

Energized Study Material of

Informatics Practices XII

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A complete energized Study material of Informatics Practices for Class XII



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Unit 1

Computer Networking & OSS

Objectives:

In this Chapter you will learn about:

- Networking and Its Need
- Internet
- Switching Techniques
- Transmission Media
- Networking Devices
- Network Topologies & Types
- Network Technology
- Network Security Concepts
- Open Source Concepts

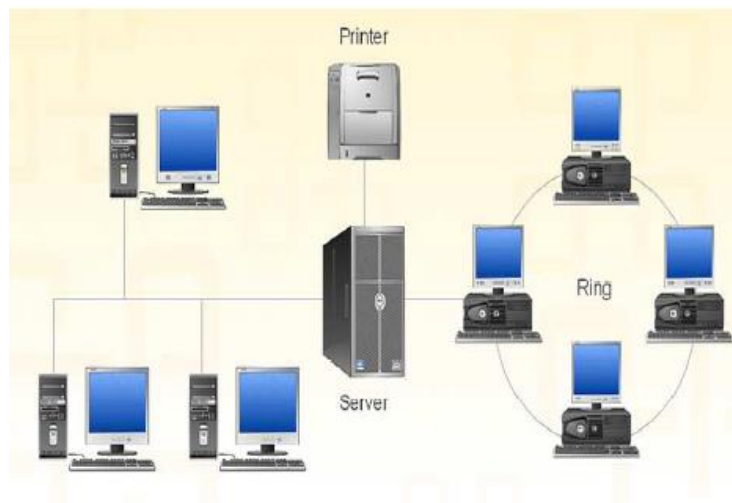


Networking:

We often need peripheral devices and data to be shared among various computers. In fact, in your school's computer lab, you must have seen one printer which is connected to only one computer, serving to the needs of all the computers in the lab. How does this happen? This happens because all your lab's computers and peripherals are forming a network. They are interconnected with each other enabling you to send and receive data from one computer to another. Hence it can be said that two computers are interconnected if they are able to exchange information.

A network is any collection of independent computers that communicate with one another over a shared network medium. In simple terms, a computer network is a collection of two or more computers linked together for the purpose of sharing information and resources. When these computers are joined in a network, people can share files and peripherals such as modems, printers, backup drives, or CD-ROM drives. Each computer on the network is called a node and hence, a network is a series of points or nodes interconnected by communication paths (transmission media). A network can be as small and simple as two computers that share a printer or as complex as the world's largest network, the Internet. When networks at multiple locations are connected using services available from phone companies, people can send e-mail, share links to the global Internet, or conduct video conferences in real time with other remote users. As companies rely on

applications like electronic mail and database management for core business operations, computer networking becomes increasingly more important.



Needs:

1. **Resource Sharing**
2. **Reliability**
3. **Cost Factor**
4. **Communication Medium**

Resource Sharing means to make all programs, data and peripherals available to anyone on the network irrespective of the physical location of the resources and the user.

Reliability means to keep the copy of a file on two or more different machines, so if one of them is unavailable (due to some hardware crash or any other) then its other copy can be used.

Cost factor means it greatly reduces the cost since the resources can be shared.

Communication Medium means one can send messages and whatever the changes at one end are done can be immediately noticed at another.

Identifying Computers & Users Over a Network:

As there are millions of computers in a computer network. Each computer is identified by a unique address called I.P address (Internet Protocol Address) in a computer network. The I.P Address is unique and universal. That is each computer in a computer network (internet) is associated with this unique address and this cannot be address of any other computer.

There are two versions of **I.P address**:

- ✓ **IPv4 (IP version 4):-** it is 32 bits or 4 bytes in length.

Example

248.128.88.12

- ✓ **IPv6 (IP version 6):-** it is 128 bits in length.

Example

AE20:0DB8:AC10:FE01:0000:0000:0000:0000

Another popular form of address is:

MAC(Median Access Control) Address:

- The MAC Address is also called Ethernet or Physical address and is six bytes (48) bits in length.
- MAC Address is most often assigned by the manufacturer of network interface card (NIC)
- The MAC address uniquely identifies an adapter on LAN and is 12 digits (48 bits) in length.
Example 00:0A:C9:12:C8:29
- Logically MAC addresses are used in the medium access control sub layers of data link layer of the OSI (open system interconnection) reference model as shown below.

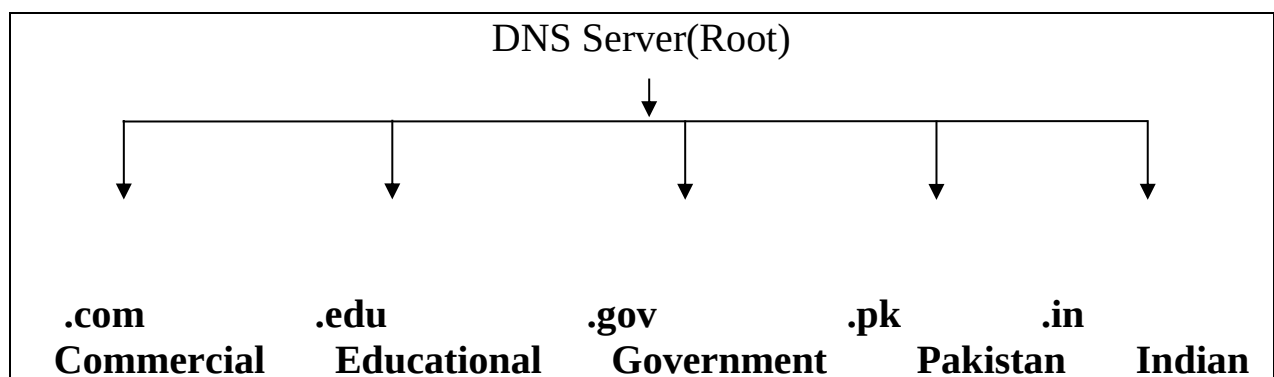
Application layer	
Presentation layer	
Session layer	
Transport layer	
Network layer	
DataLink layer	LLC
	MAC
Physical layer	

(OSI model)

Domain Name System:

The domain name system (DNS) translates the internet domain names into I.P addresses. As we know there are different servers with different domain names:

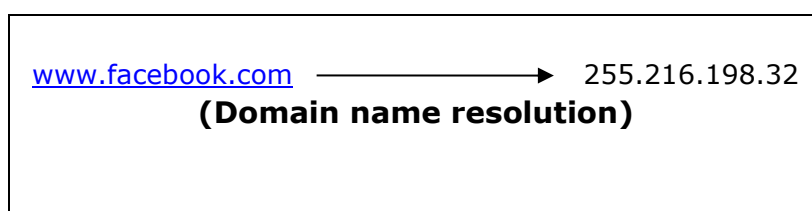
Country Code TLD	Country
.au	Australia
.br	Brazil
.ca	Canada
.gr	Greece
.in	India
.ru	Russian Federation
.uk	United Kingdom



So DNS converts user understandable Domain Name into respective I.P address.

Domain name Resolution:

The way in which the host names are converted to their respective I.P addresses is called domain name Resolution and is done by DNS (Domain Name System). When we enter a domain name in an application that uses internet, the application will issue a command to the operating system which in turn will convert domain name into its I.P address.



Internet:

The Internet is a system of linked networks that are worldwide in scope and facilitate data communication services such as remote login, file transfer, electronic mail, the World Wide Web and newsgroups. The internet is made up of many networks each run by a different companies and are interconnected at peering points. It is really a network of networks spread across the globe, all of which are connected to each other. This super network is a glorified WAN in many respects. It connects many smaller networks together and allows all the computers to exchange information with each other through a common set of rules for communication. These rules are called protocols and the internet uses Transmission Control Protocol/Internet Protocol (TCP/IP). Programs such as web browsers, File Transfer Protocol (FTP) clients, and email clients are some of the most common ways through which the users work on the Internet. With the meteoric rise in demand for connectivity, the Internet has become a communications highway for millions of users. The Internet was initially restricted to military and academic institutions, but now it is a full-fledged conduit for any and all forms of information and commerce. Internet websites now provide personal, educational, political and economic resources to every corner of the planet.

SWITCHING TECHNIQUES:

Switching techniques are used for transmitting data across networks.

Different types are :

1. Circuit Switching
2. Message Switching
3. Packet Switching

Circuit Switching

- Circuit switching is the transmission technology that has been used since the first communication networks in the nineteenth century.
- First the complete physical connection between two computers is established and then the data are transmitted from the source computer to the destination.
- When a call is placed the switching equipment within the system seeks out a physical copper path all the way from the sender to the receiver.
- It is must to setup an end-to-end connection between computers before any data can be sent.
- The circuit is terminated when the connection is closed.
- In circuit switching, resources remain allocated during the full length of a communication, after a circuit is established and until the circuit is terminated and the allocated resources are freed.

Message Switching

- In this the source computer sends data or the message to the switching circuit which stores the data in its buffer.
- Then using any free link to the switching circuit the data is sent to the switching circuit.
- Entire message is sent to the destination. It reaches through different intermediate nodes following the “store and forward” approach.
- No dedicated connection is required.

Packet Switching

- Conceived in the 1960's, packet switching is a more recent technology than circuit switching.
- Packet switching introduces the idea of cutting data i.e. at the source entire message is broken in smaller pieces called packets which are transmitted over a network without any resource being allocated.
- Then each packet is transmitted and each packet may follow any route available and at destination packets may reach in random order.
- If no data is available at the sender at some point during a communication, then no packet is transmitted over the network and no resources are wasted.
- At the destination when all packets are received they are merged to form the original message.
- In packet switching all the packets of fixed size are stored in main memory.

TRANSMISSION MEDIA:

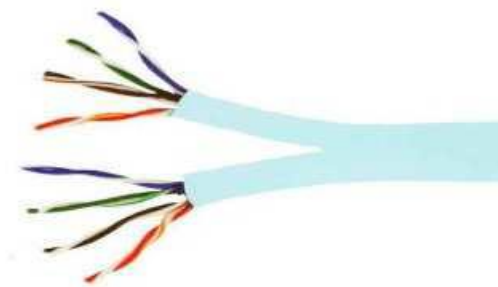
A transmission medium (plural media) is one which carries a signal from one computer to another. It is also known as communication channel. Transmission medium can be wired or wireless. We also name them as Guided and Unguided Media respectively. Wired transmission media includes twisted pair cable, Ethernet cable, coaxial cable and optical fibre whereas wireless transmission media includes microwave, radio wave, satellite, infrared, Bluetooth, WIFI etc.

Wired transmission media:

The wired or guided transmission media physically connects the two computers. The data signal physically gets transferred from the transmitting computer to the receiving computer through the wired transmission medium. Some of the wired transmission media are discussed below:

1. Twisted Pair Cable

- These cables consist of two insulated copper wires twisted around each other in a double helix.
- Twisting of wires reduces crosstalk which is bleeding of a signal from one wire to another.



Types:

- Unshielded Twisted Pair (UTP)
- Shielded Twisted Pair (STP)

STP offers greater protection from interference and crosstalk due to shielding. But it is heavier and costlier than UTP.

USE:

- In local telephone communication
- For digital data transmission over short distances upto 1 km

Advantages:

- Easy to install and maintain
- Simple
- Inexpensive
- Low weight
- Suitable for small (Local) Networks

Disadvantages:

- Not suitable for long distance due to high attenuation.
- Low bandwidth support.
- Low Speed

2. Coaxial cable:

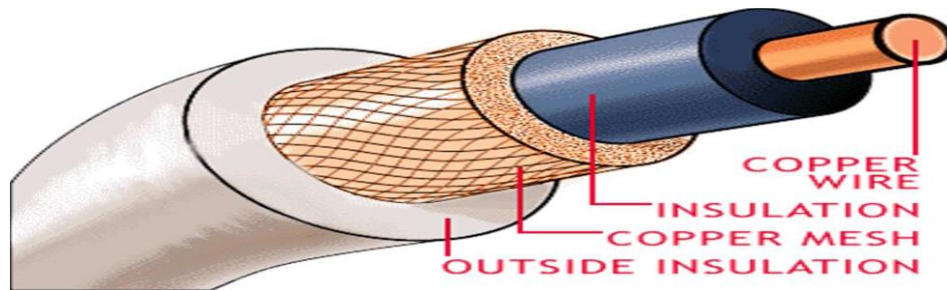
- Coaxial cable consists of a solid copper wire core surrounded by plastic cladding shielded in a wire mesh.
- Shield prevents the noise by redirecting it to ground.

Types:

Coaxial cable comes in two sizes which are called thinnet and thicknet.

- Thicknet : segment length upto 500 m
- Thinnet : segment length upto 185 m

USE: In TV channel communication



Advantages:

- Better than twisted wire cable.
- Popular for TV networks.
- Offers higher bandwidth & Speed

Disadvantages:

- Expensive than twisted wires.
- Not compatible with twisted wire cable.

3. Optical Fibres:

- Thin strands of glass or glass like material designed to carry light from one source to another.
- Source converts (Modulates) the data signal into light using LED (Light Emitting Diodes) or LASER diodes and send it over the Optical fiber.

It consists of three parts:

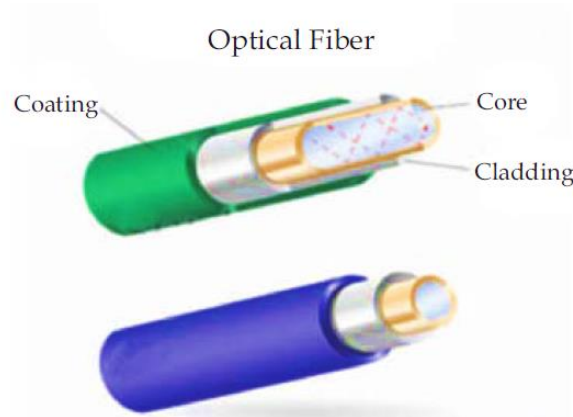
1. The core: glass or plastic through which the light travels.
2. The cladding : covers the core and reflects light back to the core
3. Protective coating : protects the fiber

Advantages

- Not affected by any kind of noise.
- High transmission capacity
- Speed of Light
- Suitable for broadband communication

Disadvantages

- Installation requires care.
- Connecting two Optical fibers is difficult.
- Optical fibers are more difficult to solder
- Most expensive



Wireless Transmission Media:

Wireless or unbounded or unguided media transport electromagnetic waves without using a physical conductor. The signals are broadcasted through air or water and thus are available to anyone that has a device capable of receiving them. Some of the wireless media are:

Bluetooth:

Bluetooth technology is named after herald Bluetooth and has a range of 10 meters. This type of wireless technology is ideal for mobile battery operated devices. This type of technology depends on two basic things.

