEC was used to evaluate, classify and select computer systems being considered for the processing, storage and retrieval of sensitive or classified information.

5.1.3.6 Internal security

Internal security can be thought of as protecting the computer's resources from the programs concurrently running on the system. Most operating systems set programs running natively on the computer's processor, so the problem arises of how to stop these programs doing the same task and having the same privileges as the operating system (which is after all just a program too). Processors used for general purpose operating systems generally have a hardware concept of privilege. Generally less privileged programs are automatically blocked from using certain hardware instructions, such as those to read or write from external devices like disks. Instead, they have to ask the privileged program (operating system kernel) to read or write. The operating system therefore gets the chance to check the program's identity and allow or refuse the request.

An alternative strategy, and the only sandbox strategy available in systems that do not meet the Popek and Goldberg virtualization requirements, is the operating system not running user programs as native code, but instead either emulates a processor or provides a host for a p-code based system such as Java.

Internal security is especially relevant for multi-user systems; it allows each user of the system to have private files that the other users cannot tamper with or read. Internal security is also vital if auditing is to be of any use, since a program can potentially bypass the operating system, inclusive of bypassing auditing.

5.1.3.7 External Security

Typically an operating system offers (or hosts) various services to other network computers and users. These services are usually provided through ports or numbered access points beyond the operating systems network address. Services include offerings such as file sharing, print services, email, web sites, and file transfer protocols (FTP), most of which can have compromised security.

At the front line of security are hardware devices known as firewalls. At the operating system level, there are a number of software firewalls available. Most modern operating systems include a software firewall, which is enabled by default. A software firewall can be configured to allow or deny network traffic to or from a service or application running on the operating system.

Therefore, one can install and be running an insecure service, such as Telnet or FTP, and not have to be threatened by a security breach because the firewall would deny all traffic trying to connect to the service on that port.

5.1.3.8 Graphical User Interfaces

Today, most modern operating systems contain Graphical User Interfaces (GUIs, pronounced goo-eez). A few older operating systems tightly integrated the GUI to the kernel—for example, the original implementations of Microsoft Windows and Mac OS. More modern operating systems are modular, separating the graphics subsystem from the kernel (as is now done in Linux, Mac OS X, and to a limited extent in Windows).

Many operating systems allow the user to install or create any user interface they desire. The X Window System in conjunction with GNOME or KDE is a commonly found setup on most Unix and Unix derivative (BSD, Linux, Minix) systems.

Graphical user interfaces tend to evolve over time. For example, Windows has modified its user interface almost every time a new major version of Windows is released, and the Mac OS GUI changed dramatically with the introduction of Mac OS X in 2001.

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5.1.3.9 Device Drivers

A device driver is a specific type of computer software developed to allow interaction with hardware devices. Typically this constitutes an interface for communicating with the device, through the specific computer bus or communications subsystem that the hardware is connected to, providing commands to and/or receiving data from the device, and on the other end, the requisite interfaces to the operating system and software applications.

It is a specialized hardware-dependent computer program which is also operating system specific that enables another program, typically an operating system or applications software package or computer program running under the operating system kernel, to interact transparently with a hardware device, and usually provides the requisite interrupt handling necessary for any necessary asynchronous time-dependent hardware interfacing needs.

The key design goal of device drivers is abstraction. Every model of hardware (even within the same class of device) is different. Newer models also are released by manufacturers that provide more reliable or better performance and these newer models are often controlled differently. Computers and their operating systems cannot be expected to know how to control every device, both now and in the future. To solve this problem, OSes essentially dictate how every type of device should be controlled. The function of the device driver is then to translate these OS mandated function calls into device specific calls. In theory a new device, which is controlled in a new manner, should function correctly if a suitable driver is available. This new driver will ensure that the device appears to operate as usual from the operating systems' point of view for any person.

5.2 GUI

A graphical user interface (GUI) is a type of user interface which allows people to interact with a computer and computer-controlled devices which employ graphical icons, visual indicators or special graphical elements called "widgets", along with text labels or text navigation to represent the information and actions available to a user. The actions are usually performed through direct manipulation of the graphical elements. Use of this acronym led to creation of the neologism guituitive (an interface which is intuitive).

Graphical user interface design is an important adjunct to application programming. Its goal is to enhance the usability of the underlying logical design of a stored program. The visible graphical interface features of an application are sometimes referred to as "chrome". They include graphical elements (widgets) that may be used to interact with the program. Common widgets are: windows, buttons, menus,

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and scroll bars. Larger widgets, such as windows, usually provide a frame or container for the main presentation content such as a web page, email message or drawing. Smaller ones usually act as a user-input tool.

The widgets of a well-designed system are functionally independent from and indirectly linked to program functionality, so the graphical user interface can be easily customized, allowing the user to select or design a different skin at will

Some graphical user interfaces are designed for the rigorous requirements of vertical markets. These are known as "application specific graphical user interfaces." Examples of application specific graphical user interfaces:

- Touchscreen point of sale software used by waitstaff in busy restaurants
- Self-service checkouts used in some retail stores..
- ATMs
- Airline self-ticketing and check-in
- Information kiosks in public spaces like train stations and museums
- Monitor/control screens in embedded industrial applications which employ a real time operating system (RTOS).
- The latest cell phones and handheld game systems also employ application specific touchscreen graphical user interfaces.

5.2.1 Graphical User Interfaces Compared to Command Line Interfaces

Graphical user interfaces were introduced in reaction to the steep learning curve of command line interfaces (CLI), which require commands to be typed on the keyboard. Since the commands available in command line interfaces can be numerous, complicated operations can be completed using a short sequence of words and symbols. This allows for greater efficiency and productivity once many commands are learned, but reaching this level takes some time because the command words are not easily discoverable. WIMPs ("window, icon, menu, pointing device"), on the other hand, present the user with numerous widgets that represent and can trigger some of the system's available commands.

WIMPs extensively use modes as the meaning of all keys and clicks on specific positions on the screen are redefined all the time. CLIs use modes only in the form of a current directory.

Most modern operating systems provide both a graphical user interface and some level of a CLI, although the graphical user interfaces usually receive more attention. The graphical user interface is usually WIMP-based, although occasionally other metaphors surface, such as those used in Microsoft Bob, 3dwm or File System Visualizer (FSV).