- 1) radio frequency.
- 2) Bluetooth software



So the Bluetooth is a short range wireless technology used for personal area network (pan). Bluetooth implementation normally occurs with 4 pin digit.

Infrared.

Infrared technology allows the computing devices to communicate via short range wireless signals. Infrared communication occurs within short range distance and

has a range of less than 5 meters. Unlike Bluetooth the infrared signals cannot penetrate walls and has less data rate as compared to Bluetooth technology, the various disadvantages of infrared technology are as:

Blocked by materials: people ,walls etc

Short range: less than 5 meters.

Light, weather, rain, fog sensitive.

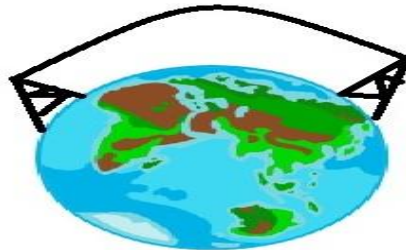
Low data rate.

Radio based communication:

This type of communication uses radio signals and travel over the frequency range of 100 kHz to 20 GHz. There are three types of radio frequency propagation.

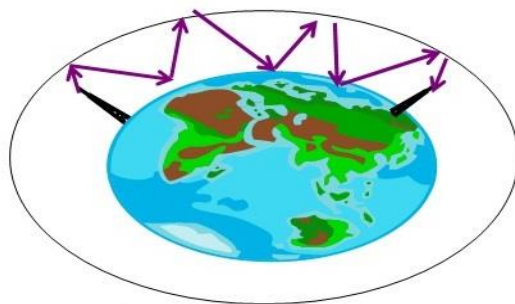
Grounded wave propagation:

Here the propagation follows the curvature of earth.



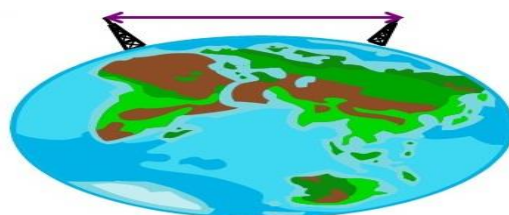
Ionosphere propagation:

In this type of propagation the signals are sent to ionosphere where they are reflected back to the earth.



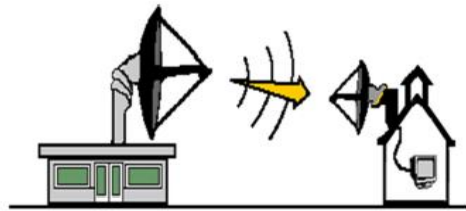
Line of sight propagation:

In this propagation transmission occurs in the line of sight that is the receiving station must be in the view of the transmitting station.

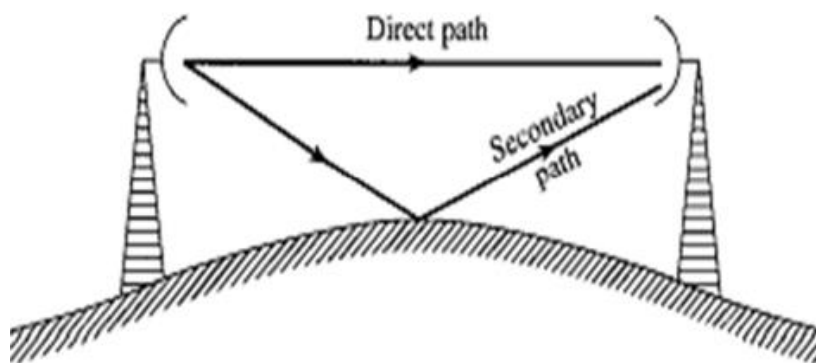


Microwaves:

Microwaves are transmitted from the transmitters placed at very high towers to the receivers at a long distance.



Microwaves are transmitted in line of sight fashion, and also propagated through the surfaces.



Advantages:

- Maintenance easy than cables.
- Suitable when cable cannot be used.

Disadvantages:

- Repeaters are required for long distance communication.
- Less Bandwidth available.

Satellite:

Geostationary satellites are placed around 36000 KM away from the earth's surface. In satellite communication transmitting station transmits the signals to the satellite. (It is called up-linking). After receiving the signals (microwaves) it amplifies them and transmit back to earth in whole visibility area. Receiving stations at different places can receive these signals. (It is called down-linking).



Advantage

- Area coverage is too large

Disadvantage

- High investment



NETWORK DEVICES:

For efficient working of any network, many devices are required. Some of the common network devices are discussed below:

Modem

- A modem is a computer peripheral that allows you to connect and communicate with other computers via telephone lines.
- Modem means Modulation/ Demodulation.
- Modulation: A modem changes the digital data from your computer into analog data, a format that can be carried by telephone lines.
- Demodulation: The modem receiving the call then changes the analog signal back into digital data that the computer can digest.
- The shift of digital data into analog data and back again, allows two computers to speak with one another.



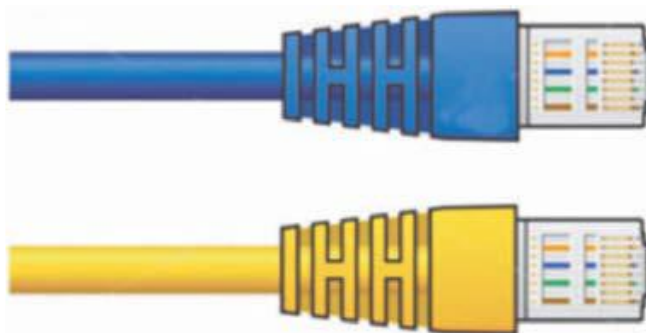
External Modem



Internal Modem

RJ- 45 Connector:

RJ-45 is short for Registered Jack-45. It is an eight wire connector which is commonly used to connect computers on the local area networks i.e., LAN.



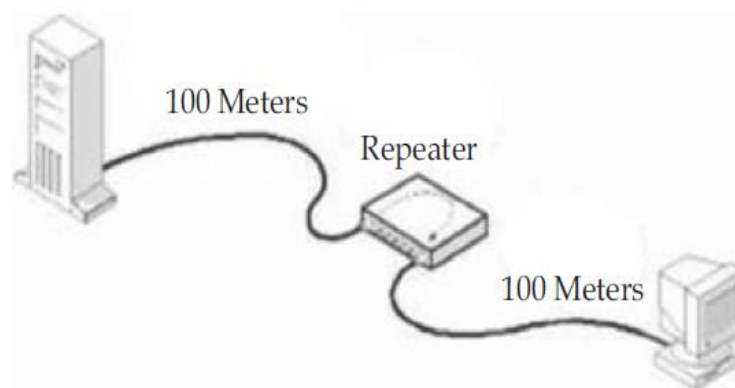
Network Interface Cards (Ethernet Card):

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 often 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.



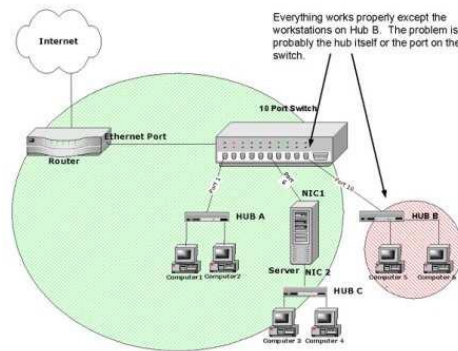
Repeaters:

A repeater is an electronic device that receives a signal and retransmits it at a higher level or higher power, or onto the other side of an obstruction, so that the signal can cover longer distances without degradation. In most twisted pair Ethernet configurations, repeaters are required for cable runs longer than 100 meters.



Hubs:

A hub contains multiple ports. When a packet arrives at one port, it is copied to all the ports of the hub. When the packets are copied, the destination address in the frame does not change to a broadcast address. It does this in a rudimentary way, it simply copies the data to all of the Nodes connected to the hub.



Bridges:

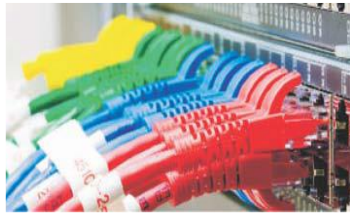
A network bridge connects multiple network segments at the data link layer (layer 2) of the OSI model. Bridges do not promiscuously copy traffic to all ports, as hubs do, but learn which MAC addresses are reachable through specific ports. Once the bridge associates a port and an address, it will send traffic for that address only to that port. Bridges do send broadcasts to all ports except the one on which the broadcast was received.

- Bridges learn the association of ports and addresses by examining the source address of frames that it sees on various ports. Once a frame arrives through a port, its source address is stored and the bridge assumes that MAC address is associated with that port. The first time that a previously unknown destination address is seen, the bridge will forward the frame to all ports other than the one on which the frame arrived.
- Bridges come in three basic types:
 - Local bridges: Directly connect local area networks (LANs)
 - Wireless bridges: Can be used to join LANs or connect remote stations to LANs.



Switches:

Switch is a device that performs switching. Specifically, it forwards and filters OSI layer 2 datagrams (chunk of data communication) between ports (connected cables) based on the Mac- Addresses in the packets. This is distinct from a hub in that it only forwards the datagrams to the ports involved in the communications rather than all ports connected. Strictly speaking, a switch is not capable of routing traffic based on IP address (layer 3) which is necessary for communicating between network segments or within a large or complex LAN. Some switches are capable of routing based on IP addresses but are still called switches as a marketing term. A switch normally has numerous ports with the intention that most or all of the network be connected directly to a switch, or another switch that is in turn connected to a switch.



Routers:

- • Routers are networking devices that forward data packets between networks using headers and forwarding tables to determine the best path to forward the packets. Routers work at the network layer of the TCP/IP model or layer 3 of the OSI model. Routers also provide interconnectivity between like and unlike media (RFC 1812).
- A router is connected to at least two networks, commonly two LANs or WANs or a LAN and its ISP's network.

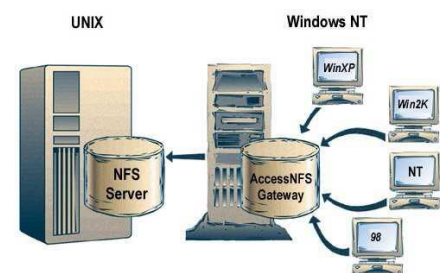
Gateway:

A Gateway is a network device that connects dissimilar networks. It established an intelligent connection between a local area network and external networks with completely different structures.

The computers that control traffic within your company's network or at your local Internet Service Provider (ISP) are gateway nodes. A network gateway can be implemented completely in software, completely in hardware, or as a combination of both. In the network for an enterprise, a computer server acting as a gateway node is often also acting as a proxy server and a firewall server. Here a proxy server is a node that is not actually a server but just appears to be so and a firewall is a system designed to prevent unauthorized access to or from a private network. A gateway is often associated with both a router, which knows where to direct a given packet of data that arrives at the gateway, and a switch, which furnishes the actual path in and out of the gateway for a given packet. It expands the functionality of the router by performing data translation and protocol conversion.

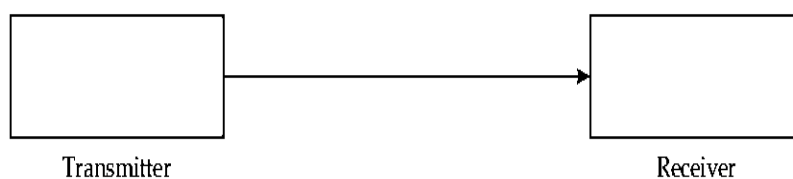
You will sometimes see the term default gateway on network configuration screens in Microsoft Windows.

In computer networking, a default gateway is the device that passes traffic from the local subnet to devices on other subnets. The default gateway often connects a local network to the Internet, although internal gateways for local networks also exist.



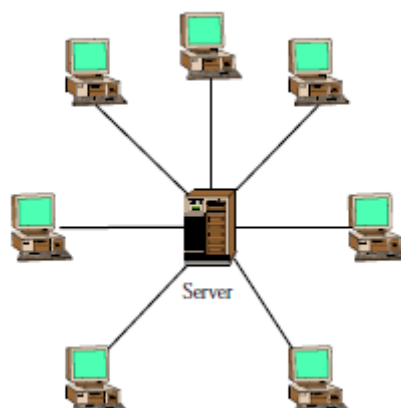
NETWORK TOPOLOGIES AND TYPES:

Topology is the pattern of interconnection of nodes in a local area network(LAN). The topology used helps to select the communication medium and the other network devices. While choosing a topology, care has to be taken that the installation cost is minimum, the network so designed should be reliable and flexible. In simple terms the addition or reduction of nodes should be easy and also fault detection and removal should be simple. Before we talk about topologies in detail, let us learn about point to point link which has two ends transmitter and receiver. The main characteristic of Point to Point link is that each transmitter transmits to exactly one receiver and each receiver receives exactly form one transmitter. The transmission might occur on a single medium i.e. single wire or over separate wires.



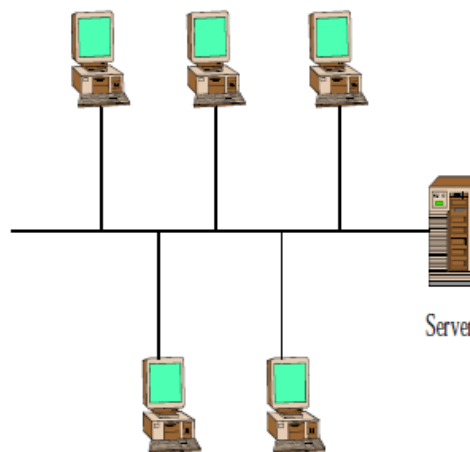
Star Topology:

The type of network topology in which each of the nodes of the network is connected to a central node with a point-to-point link in a 'hub' and 'spoke' fashion, the central node being the 'hub' and the nodes that are attached to the central node being the 'spokes' (e.g., a collection of point-to-point links from the peripheral nodes that converge at a central node) – all data that is transmitted between nodes in the network is transmitted to this central node, which is usually some type of device that then retransmits the data to some or all of the other nodes in the network, although the central node may also be a simple common connection point (such as a 'punch- down' block) without any active device to repeat the signals.