Applications may also provide both interfaces, and when they do the graphical user interface is usually a WIMP wrapper around the command-line version. This is especially common with applications designed for Unix-like operating systems. The latter used to be implemented first because it allowed the developers to focus exclusively on their product's functionality without bothering about interface details such as designing icons and placing buttons. Designing programs this way also allows users to run the program non-interactively, such as in a shell script.

5.3 INTRODUCTION TO DOS

DOS translates the commands that we enter through the keyboard into signals that can be interpreted by the computer. The CPU (Central Processing Unit) processes the raw data as per the commands we feed (Input) into the computer and returns the results (gives the Output).

The results are displayed on the Monitor in our language. The results can also be printed on a printer. Directed by the instruction that we type, the DOS operates and controls the operating system. With DOS we can do the following:

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- Create new files
- Delete old files
- Rename existing files
- List all the files in the hard disk or floppy
- Enhance the storage capacity of the disk
- Format new floppy or hard disk for usage
- Reorganize the storage files on the disk
- Make back up files on the hard disk or to the floppy disks
- Scan for viruses

5.3.1 Type of DOS Commands

There are 2 types of DOS commands, mainly, Internal and External commands.

5.3.1.1 Internal Commands

These commands can be given from the DOS prompt, irrespective of the fact the command is there in the DOS directory or not. These can be said to be the in-built commands of DOS.

For example, the following commands are internal commands:

Chdir It changes the current directory, shortname is CD.

Cls It clears the screen.

Copy It is used for copying files, read more about it later in the chapter.

Copy con It is used to create a quick batch file.

Ctty This command is used to redirect the keyboard and screen to the serial port.

5.3.1.2 External Commands

These commands are such they have to be present in the hard disk to be used.

Some of external commands are given below:

Append It lets programs open data files as if they were in the current directory.

Assign It is used to reassign drives when programs work only with specific drives.

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Attrib It changes file attributes, which are settings in every DOS file.

Backup/Restore It lets you backup your hard disk onto as many floppies as required. Restore command can be used to use backedup files.

Chkdsk It checks disk status, memory status, files and flags unidentifiable files.

Comp It compares two files for identical content and reports up to 10 mismatches.

5.3.1.3 File Structure in DOS

All the data in the computer is stored in terms of Files. Each file is unique and is identified by name, date and time of creation, number of bytes, etc. The name of the file usually in the form of 8 + 3 digits (also called 8.3 rule) which is recognised by DOS. The 8 digits are reserved for the first name and the next 3 for the extension, which signifies the type of the file.

A typical filename in DOS can be represented as:

MSM.COM

where

MSM is the first name

. is always there

COM represents the last name or popularly called extension

5.3.2 Storage of Files

Files are stored in the hard disk just as we store packets in godown. A hard disk is divided into various subdirectories like rooms in a house. When you start your PC, the first directory that you see is the root directory. The root directory can be compared to a house. Within a subdirectory, you can have another subdirectory and files. You can create and delete these directories yourself. Related files are kept in the same directory.

5.3.2.1 Seeing the File

If you want to see the files or subdirectories available in a particular directory, you use the DIR command. Simple DIR command produces the display shown on the next page.

All the files in this directory will be listed along with the information like name, extension, number of bytes, data and time of creation. At the end, the total number of files in the directory is given along with the total number of bytes used. The total number of bytes remaining free in the hard disk is also given.



Another way of using the DIR command is DIR/P.



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The /P added to DIR, stands for pagewise. Suppose there are a large number of files and subdirectories within a directory. Now when you use DIR command, you will find that most of the file names scroll past the screen and only the last few entries are displayed. This may result in your not seeing the required file which may appear in the first lot. For this you should be able to stop and continue at will, the scrolling of the listing to look for a particular file. The following command gives you that option:

Once the screen has been filled up, the listing on the screen will stop with this message at the bottom:

Press any key to continue

When you do press any key, the monitor will again display the next screen and stop. You can repeat this till all the files in the directory have been displayed.

Another option is DIR/W.

The /W stands for widthwise display. This command is used when you want to see



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only the names of the files and are not interested in any detail. This results in the appearance of file names on the screen in groups of 3-4. Usually, all the files are listed together on the screen. If however, the files still don't fit together on the screen, you can give the command DIR/W/P. Then the following will be displayed:

5.3.3 Creating and Changing Directory

To create a new directory, you have to assign a name to it. This should, as far as possible, signify the type of data or programs you are going to store into it. The command is given as following:

```
MD SACHIN
```

This will create a new directory by the name of SACHIN. In the beginning, it is blank. Your cursor will remain at the position of its start.

Supposing you want to enter this or any other directory, then the command will be:

5.3.3.1 Change Directory

This command can be given as following:

```
C:\>CD SACHIN
```

```
C:\>SACHIN>
```

This means that you have entered the directory called SACHIN. However, if you are in any other directory and want to enter the SACHIN directory from there, the command becomes:

```
C:>CD\
```

The backslash (\) means that you are entering a different directory. Actually (\) means more than that. If you type CD\ at the DOS prompt of any subdirectory, your cursor reaches the root directory. This is a quick way to go to the root directory, skipping several levels of subdirectories. If you write only CD then it will show the current directory.



5.3.3.2 Remove Directory

Sometimes, it is possible that you have finished using a software and do not want to keep it or have finished with a project and taken the backup too and don't want to burden your hard disk by keeping it. In this case you would like to remove the directory all together. This would help in having more space for working. This command has to be given from outside the directory which you want to remove. So, if you are in the directory, go out from it and then give the remove directory command. You can use either RD or RMDIR. The command is given as:

```
RD SACHIN
```

Before, you do this, however, you must make sure that you have removed all the files in the directory by using the DEL command. If you have not done so, this command will give you the message that the directory is not empty and cannot be deleted.

5.3.4 DOS Commands

Now you will be introduced to various DOS commands, mainly copy, delete, rename, etc.

5.3.4.1 Copying a File

It is used to copy file or files from one directory to another or to shift to another drive. The command given is:

Copy sachin.doc a:sachin.doc

Here the file sachin.doc would be copied to drive A with the same name, i.e., sachin.doc. If you want to change the name, that is also possible. Then after the a: type the new name.