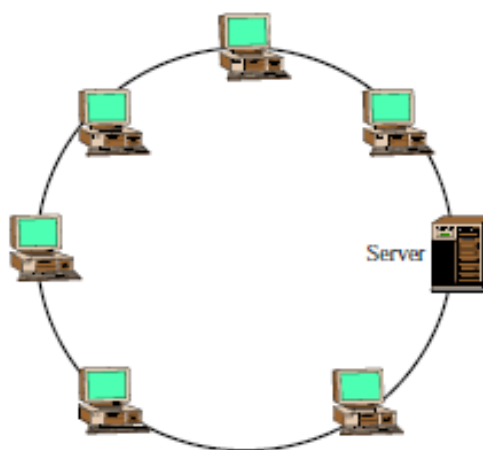
Bus Topology:

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).



Ring Topology:

The type of network topology in which each of the nodes of the network is connected to two other nodes in the network and with the first and last nodes being connected to each other, forming a ring – all data that is transmitted between nodes in the network travels from one node to the next node in a circular manner and the data generally flows in a single direction only.



Computer Networks:



A communications network is two or more computers connected to share data and resources are “networked.” The simple idea behind computer networking is to allow users to access more information and give them access to devices not directly attached to their “local” system, such as printers or storage devices.

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. For example, a library will have a wired or a communications network is two or more computers connected to share data and resources are “networked.” The simple idea behind computer networking is to allow users to access more information and give them access to devices not directly attached to their “local” system, such as printers or storage devices.

Metropolitan Area Network (MAN):

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

Wide Area Network (WAN):

WAN is a data communications network that covers a relatively broad geographic area(i.e. one city to another and one country to another country) and that often uses transmission facilities provided by common carriers, such as telephone companies.

WAN technologies generally function at the lower three layers of the OSI reference model: the physical layer, the data link layer, and the network layer.

NETWORK TECHNOLOGY:



1. Ethernet

Ethernet is a type of network developed by Xerox in the late 1970. While Internet is a global network, Ethernet is a local area network (LAN). Ethernet uses a communication concept called datagrams to get messages across the network. The Ethernet datagrams take the form of self-contained packets of information. These packages have fields containing information about the data, their origin, their destination and the type of data. The data field in each package can contain up to 1500 bytes.

2. Bluetooth:

Bluetooth technology is named after herald Bluetooth and has a range of 10 meters this type of wireless technology is ideal for mobile battery operated devices. This type of technology depends on two basic things.

- 1) radio frequency.
- 2) Bluetooth software



So the Bluetooth is a short range wireless technology used for personal area network (pan). Bluetooth implementation normally occurs with 4 pin digit.

3. **Wi-Fi**---Wi-Fi is short for Wireless Fidelity . Wi-Fi is a wireless technology that uses radiofrequency to transmit data through the air. An Access Point is a separate wireless unit, which has the ability to extend from the router to maximize wireless reception. Up to 16 users can connect to one access point .It allows several wireless clients to connect to a single device.Wi-fi hot spot is defined as any location in which wireless technology both exists and is available for use to consumers. Wi-fi was intended to be used for wireless devices and LANS, but is now often used for internet access.

NETWORK SECURITY CONCEPTS:



Network Security

Network security consists of the policies adopted to prevent and monitor unauthorized access, misuse, modification, or denial of a computer network and network- resources. Network security involves the authorization of access to data in a network, which is controlled by the network administrator. Users choose or are assigned an ID and password or other authenticating information that allows them access to information and programs within their authority. Network security covers a variety of computer networks, both public and private, that are used in everyday jobs; conducting transactions and communications among businesses, government agencies and individuals. Networks can be private, such as within a company, and others which might be open to public access. Network security is involved in organizations, enterprises, and other types of institutions. It does as its title explains: It secures the network, as well as protecting and overseeing operations being done. The most common and simple way of protecting a network resource is by assigning it a unique name and a corresponding password.

Network Threats

There are four primary classes of threats to network security as given below.

Unstructured threats:

Unstructured threats consist of mostly inexperienced individuals using easily available hacking tools such as shell scripts and password crackers.

Structured threats

Structured threats come from hackers who are more highly motivated and technically competent. These people know system vulnerabilities and can understand and develop exploit code and scripts.

External threats

External threats can arise from individuals or organizations working outside of a company. They do not have authorized access to the computer systems or network. They work their way into a network mainly from the Internet or dialup access servers.

Internal threats

Internal threats occur when someone has authorized access to the network with either an account on a server or physical access to the network. According to the FBI, internal threat accounts for 60 percent to 80 percent of reported incidents.

Virus

They are programs which can destroy or cause damage to data stored on a computer system and to the computer itself! Virus program must be executed in order to infect a computer system. Viruses can attach themselves to other programs in order to ensure that this happens.

Worms

Worms operate differently to viruses. Worms can spread themselves to other computers without needing to be transferred as part of a host program i.e. they do not need carriers for infecting other computers. The first time a user may notice the presence of a worm is when the computer's memory UNEXPECTEDLY fills up.

Trojan horse

Trojan horse, also known as Trojan, describes a list of computer threats that appear to perform good functions, but actually performs malicious functions that allow unauthorized access to the hosting machine. FOR EXAMPLE – If a program is designed in such a way, it could open a gateway for hackers to control and attack the computer of the user, then this said to be a Trojan horse.

Denial Of Service

It is a type of cybercrime in which a server is flooded by thousands of requests from illegal users thus denying the access of service to authorized users. The main aim of this crime is to make server busy which in turn is unable to provide the service to authorized users.

Snooping

It is an unauthorized access to another person's data. Snooping can include casual observance of an email that appears on another's computer screen or watching what someone else is typing. The hackers can also use special software for snooping the target computer.

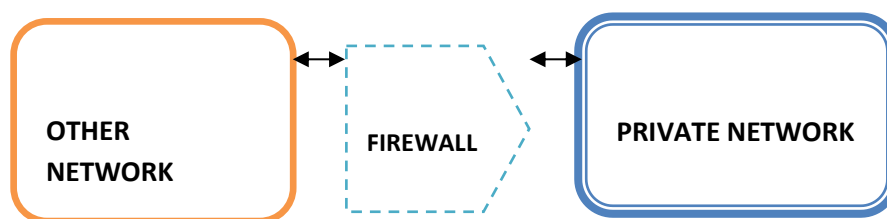
Network Security Measures

Anti-virus

Antivirus (or anti-virus) software is used to safeguard a computer from malware, including viruses, computer worms, and Trojan horses. Antivirus can detect, prevent and clean up computer viruses which may attempt to infect your computer system.

Firewalls

Firewalls play a vital role in providing network security and integrity. A fire wall is a set of programs located on a network server that protects the network from the users of other network.



Intrusion Detection

An Intrusion Detection System (IDS) is a device or software that monitors network or system activities for malicious activities policy violations and produces electronic reports to the management station. IDS can be either network based, host based or application based, depending on where they are deployed. Irrespective of their deployment, IDS function in a generic way. Input data from a system is collected and processed into a manageable format. The data items are classified as a threat or harmless. If a threat is detected, then a response is produced, usually in the form of an alert to the system administrator.

OPEN SOURCE CONCEPTS

Open source software

Open source software refers to a program or software in which source code is available to the general public for use and for modification from its original design. Because the source code of open source software is continuously modified by new programmers, a more bug (error) free software is produced.

The various examples of open source software are:

GNU, WWW ,Mozilla ,MySQL ,Open office etc.

OSI (Open Source initiative)

OSI is a nonprofit organization that promotes the integrity of the open source software's. The main aim of OSI is to educate about the benefits of Open Source Software's. The description of various Open Source Software are as below.

GNU

It is a UNIX like operating system developed by free software movement in 1984. The main objective behind GNU is to produce UNIX like operating system that is free of cost. Anyone can download, modify and redistribute.

Firefox

Mozilla Firefox is a fast, full featured web browser, that allows us to access the websites more fastly. It has also additional features that make us to use it efficiently and can freely downloaded from the internet.

Open Office

Is leading open-source software which helps us in word processing, spread sheets, presentation, database and more. It is available in all languages and works on all computers. It can be downloaded and used completely free of charge for any office purpose.

LINUX

Linux is the best known and most used open source operating system. In many ways Linux is similar to other operating systems like Windows, OS having graphical interface. But it is different from in many important ways. First, and perhaps most importantly, Linux is open source software. The code used to create Linux is free and available to the public to view, edit and for users to contribute to.

Unit 2

Visual Basic Programming

Objectives:

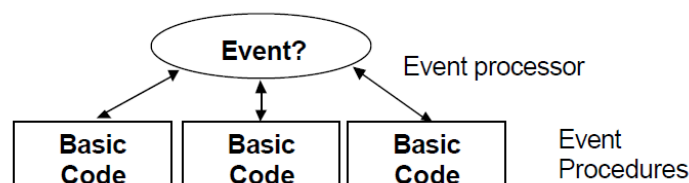
In this Chapter you will learn about:

- VB Basics
- Visual Basic Loops
- Visual Basic Functions
- Forms



What is Visual Basic?

- Visual Basic is a tool that allows you to develop Windows (Graphic User Interface - GUI) applications. The applications have a familiar appearance to the user.
- Visual Basic is event-driven, meaning code remains idle until called upon to respond to some event (button pressing, menu selection, ...). Visual Basic is governed by an event processor. Nothing happens until an event is detected. Once an event is detected, the code corresponding to that event (event procedure) is executed. Program control is then returned to the event processor.



Some Features of Visual Basic:

- ✓ Full set of objects - you 'draw' the application
- ✓ Lots of icons and pictures for your use
- ✓ Response to mouse and keyboard actions
- ✓ Clipboard and printer access
- ✓ Full array of mathematical, string handling, and graphics functions
- ✓ Can handle fixed and dynamic variable and control arrays
- ✓ Sequential and random access file support
- ✓ Useful debugger and error-handling facilities
- ✓ Powerful database access tools
- ✓ ActiveX support

- ✓ Package & Deployment Wizard makes distributing your applications simple

Structure of a Visual Basic Application:

Application (Project) is made up of:

- Forms - Windows that you create for user interface
- Controls - Graphical features drawn on forms to allow user interaction (text boxes, labels, scroll bars, command buttons, etc.) (Forms and Controls are objects.)
- Properties - Every characteristic of a form or control is specified by a property. Example properties include names, captions, size, color, position, and contents. Visual Basic applies default properties. You can change properties at design time or run time.
- Methods - Built-in procedure that can be invoked to impart some action to a particular object.
- Event Procedures - Code related to some object. This is the code that is executed when a certain event occurs.
- General Procedures - Code not related to objects. This code must be invoked by the application.
- Modules - Collection of general procedures, variable declarations, and constant definitions used by application. Steps in Developing Application

There are three primary steps involved in building a Visual Basic application:

1. Draw the user interface
2. Assign properties to controls
3. Attach code to controls

We'll look at each step.

1. Drawing the User Interface and Setting Properties

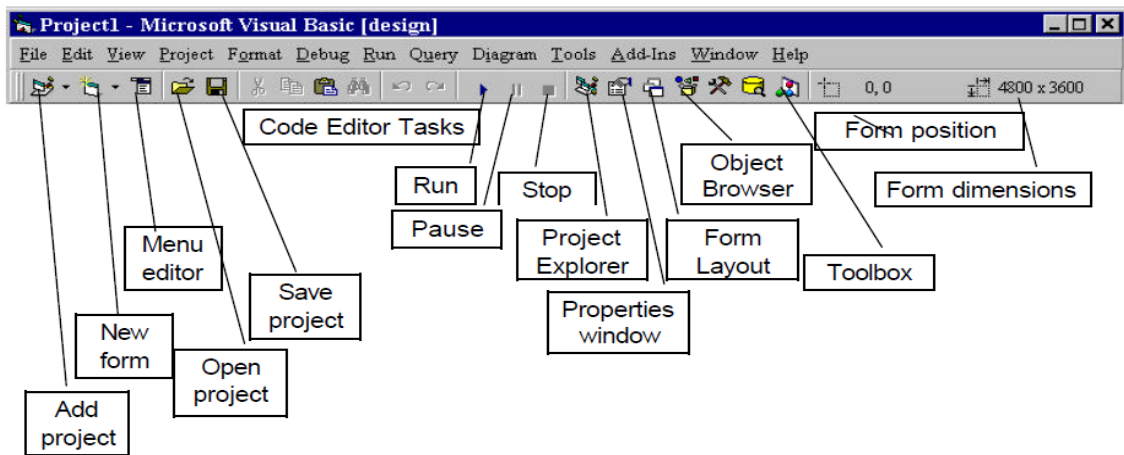
- Visual Basic operates in three modes.
 - Design mode - used to build application
 - Run mode - used to run the application
 - Break mode - application halted and debugger is available

We focus here on the design mode.

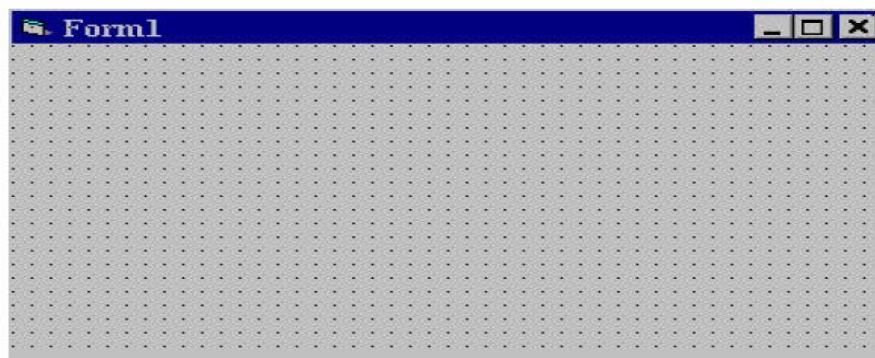
2. Six windows appear when you start Visual Basic.

- The **Main Window** consists of the title bar, menu bar, and toolbar. The title bar indicates the project name, the current Visual Basic operating mode, and the current form. The menu bar has drop-down menus from which you control the operation of the Visual Basic environment. The

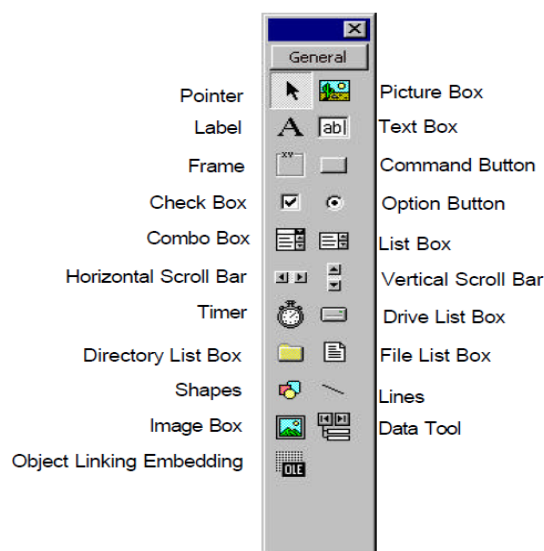
toolbar has buttons that provide shortcuts to some of the menu options. The main window also shows the location of the current form relative to the upper left corner of the screen (measured in tips) and the width and length of the current form.



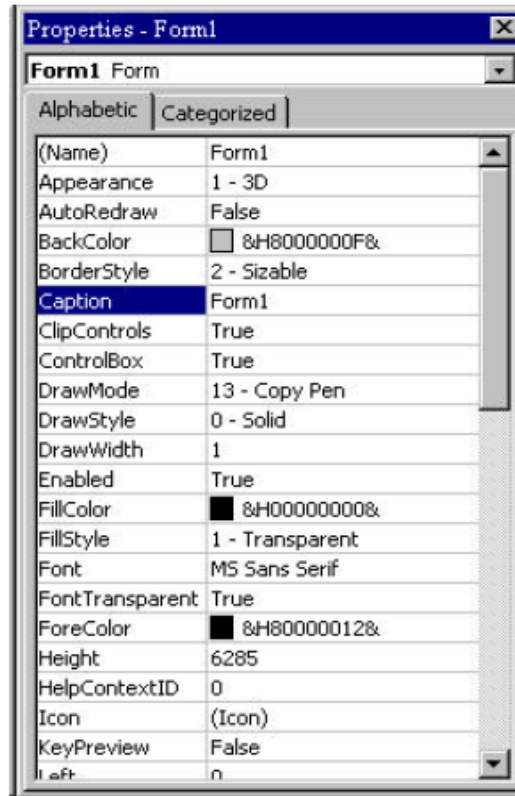
- The **Form Window** is central to developing Visual Basic applications. It is where you draw your application.



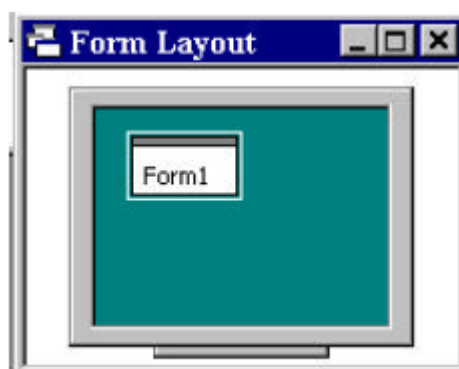
- The **Toolbox** is the selection menu for controls used in your application.



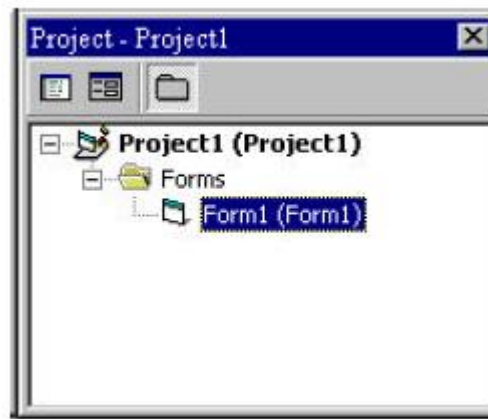
- The **Properties Window** is used to establish initial property values for objects. The drop-down box at the top of the window lists all objects in the current form. Two views are available: Alphabetic and Categorized. Under this box are the available properties for the currently selected object.



- The **Form Layout Window** shows where (upon program execution) your form will be displayed relative to your monitor's screen:

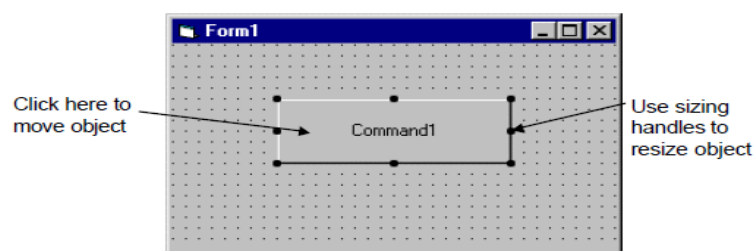


- The **Project Window** displays a list of all forms and modules making up your application. You can also obtain a view of the Form or Code windows (window containing the actual Basic coding) from the Project window.



As mentioned, the user interface is ‘drawn’ in the form window. There are two ways to place controls on a form:

1. Double-click the tool in the toolbox and it is created with a default size on the form. You can then move it or resize it.
 2. Click the tool in the toolbox, then move the mouse pointer to the form window. The cursor changes to a crosshair. Place the crosshair at the upper left corner of where you want the control to be, press the left mouse button and hold it down while dragging the cursor toward the lower right corner. When you release the mouse button, the control is drawn.
- To **move** a control you have drawn, click the object in the form window and drag it to the new location. Release the mouse button.
 - To **resize** a control, click the object so that it is selected and sizing handles appear. Use these handles to resize the object.



Variables in VB:

Variables are used by Visual Basic to hold information needed by your application. Rules used in naming variables:

- No more than 40 characters
- They may include letters, numbers, and underscore (_)
- The first character must be a letter
- You cannot use a reserved word (word needed by Visual Basic)

Visual Basic Data Types

Data Type	Suffix
Boolean	None
Integer	%
Long (Integer)	&
Single (Floating)	!
Double (Floating)	#
Currency	@
Date	None
Object	None
String	\$
Variant	None

Variable Declaration

There are three ways for a variable to be typed (declared):

1. Default
2. Implicit
3. Explicit

If variables are not implicitly or explicitly typed, they are assigned the variant type by default. The variant data type is a special type used by Visual Basic that can contain numeric, string, or date data.

Visual Basic Statements and Expressions:

The simplest statement is the assignment statement. It consists of a variable name, followed by the assignment operator (=), followed by some sort of expression.

Examples:

```
StartTime = Now
```

```
Explorer.Caption = "Captain Spaulding"
```

```
BitCount = ByteCount * 8
```

```
Energy = Mass * LIGHTSPEED ^ 2
```

```
NetWorth = Assets - Liabilities
```

The assignment statement stores information.

- Statements normally take up a single line with no terminator. Statements can be stacked by using a colon (:) to separate them. Example:

```
StartTime = Now : EndTime = StartTime + 10
```

(Be careful stacking statements, especially with If/End If structures. You may not get the response you desire.)

- If a statement is very long, it may be continued to the next line using the continuation character, an underscore (_). Example:

Months = Log(Final * IntRate / Deposit + 1) / Log(1 + IntRate)

- Comment statements begin with the keyword Rem or a single quote ('). For example:

```
Rem This is a remark
' This is also a remark
x = 2 * y ' another way to write a remark or comment
```

You, as a programmer, should decide how much to comment your code. Consider such factors as reuse, your audience, and the legacy of your code.

Visual Basic Operators:

➤ The simplest operators carry out arithmetic operations. These operators in their order of precedence are:

Operator	Operation
^	Exponentiation
* /	Multiplication and division
\	Integer division (truncates)
Mod	Modulus
+ -	Addition and subtraction

➤ Parentheses around expressions can change precedence.

➤ To concatenate two strings, use the & symbol or the + symbol:

```
lblTime.Caption = "The current time is" & Format(Now, "hh:mm")
txtSample.Text = "Hook this " + "to this"
```

➤ There are six comparison operators in Visual Basic:

Operator

>
<
>=
<=
=
<>

Comparison

Greater than
Less than
Greater than or equal to
Less than or equal to
Equal to
Not equal to

- The result of a comparison operation is a Boolean value (True or False).
- We will use three logical operators:

Operator

Not
And
Or

Operation

Logical not
Logical and
Logical or

- The Not operator simply negates an operand.
- The And operator returns a True if both operands are True. Else, it returns a False.
- The Or operator returns a True if either of its operands is True, else it returns a False.
- Logical operators follow arithmetic operators in precedence.

Visual Basic Branching - If Statements:

Branching statements are used to cause certain actions within a program if a certain condition is met.

The simplest is the If/Then statement:

- If Balance - Check < 0 Then Print "You are overdrawn"
Here, if and only if Balance - Check is less than zero, the statement "You are overdrawn" is printed.
- You can also have **If/Then/End If** blocks to allow multiple statements:
 If Balance - Check < 0 Then
 Print "You are overdrawn"
 Print "Authorities have been notified"
 End If

In this case, if Balance - Check is less than zero, two lines of information are printed.

- Or, **If/Then/Else/End If** blocks:
 If Balance - Check < 0 Then
 Print "You are overdrawn"
 Print "Authorities have been notified"
 Else
 Balance = Balance - Check
 End If

Here, the same two lines are printed if you are overdrawn (Balance - Check < 0), but, if you are not overdrawn (Else), your new Balance is computed.

- Or, we can add the **ElseIf** statement:
 If Balance - Check < 0 Then
 Print "You are overdrawn"
 Print "Authorities have been notified"
 ElseIf Balance - Check = 0 Then
 Print "Whew! You barely made it"
 Balance = 0
 Else
 Balance = Balance - Check
 End If

Now, one more condition is added. If your Balance equals the Check amount (ElseIf Balance - Check = 0), a different message appears.

- In using branching statements, make sure you consider all viable possibilities in the **If/Else/EndIf** structure. Also, be aware that each If and ElseIf in a block is tested sequentially. The first time an If test is met, the code associated with that condition is executed and the If block is exited. If a later condition is also True, it will never be considered.

Select Case - Another Way to Branch:

- In addition to If/Then/Else type statements, the **Select Case** format can be used when there are multiple selection possibilities.
- Say we've written this code using the If statement:
 If Age = 5 Then
 Category = "Five Year Old"
 ElseIf Age >= 13 and Age <= 19 Then
 Category = "Teenager"
 ElseIf (Age >= 20 and Age <= 35) Or Age = 50 Or (Age >= 60 and Age <= 65) Then
 Category = "Special Adult"
 ElseIf Age > 65 Then
 Category = "Senior Citizen"
 Else

```
        Category = "Everyone Else"  
    End If
```

The corresponding code with Select Case would be:

```
    Select Case Age  
        Case 5  
            Category = "Five Year Old"  
        Case 13 To 19  
            Category = "Teenager"  
        Case 20 To 35, 50, 60 To 65  
            Category = "Special Adult"  
        Case Is > 65  
            Category = "Senior Citizen"  
        Case Else  
            Category = "Everyone Else"  
    End Select
```

Notice there are several formats for the Case statement. Consult on-line help for discussions of these formats.

Visual Basic Looping:

- Looping is done with the **Do/Loop** format. Loops are used for operations are to be repeated some number of times. The loop repeats until some specified condition at the beginning or end of the loop is met.

- **Do While/Loop Example:**

```
Counter = 1  
Do While Counter <= 1000  
    Debug.Print Counter  
    Counter = Counter + 1  
Loop
```

This loop repeats as long as (**While**) the variable Counter is less than or equal to 1000. Note a Do While/Loop structure will not execute even once if the While condition is violated (False) the first time through. Also note the Debug.Print statement. What this does is print the value Counter in the Visual Basic Debug window. We'll learn more about this window later in the course.

- **Do Until/Loop Example:**

```
Counter = 1  
Do Until Counter > 1000  
    Debug.Print Counter  
    Counter = Counter + 1  
Loop
```

This loop repeats Until the Counter variable exceeds 1000. Note a Do Until/Loop structure will not be entered if the Until condition is already True on the first encounter.

- **Do/Loop While Example:**

```
Sum = 1
```

```
Do
```

```
    Debug.Print Sum
```

```
    Sum = Sum + 3
```

```
Loop While Sum <= 50
```

This loop repeats While the Variable Sum is less than or equal to 50. Note, since the While check is at the end of the loop, a Do/Loop While structure is always executed at least once.

- **Do/Loop Until Example:**

```
Sum = 1
```

```
Do
```

```
    Debug.Print Sum
```

```
    Sum = Sum + 3
```

```
Loop Until Sum > 50
```

This loop repeats Until Sum is greater than 50. And, like the previous example , a Do/Loop Until structure always executes at least once.

- Make sure you can always get out of a loop! Infinite loops are never nice. If you get into one, try Ctrl+Break. That sometimes works - other times the only way out is rebooting your machine!
- The statement Exit Do will get you out of a loop and transfer program control to the statement following the Loop statement.

Visual Basic Counting:

- Counting is accomplished using the **For/Next** loop.

Example

```
For I = 1 to 50 Step 2
```

```
    A = I * 2
```

```
    Debug.Print A
```

```
Next I
```

In this example, the variable I initializes at 1 and, with each iteration of the For/Next loop, is incremented by 2 (Step). This looping continues until I becomes greater than or equal to its final value (50). If Step is not included, the default value is 1. Negative values of Step are allowed.

- You may exit a For/Next loop using an Exit For statement. This will transfer program control to the statement following the Next statement.