Another way of using the copy command is by using the wild card option, i.e., *. This is how it is used:

Copy *.doc a:

The above command will copy all files ending with doc to the floppy drive a. Let us use * at both the places, for example:

Copy *.* a:

This will copy all files irrespective their names or extensions to drive a.

You can, if you want, copy files starting with an alphabet. For example:

Copy l*.doc a:

will copy all doc files starting with l.

5.3.4.2 Xcopy

This command is an extended command of copy. Here you can copy any number of files from any place in the hard disk to another place. The command is written as:

Xcopy source:path target:path switches

where you have to define the path of the source files and similarly define the path of the target. Various switches used here are listed below:

Switch	Action
/A	Copies only those files matching the source specification that also have their archive bit set.
/D:date	Copies file that were modified on or after the specified date.
/E	Creates subdirectories on the target location, even if there are no files in them.
/M	Resets the archive bit in a file after making the copy.
/P	Issues a prompt asking you to confirm the copy of each source file.
/S	Copies files matching the source specification that are found in sub directories nested below the source subdirectory.
/V	Performs a verification check against the image of the file in memory.

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W Causes XCOPY to pause before making copies allowing you an opportunity to change disks in the source drive if necessary.

For example,

```
Xcopy c:\sachin\*.doc a:
```

This command will copy all the doc files from the sachin subdirectory to the drive a.

5.3.4.3 Backup

There are times when you need to backup files to another drive to save the disk space area. The command is used as:

```
MSBACKUP file(s) /switches
```

where file(s) are the files which have to be backedup. Following switch options are available:

Switch	Action
/BW	Starts MSBACKUP in black-and-white for monitors that have trouble displaying the screen colours.
/TD	Backups up all files named in the specification file that have changed since the last full backup.
/TF	Backs up all files named in the specification.
/TI	Backs up all files named in the specification file that have changed since the last full backup.

5.3.4.4 Deleting a File

By deleting the name of a file, you remove it completely, including its contents. So be very sure that you are not going to need the file again before giving the delete command. You can delete a file by giving its full name. For example, when you give the following command:

```
DEL SACHIN.DOC
```

This would delete the file called sachin.doc.

5.3.4.5 Date and Time

These commands are used to display system time and date. By simply typing Date and Time, you can see the system date and time. What's more you can change them too, by retying the Date and Time in the same format as displayed. Date is usually displayed in the format of Day and mm-dd-yyyy, where dd, mm and yy have the usual notations. Time is shown in terms of hours, minutes, seconds, etc. You can opt to display the time in 12-hour or 24-hour format.

5.3.4.6 Prompt

If you do not like the usual C:\ format, you can change it various other options available under DOS. The various switch options are:

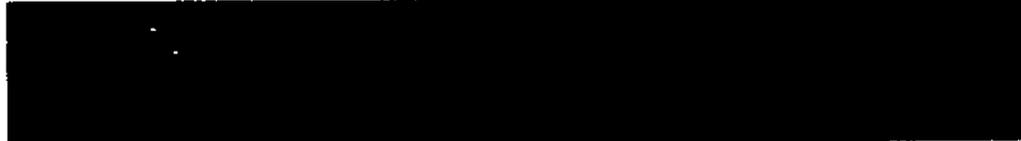
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<i>Switch</i>	<i>Action</i>
PROMPT	This option is used to get the default setting.
String	Specifies the text that you want to display as your system prompt.
\$\$	\$(dollar sign)
\$_	Carriage return/linefeed.
\$B	(bar or pipe symbol)
\$D	Current date
\$e	Escape code (you cannot use E instead)
\$G	> (greater than symbol)
\$H	Backspace (erases the preceding character)
\$L	< (less than symbol)
\$N	Current drive
\$P	Current drive name and path name
\$Q	= (equal sign)
\$T	Current time
\$V	System DOS version number

5.3.4.7 Renaming a File

Sometimes, you may not like the name that you gave to a file. You may want to give it a new name without distributing the contents of the file. For this, you use the



Rename command as following:

```
REN SACHIN.DOC GOLDEN.DOC
```

This will result in changing the name of the file from sachin.doc to golden.doc. Remember to put a space in between the two file names.

5.3.4.8 Restore

Once you backup the file, you must restore them too. The command for this is:

```
Restore source drive: target drive: /switches
```

where source drive has the files which have been backed up. Various switch options are:

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Switch	Action
/A:mm-dd-yy	Restores only those files that were modified on or after the specified date, where mm is the month, dd is the day and yy is the year.
/B:mm-dd-yy	Restores only those files that were modified on or before the specified date, namely mm-dd-yy.
/D	Displays file name(s) on the backup disk but does not restore them.
/E:hh-mm-ss	Restores those files modified at or earlier than the specified time, where hh is the hour (in 24 hour format), mm is the minutes after the hour, and ss is the seconds.
/L:hh: mm: ss:	Restores only those files that were modified at or after the specified time.
/M	Restores files that were modified since the last backup was made.
/N	Restores files that were deleted since the last backup.
/P	Prompts to confirm the restoration of files that were changed since the last backup or marked as read-only files.
/S	Restores files in sub directories nested below the specified target subdirectory.

5.3.4.9 Changing the Attrib

Each file in DOS has various attributes attached to it. These attributes decide the fate of the file. Among them are read-only, hide, etc. So you can change the attribute of a file using the command called Attrib, and the options attached to it. The command is:

Attrib modes path /switches

where path is the path of the file whose attributes you want to change. Various switches in use are:

Switch	Action
+A	Changes file setting to archived.
-A	Changes file settings to not archived.
+H	Changes specified file(s) to hidden, which means the file(s) will not be visible to most DOS operations.
-H	Makes hidden files visible again.
+R	Changes specified file(s) to read-only which means the file(s) cannot be overwritten or erased.
-R	Changes specified file(s) to read write which means, the file may be overwritten or erased.
+S	Marks specified file(s) as DOS system file(s).
-S	Removes DOS system-file setting.

/S Used with the file names that contain wildcard character or subdirectory names without file names. This option will include matching files in sub directories nested below the current subdirectory.

5.3.4.10 Type

This command is used to see the contents of a text file. The command is:

Type filename

where filename is the name of the file whose contents you have to see. Since this shows the plain listing of the files, it is advised that you use this command mainly for plain text files and not for formatted document files.

You can use | More to see all the contents of the file.



This is not the end of the DOS commands, there are more. The commands given here are just to give you an idea of the type of commands available under DOS. You can get the complete list of commands of DOS by typing

?

at the DOS prompt.

5.4 INTRODUCTION TO MS WINDOWS

Windows is nothing but graphics-based operating environment from Microsoft. It provides a desktop environment similar to the Macintosh, in which each active application is displayed in a resizable, moveable window on the screen. Initially Windows ran on DOS platform, but now-a-days it runs on its own platform.

Windows 1.x, Windows 286 (2.x) and Windows 386 were first attempts. Windows 3.0 had its own enhanced user interface and ability to manage extended memory, upto 16MB with built-in DOS extender.

Windows 3.1 (1992) was faster and supported multimedia, true type fonts, drag and drop, among other features. It was the last of the Windows versions based to work on DOS platform. From this point onward Microsoft introduced Windows 95 which was independent of DOS and had its booting capabilities.

Windows for Workgroups for introduced in 1993. It was the first version of Windows which truly supported networking. This was later enhanced to Windows NT, which was introduced in 1993.

5.4.1 Starting Microsoft Windows

As we learned in the earlier part of the chapter, Windows 98 is an operating system,

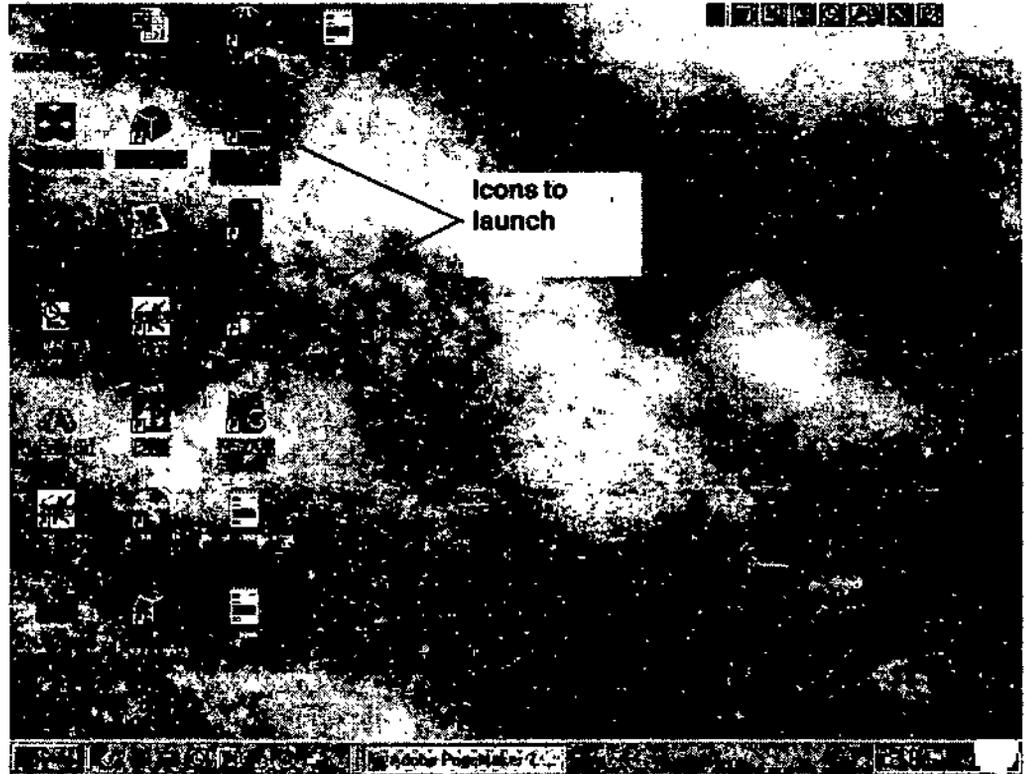
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it does not need to be started. It starts when the computer is put on. The first software which takes over the computer is Windows 98. The first thing that you see on the screen is the desktop, which is like the platform from where every application is launched and you would return to it after completing the application.

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5.4.2 Desktop

As you might have noticed that there are various icons on the desktop. These are nothing but the graphical representations of the applications, programs, documents, etc. I will explain later in the chapter, how these icons can be created. By clicking with mouse onto an icon, once or twice, as you may set in the Windows setup, you can run the program or application.



On the desktop, there are few icons which are a must for all the desktops being used by Windows and there are few which are optional and are created by the users according to their likings. Among the permanent ones are: My Computer, Recycle Bin, My Documents, Network Neighborhood, etc.

I will explain about them a little later. First about icons.

5.4.3 Icons

Icon is a graphic presentation of a window element. Icons are of four types which are as follows:

5.4.3.1 Disk Drive Icons

These type of Icons represents the Drives of the computer. For example: Drive 3 1/2 Floppy A:, Hard Disk drive, CD Drive, etc.



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5.4.3.2 Application Icons

Application Icons means the software package which are used to run various programs. For Example: MS-Office, MS-Word, MS-Excel, MS- Access, PageMaker, CorelDraw etc.



5.4.3.3 Shortcut Icons

Shortcut Icons are created by using the option from Desktop/New/Shortcut.



5.4.3.4 Document Icons

You can create a graphical representation of any document.



5.4.4 Use of Start Button

There are lot of things which can be done from the Start button. For others you have to use either My Computer or Windows Explorer. I would talk about them a little later but let us concentrate on Start button first. At the bottom most left corner of the desktop is the Start button. By pressing it you can launch the following options (your computer may different options, but quite a number of them are same):

Windows Update Microsoft from time to time announces the update of the software. Using this option you can upgrade your Windows version after connecting to the Microsoft website.

WinZip: A very useful program for compressing the files.

Kundli for Windows: An astrological software, not available with Windows but put in for use by yours truly.