VISUAL BASIC FUNCTIONS:

- Visual Basic offers a rich assortment of built-in functions. The on-line help utility will give you information on any or all of these functions and their use. Some examples are:

Function	Value Returned
Abs	Absolute value of a number
Asc	ASCII or ANSI code of a character
Chr	Character corresponding to a given ASCII or ANSI code
Cos	Cosine of an angle
Date	Current date as a text string
Format	Date or number converted to a text string
Left	Selected left side of a text string
Len	Number of characters in a text string
Mid	Selected portion of a text string
Now	Current time and date
Right	Selected right end of a text string
Rnd	Random number
Sin	Sine of an angle
Sqr	Square root of a number
Str	Number converted to a text string
Time	Current time as a text string
Timer	Number of seconds elapsed since midnight
Val	Numeric value of a given text string

Some of the built-in functions are implemented below:

String Function:

String function are used for manipulation of string

Space ():

The function returns the number of spaces you want to have in the string

Example:

Dim S1

S1= Space (20)

This will return a string with 20 spaces

Dim S2

S2 = "Hello"& space (15) & "sameer"

Output:- S2 ->Hello (15 spaces) sameer

Str Function:

The Str() Function converts numbers into strings

Syntax: Str (Number)

Example:

Str (123) → Returns "123"

Right Function:

The Right() function selects the right most position of a string

Syntax: Right (String, Length)

Example:

Dim S1, S2

S1 = "Applications"

S2 = Right (S1, 6) →Returns "ations"

S2 = Right (S1, 8) →Returns "ications"

S2 = Right (S1,20)→ Returns "Application"

Left Function ():

The Left() Function selects the leftmost portion of a string

Syntax: Left (String, Length)

Example:

Left ("Computer",3) → Returns :- Com

Instr function:

The **Instr** function is used for searching strings within one string (i.e. search string) to determine whether it contains another strings (i.e search string).If the second string is found the starting character location of that string is returned. If the second string contains no character, the starting position is returned.

Syntax: Instr([start],string1,string2,[compare])

Example:

```
Dim string1,s1,op;  
S1= "a"  
String = "Computer And Internet"  
P= Instr (1,String1,s1,1)  
Print p
```

Output :- >> 10

Mid() Function:

The Mid Function returns a string containing a specified number of characters from a string

Syntax: Mid (String, star,[Length])

Example:

```
Mid ("Computer Application ",1,4)  
Returns >>"Comp"  
Mid("Computer Application",10,4)  
Returns >> "Appl"
```

Len () Function:

The **Len** Function is Used To Determine the Length of a string

Syntax: Len (String)

Example:

```
Len ("Hello") → Returns :- 5  
Len ("Computer Application") → Returns :- 21
```

Trim(), Ltrim(), Rtrim() Function:

These Functions remove spaces from string

Syntax:

Ltrim (String)
Ltrim (String)
Trim (String)

Example:

```
Dim a,b  
A= “__ Computer”  
B= Trim (a)  
Print b
```

Output: >> Computer

Ucase and Lcase Function:

The Ucase converts a particular string to uppercase and Lcase converts the string to lower case format

Syntax: Ucase (String)

Example:

```
Ucase (“CoMpUtEr AppLiCatIoN”)  
Output>> COMPUTER APPLICATION  
And  
Lcase (“CoMpUtEr AppLiCatIoN”)  
Output>> computer application
```

The Asc () Function:

The Function Give us the ascii value of a particular character

Syntax: Asc (String)

Example:

```
asc (“C”)           >> Returns = 67  
asc (“City”)        >> Returns = 67
```

Here we get the same output as this asc function considers the only ist letter of a string

The strReverse Function:

This function returns a string in which the character order of a given string is deserved

Syntax: strReverse (String)

Example:

StrReverse (“Hello”)

Output = olleh

StrReverse (“Hello Kashmir”)

Output = olleH rimhsak

Numeric Function:

The Numeric functions are also called mathematical functions which help us in various mathematical calculations.

Sgn () Function:

This Function Returns the sign of an integer or number

Syntax: sgn (Number)

If Number > 0 Returns > 1

Number < 0 Returns < -1

Number = 0 Returns = 0

Example:

Sign (-12) Returns -1

Sign (0) Returns 0

Sign (14) Returns 1

Int () Function :

This Function is used to find the integer value of a given number. If the number is negative, it returns the first Negative number Equal to or less than the number.

Syntax:

int (number)

Example:

Int (9.8) Returns = 9

Int (-9.8) Returns = -10

Int (9.1) Returns = 9

Val () Function:

The Val function returns the numbers contained in a string as a numeric value of appropriate type

Syntax: val (String)

The val function stops reading the string at the first character it can't recognize as a part of a number.

Example:

Val ("1125 Computers")	Returns = 1125
Val ("Computers 1125")	Returns = 0
Val ("34 and 25")	Returns = 34

Date Time Related Functions:**Date () Function:**

The date () Function returns the date in mm/dd/yyyy format

Syntax: Date ()**Example:**

```
Dim a
a= date ( )
print a
```

Output: 02/08/2015

Day () Function:

The day() Function returns the day by passing the date as argument

Syntax: Day (Date)**Example:**

```
Dim a,b
a= "02/11/2014"
b= day(a)
print b
```

Output: 02

Time() Function:

The time function returns a current system time.

Syntax: Time ()**Example:**

```
Dim a
```

```
a= Time ( )
```

```
print a
```

Output: 02:11:14 AM

Now() Function:

The Now() function returns the current system date and time

Syntax: Now ()

Example:

```
Dim a
```

```
a= Now ( )
```

```
print a
```

Output: 02/11/2014 02:11:14

Month () Function:

The Month () Function returns the month by passing date as argument

Syntax: Month (Date)

Example:

```
Dim a,b
```

```
a= 02/11/2014
```

```
b= Month(a)
```

```
print b
```

Output: 11

Minute() Function:

The Minute function returns the minute by passing the time as argument

Syntax: Minute (Time)

Example:

```
Dim a
```

```
a= Minute (Time )
```

```
print a
```

Output: 33 (i.e. Current Minute of The Current System time)

MESSAGE BOX() AND INPUT BOX() FUNCTIONS:

Message Box()

As a name implies, it is a mechanism to show a small dialog, which pops up over the existing application for displaying custom message

Example:

```
Dim a as integer
a=20
If a > 10 then
    MsgBox("Number is greater than 10")
Else
    MsgBox("Number Is less than 10")
end if
```

Output:



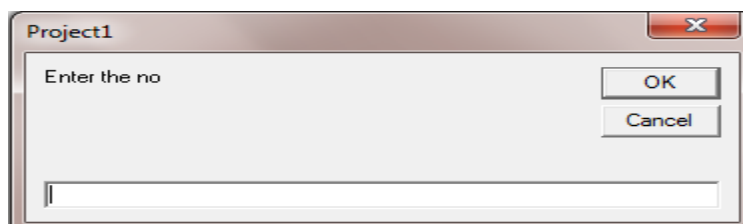
Input () Box Function:

The input box is used for displaying a message but besides that one extra functionality it performs collecting user inputs. The input box gathers user data in string form

Example:

```
Dim a
a=val (input box ("Enter the no"))
if a >=0 then
    print "Positive Number"
else
    print "Negative Number"
end if
```

Output:



FORMS:

Forms are the basic building blocks of a visual basic application. They are the actual windows where the user interact while running an application. Forms have their own Properties, Events and methods for controlling their appearances.

Visual basic supports two types of forms:

1. SDI (Single Document Interface)
2. MDI (Multiple Document interface)

1. SDI (Single Document Interface):

When an SDI application such as notepad or WordPad executes, It can display only one document at a time. If we have to open an another WordPad we have to open new instance of WordPad

2. MDI (Multiple Document interface):

MDI application has one parent form and all other forms are child forms, these child forms are contained within the parent form. With MDI Application, All the child forms can be easily organized, For example, The entire group of forms can be minimized just by minimizing the parent form.

In MDI application the parent form is known as MDI form. This MDI form is the container for all the child forms of the application.

Creating an MDI Parent Form:

To make an application an MDI application the MDI form needs to be added to the project for that, we start the **new project > Select Project > Add MDI form** or choose MDI form from the add button.

After creating an MDI form, two key properties are set these are auto show children property and scroll bar property and set these properties to true.

Setting up MDI Child Form

A standard form is set to made MDI child form. TO make a standard form an MDI child form, set the forms of MDI child property to true. When the MDI child property is said true, the form can be displayed within the MDI parent form area.

Characteristics of MDI child Form:

- ✓ When an MDI child is maximized, The entire area of the parent form is filled with the child form

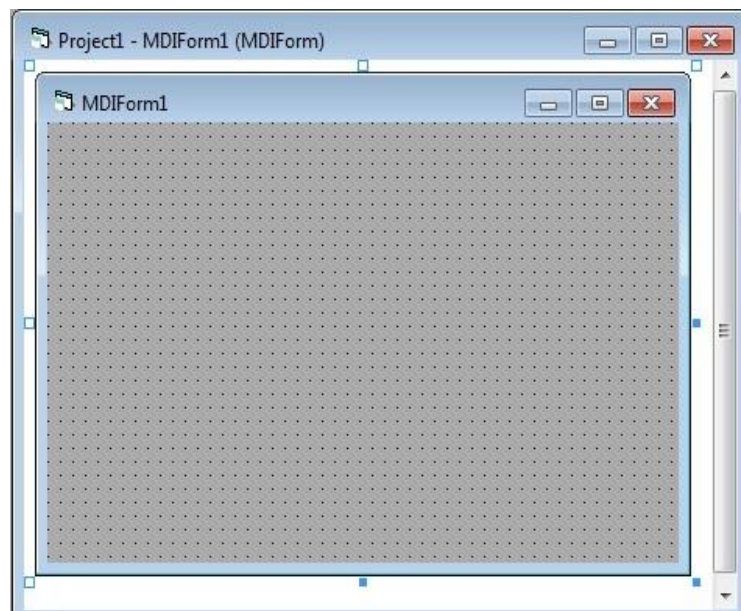
- ✓ The caption of the child form is also merged with the caption of the parent form.
- ✓ When an MDI child form is minimized, the icon of the minimized child form is displayed in the area of the parent form.
- ✓ One MDI form cannot block other MDI child winds

Once an MDI application is created. With one MDI parent and no of MDI child forms. The MDI form is usually made the startup form.

To make the MDI parent form to be the startup form, Go to the project menu and select project properties and choose the name of MDI form as the startup project.

Now when we open the application, the MDI form will appear first.

MDI Form is dark grey in color as shown below.



Unit 3

Fundamentals of DBMS

Objectives:

In this Chapter you will learn about:

- Basics
- Data Types
- Data Integrity
- Constraints
- Keys in Database
- SQL



Introduction:

Database is a collection of related information that is organized in such a way that supports for easy access, modify and maintain data. The contents of a database are obtained by combining data from all the different sources in an organization. Generally, the database is managed by some special software packages known as Database Management Systems (DBMSs). DBMSs are specially designed applications to create connection between user and program, and to store data in an organized manner. The purpose of DBMSs software is to allow the user to create, modify and administration of database. Examples of database management systems are:

Ms-Access, MySQL, PostgreSQL, SQLite, Microsoft SQL Server, Oracle, SAP, dBASE, FoxPro, etc.

Relational data model:

The relational data model is a database model based on first-order predicate logic (First Order Predicate Logic is one where the quantification is over simple variables), formulated and proposed by Edgar F. Codd. in 1969. The first-order predicate logic is a symbolized reasoning, in which statement is broken down into a subject and a predicate. The predicate modifies the properties of the subject, while in the first order logic, a predicate can only refer to a single subject. In the relational data model, database is represented as collection of related tables. Each table is termed as relation and has its unique name in the relational data model. Tables are formed by using rows and columns. A row (horizontal subset) of a table represents a tuple or record, while column (vertical subset) of a table represents an attribute.

Relation:

In database, a relation means a 'table', in which data are organized in the form of rows and columns. Therefore in database, relations are equivalent to tables.

For example

Relation: Student

Ad No	Name	Class	Section	Average
101	Anu	12	A	85
105	Balu	12	D	65
203	Leena	11	B	95
205	Madhu	10	B	75
305	Surpreeth	9	C	70
483	Usha	6	A	60

Domain:

A domain is the original sets of atomic values used to model data. In data base management and database, a domain refers to all the possible unique values of a particular column.

For example:

1. The domain of gender column has a set of two possible values i.e, Male or Female.
2. The domain of marital status has a set of four possible values i.e, Married, Unmarried, Widows and Divorced.

Therefore, a domain is a set of acceptable values of a particular column, which is based on various properties and data types. We will discuss data types later in this chapter.

Basic Database concepts

Data :- Raw facts and figures which are useful to an organization. We cannot take decisions on the basis of data.

Information:- Well processed data is called information. We can take decisions on the basis of information

Field: Set of characters that represents specific data element.

Record: Collection of fields is called a record. A record can have fields of different data types.

File: Collection of similar types of records is called a file.

Table: Collection of rows and columns that contains useful data/information is called a table. A table generally refers to the passive entity which is kept in secondary storage device.

Relation: Relation (collection of rows and columns) generally refers to an active entity on which we can perform various operations.

Database: Collection of logically related data along with its description is termed as database.

Tuple: A row in a relation is called a tuple.

Attribute: A column in a relation is called an attribute. It is also termed as field or data item.

Degree: Number of attributes in a relation is called degree of a relation.

Cardinality: Number of tuples in a relation is called cardinality of a relation.

Example:

Relation: Student

AdNo	Name	Class	Section	Average
101	Anu	12	A	85
105	Balu	12	D	65
203	Leena	11	B	95
205	Madhu	10	B	75
305	Surpreeth	9	C	70
483	Usha	6	A	60

Fields (Attributes/Columns):- AdNo, Name, Class, Section and Average.

Tuples (Rows/Records):

101	Anu	12	A	85
-----	-----	----	---	----

Domain: Possible values of section are ('A','B','C','D')

Degree: 5 (Number of columns).

Cardinality: 6 (Number of rows).

KEYS:

Keys are an important part of a relational database and a vital part of the structure of a table. They help enforce integrity and help identify the relationship between tables. There are three main types of keys - candidate keys, primary keys, foreign keys and alternate keys.

Primary Key: Primary key is a key that can uniquely identifies the records/tuples in a relation. This key can never be duplicated and NULL.

Foreign Key: Foreign Key is a key that is defined as a primary key in some other relation. This key is used to enforce referential integrity in RDBMS.

Candidate Key: Set of all attributes which can serve as a primary key in a relation.

Alternate Key: All the candidate keys other than the primary keys of a relation are alternate keys for a relation.

DBA: Data Base Administrator is a person (manager) that is responsible for defining the data base schema, setting security features in database, ensuring proper functioning of the data bases etc.

Data Types:

Data type is an attribute that specifies type of data of any object. Each column, variable and expression has related data type in SQL. We would use these data types while creating our tables. We would choose a particular data type for a table column based on our requirement.

S.No	Data Type	Description
1	STRING	Character string, has a fixed size up to 64 Kbytes.
2	DATE	This field is used to store the date. It takes 3 bytes and actually contains the number of days from January 1, Year 0000.
3	TIME	This field contains time. It takes 3 or 4 bytes and contains number of seconds from the start of the day (midnight) or number seconds from 1 Jan 1970.
4,5	INTEGER, UNSIGNED	These types of fields are designed to store integer. Size may vary from 1 to 8 bytes. 8 bytes holds a very large number.

6,7	FLOAT, DOUBLE	Four and eight bit numbers with floating point. Size is fixed, but you can pick how precise you want them to be.
8,9	TEXT, BINARY	These are regular fields with a varying size. You can store unlimited size (limited by disk space) text or binary information .
10	IMAGE	This is a BINARY field clone. Contains GIF or JPEG image.
11	FILE	This field is similar to TEXT, but contains the name of the file in a file system. Essentially this is a pointer to a file.

Data integrity:

Data integrity refers to maintaining and assuring the accuracy and consistency of data over its entire life-cycle. Data integrity is the opposite of data corruption, which is a form of data loss.

Types of integrity:

Entity integrity:

It concerns the concept of a primary key. Entity integrity is an integrity rule which states that every table must have a primary key and that the column or columns chosen to be the primary key should be unique and not null.

Referential integrity:

It concerns the concept of a foreign key. A foreign key is generally a primary key from one table that appears as a field in another where the first table has a relationship to the second. In other words, if we had a table A with a primary key X that is linked to a table B where X was a field in B, then X would be a foreign key in B.

Domain integrity:

It specifies that all columns in a relational database must be declared upon a defined domain. A domain is a set of values of the same type. Domains are therefore pools of values from which actual values appearing in the columns of a table are drawn.

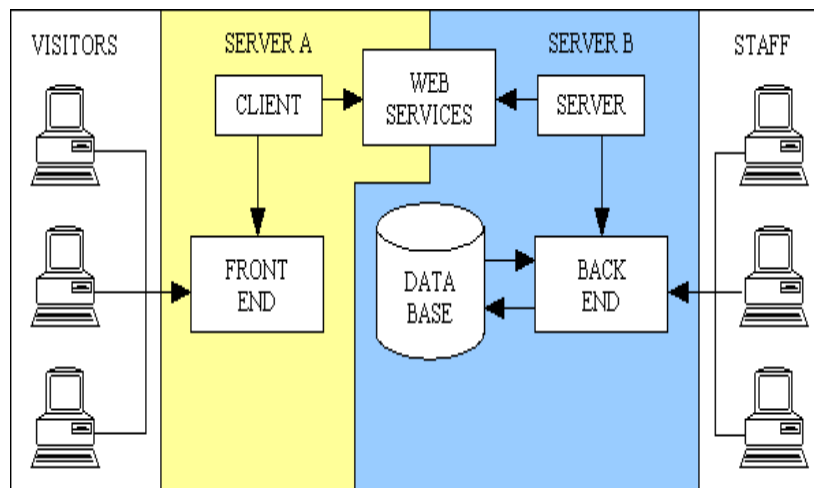
User-defined integrity:

It refers to a set of rules specified by a user, which do not belong to the entity, domain and referential integrity categories.

FRONT END AND BACK END

Front End: User interface by using which the user enters data.

Back end: The layer where actually your tables are created and the data inserted is stored.



The front-end is also referred to as the client-side and is sometimes considered “web design”. The back-end of the web industry is often called the server-side, as shown below.

The front-end is everything involved with what the user sees, including design and some languages like HTML and CSS. The back-end, or the “server-side”, is basically how the site works, updates and changes. This refers to everything the user can’t see in the browser, like databases and servers. Usually people who work on the back-end are called programmers or developers. Back-end developers are mostly worried about things like security, structure and content management.

Constraints:

Constraints keep user data constrained, thereby helping to prevent invalid data from being entered into the database.

NOT NULL:

The constraint NOT NULL prevents NULL values from appearing in a column.

Example:

```
CREATE TABLE student (col1 INTEGER NOT NULL );
```

Here in the table student the null values will not be accepted by the table.

UNIQUE:

The UNIQUE constraint prevents duplicate values from appearing in the column. It is implemented by creating a unique index on a column, as shown below.

```
CREATE TABLE student (col1 INTEGER UNIQUE);
```

Multiple NULL values can be inserted into a UNIQUE column. UNIQUE constraint may consists of more than one column as shown below.

```
CREATE TABLE student2 (col1 INTEGER, col2 INTEGER, UNIQUE (col1, col2) );
```

While col1 or col2 themselves may not be unique, the constraint requires the combination of col1 and col2 to be unique.

Null:

Null is a special marker used in Structured Query Language (SQL) to indicate that a data value does not exist in the database. A good way to remember what null means is to remember that in terms of information, "lack of a value" is not the same thing as "a value of zero". For example, consider the question "How many books does Sajad own?" The answer may be "zero" (we know that he owns none) or "null" (we do not know how many he owns, or doesn't own). In a database table, the column reporting this answer would start out with a value of null, and it would not be updated with "zero" until we have ascertained that Sajad owns no books.

Example:

```
INSERT INTO Student VALUES (135, 'Maggie', NULL, NULL);  
or  
INSERT INTO Student (SID, name) VALUES(135, 'Maggie');
```

The Database Terms of Reference (keys in Database):

Keys are, as their name suggests, a key part of a relational database and a vital part of the structure of a table. They ensure each record within a table can be uniquely identified by one or a combination of fields within the table. They help enforce integrity and help identify the relationship between tables. There are three main types of keys, **candidate keys**, **primary keys** and **foreign keys**. There is also an **alternative key** or **secondary key** that can be used, as the name suggests, as a secondary or alternative key to the primary key.

Super Key:

A Super key is any combination of fields within a table that uniquely identifies each record within that table.

Candidate Key:

A candidate is a subset of a super key. A candidate key is a single field or the least combination of fields that uniquely identifies each record in the table. The least combination of fields distinguishes a candidate key from a super key. Every table must have at least one candidate key but at the same time can have several.

As an example we might have a student_id that uniquely identifies the students in a student table. This would be a candidate key. But in the same table we might have the student's first name and last name that also, when combined, uniquely identify the student in a student table. These would both be candidate keys.

Candidate Keys



StudentId	firstName	lastName	courseId
L0002345	Jim	Black	C002
L0001254	James	Harradine	A004
L0002349	Amanda	Holland	C002
L0001198	Simon	McCloud	S042
L0023487	Peter	Murray	P301
L0018453	Anne	Norris	S042

In order to be eligible for a candidate key it must pass certain criteria.

- ✓ *It must contain unique values*
- ✓ *It must not contain null values*
- ✓ *It contains the minimum number of fields to ensure uniqueness*
- ✓ *It must uniquely identify each record in the table*

Once your candidate keys have been identified you can now select one to be your primary key.

Primary Key:

A primary key is a candidate key that is most appropriate to be the main reference key for the table. As with any candidate key the primary key must contain unique values, must never be null and uniquely identify each record in the table.

As an example, a student id might be a primary key in a student table, a department code in a table of all departments in an organization. In the table below we have selected the candidate key student_id to be our most appropriate primary key

Primary keys are mandatory for every table each record must have a value for its primary key. When choosing a primary key from the pool of candidate keys always choose a single simple key over a composite key.

Primary Keys

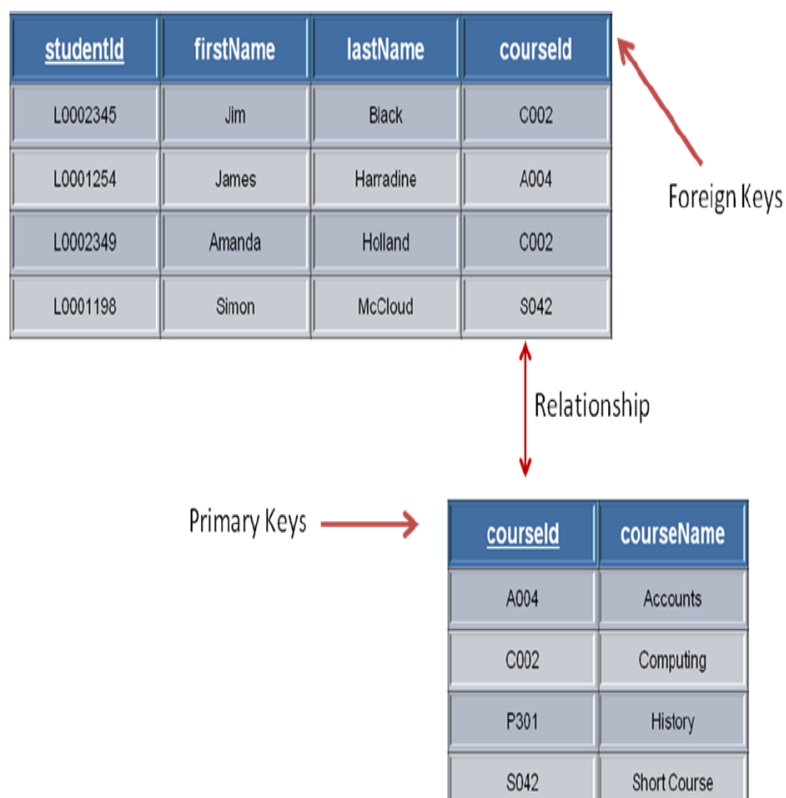


<u>StudentId</u>	firstName	lastName	courseId
L0002345	Jim	Black	C002
L0001254	James	Harradine	A004
L0002349	Amanda	Holland	C002
L0001198	Simon	McCloud	S042
L0023487	Peter	Murray	P301
L0018453	Anne	Norris	S042

Foreign Key:

A foreign key is generally a primary key from one table that appears as a field in another where the first table has a relationship to the second. In other words, if we had a table A with a primary key X that is linked to a table B where X was a field in B, then X would be a foreign key in B.

An example might be a student table that contains the course_id the student is attending. Another table lists the courses on offer with course_id being the primary key. The 2 tables are linked through course_id and as such course_id would be a foreign key in the student table.



Secondary Key or Alternative Key:

A table may have one or more choices for the primary key. Collectively these are known as candidate keys as discussed earlier. One is selected as the primary key. Those not selected are known as secondary keys or alternative keys.

For example in the table showing candidate keys above we identified two candidate keys, **student Id and first Name + last Name**. The student Id would be the most appropriate for a primary key leaving the other candidate key as secondary or alternative key.

Structured Query Language (SQL):

SQL is a standard query language which is used to perform tasks such as update data on a database, or retrieve data from a database.

Characteristics of SQL

1. It is very easy to learn and use.
2. Large volume of databases can be handled quite easily.
3. It is nonprocedural language. It means that we do not need to specify the procedures to accomplish a task but just to give a command to perform the activity.
4. SQL can be linked to most of other high level languages that makes it first choice for the database programmers.

Operators in SQL:

The following are the commonly used operators in SQL

- | | |
|-------------------------|---------------------|
| 1. Arithmetic Operators | +, -, *, / |
| 2. Relational Operators | =, <, >, <=, >=, <> |
| 3. Logical Operators | OR, AND, NOT |

Data types of SQL

Just like any other programming language, the facility of defining data of various types is available in SQL also. Following are the most common data types of SQL.

1. NUMBER e.g. Number(n,d) Number (5,2)
2. CHAR CAHR(SIZE)
3. VARCHAR / VARCHAR2 VARCHAR2(SIZE)
4. DATE DD-MON-YYYY
5. LONG
6. RAW/LONG RAW

Processing Capabilities of SQL

The following are the processing capabilities of SQL

1. Data Definition Language (DDL)

DDL contains commands that are used to create the tables, databases, indexes, views, sequences and synonyms etc.

e.g: Create table, create view, create index, alter table etc.

Example:

CREATE

Creates new databases, tables and views from RDBMS

Syntax:

```
Create database tutorialspoint;  
Create table article;  
Create view for_students;
```

ALTER

Modifies database schema.

Syntax:

```
Alter table article add subject varchar;
```

This command adds new column in the Table article with the name subject of varchar type.

DROP

Drops commands, views, tables, and databases from RDBMS.

Syntax:

```
Drop object_type object_name;  
Drop database shahi;  
Drop table article;  
Drop view student;
```

2. Data Manipulation Language (DML)

DML contains command that can be used to manipulate the data base objects and to query the databases for information retrieval.

e.g Select, Insert, Delete, Update etc.

SELECT/FROM/WHERE:

For example

```
Select authorname  
From book_author  
Where age > 50;
```

This command will yield the names of authors from the relation book_author whose age is greater than 50.

INSERT INTO/VALUES:

This command is used for inserting values into the rows of a table relation.

Syntax:

```
INSERT INTO table (column n1 [, column n2, column n3 ... ]) VALUES  
(value1 [, value2, value3... ])
```

Or

```
INSERT INTO table VALUES (value1, [value2, ... ])
```

For example:

```
INSERT INTO book (Author, Subject) VALUES ("Sajad", "information practice");
```

This command will add new row in a table book with Sajad and information practice as data items.

UPDATE/SET/WHERE:

This command is used for updating or modifying the values of columns in a table relation.

Syntax:

```
UPDATE table_name SET column_name = value [column_name = value ...]  
[WHERE condition]
```

For example:

```
UPDATE book SET Author="Sajad" WHERE Author="anonymous";
```

This command will replace author anonymous with Sajad in table book

DELETE/FROM/WHERE:

This command is used for removing one or more rows from a table relation.

Syntax:

```
DELETE FROM table_name [WHERE condition];
```

For example:

```
DELETE FROM book WHERE Author="unknown"
```

This command will delete all those rows where author field contains unknown as data item.

3. View Definition:

DDL contains set of command to create a view of a relation.

e.g : create view

4. Data Control Language:

This language is used for controlling the access to the data. Various commands like GRANT, REVOKE etc are available in DCL.

5. Transaction Control Language (TCL)

TCL include commands to control the transactions in a data base system. The commonly used commands in TCL are COMMIT, ROLLBACK etc.