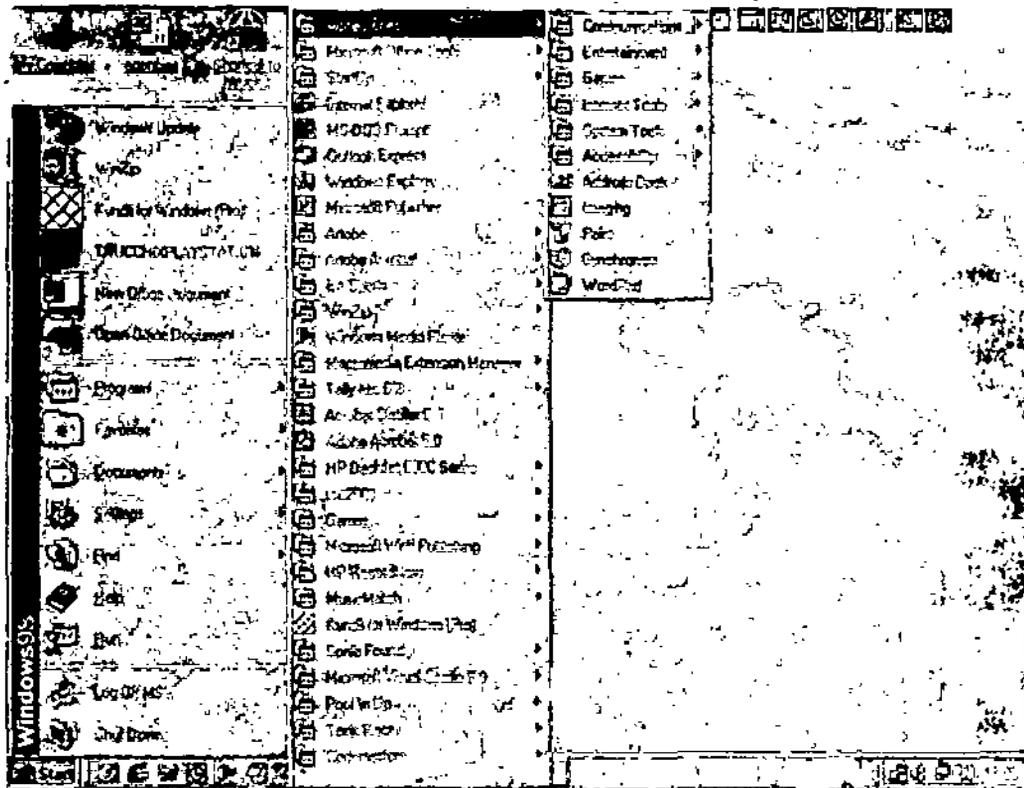
TRUCHHIPLAYSTATION: Another one of my programs.

New Office Document: This helps you in creating a new office document, which can be a document of MS Word, a spreadsheet of MS Excel, etc.

Open Office Document: Similar to above, you can open an existing document.

Programs: It opens a list of various folders and their programs to choose from to run them.

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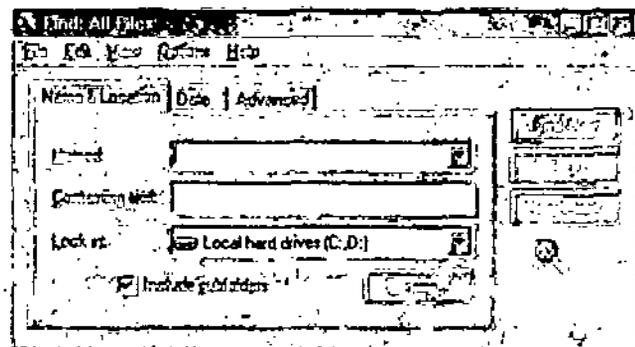


Favorites: It gives you access to various channels, links and software updates.

Documents: It gives you access to the last 15 documents opened.

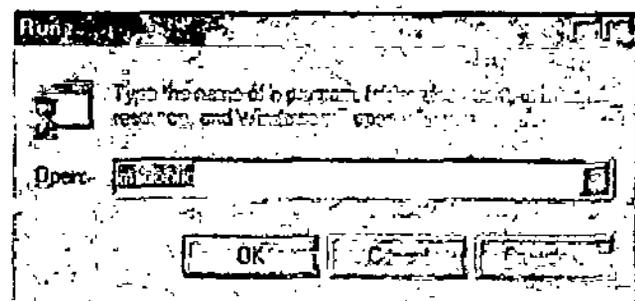
Settings: It provides access to Control Panel, Printers, Taskbar and Start Menu, Folder Menu, Active Desktop and Windows update controls.

Find: Using this you can search for a file, folder, device or a computer. You can also search the Internet and look for personal contact information.



Help: It opens the extensive Windows Help system and gives you access to the Troubleshooting.

Run: Allows you to run a particular program using a dialog box.



Log Off: It logs off the system quickly so that you can log back on with a different user profile or so that another user can log on.

Shut Down...: It prepares the computer to shut down or to be restarted.

Now we talk about the various parts of the desktop, starting with My Computer.

5.4.5 My Computer

As the name suggests it shows you the contents of your computer. This has the following icons for the followings:

Drive A: It will show the contents of the floppy drive.

Drive C: It will show the contents of the hard disk.

Drive D: It will show the contents of drive D (CD drive).

Control Panel It will show the contents of the control panel.

Printers It will show the number of printers installed.

Scheduled Tasks It will show you the tasks which you have scheduled to be performed at a particular time.

Dial-up Networking It will dial the network for you.

Web Folders It will show you the various web folders.

Clicking the icon of drive C will show you the icons in the drive. Clicking at the various folders you can see the files under them. If you click at any document file, it would launch the program associated with it and open the document in it. Similarly if you click at an application, the application is launched.

5.4.6 Recycle Bin

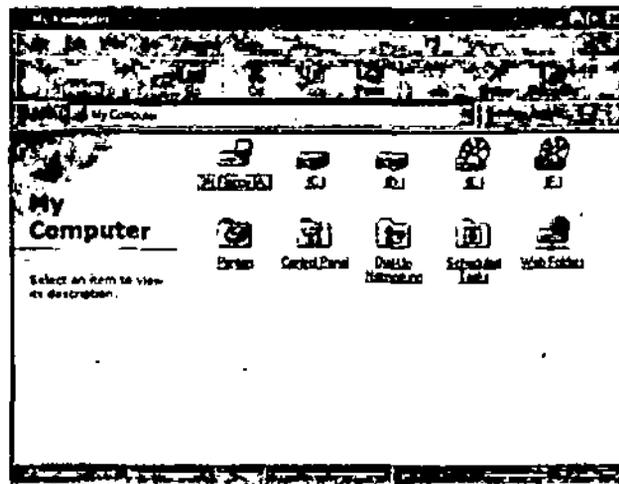
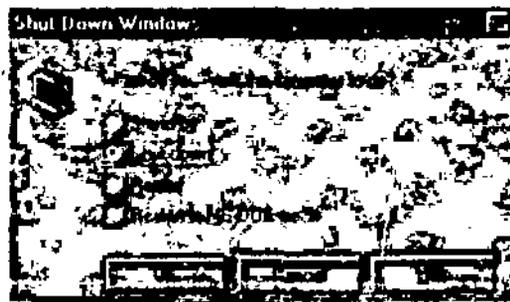
It is like a dust bin of the computer. All the deleted files are transferred here. You can in fact open this folder to see the files present in it. If you want at any stage to retrace any file, you can do it, if it is present in the Recycle Bin. However, if you choose to empty the recycle bin and delete the files altogether, then you cannot restore any of the file.

5.4.7 My Documents

This folder contains all your files which you have created and saved in it. Irrespective of the program, you can click the files to open them. The relative program will be launched automatically.

5.4.8 Network Neighborhood

It opens a viewer that presents system information about your computer's place in a



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network. So far we have talked about shortcuts or icons on the desktop. But, we have not told you how they are created.

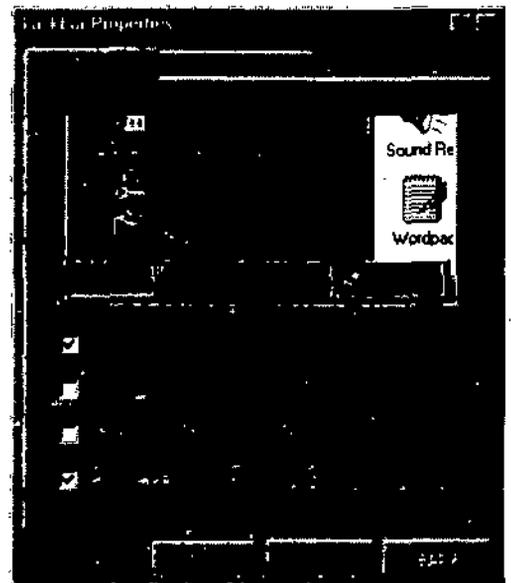
5.4.9 Exploring the Taskbar

It is the bottom key line on the desktop. Starting with the right most corner, we see the following:

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- Date and Time** It shows you the date and time of the system.
- Task Scheduler** It shows the tasks which you have scheduled for running at different times.
- Quick Launch Toolbar** Various icons here are the ones used for launching different programs. You have an option to put these icons here for the programs which you often use.
- Running Tasks** When you have a program running in your system, its name will be reflected here on this taskbar to show that this program is open.

You can change the various options of the taskbar using the option dialog box from Start button, Settings, Taskbar and Start menu. This dialog box is shown here. It has 2 panels: Taskbar options and Start Menu Programs. Select the panel and make the changes you would like to make.



5.4.10 Running an Application

An application can be run under Windows by various methods. They are:

By Icon: Clicking at the icon of the application at the desktop.

From Windows Explorer: Click at the file/icon of the application in Windows Explorer.

From Start Menu: Click at Program and then the program name from its sub-menu. For example, for running Paintbrush, you will have to go to Programs, Accessories and then Paint.

5.4.11 Working on Windows

So far you have seen how the various sections of Windows work. Now we see how you can control the working of the Windows or for that any of the Windows dialog box.

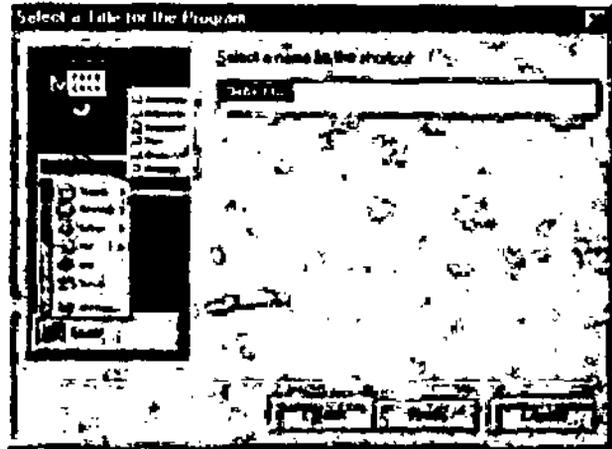


Minimizing the Windows: You can work on more than one application at the same time under windows. For this you have to minimize one application, which is done by using Minimize button, as shown here. Once you are through with the other application you can minimize that and come back to this application.

Restoring the Windows: If you have minimized an application, then there must be some button to restore it. Using this button you can restore the application back to

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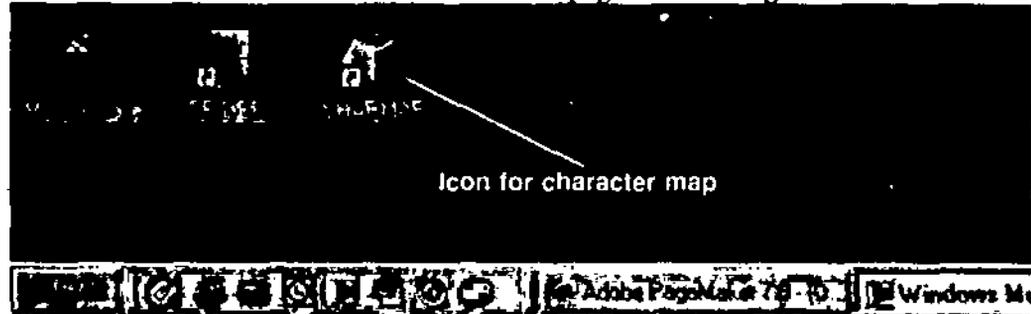
7. Click at Next to get the next dialog box. This will ask you fill up the name you want to give to the shortcut. Here we have given it as CHARMAP.
8. Clicking at Finish will end the procedure to create the shortcut. Once done, it will create a new shortcut named CHARMAP on the desktop. You can now use it to launch Character Map.



5.4.13 Windows Explorer

It offers you the easiest way of viewing folders, files and other resources located on your machine. The default Explorer is a two-pane window. When you click on an item in the left window pane, the right pane displays the contents.