COMMIT command:

Commit command is used to permanently save any transaction into database.

Syntax:

commit;

Rollback command:

This command restores the database to last committed state. It is also use with savepoint command to jump to a savepoint in a transaction.

Syntax:

rollback to savepoint-name;

Savepoint command:

Savepoint command is used to temporarily save a transaction so that you can rollback to that point whenever necessary.

Syntax:

savepoint savepoint-name;

SQL Functions:

SQL provides large number of functions which can be categorized into two types of functions.

- Single Row Function
- Multiple Row Function (Group Functions)

Single Row Function:

It operates on the single row and return one result per row.

○ **Character & String Function**

The Various Characters Functions which work on characters are:

LOWER:

It takes any string or Column and converts it to lower case

→ LOWER(String/Column name)

UPPER:

It Works Opposite to Lower function

→ UPPER (String/Column name)

INIT CAP:

It Converts the First letter of each word to upper case and remaining letter to lower case.

→ INIT CAP (String/Column name)

CON CAT:

It concatenates the two given strings

Example:

```
SQL> set serveroutput on;
declare
    a varchar(12):= 'Junaid Nazir';
    b varchar(12):= 'JayEnn';
    c varchar(12):= Upper(a);
    d varchar(40):= INTICAP(a);
    e varchar(40):= Concat(a,b);
begin
    dbms-output.put-line(c);
    dbms-output.put-line(d);
    dbms-output.put-line(e);
end;
```

Output→

```
JUNaid NAZIR
Junaid Nazir
Junaid Nazir JayEnn
```

Output:

```
JUNaid NAZIR
Junaid Nazir
Junaid Nazir JayEnn
```

Length:

It Returns the length of a string

LENGTH (String);

Example:

Length('text');

Output: 4

TRIM

This Function returns the trim heading and trailing characters or both from a character string. There are two types of TRIM

RTRIM:

Example:

RTRIM('ABCXY','XY');

Output: ABC

LTRIM:

Example:

LTRIM('xyzABC','xy');

Output: zABC

Instr:

Returns the position of the first occurrence of substring substr in string str.

Syntax:

INSTR(str,substr)

Example:

INSTR('foobarbar', 'bar');

Output: 4

LPad

Syntax:

LPAD(str, len, padstr)

Returns the string str, left-padded with the string padstr to a length of len characters. If str is longer than len, the return value is shortened to len characters.

Example:

LPAD('hi',4,'??');

Output: '??hi'

LPAD('hi',6,'??');

Output: '????hi'

LPAD('hi',1,'??');

Output: 'h'

Substr:

SUBSTR () is a synonym for SUBSTRING ().

Syntax:

SUBSTRING (str,pos)

Returns a substring from string str starting at position pos.

Example:

SUBSTRING('Quadratically',5);

Output: 'ratically'

○ **Number Function:**

ABS (Absolute Function)

The ABS (value) Returns an Absolute and Positive Integer.

ABS (123) → Returns 123

ABS (-456) → Returns 456

ABS (234.567) → Returns 234.567

CEIL Function:

This Function Returns the smallest integer (or Whole Number) That is greater than or equal to a specific value.

Syntax:

CEIL(value, Precession)

Example:

Select CEIL (123),CEIL(-456);

CEIL (234.567) From Dual;

When we execute the above statement

CEIL(164.2) -> 164

CEIL(-456) -> -456

CEIL(234.567) -> 234

MOD:

This Function divides one numeric expression by another numeric expression and returns the remainder

Syntax:

MOD(Value, divisor)

Example:

MOD (50,10) → 0

MOD(-50,10) → 0

Power:

This Function has the ability to raise a value to a given positive exponent

Syntax:

Power (value, exponent)

Example:

Power (10,3) → returns → 1000

Power (5,5) → returns → 625

Round:

This function rounds off a number to a given number of digits of precision if the value is -ve, Round() Returns a whole number containing precession point

Example:

Round (value, precision)

Round (12345.678) → 12345.7

Round (-3456.65, -2) → -3500

SQRT:

Finds the square root of a number

Syntax:

SQRT (Value)

Example:

SQRT (100) → 10

SQRT (121) → 11

○ **Date Functions:**

These Functions allow us to generate and manipulate date data. We can use data functions to determine the number of months between two dates etc.

MONTH_BETWEEN:

This Function returns the number of months between two dates date1 and date2. This can be +ve or negative if the date1 is larger then date2. The result is +ve Otherwise result is negative

Syntax:

MONTH_BETWEEN(date1,date2)

ADD_MONTHS:

It returns the date by adding n number of calendar months to a given date.

Syntax:

ADD_MONTHS(date1,n)

NEXT_DAY:

This function finds the date of the next specified day of the week('char') i.e- Sunday,Monday.....Saturday after the given date.

Syntax:

NEXT_DAY(date1,'char')

This function finds the date of the next special day of the week.

NEXT_DAY('26April-2012', 'Monday')

LAST_DAY:

This Function returns the date of the last date of the month. i.e. It contains the date of the last day of the month

Syntax:

LAST_DAY(MONTH)

○ **Conversion Function:**

These Functions are used to convert data from one type to another

The data type conversion can be implicit or explicit

Implicit datatype Conversion:

When the oracle server automatically converts the data to the expected data type, it is called Implicit Datatype Conversion

Oracle Server can automatically convert the following:

VARCHAR or CHAR → NUMBER

VARCHAR or CHAR → DATE

NUMBER → VARCHAR

DATE → VARCHAR

Explicit data type conversion:

Is done by using the conversion functions. Conversion functions convert one data type to another

The various Functions are:-

TO_CHAR function is used to typecast a numeric or date input to character type with a format model (optional).

Syntax

`TO_CHAR(number1, [format], [nls_parameter])`

For number to character conversion, nls _parameters can be used to specify decimal characters, group separator, local currency model, or international currency model.

For Example X will return the hexadecimal value of the specified number of digits.

TO_NUMBER()

The **TO_NUMBER** function converts a character value to a numeric datatype. If the string being converted contains nonnumeric characters, the function returns an error.

Syntax:

`TO_NUMBER (string1, [format], [nls_parameter])`

For Example YYYY will represent Year with 4 numbers

TO_DATE()

The function takes character values as input and returns formatted date equivalent of the same. The **TO_DATE** function allows users to enter a date in any format, and then it converts the entry into the default format used by Oracle 11g.

Syntax:

`TO_DATE( string1, [ format_mask ], [ nls_language ] )`

A `format_mask` argument consists of a series of elements representing exactly what the data should look like and must be entered in single quotation marks.

For Example `YYY,YY,Y` represents Last 3, 2, or 1 digit(s) of year.

Multiple Row Functions or Group Functions or Set Functions:

Many times the information we require from table doesn't relate to individual rows but to set of rows. In such case we can use Set functions provided by the SQL Server.

COUNT

The COUNT function returns the rows count in the table. When used with WHERE clause, only number of rows which satisfy the condition will be returned. Returns the number of non-null column values or whole Rows.

```
SELECT COUNT(*) "Number of Countries"  
FROM wf_countries
```

Number of Countries
244

1 rows returned in 0.01 seconds

MAX

The MAX function returns the maximum value in the specified column. The MAX function can also be used as the part of sub-query. It is Used with columns that store any data type to return the maximum value, ignoring null values.

```
SELECT MAX(highest_elevation) "All time high"  
FROM wf_countries;
```

All time high
8850

1 rows returned in 0.01 seconds

MIN

The MIN function returns the minimum value in the specified column. The MIN function can also be used as the part of sub-query. It is Used with columns that store any data type to return the minimum value, ignoring null values.

```
SELECT MIN(lowest_elevation) "All time low"  
FROM wf_countries;
```

All time low
-2555

1 rows returned in 0.01 seconds

SUM

The SUM function adds up the values in a specified column. The column must be of one of numeric data types. The DISTINCT can be used to get the sum of only unique values. It is used with columns that store numeric data to find the total or sum of values, ignoring null values

```
SELECT SUM(area) "Total area" FROM wf_countries;
```

Total area
148,148,433.00

1 rows returned in 0.00 seconds

AVG

The AVG function returns the average of all the values in the specified column. As with SUM function, the column must be of one of numeric data types. The DISTINCT function can be used to get the average of only unique values. It is used with columns that store numeric data to compute the average, ignoring null values

```
SELECT AVG (population) AVERAGE  
FROM wf_countries;
```

AVERAGE
27,130,848.07

1 rows returned in 0.02 seconds

Unit 4

Internet and Web Application Development

Objectives:

In this Chapter you will learn about:

- Internet Basics
- HTML
- Web Browser



Communication:

Communication means to convey. In today's fast changing world, data needs to be transferred efficiently, frequently and speedily. To move data at a fast speed and that too with minimum data loss, networking plays an important role. Computer networks have made a major impact on the society as a whole. As we are moving ahead in the 21st century, the world seems to be converging. The merging of computers and communication technology has changed the very perspective of communication today. It has had a profound influence on the way the computer systems are organized and used today. The old model of a single computer serving all of the organization's computational needs has been replaced by one in which large number of separate but interconnected computers do the same job. These systems together form a computer network.

Internet:

The Internet is a system of linked networks that are worldwide in scope and facilitate data communication services such as remote login, file transfer, electronic mail, the World Wide Web and newsgroups. The internet is made up of many networks each run by a different companies and are interconnected at peering points. It is really a network of networks spread across the globe, all of which are connected to each other. This super network is a glorified WAN in many respects. It connects many smaller networks together and allows all the computers to exchange information with each other through a common set of rules for communication. These rules are called protocols and the internet uses Transmission Control Protocol/Internet Protocol (TCP/IP). Programs such as web browsers, File Transfer Protocol (FTP) clients, and email clients are some of the most common ways through which the users work on the Internet. With the meteoric rise in demand for connectivity, the Internet has become a communications highway for millions of users. The Internet was initially restricted to military and academic institutions, but now it is a full-fledged conduit for any and all forms of information and commerce. Internet websites now provide

personal, educational, political and economic resources to every corner of the planet.

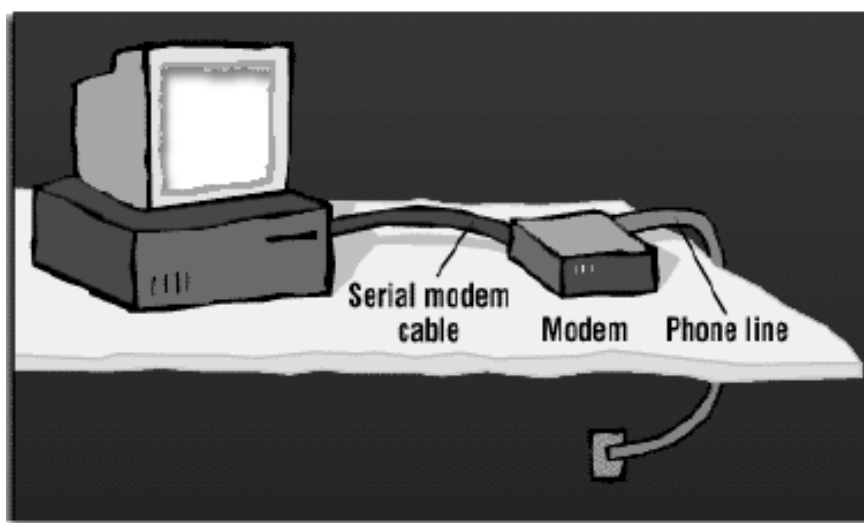
Uses and Facilities of Internet:

- Exchange messages using e-mail (Electronic mail).
- Transfer files as well as software.
- Browse through information on any topic on web.

- Communicate in real time (chat) with others connected to the Internet.
- Search databases of government, individuals and organizations.
- Read news available from leading news groups.
- Send or receive animation and picture files from distant places.
- Set up a site with information about your company's products and services.

Hardware and Software requirement for Internet:

Any terminal to activate internet services on it requires a internet connection from a Internet Service Provider (ISP). There are several Internet Service Providers (ISP) in each locality.



There are many ways to get connected to the Internet.

- **Through dial-up connection:**
User is supposed to get connected to the internet after dialing up the number used for connection.

- **Through leased lines:**
In this a dedicated line is laid specifically for connection.

- **Through broadband :**

In this you can get a broadband connection which provides a high bandwidth for the internet connection.

- These days even wireless connections are available. For this you need to have a Wi Fi card attached to your computer which can be useful if you do not have proper place to lay down the wires.

World Wide Web (WWW):

The World Wide Web (“WWW” or simply the “web”) is a collection of electronic documents (called web pages) that are linked together like a spider web. These documents are stored on computers called servers located around the world.

Web Browser:

A web browser is software that allows us to view Web Pages. The most common web browser is Microsoft Internet Explorer followed by Google chrome, Firefox, opera etc. The Web browser communicates with the web servers via http protocol.



Web Address or URL Address:

Each website in the internet possesses at least one internet protocol (IP) address also known as web address or URL (Uniform Resource Locator).

The IP address is 32 bit (Ipv4) or 128 bit(ipv6) and is given in user-friendly format this we call URL (Uniform Resource Locator)

Example:

www.computeworld.com is a URL of computer world server

and

255.128.196.28 represent its (I.P address)



Protocols:

The protocols represent the set of rules and regulations which help in successful communication between any two computers in a computer network. A protocol is the “Language” of the network.

There are large numbers of protocols working in the network each with definite function.

Example:

- **http** (hyper text transfer protocol) This helps in sending requests from client to server
- **FTP** (file transfer protocol) This helps us in sending files across computer network
- **SMTP** (Simple mail transfer protocol) This provides the email service to the user etc

ISP(Internet Service Provider):

It refers to a company that provides Internet services, including personal and business access to the Internet. Internet service providers may be organized in various forms, such as commercial, community-owned, non-profit, or otherwise privately owned. ISPs provide Internet access, employing a range of technologies to connect users to their network. Available technologies have ranged from computer modems to telephone lines, to television cable (CATV), wireless Ethernet (Wi-Fi), and fiber optics.

Web Page & Types:

A web page is a web document that is suitable for the World Wide Web and the web browser.