You can choose different viewing options from the View menu, the two options, small icons and details are shown on the next page. For moving files from one folder



to another, you can open more than one window of the Windows Explorer and then drag & drop.

5.4.14 Creating and Renaming of Files and Folders

A folder is like a directory where all the relative files are kept. For example, all your files pertaining to a book would be in one folder. If you look at the picture shown earlier of Windows Explorer, it contains the various folders and files. Each folder has the files related to that folder.

Creating a Folder: For creation of a new folder, you will have to go to either My Computer or Windows Explorer. Let me explain how it is done in My Computer.

For that follow the following steps.

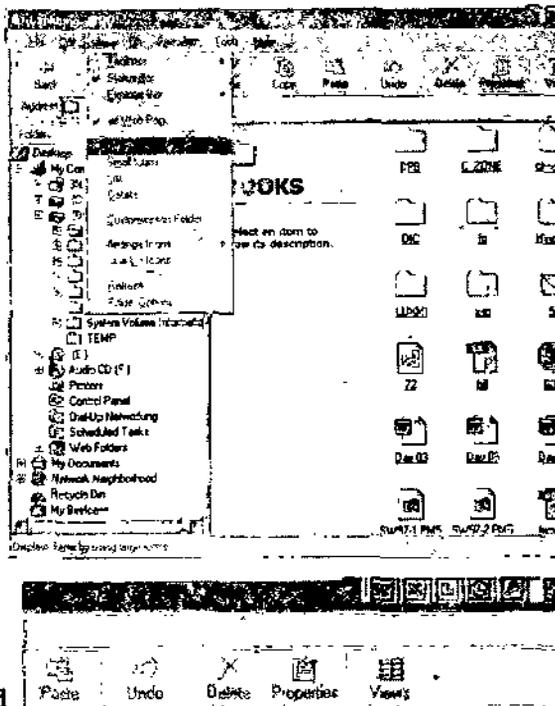
1. Start My Computer from the desktop.
2. Right click the mouse to get the following menu.
3. Click at New and then Folder to get a new blank folder on the screen.
4. By clicking at its name you can type the name you want for the folder.

5. After typing press Enter to have the folder.

Copying of a File: For copying also you can use either My Computer or Windows Explorer. Let me explain how it is done in My Computer.

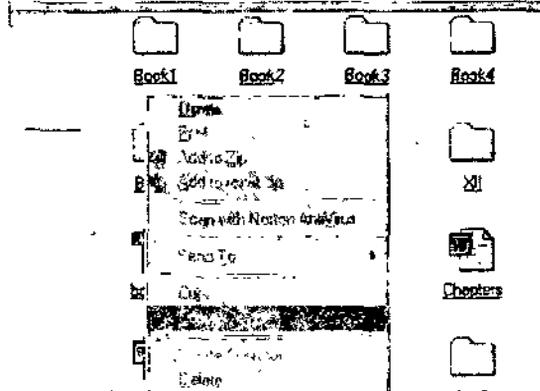
For that follow the following steps.

1. Start My Computer from the desktop.
2. Right click the mouse to get the menu.
3. Click at Copy and then the Folder where you want this file to be copied.
4. Reclick the right mouse.
5. Select Paste this time
6. The copied file will be pasted here.



Renaming the Files/Folder: After giving the files their names, you can change them if you like. For this we have the Rename command. Follow the following procedure to rename a file.

1. Select the file which you want to rename by single clicking it.
2. From the File menu, click at Rename.
3. Retype the new name for the file.



Similarly you can change the name of the folder.

5.4.15 Basic Components of a Window

A window here is taken here as the name of the dialog box, as mentioned earlier in the chapter. Let me explain the various components of a dialog box/window.

Title bar: This bar is displayed at the top of the window. It displays the name of the program and name of the currently active document.

Menu bar: This bar is just below the Title bar. When you select a key word on the Menu bar, a list falls down.

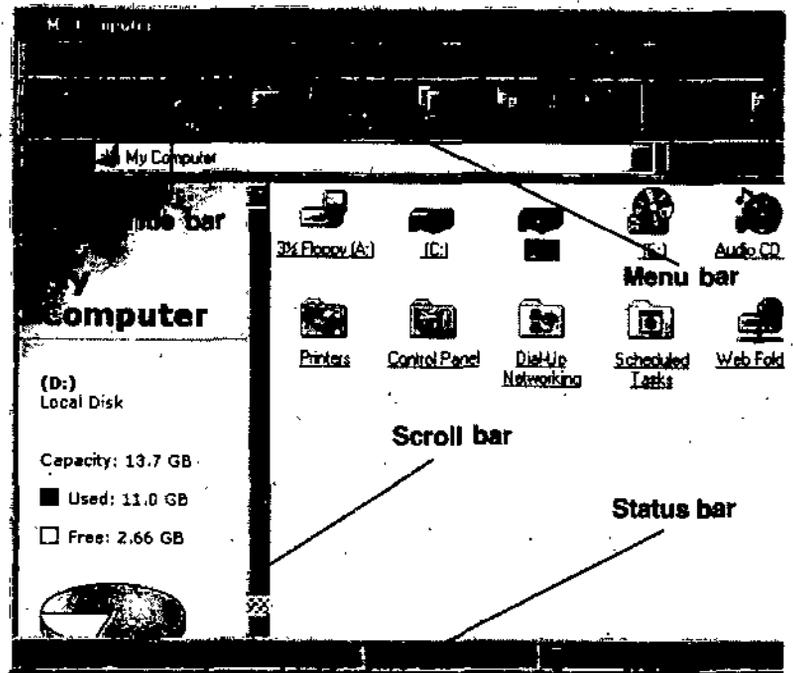
Some of the items will be grey in colour, which shows that they cannot be used at this stage. Select one of the available item to perform some operation.

Scroll bar: There are two types of scroll bars: the horizontal and the vertical scroll bar. When there is insufficient space available, these scroll bar appears automatically.

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We can scroll either by clicking on the arrow marks or by dragging the little bar with the help of the mouse.

Status bar: This bar displays the information about the active document or the task that the user is currently working on.