Types of Web pages:

There are two types of web pages

- **Static web pages:**
Static means unchanged or constant i.e. the content of static web page does not change. Static pages are easy to maintain and does not need higher technology.
- **Dynamic web pages:**
Dynamic web pages change their content after every second, minute or hour. Making the web page live. It offers the highly customized visitor options and is usually written in ASP,PHP,JSP etc

Search Engines:

A web search engine is a software system that is designed to search for information on the World Wide Web. A search engine maintains the following processes in searching information on WWW.

- ✓ Web crawling
- ✓ Indexing
- ✓ Searching



The various types of search engines are Google, yahoo, bing etc

Web Application:

A Web application (Web app) is an application program that is stored on a remote server and delivered over the Internet through a browser interface. Web applications are popular due to the easy availability of web browsers, and the convenience of using a web browser. Common web applications include webmail, online retail sales, online auctions, wikis, instant messaging services and many other functions.



HTML:

HTML Stands for **Hypertext markup language** Used to design web pages. As its name suggests, HTML is a Markup Language which means you use HTML to simply "mark-up" a text document with tags that tell a Web browser how to structure it to display.

The basic elements necessary to design web pages HTML are as:

- ✓ Window based computer system with any text editor like Notepad, WordPad etc.
- ✓ Browser (internet explorer, opera etc)

There are two types of web pages designed with the help of HTML

Static web pages:

Static means unchanged or constant i.e. the content of static web page does not change. Static pages are easy to maintain and does not need higher technology.

Dynamic web pages:

Dynamic web pages change their content after every second, minute or hour. Making the web page live. It offers the highly customized visitor options and is usually written in ASP,PHP,JSP etc

Page Structure of HTML document:

The HTML document is designed with the help of various HTML tags.

The complete document is written between <HTML> and </HTML>. The <HTML> is the starting and the </HTML> is the Termination or finish/exit/end tag.

```
<HTML>
<HEAD>
<TITLE>.....</TITLE>
</HEAD>
<BODY>
~~~~~
~~~~~
~~~~~
</BODY>
</HTML>
```

Tags can be written in any case (Lower or Upper case) i.e. HTML is not case sensitive.

Designing web pages:

Step1: Open notepad

Step2: Type the HTML tags as shown below.

```
<HTML>
<HEAD>
<TITLE> First Web page </TITLE>
<BODY>
Hello i am learning
</Body>
</HTML>
```

Step3: Click file >> Save >> Give file name with “.HTML” or “.htm” extension (e.g sadaan.html)

Step4: Once the file is saved the file will be executed by the respective Default internet Browser.

HTML Tags:

There are two types of HTML tags: **Container tags and Empty tags**

Container Tags:

Container tags are those tags which are used in pairs E.g.:-

<HTML> </HTML>

<BODY> </BODY>

Empty Tags:

Empty tag is a solo or single tag. It does not have any closing tag e.g:-

 => break tag

<Hr> => Header Tag etc

Heading Tags:

To display the text in some special size, heading tags are used. HTML provides six different heading tags i.e.:- H1 to H6

<H1> Computer </H1>

<H2> </h2>

↓↓ ↓↓

<H6> </H6>

H1 is the highest size and H6 is the lowest size

Body Tags:

All other tags and text we want to show on web page are present within the <BODY> tags

<BODY>

</BODY>

Attributes of <BODY> tag:

Some attributes of <BODY> tags are as below:

⇒ **Background color :**

```
<body bgcolor="pink">
```

This will change the color of webpage to pink.

⇒ **Background:**

```
<bodybackground="maria.jpg">
```

This will put image (*Maria) as background of the webpage

⇒ **Paragraph tag:**

Paragraph tag is a container tag and is denoted by <P>----</p> this tag inserts a line break in the web page with extra spacing paragraph alignment by default is left but we align to the center or right as well.

Example:

```
<p align="center"> computers </p>
```

⇒ **Horizontal rulers:**

Horizontal rulers can be shown in web pages to identify some portion of text in a particular way. It is denoted by <Hr> it is an empty tag.

Example:

```
<HTML><BODY><HR></BODY></HTML>
```

The various attributes of <Hr> tag are: **Size, Width and No Shade**

Text Formation Attributes:

The various text formatting attributes are as:-

⇒ **Font Tag:**

Text can be shown in different styles and attractive looks with the help of tag. It is a container tag with both opening and closing tags

Ie: _ _ _ _ _

Attributes of Font tag:

Size:- It defines the size of the text.

Color:- It Defines the Colour of the text.

Face:- It defines the face value of font.

Example:

```
<HTML>
<HEAD>
</HEAD>
<BODY>
<Font Size = "4" Color = "Red" FACE= "4">
I am learning HTML
</FONT>
</BODY>
</HTML>
```

⇒ **Bold Tag:**

To represent the text in bold format we use bold tag i.e.

Example:

```
<b> computer </b>
```

This will display Computer in bold format in The web Page.

⇒ **Italic tag:**

we use the <i> tag to represent the text in italic format

Example:

```
<i> computer </i>
```

⇒ **Underline Tag:**

<u> tag is used to define the text in underline format.

Example:

```
<u> Computers </u>
```

⇒ **Line break Tag:**

To Create a line break we use
 tag

i.e. (br, space, forward, slash)

Example:

```
<HTML>
<HEAD>
</HEAD>
```

```
<BODY>
HELLO,I am learning HTML.<br/>
Computer is an electronic device <br/>
</BODY>
</HTML>
```

⇒ Paragraph Tag:

To represent start a new paragraph we use <p> tag. It is a container tag i.e.<p>.....</p> both opening and closing tags are to be used.

HTML <marquee> Tag:

The HTML <marquee> tag is used for scrolling piece of text or image displayed either horizontally across or vertically down your web site page depending on the settings.

Example:

```
<html>
<head>
<title>HTML marquee Tag</title>
</head>
<body>
<marquee>I am learning html</marquee>
<marquee direction="up"></marquee>
</body>
</html>
```

The direction of text “I am learning html will be from bottom to top”.

TEXT LINKS:

A webpage can contain various links that take you directly to other pages and even specific parts of a given page. These links are known as hyperlinks.

Hyperlinks allow visitors to navigate between Web sites by clicking on words, phrases, and images. Thus you can create hyperlinks using text or images available on a webpage.

Linking Documents:

A link is specified using HTML tag <a>. This tag is called anchor tag and anything between the opening <a> tag and the closing tag becomes part of the link and

a user can click that part to reach to the linked document. Following is the simple syntax to use <a> tag.

```
<a href="Document URL" ... attributes-list>Link Text </a>
```

Example:

```
<html>
<head>
<title>Hyperlink Example</title>
</head>
<body>
<p>Click following link</p>
<a href="http://www.greaterkashmir.com" >Greater Kashmir </a>
</body>
</html>
```

This will produce the following result, where you can click on the link generated to reach to the home page of Greater Kashmir (in this example).

Download Links:

We can create text link to make your PDF, or DOC or ZIP files downloadable. This is very simple; we just need to give complete URL of the downloadable file as follows:

```
<html>
<head>
<title>Hyperlink Example</title>
</head>
<a href="http://www.jkbose.nic.in/syllabus.pdf">Download PDF File</a>
</body>
</html>
```

This will produce a link (Download PDF File) and will be used to download a file.

Designing Table In The HTML:

Tables play an important role in displaying data. Table arranges the data in well-defined way.

A table is made up of rows and columns. The Horizontal area is row and the vertical area is a column.

TR	<td>	<td>	<td>
TR	<td>	<td>	<td>

Table Tag:

We use table tag to define the structure of a table. We use <tr> and <td> tags to represent the table row and table data respectively as shown above. Besides this we use <th> tag to define a header cell in table.

Attributes of the table tag:

Border :- Defines the size of border

Bgcolor :- Defines the background color

Width :- Defines the width of the table

Height :- Defines The height of the table

Examples:

```
<html><BODY>
```

```
<TABLE border =1 bgcolor= "green" width =40% Height = 40%>
```

```
<tr>
```

```
<td>
```

```
Computer
```

```
</td>
```

```
<td>
```

```
Hardware
```

```
</td>
```

```
</tr>
```

```
<tr>
```

```
<td>
```

```
Software
```

```
</td>
```

```
<td>
```

```
Memory
```

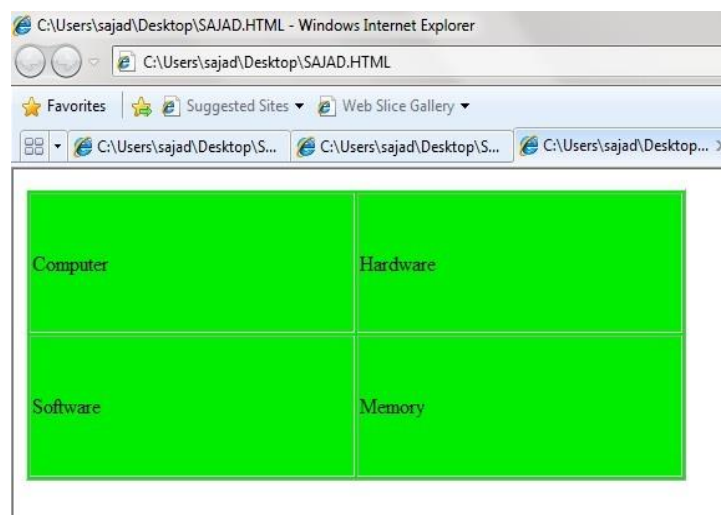
```
</td>
```

```
</tr>
```

```
</table>
```

```
</BODY></html>
```

OUTPUT:



Lists:

Lists play an important role in defining the various types of lists in the web page

There are various types of lists

1. Ordered Lists(Numbered lists)
2. Unordered Lists(Bulleted lists)

We use tag for defining ordered lists

We use tag for defining unordered Lists.

Example:

Ordered List <pre><u>Input</u> <BODY> INPUT DEVICES Keyboard Mouse Microphone </BODY></pre>	<u>Output(On Web Page)</u> <pre>INPUT DEVICES 1 Keyboard 2 Mouse 3 Microphone</pre>
Unordered List <pre><BODY> OUTPUT DEVICES Monitor Printer Speaker </BODY></pre>	<u>Output(On Web Page)</u> <pre>OUTPUT DEVICES . Monitor . Printer . Speaker</pre>

Image Tag:

Images are very important to beautify as well as to depict many complex concepts in simple way on your web page. We can insert any image in your web page by using tag as shown below.

```

```

The tag is an empty tag, which means that, it can contain only list of attributes and it has no closing tag.

Example:

```
<html>
<head>
<title>Using Image in Webpage</title>
</head>
<body>

</body>
</html>
```

Note:

We can use PNG, JPEG or GIF image file based on our comfort but make sure we specify correct image file name in src attribute. Image name is always case sensitive.

- Alternate Text:

The alt attribute is a mandatory attribute which specifies an alternate text for an image, if the image cannot be displayed as shown below.

```

```

- Set Image Width/Height (Resizing)

We can set image width and height based on our requirement using width and height attributes. We can specify width and height of the image in terms of either pixels or percentage of its actual size.

Example:

```
<html>
<head>
<title> Set Image Width and Height </title>
</head>
<body>

</body>
</html>
```

This will set the width and height of image to 150 and 100 respectively.

- Set Image Border:

By default, image will have a border around it, you can specify border thickness in terms of pixels using border attribute. A thickness of 0 means, no border around the picture.

Example:

```
<html>
<head>
<title>Set Image Border</title>
</head>
<body>
<p>Setting image Border</p>

</body>
</html>
```

- Set Image Alignment:

By default, image will align at the left side of the page, but you can use align attribute to set it in the center or right.

Example

```
<html>
<head>
<title>Set Image Alignment</title>
</head>
<body>
<p>Setting image Alignment</p>

</body>
</html>
```

HTML Backgrounds:

The <body> tag has two attributes where you can specify backgrounds. The background can be a color or an image.

- Background Color (Bgcolor)

The bgcolor attribute specifies a background-color for an HTML page. The value of this attribute can be a hexadecimal number, an RGB value, or a color name:

Example:

```
<body bgcolor="#000000">
<body bgcolor="rgb(0,0,0)">
<body bgcolor="black">
```

The lines above all set the background-color to black.

- Background Image (Background)

The background attribute can also specify a background-image for an HTML page. The value of this attribute is the URL of the image you want to use. If the image is smaller than the browser window, the image will repeat itself until it fills the entire browser window.

Example

```
<body background="sajad.gif">
<body background="http://kashmir.edu/html/graphics/clouds.gif">
```

The URL can be relative (as in the first line above) or absolute (as in the second line above). If you want to use a background image, you should keep in mind:

Will the background image increase the loading time too much?

Will the background image look good with other images on the page?

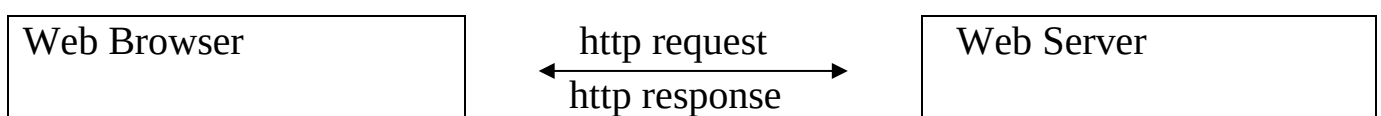
Will the background image look good with the text colors on the page?

Will the background image look good when it is repeated on the page?

Will the background image take away the focus from the text?

Web Browser:

A web browser is software that allows us to view Web Pages. The most common web browser is Microsoft Internet Explorer followed by Google chrome, Firefox, opera etc. The Web browser communicates with the web servers via http protocol.



Web Address:

Each website in the internet possesses at least one internet protocol (IP) address also known as web address.

The IP address is 32 bit (Ipv4) or 128 bit and is given in user-friendly format this we call URL (Uniformly Resource Locator)

Example:

www.computeworld.com is a URL of computer world server and
255.128.196.28 (I.P address)

Web Server:

A web server is a special software capable of servicing http requests from the client, so when we open a web site in our browser(called the client software) a request is sent to the web server on the remote machine. The web server listens to requests, process them and send responses back to client

Client Server architecture:

The Internet revolves around the client server architecture. The Computer which sends the request is called the client and the computer which sends the responses is called the server.

The client is usually a browser such as Internet Explorer interact with the server using a set of instructions called protocols these protocols help in successful communication between client and server

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