SUMMARY

1. An operating system (OS) is a set of computer programs that manage the hardware and software resources of a computer.
2. Batch processing requires that a program, its related data and relevant control commands should be submitted together, in the form of a Job.
3. A program in execution is called a Process.
4. The time-sharing interactive systems belong to the era of a large mainframe systems, that were made available to a large number of users for accessing concurrently in an interactive mode.
5. The real time systems are used in environments, where a large number of events, mostly external to the computer system, must be accepted and processed to a highly time-bound manner
6. Different types of operating systems are optimized or geared up to serve the needs of specific environments.
7. A Distributed operating system caters for a distributed environment, wherein a collection of autonomous computer systems, capable of communicating and cooperating with each other through network, are connected to each other through a LAN/WAN.
8. Any operating system should meet the following major goals: Optimize the use of computer resources so as to maximize its throughput and Create a user-friendly computing environment for accessing the computer resources.
9. Every program running on a computer, be it background services or applications, is a process.
10. Process management involves computing and distributing CPU time as well as other resources.
11. An operating system's memory manager coordinates the use of these various types of memory by tracking which one is available.
12. All operating systems include support for a variety of file systems.
13. Most current operating systems are capable of using the TCP/IP networking protocols.
14. The operating system provides access to a number of resources, directly or indirectly, such as files on a local disk, privileged system calls, personal information about users, and the services offered by the programs running on the system.

15. Internal security can be thought of as protecting the computer's resources from the programs concurrently running on the system.
16. At the front line of security are hardware devices known as firewalls.
17. Today, most modern operating systems contain Graphical User Interfaces.
18. Among the popular operating system are Disk Operating System (DOS).
19. DOS has internal and external commands.
20. Internal commands can be given from anywhere.
21. In DOS the filename is of 8 + 3 format.
22. Root directory is the main directory of the hard disk.
23. DIR command gives the listing of files in directory.
24. DIR/P allows you to view the files on screen page by page.
25. DIR/W gives the listing widthwise.
26. MD command allows you to create directory.
27. CD command is used for changing directory.
28. RD command is used for removing directory.
29. A file can be copied on to another drive or another directory.
30. Xcopy command can be used to copy various files.
31. Backup is used to copy several files at a time for storing.
32. An existing file can be deleted too.
33. Using Date and Time commands, you can see the system date and time.
34. Prompt command allows you to change the command prompt.
35. You can give a file a new name by using the REN command.
36. Restore command allows you to restore the backed up files.
37. Attribute command allows you to change the attributes of the file.
38. Among the permanent icons on the Windows desktop are: My Computer, Recycle Bin, My Documents, Network Neighborhood, etc.
39. Various other icons on the desktop are: Disk Drive Icons, Application Software Icons, Document Icons and Shortcut icons.
40. By pressing Start button on the desktop, you can initiate a number of programs.
41. Documents gives you access to the last 15 documents opened.
42. Settings provide access to Control Panel, Printers, Taskbar and Start Menu, Folder Menu, Active Desktop and Windows update controls.
43. Find helps you in searching files, folders, devices or computers. You can also search the Internet and look for personal contact information.
44. Help opens the extensive Windows Help system and gives you access to the Troubleshooting.
45. Run allows you to run a particular program using a dialog box.
46. Shut Down prepares for the computer to be shut down.
47. Recycle Bin is where you throw away all your unwanted files.
48. My Documents is where you keep all your files.
49. Network Neighborhood allows you to access your networks.
50. Quick Launch Toolbar allows you to launch applications from the toolbar.
51. You can run any application from Start menu, Windows Explorer or Shortcut.
52. You can minimize any window application.
53. You can create your own shortcuts for the applications, documents, etc.
54. Windows Explorer is the platform to working with files and folders in your computer.
55. By using Windows Explorer you can: Create a folder, Copy a file/folder; Rename a file/folder or delete the file/folder.
56. A Windows dialog box has the following units: Title bar, Menu bar, Scroll bar and Status bar.

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TEST YOURSELF

1. What is an operating system?
2. Describe the various types of operating systems.

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3. Why do you need an operating system?
4. What are the goals of an operating system?
5. What sort of services are provided by an operating system?
6. What are the characteristics of an operating system?
7. What is DOS used for?
8. What is the command to remove all files in a directory?
9. Is it possible to remove the root directory of your hard disk by using the RD command?
10. Type the command to remove a directory.
11. What are the different options of the DIR command?
12. What is the command to display a directory pagewise?
13. What does the symbol \ (backslash) stand for?
14. What display does your monitor show when you type CD?
15. What does the command Backup do?
16. How would you restore the backed up files?
17. What is prompt command used for?
18. Describe the various items on the desktop of Windows 98.
19. What all is available on the Start button?
20. What all is there in My Computer?
21. What is the significance of Network Neighborhood?
22. Describe the various features of Taskbar.
23. How would you change the features of Taskbar?
24. What do you understand by:

Minimizing the Windows	Maximizing the Windows
Restoring the Windows	Closing the Windows
25. What is the function of Windows Explorer?
26. How would you do the following using Windows Explorer?

Rename a file	Copy a file	Create a folder
Delete a file	Move a file	
27. Describe the various components of a Windows dialog box.

Multiple Choice Questions

1. The processing system which did not allow the interference of users is called:

(a) Batch Operating System	(b) Time Sharing Operating System
(c) Real Time Operating System	
2. FCFS means:

(a) First Compile First Served	(b) First Come First Served
(c) First Come First Shared	
3. Time sharing systems are:

(a) Time tested user systems	(b) Single user systems
(c) Multi programming systems	
4. Which command is used to shift the command from one directory to another?

(a) CD	(b) MD	(c) RD
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5. Which command would you use to create a new directory?

(a) CD	(b) MD	(c) RD
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6. The main directory of the hard disk is:

(a) Main directory	(b) Root directory	(c) Final directory
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7. Which command will always transfer to the root directory?

(a) CD\	(b) CD/	(c) CD
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8. For listing the files widthwise, we give the command as?

(a) DIR/P	(b) DIR/W	(c) DIR
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9. The files in DOS are named in which format ?

(a) 9 + 2	(b) 10 + 1	(c) 8 + 3
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10. A directory within a directory is called:

(a) Sub directory	(b) Part directory	(c) Junior directory
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11. Prompt command is used to change the command prompt from:

(a) c:\	(b) c:	(c) c
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